Joint Study on aviation capacity in the Sydney region

REPORT TO

Australian Government

NSW GOVERNMENT

Transmittal letter

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Parliament House
CANBERRA ACT 2600

The Hon Barry O'Farrell MP
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March 2012

Dear Minister and Premier

We are pleased to present the Report of the Steering Committee overseeing the Joint Study on aviation capacity for the Sydney region.

The Committee's findings are outlined in the attached Report. They are based on intensive and comprehensive research, and consultation with a range of stakeholders. We commend them to you.

Mike Mrdak
Co-chair

Sam Haddad
Co-chair

Les Wielinga

Warwick Smith

Jennifer Westacott

Warren Mundy

Christopher Brown

Steering Committee

Co chairs

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Director General
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The Hon Warwick Smith AM
The Hon Warwick Smith AM is a former Member of the House of Representatives and Government Minister. He currently holds positions including Chairman of the Australian New Zealand Banking Group (ANZ Ltd) for the State of NSW and ACT; and Chairman of the Advisory Board of Australian Capital Equity Group of Companies (ACE). Mr Smith was appointed in his individual capacity to the Steering Committee.

Ms Jennifer Westacott
Ms Jennifer Westacott is CEO of the Business Council of Australia. Previous appointments include Director of Housing Victoria; Secretary of Education and Training Victoria; and Director General of the NSW Department of Infrastructure, Planning and Natural Resources. Ms Westacott was the lead partner for Sustainability and NSW Government Services at KPMG and had extensive involvement with strategic land use and infrastructure planning in NSW and across Australia. Ms Westacott was appointed in her individual capacity to the Steering Committee.

Dr Warren Mundy FRAeS
Dr Warren Mundy is the Deputy Chairman of the Board of Airservices Australia and a Commissioner of the Productivity Commission. He has extensive experience in public policy, airport planning and infrastructure investment; and holds a doctorate in economics. Dr Mundy was appointed in his individual capacity to the Steering Committee.

Mr Christopher Brown
Mr Christopher Brown is a Director of the University of Western Sydney, LUCRF Super, Tourism Victoria and Moss Capital and chairs the Parramatta Economic Development Forum. Until 2011 he was Managing Director of the Tourism & Transport Forum and Deputy Chair of Infrastructure Partnerships Australia. Previous board roles include the NSW Transport Blueprint Panel, National Tourism Strategy Review and the National Aviation & Tourism Commission. Mr Brown was appointed in his individual capacity to the Steering Committee.

Foreword

We have been asked as a Steering Committee to oversee the development of an effective strategy for meeting the aviation capacity needs for the Sydney region into the future.

Previous studies have examined options for a second Sydney airport and identified potential sites. The terms of reference endorsed by the Australian and New South Wales governments for this Joint Study make it clear that this is not just another site selection exercise. What is called for is a broad examination of the future demand for aviation in the Sydney region, how that relates to the growth of the population and economic activity in the region and how an integrated aviation, surface transport and land development strategy can be developed and implemented over time.

The Steering Committee has started with a clean sheet. The key questions have included whether the expected demand can be met from the existing airport sites, and in particular Sydney (Kingsford-Smith) Airport, if best use is made of those sites. Can Bankstown Airport and RAAF Base Richmond take on roles beyond their current use for general aviation and the RAAF? Is there a case for supplementary airport capacity through upgrading existing sites or opening a new site, and if so when does that become necessary?

These are difficult questions. There is no straightforward measure of the practical capacity of an airport. Demand varies dramatically across peak and non-peak periods. Operational capacity is affected not only by the physical attributes of the infrastructure, but also by factors such as weather conditions, environmental constraints, airspace configuration and the operational choices of the operators. These factors change through time. Capacity pressures build incrementally and their effects are not always obvious, but include delays and lost opportunities for new services.

Airports are not usually presented as positive neighbours. Upgrading operations at an airport or establishing a new airport would raise a range of concerns within the local communities, most obviously around the impacts of aircraft noise. However, airports are also important generators of economic activity and employment for communities. Airports generate jobs. International experience is that airports create 1,000 jobs for every million passengers, with most employment benefits being within the local area of the airport. Airports expand the industry base of local economies, bring new supporting infrastructure and impact positively on local land and property values.

More than ever before, good access to aviation is essential for social and economic development. More and more people are choosing air travel for holidays or for catching up with family and friends. More and more businesses are heavily reliant on aviation for their links with markets, suppliers and other contacts. This is nowhere more important than in Sydney, given its place as Australia's prime international centre for business and finance, our major tourist destination and international gateway and a focus for the professional services sector. This contributes to Sydney (Kingsford-Smith) Airport being one of the key pieces of economic infrastructure in the country.

In this Joint Study, the Steering Committee has been guided by a number of key principles:

- productivity, economic growth and job creation are key objectives;
- safety must not be compromised;
- protection of communities from undue impacts of aviation operations is an important consideration;
- planning for aviation development needs to be integrated with broader planning, including:
  - planning for population growth, including the location of major growth centres, and
  - planning for the operation and development of the broader transport network;
- solutions need to be practical and realistic to implement, with costs and benefits weighed carefully; and
- different approaches will be required over the short, medium and long terms to address the progressive development of demand;

This Report presents a recommended package of actions. There is no single solution and no easy answer.

The need to act is clear. The costs of not acting are substantial.

There is a need to take action without delay to identify and secure a site for a supplementary airport as part of the long term solution. The range of potential airport sites within reach of Sydney has diminished as urban development has spread. If action is not taken quickly, the chance to secure the future of aviation for the Sydney region may be lost altogether.

The Steering Committee considers that adoption of a long-term strategic aviation plan for increasing the capacity of the Sydney region's airports is now critical for Sydney, New South Wales and Australia.

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Key Findings and Directions

- Aviation services are critical in a modern economy. Access to efficient air services for passenger travel and time-sensitive freight is essential to ensuring Sydney's place as an international commercial and financial centre and Australia's foremost tourist destination.
- The Sydney region's demand for aviation services will continue to grow as Sydney's population and business activity grow.
  - The population of the Sydney Metropolitan Area will alone reach 6.2 million by 2036, with another two million in the surrounding region.
  - Demand for Regular Public Transport (RPT) services in the region will double to approximately 88 million passenger trips per year by 2035, then double again by 2060.
- Sydney (Kingsford-Smith) Airport will continue to be the most important airport for the Sydney region and for Australia, both for passengers and freight.
- By 2035 the airport would need to be able to cope with more than 76 million passenger movements and 460,000 aircraft movements. Immediate action is needed to increase the airport's capacity to meet growing demand.
- Airside infrastructure, even with the investments proposed in the *Sydney Airport Master Plan 2009* and the recently announced concept for terminal re-development, will be unable to meet the projected aircraft movements for the medium and longer term, notwithstanding the use of larger aircraft and increased load factors.
  - The airport has limits to its ability to handle passenger growth not only because of the legislated cap on runway movements per hour but also because of the physical constraints on runway length, constraints on taxiway, gate and apron development and the commercial mix of services operating to the airport. The physical constraints at Sydney (Kingsford Smith) Airport and airline operational issues limit the scope for continued upgauging of aircraft.
- Under current constraints, Sydney (Kingsford-Smith) Airport will become unable to meet demand for new services.
  - By 2020, all slots on weekday mornings between 6.00am and 12noon and between 4.00pm and 7.00pm will be fully allocated, so growth of passenger capacity at these times will be dependent on aircraft upgauging.
  - By around 2027, all slots will be allocated, so no new entrants can be accommodated, unless another service is cancelled.
  - By around 2035, there will be practically no scope for further growth of RPT services at the airport.
- The growth in demand and increasing capacity pressures will result in:
  - increasing delays and costs for all operations as the airport cannot sustain a peak hour handling rate of 80 movements per hour for more than a limited number of consecutive hours owing to taxiway and apron congestion. Delays will be especially felt when the airport experiences reductions in capacity owing to weather events as the capacity of the airport to recover is limited if all slots are fully allocated;
  - reduced capacity to cater for new services at commercially viable times for airlines;

  - reduced capacity to 'noise share' and provide respite for those communities affected by parallel runway operations. By around 2020, the noise sharing modes will only normally be available in early mornings and late evenings; and
  - increased congestion on the surrounding roads and surface transport system.
- Investment in airfield infrastructure is required now to minimise delays and loss of potential services as operations continue to grow and the airport approaches its peak period capacity. Early additional investment in the airport's road and rail connections is also essential.
  - At the current capacity of eight trains per peak hour from the airport to the Central Business District (CBD), by 2013, services past the airport in the morning peak will be full before they reach the airport stations.
  - From 2015, the capacity of existing road junctions at the entrance to the domestic terminal precinct will be exceeded, resulting in a near constant traffic jam on key roads to the CBD and the M5 motorway.
- Sydney (Kingsford- Smith) Airport's Master Plan includes a staged upgrading of terminals and an increase in the number of gates. In December 2011, SACL announced a new concept for the use of the terminals. These proposals may offer improvements to efficiency, but do not provide long term solutions for capacity.
- The Steering Committee has considered changes to the regulatory arrangements for operations at Sydney (Kingsford-Smith) Airport to increase the capacity.
  - Advice from Airservices Australia is that the physical capacity of the runway system and airspace could support a limited increase in the movement cap from 80 to 85 movements per hour provided adequate gate and taxiway capacity is available. This could allow the airport to cope with growth for an extra few years but is not a long term solution.
  - The Committee does not support any change to the curfew.
  - The Committee is conscious of the importance of access to Sydney for regional communities and does not support the forced movement of existing regional operations to another airport.
  - There is no scope to extend the site of Sydney (Kingsford-Smith) Airport to increase the capacity of the runway system to address the underlying constraint on long term capacity.
- Not acting to implement a long-term strategy will have adverse economic costs for Sydney, New South Wales and Australia. Sydney's airports are a national infrastructure investment and productivity issue, which Australia must address.
- The other existing airports in the region should each take important roles but not as a second major airport for Sydney.
  - Newcastle Airport at RAAF Base Williamtown is too far from the Sydney market to serve as Sydney's second passenger airport. It is an important airport for the Hunter and Central Coast regions but its capacity to grow in the future needs to be settled, having principal regard to RAAF's requirements for the site as its primary fighter base.
  - Canberra Airport is also too far from the Sydney market to serve as Sydney's second major RPT airport but will grow to serve the southern NSW region and is the only airport capable of accommodating substantial overnight air freight operations for the region. It is important to protect Canberra Airport's expansion plans and curfew-free status.

- Bankstown Airport has an important role as Sydney's main general aviation airport but could be made available for a level of RPT operations by turboprop aircraft to provide an extra option for growth in that sector.
- RAAF Base Richmond could be opened to a level of civil traffic using the existing runway on a shared basis with RAAF. This would provide better access to aviation services for the northwest and additional employment opportunities, as well as underpinning RAAF's continued presence in the area.
- These airports are not expected to divert any significant level of future demand from Sydney (Kingsford-Smith) Airport, but rather will improve access to aviation services and generate related employment for a number of communities.

• From around 2030, an additional airport will be needed to supplement the capacity of Sydney (Kingsford-Smith) Airport.
  - To provide for this requirement, governments will need within the next five years to have determined the location and commenced investment into another airport site capable of handling large RPT aircraft.
  - Activity at the new airport might be expected to grow over time as an airport for Western Sydney, accommodating growth for the broader Sydney region that could not readily be provided at Sydney (Kingsford-Smith) Airport. This is likely to include some limited international services in particular by new entrant carriers such as the growing group of low cost international carriers.
• The Badgerys Creek site, which was acquired by the Commonwealth between 1986 and 1991 for a future airport, remains the best site for an additional major RPT airport.
  - It is located close to growing markets in the western regions of Sydney and close to road and rail transport links. In turn, it would provide the vitally important employment and economic opportunities for the growing western Sydney community and will be a significant catalyst to expedite the much needed supply of housing.
  - The site has been protected from encroaching development and given that the Commonwealth owns the land it would be less costly and disruptive to the community as a development site than other options.
  - The Steering Committee is conscious of commitments and statements indicating that governments no longer see the site as suitable for airport development. The decision is one for governments, but a decision is required now to confirm whether or not an airport will be built at Badgerys Creek.
• If Badgerys Creek is not ruled out, work should begin immediately to update the Environmental Impact Statement, and to plan towards the development of the first stage of the airport (single runway).
• If Badgerys Creek is ruled out, Wilton is the next best site and processes should be put in train to secure the site and undertake the full environmental assessment and airport planning processes required to protect and prepare the site for future development.
• Wilton is further than Badgerys Creek from Sydney and the current growth centres. While Sydney's growth is expected to spread to the southwest in the long term, the business case is likely to be harder to establish for an operational airport at Wilton by 2030.
  - In the interim, action should also be put in place to open RAAF Base Richmond to a level of RPT operations, noting that this will help ensure ongoing RAAF use of the Base.

- The communities around Richmond and Windsor are likely to be concerned at the potential impacts of even a relatively low level of jet RPT operations at RAAF Base Richmond and the Steering Committee notes that early and ongoing consultation, including under relevant environmental legislation would be required to identify potential environmental impacts.

- There is a need to act quickly to finalise a decision on a site for a supplementary airport and secure it, even if an airport may not need to operate at the site in the short term.
  - Further delay will rule out the remaining potential sites.
- The economic costs are substantial if Sydney's future aviation demand cannot be met.
  - By 2060, the economy-wide impacts, in 2010 dollars, across the Australian economy could total $59.5 billion in foregone expenditure and $34 billion in foregone gross domestic product.
  - 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 (GSP).
  - The number of total jobs that will not be created is estimated to grow over time as unmet demand increases. This is averaged to be 12,700 in NSW and 17,300 nationally over the period from 2011. In 2060 alone, the annual estimate of foregone jobs is approximately 57,000 in NSW and 77,900 nationally.
- The current consideration of a future east coast High Speed Rail (HSR) system linking Sydney to other major cities does not remove the need to provide additional aviation capacity. HSR and expanding aviation services are not mutually exclusive and HSR will not address many of the key drivers for aviation growth at Sydney (Kingsford-Smith) Airport. The extent to which HSR would reduce the demand for air travel to Sydney will depend on the relative effectiveness (in terms of price, frequency and travel times) of the HSR services offered and the timing of its construction.
  - The cost to governments of the construction and operation of the HSR system would be high relative to the cost of providing additional capacity expansion of the aviation system. HSR will not provide the services to fully address the growth of international and domestic peak business traffic and the limits on aviation capacity. Meanwhile, the associated economic costs to NSW and Australia of limited aviation capacity are rising quickly.
- The Steering Committee well understands why solving the issues raised in this review have been contentious. However, the option of doing nothing is no longer available and the costs of deferring action are unacceptable.
- The spread of urban development in the Sydney basin means it is already very difficult to find a suitable site for a second RPT airport. The Joint Study has found that there is no optimal site that satisfies everyone. However, the options have now become very limited.
- The opportunity to secure a suitable site is likely to disappear altogether if action is not put in train now.
- The Steering Committee is of the very strong view that to address the capacity issues of the Sydney region an integrated aviation and land use planning strategy is required that includes three core elements.
- Optimise the use of Sydney (Kingsford-Smith) Airport as the primary airport for Sydney and NSW for RPT international, domestic and regional passengers, by ensuring that

it operates efficiently and safely, and can grow to its maximum practical operational capacity. Key actions include:

  - lift the statutory movement cap from 80 to the 85 movements per hour in peak hours each weekday to enable greater rates of handling of peak hour traffic and take action to ensure the optimum use of larger aircraft;
  - increase the take-up of public transport to the airport precinct, by making fares for services to and from the airport stations comparable to normal CityRail fares;
  - commence work on the detailed planning required for a program of surface transport works to improve the connections to the airport and the surrounding precinct, including key connections such as the M4 and M5 motorways, a commitment to investment in suitable rolling stock and train paths, and expansion of the Sydney bus network to the airport; and
  - immediately initiate a new Master Plan process, including a firm program for upgrade works to provide for the expected shortfall of gates, manage the runway balance utilisation requirements and limit any increase in taxiway congestion in the short term.

- Protect and optimise the use of other existing airports in the Sydney region. Key actions include:
  - develop a joint strategy for accommodating growth in aviation demand for the Hunter and Central Coast regions;
  - ensure that Canberra Airport is protected from encroaching noise-sensitive urban development incompatible with expansion of the airport over time into a significant domestic and international aviation centre for both passenger and freight services for south-eastern Australia;
  - use the Master Plan process to resolve a strategy to allow Bankstown Airport to accommodate RPT operations by smaller turbo-prop RPT aircraft, including in particular regional services, as slots for additional services become unavailable at Sydney (Kingsford Smith) Airport; and
  - initiate action to progressively open RAAF Base Richmond to a level of civil traffic using the existing east-west runway alignment.
- These actions will assist in meeting some future demand, however to meet long term demand, there is a need to act now to select a site for a new supplementary airport, capable of accommodating another full service airport for the Sydney region in the long term, and commence planning for its operation while monitoring aviation growth to ensure operations commence at the appropriate time.

Overview

This Joint Study examines the aviation needs of the Sydney region and how they can be met over the short, medium and long term. It was commissioned jointly by the Australian and New South Wales governments, with broad terms of reference aimed at achieving an effective aviation strategy for the future, integrated with the broader planning for land use, development and transport in the Sydney region.

A key element of the Study has been to identify how to get the most out of Sydney (Kingsford-Smith) and other existing airports. This has been much more than just another site selection study for a second Sydney airport.

Aviation services are critical in a modern economy. They are particularly important in the case of Australia's economy which has a strong focus on export markets and global tourism and services sectors. Access to efficient air services for passenger travel and time-sensitive freight adds to the value of businesses and also to quality of life for Sydney residents. A failure to address the need for aviation infrastructure into the future would put at risk Sydney's place as an international commercial and financial centre and Australia's foremost tourist destination.

The demand for aviation services for Sydney will continue to grow as Sydney's population and business activity grow. Any shortfall in capacity to meet the demand as it increases will affect future economic growth, productivity and employment. It will also affect amenity and social outcomes, as record numbers of Australians choose to travel by air for leisure, family or social reasons.

Sydney now and in the future

The Sydney region is home to approximately six million people, with more than 4.2 million in the Sydney Metropolitan Area. Australian Bureau of Statistics forecasts indicate the population of the Sydney Metropolitan Area is expected to reach 6.2 million by 2036, with a compound annual growth rate of about 1.2 per cent per year. By 2056, the population is estimated to reach between seven and 7.5 million.

The NSW Metropolitan Plan 2036 projects the greatest population growth will occur in Sydney's South West, North West and West Central subregions, with proportional growth also expected in the Central Coast subregion as shown in Table 1.

Table 1 Population projections for Sydney subregions (population in thousands)

Sydney	2010	2036	Growth to 2036
City of Sydney	182.2	264.8	82.6
East	299.0	334.0	35.0
Inner North	318.3	378.9	60.6
Inner West	247.8	307.0	59.1
North	278.2	321.2	43.0
North East	247.6	277.0	29.4
North West	815.7	1155.6	339.9
South	688.9	747.6	58.7
South West	439.6	874.8	435.3
West Central	738.5	896.6	158.1
Central Coast	319.7	424.7	104.9
Total	4,577.5	5,982.1	1404.5

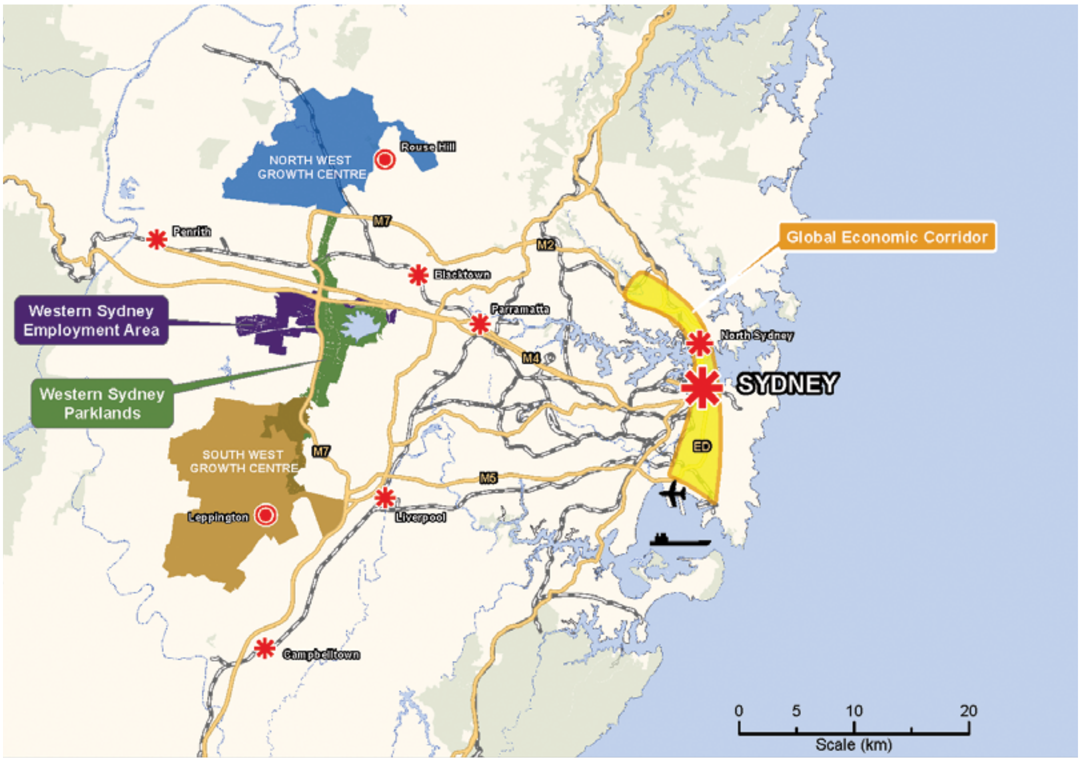
Source: NSW Metropolitan Plan for Sydney 2036

Beyond 2036, the only direction in which Sydney's growth can realistically spread is to the southwest.

The planning for this population growth will need to be aligned with plans for employment generation, infrastructure provision and access to services, including aviation services. Figure 1 highlights the key growth centres for Sydney.

Planning for the surface transport network is a key element. Sydney (Kingsford-Smith) Airport is located close to Port Botany within the Global Economic Corridor, a key precinct for business growth in Sydney. The NSW Metropolitan Plan for Sydney also set challenging targets for residential infill developments for areas close to the airport. Business and residential growth in surrounding areas, combined with continued growth of aviation activity at the airport, will add to existing pressures on the roads and public transport systems. Unless there is effective investment, this will lead to overloading and congestion in the transport network.

Figure 1 **Map of Sydney's key growth centres**



Source: NSW Metropolitan Plan for Sydney 2036

Demand for aviation in the Sydney region

On conservative forecasts of less than three per cent growth per year, demand for aviation Regular Public Transport (RPT) services in the Sydney region will double to nearly 88 million passenger movements by 2035, growing to 165 million passenger movements by 2060. Table 2 shows the unconstrained forecast demand for passenger and aircraft movements in the Sydney region and at Sydney (Kingsford-Smith) Airport.

Table 2 **Unconstrained forecast demand, 2010 to 2060**

Type	Current (2010)	Forecast for 2020	Forecast for 2035	Forecast for 2060
Sydney region passenger movements	40.1 million	57.6 million	87.4 million	164.6 million
Sydney (Kingsford-Smith) Airport passenger movements	35.7 million	50.6 million	76.8 million	145.7 million
Sydney region RPT movements	344,500	421,200	528,600	800,800
Sydney (Kingsford-Smith) Airport RPT movements	286,600	343,300	428,900	652,700
Sydney region total aircraft movements	0.8 million	0.9 million	1.2 million	1.5 million
Sydney (Kingsford-Smith) Airport total aircraft movements	311,400	369,000	459,600	699,500

Source: Booz & Company analysis

In the absence of other RPT airports close to Sydney, this growth will focus on Sydney (Kingsford Smith) Airport. In 2035, the airport would need to be able to cope not only with close to

80 million passenger movements per year (double the current number) but with nearly 430,000 annual RPT aircraft movements (an increase of nearly 50 per cent).

The challenges of coping with growth

Sydney (Kingsford-Smith) Airport will continue to be the major focus for international and domestic airlines operating to Sydney, both for passenger and freight services. It is well connected to both the major road and urban rail networks. Its location has been central to its success. A key consideration for the Steering Committee has been how to make the most of Sydney (Kingsford-Smith) Airport and the extent to which its capacity can be expanded to cater for this demand.

Sydney (Kingsford-Smith) Airport has identified its proposals for operation and development of the site. The *Sydney Airport Master Plan 2009* (the Master Plan) sets out a series of proposed enhancements to terminals, gates and taxiways to help meet demand to 2029.

In December 2011, Sydney Airport Corporation Limited (SACL) announced a new concept for improving the efficiency of operations and improving the passenger experience. The new concept involves reconfiguring the use of the two terminal precincts so that the Qantas Group and its partners would operate from what is currently the domestic terminal precinct and the Virgin Australia Group and its partners would operate from the current international terminal precinct.

The proposal is in the early stages of development. If the new concept is found to be viable and brought to fruition, one of the benefits will be to make more space available than anticipated under the Master Plan in the terminal precincts for future development of additional gates and apron.

The Steering Committee supports SACL's goal to improve the passenger experience, the efficiency of gate utilisation and the efficient operation of the international and domestic terminals by improved aircraft utilisation. The SACL proposal seeks to address some key issues identified by the Steering Committee, namely the availability of gates and apron for new larger aircraft and enhancing safe and efficient ground movements by aircraft on the taxiway system.

The Steering Committee notes the complexity of the changes proposed under the new concept and the challenges in developing the details of the proposal and negotiating agreement with all the major stakeholders. While welcoming the objectives of the new concept, the Steering Committee notes it is important that the investment urgently required in enhancements to gates, aprons and taxiways is not delayed while the planning and negotiation processes proceed. The Steering Committee also notes that while the changes as proposed under the new concept may improve the utilisation of the airport's current capacity, they do not add significantly to that capacity. In particular, they do not remove the underlying limitations of the runway system and the small airport site. SACL has yet to demonstrate the ability of the new concept to ensure the airfield delivers a consistently efficient hourly throughput or to help address the growing landside transport systems constraints.

There is no straightforward measure to determine the practical capacity of an airport. Operational capacity is affected by the physical attributes of the site and its infrastructure, but also by factors such as weather conditions, environmental constraints, airspace configuration and the operational choices of operators. The capacity for an airport to cope in peak periods will be a key factor, as demand will always vary across peak and off-peak periods. As an airport approaches capacity, indications of capacity pressures appear progressively in the form of congestion and delays, disruption to schedules and loss of potential opportunities for new services.

At Sydney (Kingsford-Smith) Airport, the limitations of the existing infrastructure will start to have a significant effect on airport operations from around 2015.

Assessment conducted, comparing the infrastructure availability in SACL's Master Plan with the aviation activity forecast in this Joint Study, indicated that by 2015, unless work is brought forward on additional gates and apron, there could be a shortfall of 25 aircraft stands to meet projected demand. This shortfall would have greatest impact on international arrivals during the morning peak period. This shortfall would to some extent be addressed by the implementation of the SACL planned Master Plan works and the announced terminal redevelopments.

By 2020, there would be an estimated shortfall of 19 stands, assuming the development program proposed in the Master Plan has been implemented.

Taxiway capacity also becomes an issue where there is congestion arising from a shortage of gates or parking stands or when queues develop as a result of the imbalance between uses of the two parallel runways.

While the initial pressures on gates and taxiways can be addressed to some extent in the short term through investment and operational improvements at the site, in the long term, the underlying limitations of the site mean that Sydney (Kingsford-Smith) Airport will not be able to cope with the forecast growth. In particular, the clear limits to the runway system, arising from the length and spacing of the runways and the international requirements for aircraft separation cannot be overcome.

By around 2035, the capacity pressures identified in terms of aprons, gates and taxiways will lead to major impacts and costs.

Physical constraints of the airport site

The capacity for Sydney (Kingsford-Smith) Airport to continue to grow to meet demand is affected by a number of factors.

The site measures some 907 hectares, small by comparison to other major airports in Australia and overseas. The site has operated as Sydney's main airport since 1920 and, has been developed and expanded over time, including by extending runways to the south into Botany Bay. Any further extension of the site is limited by urban development and by Botany Bay to the south, the Cooks River to the west and Port Botany to the south-east.

The particular configuration of the runways, taxiways, terminals and aprons arises from the staged development of the site over time and the constraints of the site. It does not reflect the optimal layout for terminals and runways at a major airport.

There are currently three runways: the main runway 16R/34L at 3,962 metres long, the parallel north-south runway 16L/34R at 2,438 metres and the single east-west cross runway 25/07 at 2,530 metres.

If weather prevents the use of the dual parallel runway system, the capacity is limited to a maximum of around 55 movements per hour – well below the current demand during substantial periods of the day. The length of the cross runway means that it is not suitable for use by all large aircraft operations.

There is a variety of limitations on runway 16L/34R due to its shorter length. For example, the taxiway fillet design does not cater for long wheel base aircraft such as the B777-300. Standard operating procedures also generally preclude aircraft greater than B767 from using that runway. This creates an imbalance between the two parallel runways and reduces the capacity to operate the parallel runway system efficiently.

In the long term, the runway imbalance will limit the scope for continued increases in the use of very large aircraft as a key element in the strategy to handle growing traffic within the constraints of the site.

The constraints of the small airport site also rule out any significant realignment of runways or rationalisation of the taxiway and apron systems.

At current demand levels, the existing stands and apron areas are already heavily utilised at each terminal during peak times. Growth in aircraft movements, particularly in peak times, will require additional gate capacity in the near to medium-term.

There is already a requirement to tow aircraft off to remote stands, particularly from the international terminal, to free up gate availability. This has flow-on effects to the runways and taxiways.

The capacity of the runway system is limited both by physical constraints and a legislative cap set on the maximum movement rate. Commonwealth legislation sets a cap on the rate of aircraft movements on the runways at 80 movements per hour. The legislation was introduced in conjunction with the commissioning of the parallel runway and is aimed at providing a level of protection to communities affected by increased operations at the airport, in particular from the impacts of aircraft noise. In line with the movement cap, slot allocations to operators are managed so that no more than 80 movements are scheduled in any hour.

The capacity of the runway system is also affected by the requirement to maintain the safety of operations. International standards apply to the separation of aircraft in the airspace around the airport and on the airfield itself.

Analysis by Airservices Australia indicates that in good weather conditions, the parallel runway system could physically cope with between 85 and 87 runway movements per hour, provided that taxiway and gate capacity is available. Airservices Australia advises that the airport's sustainable capacity for scheduling of services would not exceed 85 movements per hour.

In peak times, the movement rate is already at or close to the legislated cap of 80 runway movements per hour, noting that on many occasions this rate cannot be achieved in practice due to weather conditions.

The practical effects if Sydney's aviation demand cannot be met

Even on conservative forecasts, demand is expected to more than double to 76.8 million passenger movements in less than 25 years (by 2035).

Notwithstanding the expectations for higher load factors and continued upgauging to larger aircraft, demand for aircraft movements will also continue to grow. The effects of pressure on Sydney (Kingsford-Smith) Airport's capacity will progressively grow as movement numbers continue to increase. These include increased costs and delays, lack of access for new services at preferred times of operation, reduction in noise sharing and periods of respite for affected residents around the airport and increased traffic congestion.

As Sydney (Kingsford-Smith) Airport becomes increasingly unable to cater effectively for the growth, it will result in:

- **Increased delays for all operations**

Currently delays on the taxiways and aprons are estimated to be approximately six minutes for each arrival and twelve minutes for each departure during peak period movements.

Capacity pressures at the airport will contribute to increases in these delays. These will be exacerbated when the airport experiences reduction in capacity due to factors such as non visual conditions resulting from rain, storms, low cloud or fog, or when winds require use of the cross runway.

The capacity of the airport to be able to recover from periods of reduced capacity will also be more limited. Delays occurring in the morning peak will flow on to affect later services and will not be able to be recovered for much of the day, with flow on consequences across the national network.

- **Reduced capacity to grow new services**

There will also be reduced capacity to cater for new services.

By 2020, all slots on weekday mornings between 6.00am and 12.00noon and afternoons between 4.00pm and 7.00pm will be fully allocated and there will be no slots available for any new services. By around 2027, no slots will be available for new services across the full day at Sydney (Kingsford-Smith) Airport.

In practice, the capacity pressures will lead to loss of opportunities for new services well before the available slots run out. Airlines will have limited scope to shift proposed new services to a different schedule if their preferred slots are not available. They will be restricted by a range of factors relating to aircraft utilisation, operating restrictions such as slots or curfews at other airports and the commercial demands of their customers.

Airlines proposing new services require suitable slots for both arrival and departure and also normally require a series of slots for services at the same time on several days of the week if not the whole week. It is already difficult to find such a series of slots in the morning peak and it will become increasingly difficult at other times of day.

Sydney will increasingly be unable to benefit from the growth in new services that the growth in demand would otherwise support. This includes benefits from growth in the key international markets such as China and the next generation of low cost carriers and new entrant products.

- **Reduced capacity to 'noise share' by providing relief from parallel runway operations**

The growth in operations at Sydney (Kingsford-Smith) Airport will also lead to loss of the capacity to share noise and provide respite in accordance with the Long Term Operating Plan (LTOP).

By 2015, nine hours of the weekday will have demand levels exceeding 55 movements per hour, the approximate point beyond which the LTOP noise sharing modes can no longer be operated and parallel runway operations are required.

By 2020, demand in all the hours between 7.00am to 1.00pm and 3.00pm to 8.00pm will be above 55 aircraft movements per hour. For the communities most affected by aircraft noise, noise sharing modes which provide respite will only be possible in the evenings after 8.00pm and for a small number of weekend hours.

- **The surface transport systems in the airport precinct will not cope**

Continued growth of operations at the airport will also lead to overloading of the ground transport linkages to the airport.

Current roads and intersections at the entrance to the airport Domestic Terminal precinct are expected to reach a critical point as early as 2015. Unless substantial investment is made in upgrading the ground transport network, by 2023 road traffic to and from the airport will experience substantial delays and a near constant traffic jam on key roads around the airport, the links to the CBD and the M5 Motorway.

At the current level of operations, train services to the city travelling via the airport will reach capacity by 2013 in the morning peak period. Even with the increase to 12 trains per hour proposed, the morning peak period will be at capacity by 2018 for CBD-bound trains.

The cost of doing nothing is substantial

A shortfall in airport capacity, if unaddressed, would inevitably lead to substantial economic costs and loss of productivity, particularly in the NSW economy but also in the broader Australian economy.

On conservative estimates, by 2060 demand for RPT services would exceed capacity by 54 million passenger movements per year. The cumulative total of unmet demand would be approximately 665 million passenger movements between 2035 and 2060.

As weekday peak slots become full, impacts will emerge including:

- passengers experiencing higher airfares and more difficulty finding available seats;
- redistribution and suppression of services (including nearly 14,000 passenger trips in 2016); and
- direct expenditure in NSW being $200 million per year lower by 2015, $500 million per year lower in around a decade's time, and the amount foregone continuing to increase.

By 2060 the economy-wide (direct and flow-on) impacts across all sectors of the Australian economy could total $59.5 billion in foregone expenditure and $34.0 billion in foregone gross domestic product (GDP) (discounted to 2010 dollars).

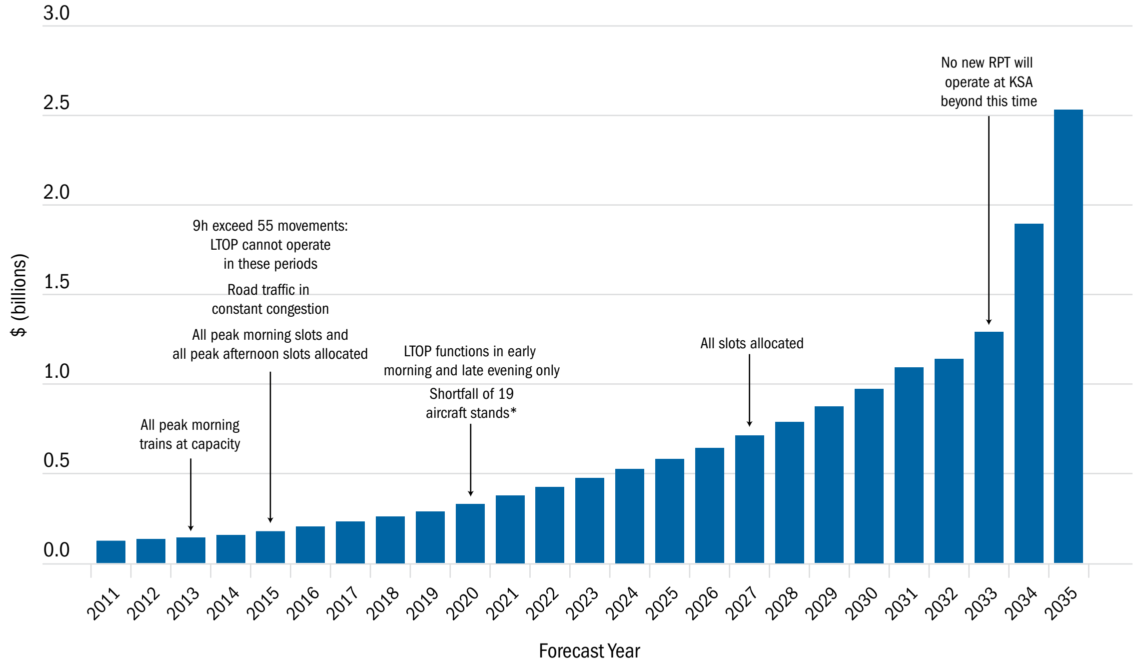
The NSW economy would be especially heavily affected, with losses across all industries totalling $30.6 billion in foregone expenditure and $17.5 billion in foregone gross state product (GSP) (discounted to 2010 dollars).

The number of total jobs that will not be created is estimated to grow over time as unmet demand increases. This is averaged to be 12,700 in NSW and 17,300 nationally over the period from 2011. In 2060 alone, the annual estimate of foregone jobs is approximately 57,000 in NSW and 77,900 nationally.

- **Direct economic impacts on aviation and related industries**

As shown in Figure 2 and Figure 3, the forecast economic costs due to capacity constraints would be significant and steadily growing in the medium term, but would then grow at an accelerated rate from around 2035 once the scope for further growth of new services at Sydney (Kingsford-Smith) Airport is effectively exhausted.

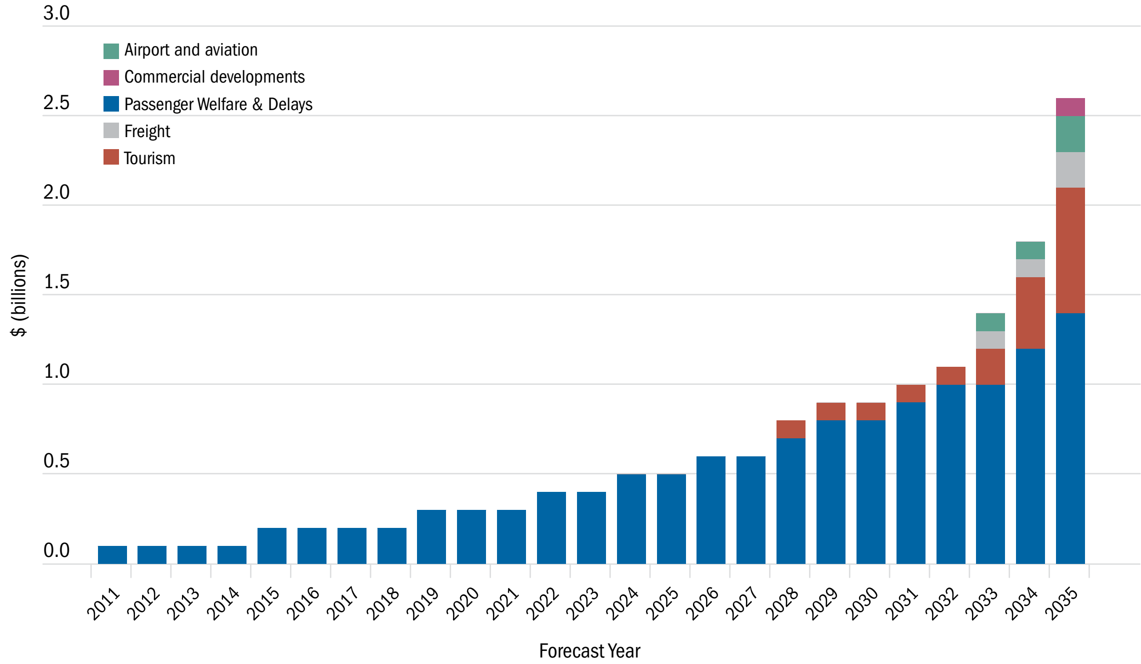
Figure 2 **Key impacts and foregone NSW direct expenditure, 2011 to 2035 (medium scenario, undiscounted)**



Note: Shortfall in aircraft stands assumes the development program proposed in the Master Plan has been implemented

Source: Australian Department of Infrastructure and Transport and Ernst & Young

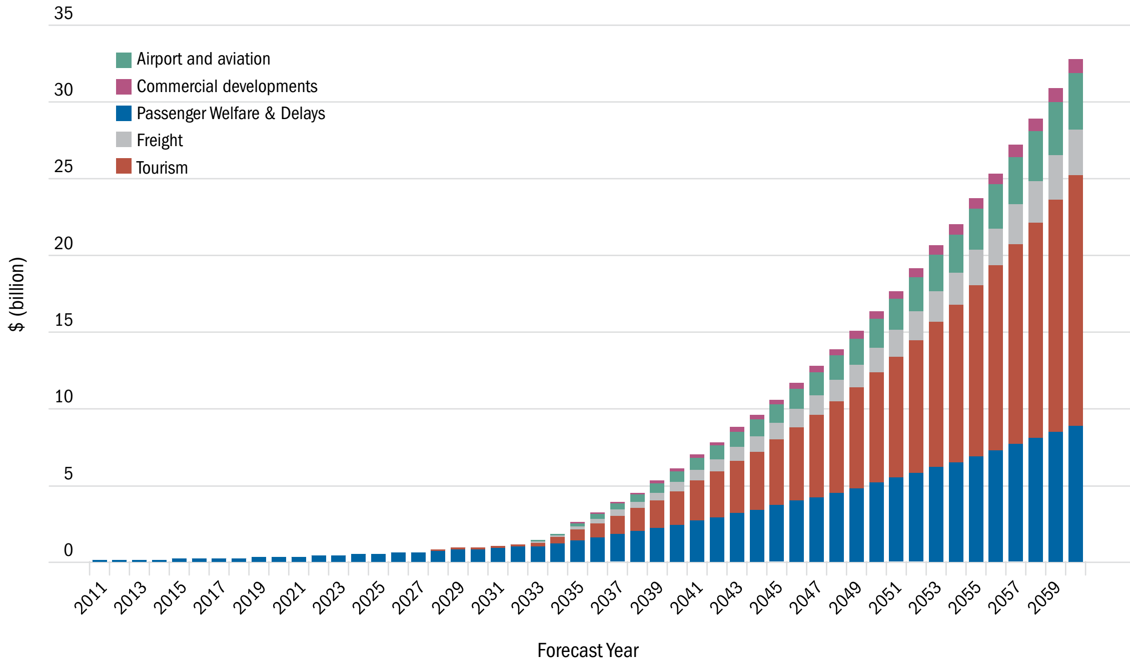
Figure 3 **Foregone NSW direct expenditure, 2011 to 2035 (medium scenario, undiscounted)**



Source: Ernst & Young

Figure 4 shows the forecast economic costs to NSW through to 2060.

Figure 4 Foregone NSW direct expenditure, 2011 to 2060 (medium scenario, undiscounted)

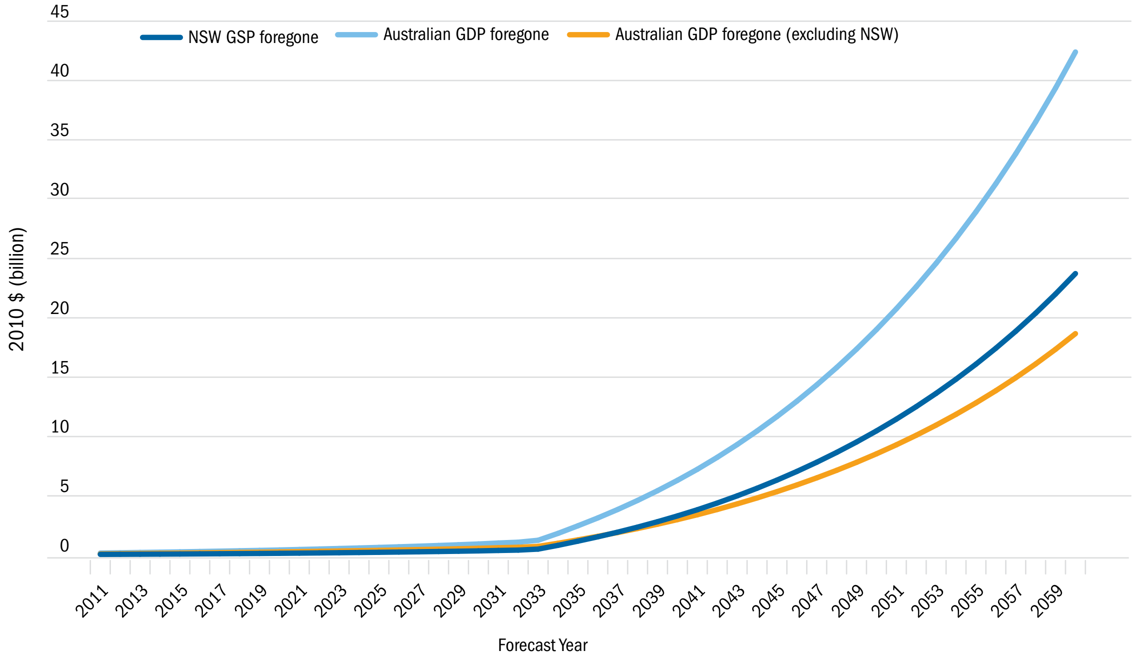


Source: Ernst & Young

- **Total (direct and flow-on) impacts on the broader economy**

The profile of total (direct and flow-on) economic activity lost to NSW and Australia in terms of GSP and GDP is presented in Figure 5.

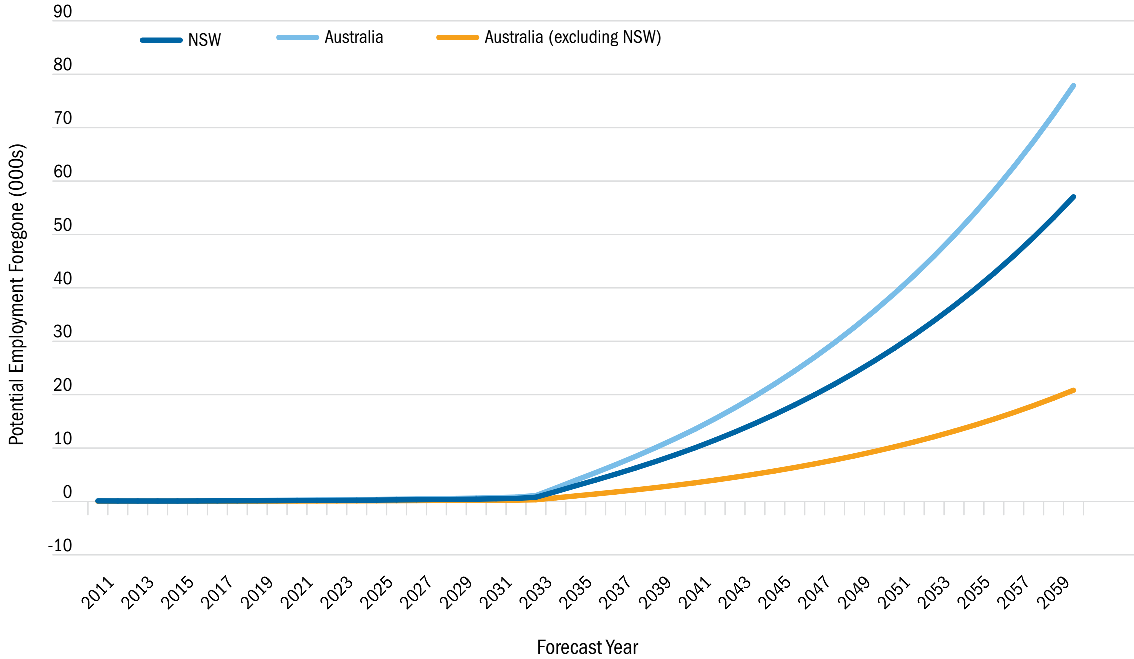
Figure 5 **NSW GSP and national GDP (medium scenario, 2010 dollars, $ billions)**



Source: Ernst & Young

The impacts on foregone direct and flow-on employment are presented in Figure 6.

Figure 6 **NSW and Australia employment outcomes (medium scenario)**



Source: Ernst & Young

Strategies for meeting the Sydney region's aviation infrastructure needs

It is not possible to provide a single simple solution to meet the Sydney region's aviation needs.

A co-ordinated suite of measures is required to address pressures across the short, medium and long-term.

Sydney (Kingsford Smith) Airport is one of the most economically significant pieces of infrastructure in Australia and will remain the primary international, domestic and regional airport for the Sydney region. Given its location next to the Sydney CBD, and its proximity to the market catchment for business, freight and leisure travel, and taking into account the existing sunk and programmed investment in infrastructure, the airport will continue to be the focus of demand particularly for peak business and high value air freight.

There is no realistic option of developing an alternate major airport to replace Sydney (Kingsford-Smith) Airport or displace its primary role. It is necessary to provide for the growth which will continue to focus on the airport. Sydney (Kingsford-Smith) Airport needs to be able to meet the forecast demand and operate safely and efficiently to its full capacity, within the limitations imposed by the legislated curfew and demand management scheme.

There are important measures that can be taken at Sydney (Kingsford-Smith) Airport and the other existing airports to get the most out of the existing sites. These would delay by a few years the worst impacts of the capacity shortfall, but they do not represent solutions for the long term.

The Steering Committee considers that:

- Increasing the capacity of Sydney (Kingsford-Smith) Airport by expanding the size of the airport or by developing additional runways in the Botany Bay region are not realistic options.
- Options for changing the legislated cap on hourly movements would provide some additional capacity, but will not meet the capacity gap in the medium and long term, particularly in the peak periods. Increasing the movement cap to 85 movements per hour (the practical capacity for the runway configuration) for all non-curfew hours would only provide a six per cent increase in the total slots available to be allocated.
- Limiting the growth of new services by smaller aircraft at Sydney (Kingsford-Smith) Airport would assist in reserving the remaining available slots for larger international and domestic aircraft and lead to more efficient use of the asset. However, it would not meet the medium to long term capacity gap and it would adversely impact regional air travellers and regional communities' access to the Airport.
- Bankstown and Richmond aerodromes can be upgraded and made available to cater for a level of civil RPT traffic. However, Bankstown and Richmond can only meet segments of the RPT market with their existing site configurations and they do not provide a solution to the capacity needs of forecast international and domestic RPT services.
- Canberra and Williamtown aerodromes cannot take the role of Sydney's second RPT airport, but need to be protected to grow to meet forecast segments of their catchment markets, including overnight air freight at Canberra.
- The consideration of a future High Speed Rail (HSR) system linking Sydney to other cities does not remove the need to act to provide additional aviation capacity. HSR and additional aviation capacity should not be considered mutually exclusively. HSR could provide an alternative for some domestic travel between cities in south eastern Australia, but is not an alternative for much of the Sydney aviation passenger demand. There is

a range of factors including frequency, travel time, cost and station location which will affect the extent of substitution. HSR cannot be expected to be the solution for aviation capacity challenges.

It is clear that by 2030, a second RPT airport will be required to be operational to supplement the capacity of Sydney (Kingsford-Smith) Airport. To provide for this requirement, governments will need within the next five years to have determined the location and commenced investment into another airport site capable of handling large RPT aircraft.

Importantly, a new airport site will provide the employment and investment drivers which will address the employment and services gap that will result from the projected population growth in Western Sydney. The growing populations in the growth centres require access to employment nodes, transport services and access to aviation facilities. Airports are important generators of economic activity and employment for communities. This is evidenced by the growth of airports as business hubs since the lease of Australia's major airports.

International experience is that airports create 1,000 direct new jobs for every million passengers, with most employment being within the local area of the airport. Airports expand the local business base and bring supporting infrastructure and impact positively on local land and property values. The Steering Committee considers that establishing a new major airport site will provide the significant employment and investment drivers which Sydney's spatial growth requires. In the absence of such development the existing employment and services disadvantage faced by Western Sydney will continue.

The Committee considers that there are three key parts of the strategy which needs to be put in place by Australian and NSW governments, the aviation industry and the community to meet the Sydney region's long term aviation infrastructure requirements and maximise community economic and environmental outcomes. These are to:

- Optimise the use of Sydney (Kingsford-Smith) Airport for RPT international, domestic and regional passengers by ensuring that it operates efficiently and safely, and can grow to its practical maximum operational capacity;
- Protect and optimise the use of the other existing airports in the Sydney region; and
- Select and confirm the site for a new supplementary airport for the Sydney region. The new site should be capable of eventually accommodating a full service airport serving all market segments.

Optimising Use of Sydney (Kingsford-Smith) Airport

Ensuring that Sydney (Kingsford-Smith) Airport operates efficiently and safely, and can continue to grow to its maximum practical statutory capacity is critical to Sydney's and Australia's economic development.

SACL's Master Plan and program of investment in airport infrastructure

Investment is required urgently in airport infrastructure to address current pressures and the additional demands of continuing growth. In the Master Plan, SACL identified a range of works to upgrade taxiways, gates and terminals. These works were to be undertaken on a staged basis, with some identified for completion by 2019 and the balance by 2029. These works need to be brought forward.

More recently, SACL announced that it is developing a revised concept for use of the terminals. SACL's objectives for the proposal are to improve passenger experience through faster connection times and more efficient airline and airport operations. SACL is working with its stakeholders to progress the proposal. However, a number of key issues remain to be resolved, with details and funding arrangements to be negotiated, before any formal decisions can be made to proceed.

The Steering Committee welcomes the intentions to improve the passenger experience and efficiency of operations on the site but notes the need to finalise issues quickly so that essential investment is not delayed.

Recommendation 1

A plan of investment for Sydney (Kingsford-Smith) Airport needs to be settled as quickly as possible to meet the growth in larger aircraft types and the current and forecast shortfall in gates and parking at the airport. The Minister for Infrastructure and Transport (Commonwealth) should exercise the power under the *Airports Act 1996* to require that a new Master Plan process be initiated immediately by SACL. There is a need, highlighted in this review, to bring forward investments in terminals, aprons and parking for aircraft to ensure that Sydney (Kingsford-Smith) Airport is able to meet the forecast growth in aircraft movements and passenger throughput.

This Master Plan process should include the development of a definite program of works, with clear performance timeframes for each project, to support the expansion of the capacity of the terminals, gates and taxiways. The program should take account of the plans and scope for continued upgauging of aircraft, in particular the requirements to accommodate Code E and F aircraft.

Under normal arrangements, the next Master Plan is due for endorsement in 2014. While acknowledging that the Master Plan process is complex and time-consuming, the Committee is concerned that a firm program for upgrade works be resolved without unnecessary delay. The program should address the clear need to provide for the expected shortfall of gates, manage the runway balance utilisation requirements and limit any increase in taxiway congestion in the short term.

Air traffic management enhancements

Recommendation 2

SACL, Airservices Australia and airlines should accelerate plans for the implementation of advanced technologies and air traffic management practices including satellite based systems at Sydney (Kingsford-Smith) Airport. These do not significantly change the capacity of the airport, but help to maintain traffic handling rates and efficiency of operations as capacity pressures build. System performance measures such as target levels of congestion and delays should be identified which guide the implementation of efficiency measures. A 20 year investment plan should be developed to address both current proposals and long-term enhancements.

Surface transport links to Sydney (Kingsford-Smith) Airport

Sydney (Kingsford-Smith) Airport sits within the key economic precinct for Sydney and NSW, alongside Port Botany. Road congestion in the areas around the airport will increasingly impact on operations at the airport and affect the activity within the economic precinct. Increased activity at the airport will itself contribute to the problem. A key element of the strategy for making Sydney (Kingsford-Smith) Airport work into the future will be to increase the take-up of public transport by passengers, airport workers and others travelling to the airport precinct.

The Australian and NSW Governments need to urgently undertake joint planning to develop a long-term surface transport investment and operations management strategy for the Sydney (Kingsford-Smith) Airport/Port Botany economic precinct.

Recommendation 3

The Steering Committee recommends that the NSW Government, in consultation with the Australian Government and SACL, develop and implement a strategy for increasing the patronage of the airport rail system which includes removing the existing access fee to the two airport rail stations. This would mean that fares for services to and from the airport stations would be comparable to normal CityRail fares.

- Consideration should be given to the appropriate long term funding arrangements for this measure, with costs of removing the station access fee to be met by the airport operator.
- The strategy should set annual targets for airport rail patronage growth and system performance measures which are transparent and reported.

Recommendation 4

The Steering Committee recommends that the Australian and NSW governments, in consultation with SACL, immediately commence work on the detailed planning required for a program of surface transport works to improve the connections to the airport and the surrounding precinct. This should include:

- a program to upgrade roads and intersections in the locality of the airport, including key connections such as the M4 and M5 motorways. This should include road widening and traffic flow measures to reduce congestion around the domestic terminal precinct and to provide additional bus lanes and capacity for improved bus services;
- a commitment by the governments to the investment in suitable rolling stock and train paths to enable the airport rail link to provide at least 20 peak hour trains per hour by 2020, with a long term investment plan for increase of an additional ten trains per hour by 2035;
- expansion of the Sydney bus network to the airport, in particular to link the airport directly to the CBD, Parramatta, St George/Sutherland area and the Lower North Shore. This will need to be undertaken in parallel with the strategy on the removal of the station access fee; and
- development and implementation of a plan to facilitate bus and mini-bus access to a centralised transit point or points at the airport terminal precincts.

The Committee notes that Transport for NSW has already put a submission to Infrastructure Australia for funding for a major transport study for the Sydney (Kingsford-Smith) Airport/Port Botany precinct.

Changes to regulatory measures

The Steering Committee has considered a range of proposals for change to the regulatory arrangements which apply to operations at Sydney (Kingsford-Smith) Airport. These proposals include change to the level of protection of access to the airport by intrastate NSW services from regional areas, removal or relaxation of the movement cap and the approval for extra movements in curfew shoulder periods. These changes would not provide long term solutions, but could defer the impacts of capacity pressures for a few years. They could help Sydney (Kingsford-

Smith) Airport to meet the need to lift its peak hour handling capacity and also maximise passenger throughput.

The existing regulatory arrangements have been implemented to strike a balance between the use of the airport and the protection of other community interests and amenity. The Committee is aware that governments may not support change to these arrangements, particularly if alternatives are available. However, since regulatory measures including the movement cap were put in place there has been a significant investment by the aviation industry in new, quieter aircraft types which have reduced the noise impacts of operations and air navigation procedures and technologies to better distribute aircraft operations. These need to be recognised as part of achieving the balance in managing the airport's environmental impacts.

Recommendation 5

The Steering Committee recommends that the Australian Government initiate legislative amendments to the *Sydney Airport Demand Management Act 1997* to lift the statutory movement cap from 80 to the 85 movements per hour in the peak hours of 6.00 to 10.00am and 3.00 to 8.00pm each weekday to enable greater rates of handling of peak hour traffic.

Consideration was given to whether the movement cap should be lifted to 85 movements per hour for the whole day, not just for the peak periods. The Steering Committee considers that the proposal to lift the cap only for the peak periods means that the additional capacity is targeted to the periods of greatest demand. It is unrealistic to expect the airport to operate effectively at its maximum rate for the full day. In practice, there will inevitably be some level of disruption of the schedule, due to external factors such as weather or to operational issues affecting aircraft, the airfield or terminals. The proposal as recommended allows a small but important margin to help cope with these inevitable events and allow recovery.

Recommendation 6

The arrangements for implementing and monitoring the Sydney Airport Slot Management process and movement cap should be reviewed to ensure they are effective in preventing movements beyond the levels set, but are workable and consistent with safe and efficient operation of the airport and the surrounding airspace and do not lead to perverse environmental outcomes.

Recommendation 7

The Steering Committee recognises the continued importance of access by regional communities to Sydney (Kingsford-Smith) Airport both for access to the CBD and for transfers to flights to other destinations. The Committee does not recommend any reduction to the existing level of protection of slots for intrastate services; nor does the Committee support the forced relocation of any regional services to other airports.

The Steering Committee notes that a staged reduction in the level of use of small aircraft over time would assist in maximising the passenger throughput at the airport.

The Committee recommends that the Australian Government take action including amendments to the Slot Management Scheme to further limit access to new runway slots for smaller aircraft types, to maximise passenger throughput at the airport.

- The Committee supports preventing the allocation of slots for new services operated by aircraft of less than 50 seats from 2015, increasing to 70 seats from 2020.
- Recognising that the main use of aircraft up to 70 seats is for regional air services, slots allocated for services that are already operating should be grandfathered.

Aircraft Noise and the Long Term Operating Plan

Managing the balance between the needs of the airport and the impacts of aircraft noise on the surrounding communities is a key element in the planning for growth at Sydney (Kingsford-Smith) Airport. The Steering Committee does not support changes to the legislated curfew.

The use of alternate runway operating modes under the LTOP to enable the sharing of aircraft noise in the areas around the flight paths to Sydney (Kingsford-Smith) Airport has been a key measure in providing some respite to the communities most affected.

With the level of traffic growth expected, the scope to operate the noise sharing modes will be very limited by 2020. In the absence of new initiatives, the periods of respite offered for some communities will progressively become more and more limited, particularly for communities to the north of the airport. The impacts of this increased activity will be reduced somewhat by the fact that newer aircraft types have a smaller noise footprint.

Recommendation 8

The Steering Committee recommends that the LTOP for Sydney (Kingsford-Smith) Airport be reviewed with the aim of determining new, more effective measures of aircraft noise impacts and respite than the current runway end movement numbers.

- International experience regarding alternative approaches such as determining “noise budgets” and setting operating parameters for aircraft operations based on noise intensity and frequency of operation in noise sensitive hours should be examined, with a view to setting achievable noise reduction targets for the airport based on the use of new generation quieter aircraft types.

Protecting airspace around Sydney (Kingsford-Smith) Airport

It is important that the future operations of aircraft to and from Sydney (Kingsford-Smith) Airport are not restricted as a result of developments which intrude into protected airspace, create hazards to safe aircraft and airport operations or interfere with the operation of radar and other air navigation facilities.

Recommendation 9

The Steering Committee recommends that the Australian and NSW government agencies undertake an audit of existing and potential intrusions into the protected airspace for Sydney (Kingsford-Smith) Airport (addressing both the Procedures for Air Navigation Services – Aircraft Operations (PANS-Ops) and obstacle limitation surfaces (OLS)).

An agreement should be developed on statutory provisions in Australian and NSW government legislation to protect operations to and from the airport and on the administrative arrangements to support the implementation of those provisions and ensure their effective implementation.

- The arrangements should be extended to protect the operation of radar and other air navigation systems from interference arising from inappropriate location or design of structures in the airport vicinity.
- The Committee notes the pressure for continuing urban renewal in Australian cities, including in areas around airports. The Committee advocates appropriate strategic planning to support renewal opportunities without prejudicing the operation and development of airports as a result of airspace penetrations or inappropriate exposure to aircraft noise.

Optimising Use of Other Existing Airports in the Sydney Region

Airport sites are scarce and are difficult to replace or supplement. It is important that planning for each of the other existing airports, and the areas around them, should allow aviation activities to develop to the full practical potential of the sites, having regard to the physical capacity of each site and to the impacts on nearby communities.

The Australian and NSW governments need to urgently develop and agree policy and planning approaches, including airport noise amenity criteria, to guide development around airports particularly for Greenfield sites. It is critical to prevent inappropriate development within flight corridors which restrict the opportunities for future airport development.

Canberra Airport

Canberra Airport is an important airport with infrastructure capable of handling the full range of services, but is not located close enough to the Sydney market to take the role of Sydney's second RPT airport. It will serve a growing RPT market in southern NSW and will provide an additional option for a small proportion of Sydney passengers who are prepared to travel the extra distance.

Canberra Airport is the only curfew-free airport within reach of Sydney and provides the potential for night-time services which cannot be accommodated in Sydney, in particular international LCC services and overnight freight services. It is important that Canberra's 24 hour unrestricted curfew-free status be protected.

Recommendation 10

The Steering Committee recommends that the Australian, ACT and NSW governments work together to ensure that Canberra Airport is protected from encroaching noise-sensitive urban development which would be incompatible with 24-hour jet aircraft operations and could restrict the expansion of the airport over time into a significant domestic and international aviation centre for both passenger and freight services for south-eastern Australia.

- In particular, the current undeveloped approach and departure corridors to the north and south of the airport should be protected (as appropriate) from residential or other noise-sensitive development.
- The Australian, ACT and NSW governments should undertake a joint strategic planning study of these and other areas potentially affected by aircraft noise to ensure that appropriate zoning and infrastructure planning is put in place to avoid creating problems for the future.
- Measures to protect the future growth at Canberra Airport should be put in place quickly, recognising that there is already pressure for approval of greenfield residential developments in the southern corridor.
- The Committee considers that greenfield residential development in currently undeveloped approach and departure corridors, are not appropriate, having regard to the expected growth of operations at the airport and its role as an overnight hub for jet freight, noting the particular sensitivity of night-time noise.

RAAF Base Williamtown (Newcastle Airport)

Newcastle Airport is also too far from the Sydney market to serve as Sydney's second RPT airport, but will serve an important and growing market for the Hunter and Central Coast regions.

Given the aerodrome's role as the primary operational RAAF fighter base and the focus of future Joint Strike Fighter operations, its capacity to accommodate continued growth of civil operations is unclear.

Recommendation 11

The Steering Committee recommends that the Australian and NSW governments develop a joint strategy for accommodating growth in aviation demand for the Hunter and Central Coast regions, addressing short and long-term needs. Any opportunity for expansion of civil services has to be based on the aerodrome being able to meet its primary role as a RAAF fighter base.

- As an initial step, RAAF, Newcastle Airport and the aviation safety agencies should conduct a study to examine strategies to assist in meeting demand in the short-term, such as lifting the arrival rate permitted from six to eight per hour in defined peak periods.
- For the long term, the Australian and NSW governments, in consultation with RAAF and Newcastle Airport, should initiate a study to reach a clear assessment of whether the Williamtown site can meet the future needs of civil operations for the region north of Sydney, with regard to the forecast growth in the Hunter Valley and Central Coast. If the assessment is that Williamtown is not adequate to provide the necessary capacity, a strategy should be initiated for securing an alternative site for a civilian airport to service the region.

Action is also needed to ensure that Newcastle Airport is protected from encroaching urban development which would be incompatible with the airport's expansion and its operations as the primary RAAF Base in south-eastern Australia and a significant RPT airport.

Recommendation 12

The Steering Committee recommends that the NSW and Australian governments should develop a land use strategy, in consultation with Newcastle Airport, RAAF and the local councils, for land use and statutory protections in the areas around RAAF Base Williamtown and its flight-paths.

Bankstown Airport

The capacity of Bankstown Airport to accommodate services beyond the current General Aviation (GA) operations is affected by factors such as the short length of the three runways and potential airspace conflicts arising from the airport's proximity to Sydney (Kingsford-Smith) Airport flight-paths. The airport's location in a highly developed part of Sydney and the potential community impacts are also factors.

Subject to approval through the Master Plan process, Bankstown Airport could support up to about ten Instrument Flight Rules movements per hour by turboprop RPT aircraft. The airport is not suitable to accommodate jet RPT operations.

The Steering Committee supports further development of proposals for Bankstown Airport to be made available as a site for a level of turboprop RPT operations. The Committee does not support any forced relocation of RPT operations, but considers that Bankstown could provide an option for growth of operations by smaller RPT aircraft, including in particular regional services, as slots for additional services become unavailable at Sydney (Kingsford Smith) Airport.

A new Bankstown Airport Master Plan process is due to be conducted in 2012, with full public consultation, and a revised plan to be lodged early in 2013.

Recommendation 13

The Steering Committee recommends that Bankstown Airport and the Australian Government use the Master Plan process to resolve a strategy to allow Bankstown Airport to accommodate RPT operations by turbo-prop aircraft, with the following issues to be explored:

- the extent to which RPT operations might be permitted at Bankstown and any conditions which might be imposed on the operation of RPT services;
- the extent to which the main runway and associated infrastructure might be extended or upgraded to accommodate RPT aircraft, freight aircraft and business jets;
- any implications arising from the operation of RPT aircraft, freight aircraft or business jets for airspace and air traffic management in the region;
- the adequacy of existing surface transport links to allow RPT passengers to travel between Bankstown Airport and Sydney (Kingsford-Smith) Airport or the Sydney CBD;
- any implications for congestion affecting roads and intersections around the airport from the commencement of RPT services;
- an investment plan to support the changes required to accommodate RPT operations; and
- a surface transport investment plan for the upgrade of airport road links and key intersections to improve access between Sydney (Kingsford-Smith) Airport and Bankstown Airport.

NSW Government transport and planning agencies and Australian Government aviation agencies will need to work with Bankstown Airport in preparation of relevant analysis for the Master Plan process. This process also involves extensive public consultation.

The NSW Government should also initiate a strategic planning review to address the potential implications of the use of Bankstown for a level of RPT operations. This should be linked to any surface transport investment plan.

The proposal to open Bankstown to operations by turbo-prop RPT aircraft complements the proposal to prevent growth of additional small aircraft operations at Sydney (Kingsford-Smith) Airport. If new turboprop services, which typically serve regional routes, cannot be accommodated at Sydney (Kingsford-Smith) Airport, it is important that an alternative airport is available for those services.

In the initial years at least, the level of RPT operations at Bankstown Airport is likely to be at a level compatible with Bankstown's role as the major general aviation airport for the Sydney region.

RAAF Base Richmond

RAAF Base Richmond is an important economic driver for the North West subregion of Sydney. The RAAF's operational use of the site has decreased over time, and it is questionable whether the costs of maintaining the site as a base can be sustained if limited to the current range of uses. RAAF would support shared use of the site with some civil operations as a way to defray the operational costs and meet the investment needed to maintain the facility.

Given the loss of aviation facilities for the Sydney region over the past 20 years, it is critical to meeting Sydney's aviation growth and Australia's military response capability that Richmond be retained as an aerodrome to help serve Sydney's aviation needs. The Australian Government needs to ensure that the RAAF is able to continue to operate at the site and that other aviation users can utilise the aerodrome consistent with RAAF operational requirements.

For a relatively modest investment, civil services could be supported on the existing runway, providing RPT services up to something like five million passengers per year.

The location of Richmond in the northwest subregion of Sydney would provide an immediate market, improving access to services for residents of West and North West Sydney, rather than divert demand from Sydney (Kingsford-Smith) Airport. Initially, Richmond is likely to attract low cost carrier services to a small number of major domestic destinations. The market is likely to grow over time in line with projected population growth in the region.

The Steering Committee is conscious of the likely sensitivities in the local communities about the introduction of RPT services, particularly in relation to the additional exposure to aircraft noise. The Committee notes that an environmental assessment under Commonwealth law would be required for the change, which would include an extensive process of public consultation.

The Committee's expectation is that a curfew would be required for RPT services at Richmond.

Recommendation 14

The Committee recommends that the Australian Government initiate action to progressively open RAAF Base Richmond to a level of civil traffic using the existing east-west runway alignment. The civil traffic would be operated in parallel with continued Defence operations and under conditions agreed with the RAAF.

- As a first step, the Australian Government should undertake an environmental impact assessment process for the opening up of civil operations based on the investment and traffic scenarios set out in this Report for operations on the existing runway configuration. The assessment should include consideration of a curfew and any other appropriate conditions to protect amenity.
- Following the assessment, the Australian Government should move to formalise the arrangements for joint civil and RAAF use of the site, drawing on the example of the other federal leased airports, which accommodate both civil and military activity.
- The civil facility could be leased and operated under the Commonwealth *Airports Act 1996* with arrangements similar to the lease for Canberra Airport with RAAF's long term access to the airfield and the facilities it requires on the base and the civil airport lessee taking responsibility for the balance of the site.
- The arrangements should include development obligations to ensure provision of facilities for GA operations and RPT capacity without undue delay.
- The Australian and NSW governments, working closely with local government in the region, should initiate a strategic planning review to address the potential implications of the use of RAAF Base Richmond for a level of RPT operations.

Consideration was also given to an option of adding a new north-south runway at Richmond. This would allow a longer runway to be built, up to a length that would accommodate a full range of international and domestic services. A north-south alignment would also result in better outcomes for aircraft noise exposure, with flights avoiding the Richmond and Windsor townships.

For a north-south runway, acquisition of additional land and major relocations to existing road and rail systems would be required. As a result, this would be a high cost option for something that would not meet all of the projected long term aviation needs of the Sydney region.

Should RAAF Base Richmond be no longer required for RAAF use at some stage in the future, the aviation infrastructure must be retained and made available for civil use, including for GA.

A Greenfield Airport Site in the Sydney Region

None of the above changes would meet the projected long term demand for aviation in the Sydney region. The initiatives to make the most of Sydney (Kingsford-Smith) Airport and other existing airports will delay the impacts of a shortfall in airport capacity for some years, but by about 2030 or soon thereafter, a new airport will be required to supplement capacity.

The need for a new airport would not be overcome with the construction of a HSR network. HSR and additional aviation capacity should not be considered mutually exclusive, as shown in the number of countries constructing both HSR networks and new airports. These countries, and this Steering Committee, recognise both offer important economic and social benefits.

HSR is not a substitute for all air travel, especially international travel. A range of factors including frequency, travel time, cost, station location, and the likely competitive airline response, mean HSR will not remove the need for a supplementary airport.

Although previous studies have assessed a wide range of sites for a possible second RPT airport for the Sydney region, a fresh assessment was conducted *ab initio*. The search addressed the broader Sydney region, from the Hunter region in the north to Canberra in the south and the Blue Mountains to the west.

Localities were assessed to find a site suitable for either a:

- Type 1 airport – a full service airport with a runway length up to 4,000 metres, capable of serving all market segments and accommodating a future parallel runway layout; or
- Type 3 airport – a limited service airport with a runway length of up to 2,600 metres, capable of serving all market segments but with a single runway layout only.

Key issues in the shortlisting and site assessment included, but were not limited to:

- site suitability, in particular suitability of the terrain for airport construction;
- air navigation issues, including airspace conflicts with existing airports;
- environment and amenity impacts and protected ecosystems;
- proximity to demand;
- proximity to planned growth centres; and
- aviation development capacity.

A total of 18 locations were identified in the initial round of assessment, from which five were taken forward for further assessment. These comprised large areas of broadly suitable land identified in the Nepean and Hawkesbury localities, with smaller areas identified in the Cordeaux-Cataract, Burragorang and Central Coast.

The best sites in each locality were then assessed in more detail.

Figure 7 **Five localities identified for site-specific analysis**

Source: WorleyParsons/AMPC

Type 1 airport options

Site analysis was undertaken, including a technical analysis of the sites and an economic appraisal (rapid Cost Benefit Analysis) to compare suitable sites. The results showed that for a Type 1 airport, potential sites in the Nepean locality (including Badgerys Creek and Luddenham sites) were ranked the best in terms of proximity to Sydney's growth areas and had the highest Relative Benefit Cost Ratios (RBCRs). The RBCRs for the Nepean locality sites ranged from 2.7 for Luddenham to 2.4 for Greendale.

The next best site based on the quantitative economic analysis was located in Hawkesbury (Wilberforce). However, a Type 1 airport located at Wilberforce is likely to require closure of RAAF Base Richmond.

The next best sites were Somersby on the Central Coast and the Wilton site in the Cordeaux Cataract locality. However, a Type 1 airport at Somersby would be constrained due to airspace interaction with Sydney (Kingsford-Smith) Airport.

The Wilton site in the Cordeaux-Cataract locality was best placed with regards to noise impacts and is also one of the least constrained sites in terms of airspace interactions, making it a strong overall site. It currently ranks lower on proximity to market, including the Sydney area growth centres, but would be well located if the south-west corridor becomes the key focus for long-term development beyond the life of existing planning instruments.

In light of the capacity forecasts and the economic cost if demand is not met, it is important that the process be initiated without delay, notwithstanding the cost and likely opposition from some in the areas around the preferred site.

The range of potential sites for consideration has continued to shrink as development has proceeded in the Sydney basin as shown in Figure 8.

Figure 8 Potential new Sydney aviation sites previously identified

	Benefit/Cost Study of alternative Airport Proposals for Sydney (1971–74)			Major Airport needs of Sydney Study (1977–79)			Second Sydney Airport Site Selection Programme (1983–85)	
	Medium list	Select list	Short list	Zones	Sites/layouts	Short list	Nominated locations	Short list
	Wyong*						Warnervale	
	Somersby						Somersby	
	Richmond**			NW Londonderry	Londonderry		Londonderry	
	St Marys			NW Richmond				
North and west of city centre	Blue Gum Ck+	Blue Gum Ck	Blue Gum Ck	N Scheyville	Scheyville	Scheyville	Scheyville	
	Marsden Pk	Marsden Pk	Marsden Pk					
	Rouse Hill							
	Galston	Galston		N Galston				
	Prospect	Prospect				Sites foregone		
	Duffys Fst							
	Towra Pt	Towra Pt	Towra Pt					
	Wattamolla							
	Long Point++	Long Point	Long Point	S Holsworthy			Holsworthy	
South and west of city centre	Bringelly	Bringelly	Bringelly	SW Bringelly	Bringelly		Bringelly	
	Badgerys Ck			SW Badgerys Ck	Badgerys Ck	Badgerys Ck	Badgerys Ck	Badgerys Ck
							Darkes Forest	
							Wilton	Wilton
	Canberra – Goulburn						Goulburn	

* Later called Warnervale.
** East of the Londonderry site.
\+ Later called Scheyville.
\+\+ Later called Holsworthy.

Source: Department of Aviation, Sydney Second Airport Site Selection Programme Draft Environmental Impact Statement, prepared by Kinhill Stearns, 1985

Recommendation 15

The Steering Committee recommends that the Australian and NSW governments commit to establishing a supplementary airport for the Sydney region.

- The site selected for a supplementary airport should be one which is capable of accommodating a full service airport serving all market segments and with a parallel runway layout (a “Type 1” airport in the terms of the assessment conducted for this Study). This would allow staged development as aviation activity develops, with a single runway operation initially and parallel runways in the long term.
- The Badgerys Creek site (in the Nepean region), which was acquired for a future airport clearly remains the best location to provide significant additional capacity. It is located close to growing markets in the western regions of Sydney and close to road and rail transport links. In turn, it would provide much needed employment and economic opportunities for the growing residential population of Western Sydney. The site has been

protected from encroaching development and given that the Commonwealth owns the land it would be less costly and disruptive to the community as a development site than other options. In particular an airport at this site and its associated employment opportunities will provide a significant catalyst to increase much needed housing supply in the region.

- The Committee is conscious of policy statements indicating that both Australian and NSW governments no longer see the site as suitable for airport development. The decision is one for governments, but a definitive decision is required now to confirm whether or not an airport can be built at Badgerys Creek.
- If the Badgerys Creek site is not ruled out by governments, the Environmental Impact Statement should be updated immediately. Subject to the outcomes of that process, planning and other work should commence to development infrastructure so RPT operations can commence as soon as possible, thereby maximising the opportunities for increased access to aviation services and employment in Western Sydney.

Recommendation 16

If Badgerys Creek is ruled out, Wilton is the next best site. The airspace interactions with Sydney (Kingsford-Smith) Airport are less constrained than other sites, and a smaller number of people impacted by both land acquisition and aircraft noise. Sydney's growth is expected to spread further to the southwest in the long term.

If Badgerys Creek is ruled out, the Steering Committee recommends that the Australian and NSW governments proceed without delay to secure and protect the Wilton site for the development of a supplementary airport in the future.

The following initial steps should be taken in the next 12 months with regards to Wilton:

- An Environmental Impact Statement assessment, and preliminary land acquisition planning, should be initiated in order to identify potential environmental issues and strategies for managing them.
  - Processes should be put in place for identifying the properties that would need to be acquired and to make preparations for the acquisition program.
  - A review of strategic planning instruments should occur to take account of the preferred airport site, looking beyond the life of existing instruments and recognising the potential for an economic driver like an airport to contribute to planning outcomes. Planning should commence for controls on land use and development in the areas surrounding the preferred site.
  - An early comprehensive community consultation and engagement program including local government should immediately commence.
- As a minimum a supporting infrastructure plan should be developed between the Australian and NSW governments. This should include planning on surface transport links and connections to utilities, including identification of the service corridors to be protected.

Wilton is further than Badgerys Creek from Sydney and the current planned growth centres. While Sydney's growth is expected to spread to the southwest in the long term, the level of business for a new airport at Wilton is likely to be lower than for an airport at Badgerys Creek in the initial years and the commencement of operations might not be viable by 2030 for Wilton. Opening RAAF Base Richmond to RPT services would provide improved access to aviation services for the growing population of western Sydney in the interim.

Recommendation 17

The Steering Committee recommends that, if Wilton is selected as the site for a supplementary airport, it is important that action proceed in the interim to open RAAF Base Richmond to a level of RPT operations.

The development of an additional airport will require a strong ongoing commitment from both the Australian and NSW governments.

Recommendation 18

The Steering Committee recommends that when a firm decision is reached to proceed with development of a supplementary airport and the preferred site, the decision should be locked in as an ongoing commitment of both governments through legislative actions in both the Australian and NSW Parliaments. This will provide planning certainty to support the development of Sydney, both by allowing the effective development of housing, employment and transport in the areas around the selected site, and by removing conjecture over the future of other possible sites that have been suggested for an airport.

Recommendation 19

The Steering Committee recommends that, if governments confirm that the Badgerys Creek site is not to be used as an airport, an agreed approach be developed for future use of the site, recognising its potential contribution to the supply of employment lands, affordable housing and community amenity facilities.

- The Australian and NSW governments should immediately agree to a detailed planning and zoning strategy for the site which effectively preserves the site for future employment lands for the South West Growth Centre and Western Sydney.
- The Australian Government should, in consultation with the NSW Government, undertake a scoping study of the future land disposal and sale options, to determine the optimal timetable for the land to be brought to the market.
- The Australian and NSW governments should consider a suitable public-private partnership land development joint venture for the site to provide an optimal strategy for infrastructure provision, land release and financing for urban development of the site.
- The Australian and NSW governments should jointly plan infrastructure investment and programming for the site, including possible extension of the South West Rail Line from Leppington to the site.
- The current state and local government restrictions on land surrounding the site, which were put in place to protect the site for a future airport development, could be removed.

Governance, Monitoring and Reporting

It is important that the Australian and NSW governments continue to work together in taking forward the strategy for ensuring adequate aviation capacity for Sydney. A wide range of actions by both governments, airport operators and others will need to be monitored and coordinated over a long period.

Recommendation 20

The Steering Committee recommends that the Australian and NSW governments establish a joint body and an agreed process for managing and monitoring implementation of the strategy, with access to a broad-based reference group.

- Regular reports should be provided to both governments, advising on trends in aviation activity and their impact on timeframes identified in this Report; identifying progress on all elements of the strategy; and highlighting significant issues encountered.
- What is expected of airport operators should be made clear and, where practicable, formalised in instruments such as airport master plans or lease agreements.
- The monitoring should include coverage of the adequacy of airport capacity for general aviation operations as well as RPT and freight services.

Conclusions

The Steering Committee has undertaken a comprehensive integrated planning review of one of the most critical planning and investment decisions facing Sydney, New South Wales and Australia – the future aviation infrastructure needs of the Sydney region.

The work of this Joint Study seeks to ensure that sufficient future aviation capacity is in place so that Sydney and Australia can and will benefit from the growth in population, air travel and business and personal mobility. Importantly, this Study has set out to integrate for the first time aviation planning with planning for Sydney's spatial growth and its surface transport investment.

Aviation is an economic driver and a social enabler for Australia. It creates jobs and underpins the future industries and communities which Australia needs. For Sydney, NSW and Australia to be positioned as global centres of finance, trade, high value technology and manufacturing, and to support the communities we want in the region, Sydney's aviation needs must be met now and into the future.

The Steering Committee well understands why solving the issues raised in this review have been contentious. However, the option of doing nothing is no longer available and the costs of deferring action are unacceptable.

The need for both short and long-term actions is clear.

The economic costs of inaction outweigh the costs and controversy of expanding airport capacity.

The spread of urban development in the Sydney basin means it is already very difficult to find a suitable site for a second RPT airport. The Joint Study has found that there is no optimal site that satisfies everyone. However, the options have now become very limited.

The opportunity to secure a suitable site is likely to disappear altogether if action is not put in train now.

The following presents the impact of the capacity constraints identified over the short, medium and long term and the subsequent actions recommended to address them. The Committee considers that these measures recommended can be implemented in parallel.

Timeframe	Issue	Impact	Action Recommended
Short Term (0–10 years)	Shortfall in Sydney (Kingsford-Smith) Airport aircraft stands	Increasing congestion and delays with some activity constrained by lack of stands	1. Initiate a new Master Plan process to develop a definite program of works at Sydney (Kingsford-Smith) Airport, bringing forward investments in terminals, aprons and parking for aircraft, providing for management of runway balance utilisation requirements and limiting taxiway congestion
	Weekday peak slots to access Sydney (Kingsford-Smith) Airport fully allocated	New entrants excluded from peak, only some will accept other times	2. Accelerate implementation of technologies and air traffic management practices to maintain traffic handling rates / efficiency 5. Lift Sydney (Kingsford-Smith) Airport statutory movement cap from 80 to 85 in peak hours to enable greater rates of handling of peak hour traffic 6. Review the slot management process and movement cap to ensure they are effective in preventing movements beyond set levels, ensuring efficient airport operations
	Roads and intersections at entrance to Sydney (Kingsford-Smith) Airport domestic terminal near constant traffic jam in peak periods	Increasing travel time and cost between Sydney (Kingsford-Smith) Airport and the CBD / other key locations	4. Develop agreed program of surface transport works, including: • Upgrade of roads and intersections in airport locality • Investment in suitable rolling stock/train paths to provide at least 20 peak airport trains per hour by 2020 and a further 10 per hour by 2035 • Expansion of public bus network to the airport • Facilitation of centralised bus/mini-bus transit point at the airport
	CBD-bound train services from Sydney (Kingsford-Smith) Airport at capacity in the morning peak	Train travel undesirable due to crowded carriages, greater road use increasing congestion	3. Develop strategy to increase rail patronage to access Sydney (Kingsford-Smith) Airport. This should include removal of the station access fee.
	Activity at Sydney (Kingsford-Smith) Airport consistently above level required for LTOP	Capacity to share noise and provide respite only available for few hours of the day	8. Review LTOP to determine more effective measures of aircraft noise impacts and noise respite, such as noise budgets and aircraft operating parameters
	Development occurring around few remaining options for future airport sites	Options for development of current and future sites compromised	14. Undertake environmental and other assessments for opening of RAAF Base Richmond east-west runway for civil traffic 15. and 16. Undertake environmental and other assessments; and land acquisition planning to secure site for future additional airport
	Development near Sydney (Kingsford-Smith) Airport, Canberra Airport and RAAF Williamtown / Newcastle Airport	Constraints on operations at existing airports due to inappropriate development	18. Decision to proceed with supplementary airport and preferred site locked in as an ongoing commitment of the Australian and NSW governments 9. Develop and implement Australian and NSW statutory provisions to protect operations to and from Sydney (Kingsford-Smith) Airport 10. Protect current undeveloped approach and departure corridors to Canberra Airport, to enable 24-hour aircraft operations and future expansion 12. Develop strategy for land use and statutory protections in areas around RAAF Base Williamtown
	Protected regional slots full at Sydney (Kingsford-Smith) Airport	Constraints on new regional services accessing Sydney region	13. Use Master Plan process to resolve a strategy to allow Bankstown Airport to accommodate RPT operations by turbo-prop aircraft
	Fragmented planning	Uncertainty for the community and businesses	20. Australian and NSW governments establish a joint body and agreed process

Timeframe	Issue	Impact	Action Recommended
Medium Term (10–25 years)	Civilian operations at RAAF Williamtown/ Newcastle Airport reach capacity in the peak	No new civilian services possible in peak times at Newcastle Airport	11. Develop strategy to meet aviation demand in the Hunter and Central Coast regions, on the basis of the current aerodrome's primary role as a RAAF base: • Examine short term strategies such as lifting arrival rate to 8 per hour in defined peak periods • Assess the site's ability to meet future civil demand, and if capacity deemed inadequate, initiate strategy to secure alternative site for a civilian airport
	Around 2027, all slots to access Sydney (Kingsford-Smith) Airport fully allocated Around 2033 aircraft movements at Sydney (Kingsford-Smith) Airport estimated to reach legislated cap of 80 movements per hour	New entrants excluded from flying to Sydney, with no opportunities for new carriers No new flights able to operate, growth only possible through fuller or larger aircraft $2.3 billion in foregone GDP for Australia ($6.0 billion foregone in NSW GSP)	7. Further limit access to new Sydney (Kingsford-Smith) Airport runway slots for smaller aircraft: • Prevent allocation of slots for new services operated by aircraft less than 50 seats (from 2015), increasing to 70 seats (from 2020) • Grandfather slots already allocated to regional air services operating aircraft up to 70 seats 15. Commence operations at supplementary airport at Badgerys Creek **or** 14. and 17. Progressively open RAAF Base Richmond to a level of civil traffic using the existing east-west runway alignment and 16. Progress development of Wilton as supplementary airport and 19. Agree approach for future use of Badgerys Creek site
Long Term (25–50+ years)	Demand cannot be met at Sydney (Kingsford-Smith) Airport if additional capacity is not operational by 2035	Unmet demand of approximately 665 million passenger movements and 9 million tonnes of air freight $34.0 billion foregone GDP for Australia ($17.5 billion foregone NSW GSP) 17,300 foregone jobs per annum in Australia (12,700 pa in NSW)	

PART ONE
JOINT STUDY PROCESS

1.1 Background

In late 2009 the Australian and New South Wales governments agreed to work together to develop an *Aviation Strategic Plan for the Sydney Region* to ensure sufficient future aviation capacity and that aviation development is effectively integrated with future land transport and state land use planning.

The governments also agreed to jointly consider the future planning, zoning and release of land at the Commonwealth-owned Badgerys Creek site to facilitate further economic development in South West Sydney. Consideration was to be given to how the site would be best integrated with future employment locations, infrastructure needs and the overall NSW planning strategies for the region.

Terms of Reference (see 1.2) were developed and a Steering Committee comprising government and non-government members with relevant experience and expertise in infrastructure, transport, planning, aviation, economics, the environment and tourism was appointed to guide the process.

1.2 Terms of Reference

The *National Aviation Policy White Paper – Flight Path to the Future*, released in December 2009, sets out the Terms of Reference for the development of an *Aviation Strategic Plan* for the Sydney region.

Objectives and scope

Additional aviation capacity for the Sydney region

The *Strategic Plan* will:

1. consider the immediate (10-year) aviation infrastructure requirements for the Sydney region and the capacity of the existing aviation infrastructure and the land transport network linkages to meet forecast demand;
2. determine the long-term (25-year) aviation infrastructure requirements for the Sydney region and the capability of the existing aviation assets serving the region to meet the forecast market demand in passenger and freight transport and general aviation sectors of the industry. This would include consideration of:
   - current airport capacity;
   - the implications of future long-term (25 to 50+ years) demand forecasts for aviation services;
   - the planning of future economic infrastructure, including long-term spatial with land use planning for employment for the region;
   - the location and nature of future urban growth in the Sydney region; and
   - key linkages between existing aviation infrastructure and other transport networks.
3. review existing investment strategies for the civil and Defence airport facilities in the region, including an assessment of their capacity to meet the Sydney region's future aviation requirements;

4. identify strategies and locations to meet the aviation infrastructure needs of the Sydney region, through examining:
   - current and future state land use and land transport planning strategies;
   - Sydney's future requirements for transport and economic infrastructure, including Sydney's future employment nodes;
   - existing and required transport infrastructure to support additional aviation capacity for the region;
   - the need for other supporting infrastructure (such as energy, communications, gas and water);
   - the availability and application of off-airport protection measures to ensure existing and future airport capacity is protected from inappropriate development which may limit its effective long term operations and growth;
   - the interaction between airports in the region, including Sydney (Kingsford-Smith) Airport;
   - economic investment and environmental opportunities and challenges associated with future land use; and
   - existing airport policy and legislative requirements.
5. identify any other matters that will need to be considered in delivering additional aviation capacity for the Sydney region.

Future use of the Commonwealth-owned Badgerys Creek site

1. The Commonwealth and the State will develop a joint proposal for the future use of the Badgerys Creek site by giving due consideration to:
   - current state land use and land transport planning strategies;
   - the demand for land at Badgerys Creek for future employment and economic development purposes; for example, strategic manufacturing investment and business park opportunities;
   - zoning requirements;
   - existing and required transport infrastructure to support future employment generation land use;
   - the need for other supporting infrastructure (such as energy, communications, gas and water); and
   - the appropriate land release strategies which maximises long-term employment opportunities in South West Sydney.

1.3 Joint Study approach

The Steering Committee developed a set of objectives complementary to the Terms of Reference to guide work on the Joint Study.

Objectives

To develop an infrastructure and investment strategy to support sustainable economic growth, aviation demand in the Sydney region and increased productivity, while balancing the needs of communities and the environment over the short, medium and long term. This will include:

- providing a strategy to best utilise airside and landside transport capacity of Sydney (Kingsford-Smith) Airport;
- integrating the future development requirements for additional aviation infrastructure capacity required for the Sydney region with the land use and land transport plans for the region; and
- creating aviation-based employment areas, which integrate airport infrastructure with the state land use and surface transport planning, and align with future growth areas and employment zone development.

The Steering Committee aimed to bring together a number of key pieces of information and analysis to form the body of this Report. Areas of key focus for the Steering Committee included the:

- likely pattern and level of demand for aviation services in the Sydney region over the short, medium and long term;
- users of aviation services and their origins and destinations, considering the strategic economic and population growth directions of the Sydney region;
- capacity of the existing aerodromes in the Sydney region and their ability to meet current and future demand for aviation services;
- surface transport infrastructure that will be required to move aviation users to and from the identified aerodromes (including Sydney (Kingsford-Smith) Airport), and the impact this has on other users of the transport network;
- environmental or social impacts on communities, including noise and traffic;
- economic opportunities that additional aviation capacity might provide and how those could be aligned with the anticipated growth of the Sydney region;
- costs in terms of foregone economic and social amenity of maintaining the status quo;
- options for additional airport capacity and whether they can address anticipated patterns of aviation, population growth and infrastructure development; and
- optimum use of the Commonwealth-owned Badgerys Creek site (which had previously been reserved for an airport), with particular regard to its potential as an employment zone.

To complete the Joint Study, technical assistance was provided by a number of subject-matter experts. In particular:

- PwC assessed options previously identified and developed an evaluation framework to assess the needs for additional aviation capacity and surface transport to cater for aviation demand;
- Booz & Company carried out econometric modelling on aviation growth projections;
- CAPA Consulting and Booz & Company provided information on aviation networks and the operations of secondary airports;
- WorleyParsons and Airport Master Planning Consultants (together Worley Parsons/AMPC) consolidated detailed information on a number of existing aerodromes in the Sydney region and carried out investigations of both brownfield and greenfield sites as locations for additional aviation capacity;
- Ernst & Young conducted cost–benefit analyses and provided expert advice on the costs associated with maintaining the status quo;
- the NSW Department of Planning and Infrastructure advised on land planning requirements both around existing and possible future aviation sites and the impact this has on land planning and integration more broadly, as well as possible future uses of the Commonwealth-owned Badgerys Creek site and how this integrates with future planning strategies;
- Transport for NSW advised on land transport demand and capacity for current aviation facilities and identified and analysed options for additional surface transport capacity at existing or new aviation sites;
- the Australian Department of Infrastructure and Transport, Airservices Australia, the Civil Aviation Safety Authority (CASA) and the Department of Defence provided information on aviation policy, air traffic management and airspace requirements;
- the Bureau of Infrastructure, Transport and Regional Economics (BITRE) investigated aviation user preferences and the impact this may have on growth;
- Airport Coordination Australia provided advice on slot allocations at Sydney (Kingsford-Smith) Airport;
- the Department of Defence and the RAAF provided advice on operational matters, including current aviation assets at RAAF Base Williamtown, RAAF Base Richmond, HMAS Albatross and the Holsworthy Army Air Base;
- other Australian and NSW agencies, including tourism, environment and finance portfolios, provided advice on matters relevant to their portfolios; and
- PwC, together with BITRE, undertook a number of quality assurance assessments on the technical work carried out by other parties to ensure that it was of a high standard and integrated with other relevant pieces of analysis.

The Steering Committee also drew on previous aviation studies, both within Australia and internationally, where relevant.

Consultation

The Steering Committee consulted directly with a range of stakeholders as part of the Joint Study process. In particular, it sought specific advice on, or invited submissions from, a number of important industry stakeholders (airport operators, airlines and representative bodies) including representatives of:

- Sydney Airport Corporation Limited (SACL);
- Sydney Metro Airports;
- Newcastle Airport Limited
- Canberra Airport;
- Royal Newcastle Aero Club;
- Cessnock City Council;
- Shellharbour City Council;
- Goulburn Mulwaree Council;
- the Qantas Group (including Jetstar);
- the Virgin Australia Group;
- Tiger Airways Australia;
- Regional Express;
- Australian Airports Association (AAA);
- Regional Aviation Association of Australia (RAAA);
- Aircraft Owners and Pilots Association of Australia (AOPA); and
- Board of Airline Representatives of Australia (BARA).

All submissions provided as part of the open consultation process carried out during the development of the *National Aviation Policy White Paper – Flight Path to the Future* were assessed for information and views relevant to the Joint Study.

The Steering Committee received a number of unsolicited submissions from members of the public, companies and local governments, and considered the information and views provided.

New views or information contained in representations made by members of the public, local government bodies and other stakeholders to relevant Ministers and government departments during the course of the Joint Study were also brought to the Steering Committee's attention.

The Steering Committee appreciates the efforts of all those who have provided time and advice to the Joint Study process.

PART TWO

SYDNEY NOW AND IN THE FUTURE

P2

Key points

- The aviation sector drives employment and economic growth. Nationally, it contributes more than $6.5 billion per year to the economy, generating direct employment for around 60,000 people across Australia. It also indirectly stimulates a variety of other industries, including tourism (which alone directly contributes more than $35 billion to the economy).
- Access to aviation is essential to the Sydney economy. Aviation supports the services sector, which will form 85 per cent of Sydney's economy by 2020. It is essential to Sydney's continued growth as a commercial and financial centre and to Australia's position as a pre-eminent tourist destination.
- Sydney (Kingsford-Smith) Airport is the centre of the Australian aviation network, with almost 43 per cent of Australia's international passenger movements and 23 per cent of domestic passenger movements in 2010. Approximately 50 per cent of Australia's international air freight was also transported through the airport.
- The population of the Sydney Metropolitan Area will continue to grow and is alone expected to increase from 4.2 million to 6.2 million by 2036. The greatest growth will occur in Sydney's South West, North West and West Central subregions. Proportional growth is also expected in the Central Coast subregion.
- The spatial growth of the Sydney region will need to be supported by strategic integrated land use planning and transport infrastructure investment strategies. Provision for aviation industry growth will be a key element.
- As a result of the rapid population growth that is projected to occur in Western Sydney over the next 25 years, 384,000 new jobs will be required for the area.
- The Western Sydney unemployment rate (5.9 per cent) is higher than the Sydney average of 5.0 per cent. Few jobs are currently located within the area, resulting in an average commuting time for Western Sydney residents that is 35 per cent to 50 per cent longer than the Sydney average.
- Western Sydney needs employment generators and infrastructure investment to provide local employment for its growing population and to support community development.
- The North West Growth Centre, South West Growth Centre and the Western Sydney Employment Area (WSEA) will require expanded road and rail links and improved public transport access to employment areas and major facilities, including aviation facilities, to meet population and income growth.
- The population growth projections for the Hunter and Central Coast regions indicate that significant investment in infrastructure, facilities and employment zones will also be required in those regions.
- Sydney (Kingsford-Smith) Airport is located within the Global Economic Corridor (GEC) – the key economic precinct for Sydney and an important employment zone. Growth of business in the GEC – in particular, around Sydney (Kingsford-Smith) Airport and Port Botany – will add to traffic congestion.
- The employment and residential infill density targets for City of Sydney, East, South and Inner West subregions will put additional pressure on the roads and public transport systems in these locations, which will add to congestion unless effective investment and demand management measures are put in place.

- The growing population to the west and north of the city will require efficient access to aviation services. Planning for aviation infrastructure will need to be aligned with the spatial growth of the region and linked to investment in required surface transport infrastructure.
- In the long term, Sydney's growth is expected to spread to the southwest, with potential to accommodate land for a range of urban activities including residential, employment, open space, conservation and industry. The metropolitan planning review process will provide the context for considering future urban investigation areas.
- Additional airport capacity close to the areas of major population growth would improve access to services for the residents, provide additional employment opportunities for those areas and help ameliorate the growth of road traffic and congestion in the areas around Sydney (Kingsford-Smith) Airport.

- Employment impacts would be on localised direct aviation jobs, supporting local communities and economic activity in those areas with airports and more widely dispersed indirect jobs, including in sectors such as tourism.

New South Wales is Australia's largest state economy, representing 32 per cent of Australia's gross domestic product (GDP) in 2009–10 and with a gross state product (GSP) of $407 billion.[1] Sydney is Australia's largest city and, along with the surrounding region, is a major contributor to the Australian economy. Access to Sydney through airports and ports is critical to productivity and growth.

Currently, Sydney (Kingsford-Smith) Airport lies at the heart of Australia's aviation activity – as a hub for domestic passengers and as an international gateway for both business and tourism.

Sydney will continue to grow across the Sydney basin and beyond, and its population density will increase in many existing and new urban areas. Sydney, its surrounds and the region as a whole will need a well-planned infrastructure network that is integrated with the spatial growth of the region to facilitate economic and social development to support this future growth.

2.1 Population growth

The Sydney region[2] is home to approximately six million people, with more than 4.2 million living in the Sydney Metropolitan Area alone. This represents more than 60 per cent of NSW's population and 21 per cent of the Australian population. Population growth has occurred at a compound annual growth rate of 1.2 per cent per year over the past decade compared to the national rate of 1.6 per cent per year.[3]

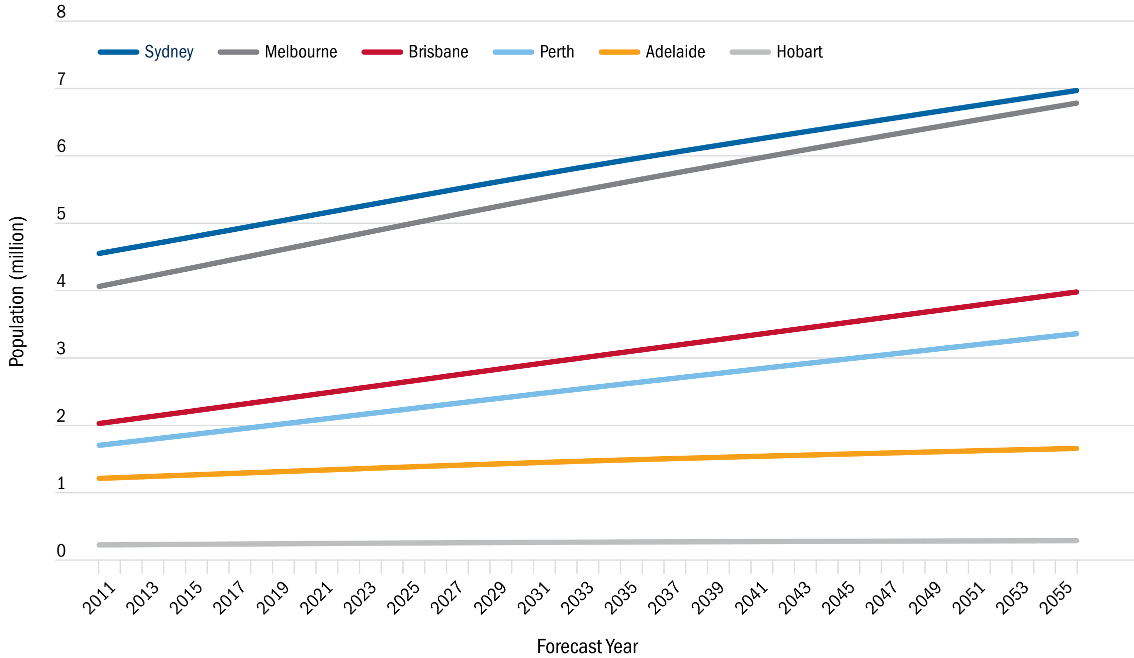
While the rate of population growth in Sydney has been slower in recent years than other major cities, the total volume of people living and working in the region continues to grow, as shown in Figure 9.

1 Industry & Investment NSW, *Fast Facts,* 2011.
2 For the purposes of this Joint Study, the Sydney region is defined as far north as Williamtown in the Hunter and as far south as Canberra.
3 ABS Cat. 3218.0 *Population Estimates by Statistical Local Area, 2001 to 2010,* released in March 2011.

Forecasts show Sydney's population is expected to reach 6.2 million by 2036 – a compound annual growth rate of about 1.2 per cent from 2010[4] – with estimates reaching between seven million and 7.5 million by 2056.[5] This is more than the current population of Melbourne and Brisbane combined; four times that of Perth; six times that of Adelaide; and 31 times that of Hobart today.

Population is expected to grow through a combination of births, higher life expectancy and domestic and overseas migration, with Sydney being the major destination for new migrants to Australia.

Figure 9 **Population projections for major capital cities, 2010 to 2060**

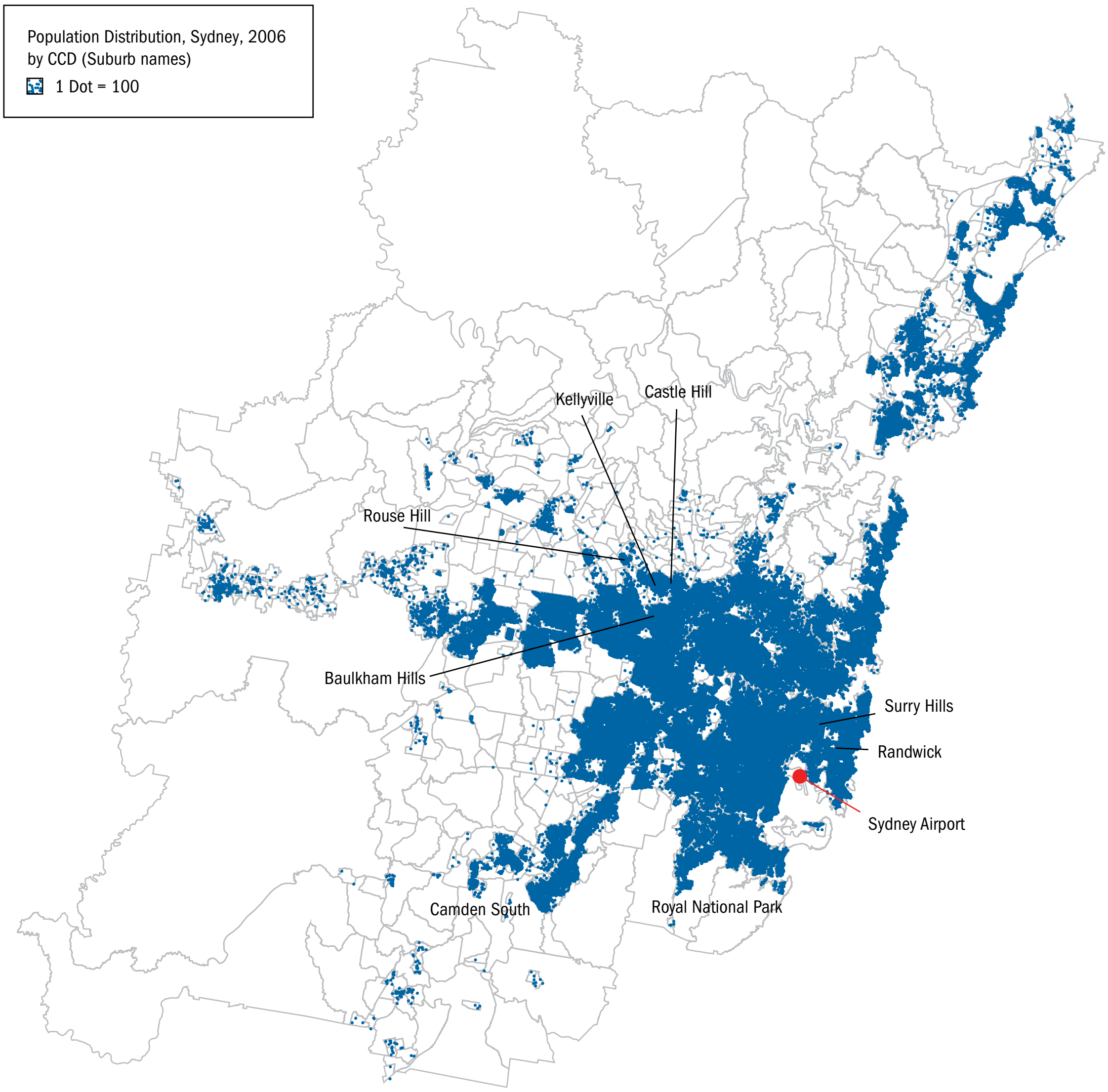


Source: ABS Cat. 3222.0 Population Projections, Australia, 2006 to 2101, Series B, released in 2008.

Figure 10gives an estimation of Sydney's spatial distribution.

4 ABS Cat. 3222.0 *Population Projections, Australia, 2006 to 2101, Series B,* released in 2008.
5 BITRE, 2011 analysis of ABS Cat. 3222.0 *Population Projections, Australia, 2006 to 2101, Series B,* released in 2008.

Figure 10 **Sydney population density, 2006**



Source: Australian Department of Infrastructure and Transport analysis of ABS 2006 data.

The spatial distribution of Sydney's population is a critical factor to take into account when considering and addressing Sydney's aviation demand and access to aviation infrastructure.

Figure 11 NSW planning subregions

Source: NSW Department of Planning and Infrastructure.

Figure 11 shows the NSW planning subregions. The NSW Government projects significant population growth in the Central Coast (an increase of 104,900). However, the greatest population growths will occur in Sydney's South West (an increase of 435,300), North West (an increase of nearly 340,000) and West Central (an increase of 158,100) subregions, as shown in Table 33.

Table 3 **Population projections for Sydney subregions (population in thousands)**

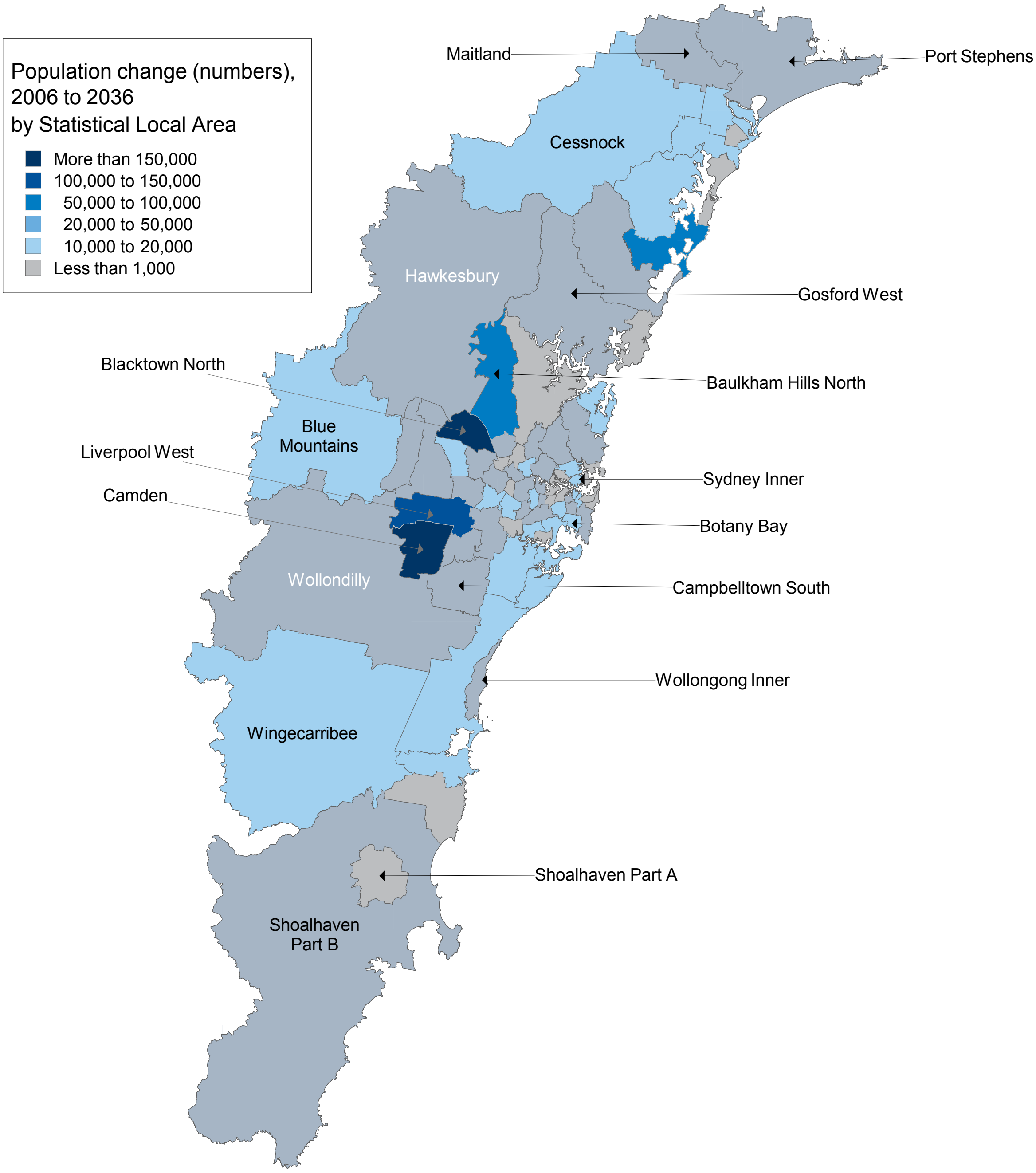
Sydney subregion	2010	2036	Growth to 2036
City of Sydney	182.2	264.8	82.6
East	299.0	334.0	35.0
Inner North	318.3	378.9	60.6
Inner West	247.8	307.0	59.1
North	278.2	321.2	43.0
North East	247.6	277.0	29.4
North West	815.7	1,155.6	339.9
South	688.9	747.6	58.7
South West	439.6	874.8	435.3
West Central	738.5	896.6	158.1
Central Coast	319.7	424.7	104.9
Total	4,577.5	5,982.1	1,404.5

Source: NSW Metropolitan Plan.

Figure 12 shows the differing levels of population growth expected in the Statistical Local Areas (SLAs) of the region between 2006 and 2036.

The Sydney region encompasses a broader area than just the defined Sydney Metropolitan Area. This recognises the close economic interrelationship of the broader region with the city of Sydney.

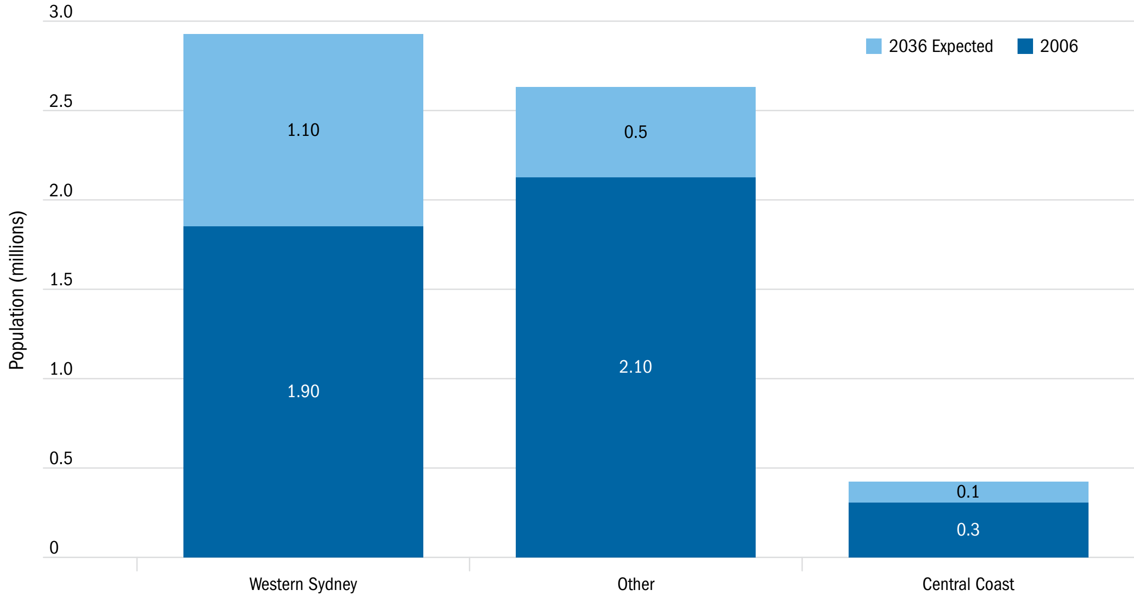
Figure 12 **Greater Sydney Metropolitan Area, projected changes in population by SLA, 2006 to 2036**



Source: NSW Department of Planning and Infrastructure.

The high levels of growth in SLAs in the South West and North West will mean that, by 2036, nearly half of the city's population will live in Western Sydney (48 per cent, up from 43 per cent in 2006), and the Central Coast will have increased its population by a third, as seen in Figure 13.

Figure 13 **Population projections, 2006 to 2036**



Source: NSW Metropolitan Plan.

2.2 Economic growth

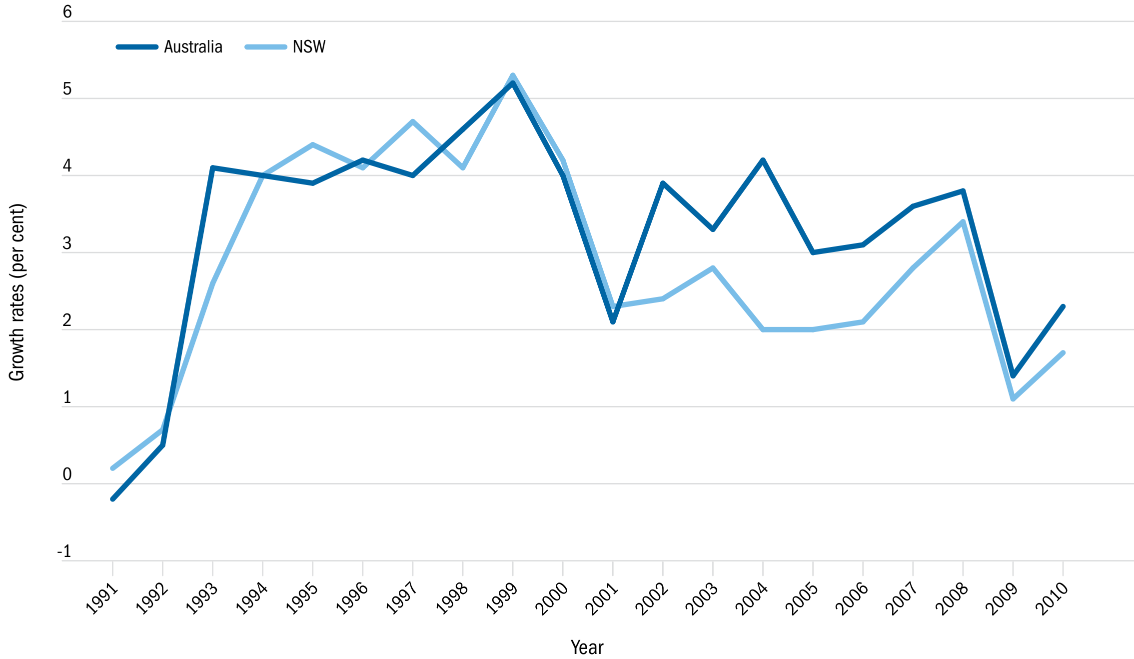
New South Wales is Australia's largest state economy, representing 32 per cent of Australia's gross domestic product (GDP) in 2009–10 and with a gross state product (GSP) of $407 billion.[6] This makes it larger than the economy of Hong Kong, Thailand, Malaysia, Singapore, the Philippines or New Zealand.[7]

NSW 2021, the NSW Government's most recent state plan, sets goals to grow the NSW GSP per capita by 1.5 per cent per year to 2020. With population growth for NSW estimated to be around 1.2 per cent per year,[8] this equates to growth in total GSP of approximately 2.7 per cent per year over the same period.

Despite the Global Financial Crisis and other recent threats to the global economic outlook, growth prospects remain sound. Since 1990, NSW GSP growth has averaged 2.9 per cent per year. Over these two decades, aside from a five-year period between 2002 and 2007, NSW economic growth has tracked the national GDP growth rate, with the latter averaging 3.3 per cent per year. These trends are illustrated in Figure 14.

6 Industry & Investment NSW, *Fast Facts,* 2011.
7 Industry & Investment NSW, *Fast Facts,* 2011.
8 ABS Cat. 3222.0 *Population Projections, Australia, 2006 to 2101, Series B,* released in 2008.

Figure 14 **Growth rates of NSW GSP and Australian GDP, 1990 to 2010**



Source: ABS Cat. 5220.0 Australian National Accounts: State Accounts, 2009–10, released November 2010.

Sydney as an economic engine for the nation

Sydney accounted for almost a quarter of Australia's GDP and 70 per cent of the NSW GSP in 2009–10.[9]

Finance and business

Approximately 44 per cent of Australia's national finance and insurance industry is located in Sydney, supported by a financial services workforce almost half the size of those in New York or London. Sydney is home to:

- 48 per cent of Australia's top 500 companies;
- the Australian Stock Exchange;
- the Australian headquarters of more than 80 per cent of foreign and domestic banks; and
- more than 60 per cent of the Asia Pacific regional headquarters of multinational companies.[10]

Sydney is the dominant destination for domestic business travel and for international business visitors to Australia.[11]

Tourism and international students

The tourism industry is a major driver of economic activity for NSW, supporting more than 160,000 jobs and contributing approximately $35 billion per year to the state economy.[12]

9 Industry and Investment NSW (now the NSW Department of Trade and Investment, Regional Infrastructure and Services), cited in the *NSW Metropolitan Plan,* 2010.

10 Industry & Investment NSW, *Fast Facts,* 2011.

11 Business travel has a higher economic benefit, as it involves a greater spend per visitor night due to more use of medium to high end hotels and hospitality sector services.

12 Tourism Research Australia, *Tourism's Contribution to the Australian Economy, 1997–98 to 2009–10*. 99 per cent of visitors travel to Australia by air, with a large proportion of domestic tourists also travelling by air.

Furthermore, according to the Tourism and Transport Forum, Sydney and its surrounds[13] are the leading tourism destinations for international travel, generating $6.7 billion out of the total estimated international tourism GDP for Australia of $38.9 billion.[14] Similarly, Tourism Research Australia measured total international visitor expenditure to be $5.54 billion in 2010.

This was 50 per cent greater than expenditure in the next most popular international tourism destination of Melbourne, at $3.65 billion.[15] Sydney continues to be the most popular tourist destination in Australia when compared with other cities in the country, with the highest number of visitors and visitor nights stayed.

In the year ending March 2011, Sydney received more than 2.6 million international overnight visitors, who stayed 55.7 million nights in the region, and 7.4 million domestic overnight visitors, who stayed 20.4 million nights in the region.[16] Sydney also has high repeat visitation, with almost half of the city's visitors having previously been to Sydney within the past two years; and 40 per cent intending to visit Sydney again for a holiday or leisure trip in the next 12 months.[17]

Those visiting NSW for education also make a significant contribution to overall visitor nights. Importantly, many of the students in Australia become a catalyst for extra tourism, as they attract visiting friends and relatives. International education tourism is a $6 billion industry for NSW. Between 2007 and 2009, the number of international visitors arriving in Australia for vocational education and training grew by 81 per cent from 73,000 to 132,000. While this market has softened, international students will remain a substantial part of the visitor economy, spending an average of 25 per cent to 30 per cent of their expenditure on tourism activities.[18]

The role of aviation in supporting the region

Australians have a heavy reliance on aviation. Aviation is a driver of economic growth: it creates jobs in the sector, and has flow-on effects for other industries, such as retail and tourism. It also facilitates finance and trade. Aviation has allowed people to travel to destinations that previously may have been time or cost prohibitive. The positioning of Sydney, NSW and Australia as global centres of finance, trade, education and high-value technology development depends on access to efficient and convenient aviation services. The ability to host internationally recognised sporting and cultural events and facilitate associated tourist traffic has also been driven by the increasing diversity of aviation services to and from Australia. In particular, since deregulation of interstate services from the 1990s, the introduction of Low Cost Carriers (LCCs) from around 2000 and increased competition in the industry, the number of people flying has trebled.[19]

An increasingly 'connected' society is optimistic in relation to the delivery of products and services. Greater importance is now being placed in the economy on 24-hour, seven-day-a-week responsiveness, with individuals and businesses purchasing products on the internet because of its emphasis on rapid delivery. Access to a variety of imports and exports, such as seafood, has also improved due to the increased speed and efficiency of airfreight services.

Aviation's role in supporting productivity, economic growth, social cohesion and inclusion should not be underestimated. A recent parliamentary inquiry in the United Kingdom (UK) noted 'if the aviation sector were removed from the UK, the economy would collapse'.[20] The capacity

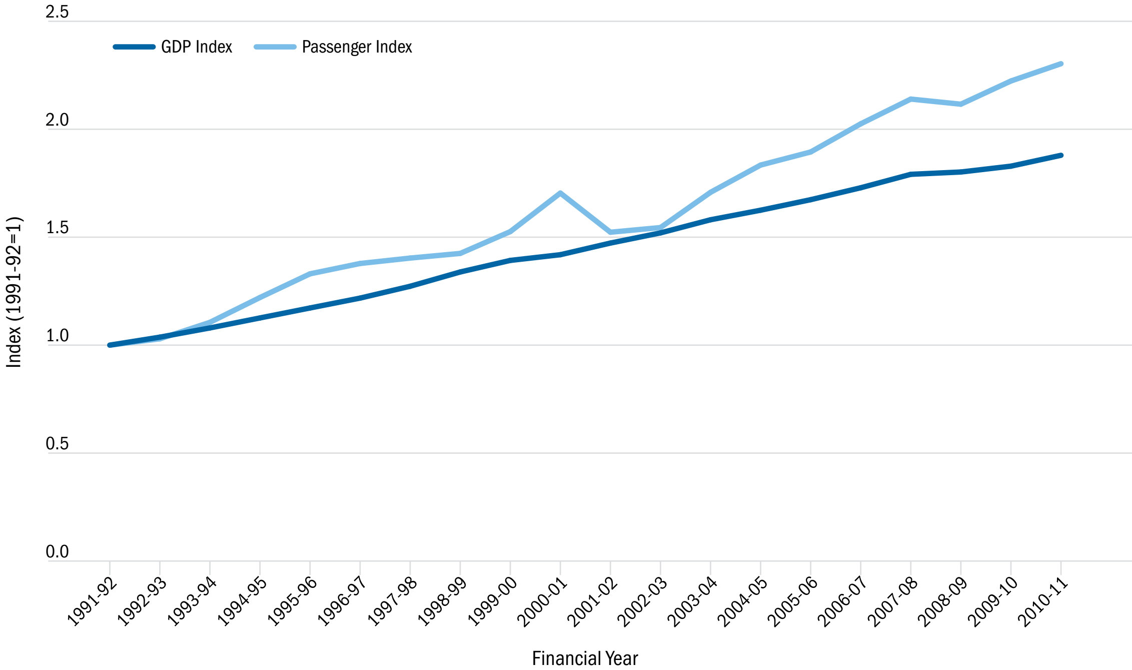
13 Tourism regions are selected by state tourism organisations for marketing purposes. Sydney and surrounds includes Sydney and the Blue Mountains.
14 Transport Tourism Forum, *Tourism Infrastructure Policies and Priorities,* Submission to Infrastructure Australia, October 2008.
15 Tourism Research Australia, *Facts & Figures at a Glance,* May 2011.
16 Tourism New South Wales, *Travel to Sydney Factsheet,* March 2011. Visitors include those travelling to Australia on business (including conferences), for holidays, visiting friends and family, and other purposes (this typically includes education and short-term employment).
17 Tourism New South Wales, *Perceptions of Sydney Precincts,* 2011.
18 NSW Minister for Tourism, the Hunter, Science and Medical Research and Women, Media Statement, *NSW International Education Market Number One in Australia*, 1 March 2011.
19 BITRE, *Airport Traffic Data 1985–86 to 2010–11*. In 2010–11, Australia facilitated approximately 135 million passengers per year compared with approximately 41.5 million passenger movements in 1990–91. Similarly, Sydney facilitated approximately 36 million passenger movements a year in 2010–11, compared with 12 million in 1990–91.
20 UK Parliament Transport Committee, *First Report into the Future of Aviation*, 2009.

restrictions on UK aviation infrastructure, especially around London, have been identified as one of the most significant impediments to economic development for the UK. Given the size of the Australian continent and the relative remoteness of many communities, reliance on aviation in this island nation is even more profound.

Balancing the growth of an airport with the impact of aircraft noise on local communities is difficult. However, any shortfall in aviation capacity will have costs in terms of loss of productivity, economic growth and employment across the range of industries noted above –not to mention the impact of the reduction in access to aviation services on social and personal needs as capacity constraints drive up airfares.

Strong growth has been experienced in both the economy and in aviation activity, as shown in Figure 15.

Figure 15 **Sydney (Kingsford-Smith) Airport passenger and Australian economic growth, 1991–92 to 2010–11**



Source: BITRE, ABS; Passenger movements and real GDP indexed to 1991–92.

Aviation currently contributes more than $6.5 billion directly to the Australian economy each year, providing direct employment in the air transport sector for around 60,000 people.[21] It also indirectly stimulates a variety of other industries including tourism (which alone directly accounts for approximately $35 billion to the economy).[22] The industry also currently facilitates 135 million passenger movements and 1.368 million tonnes of air freight each year.[23]

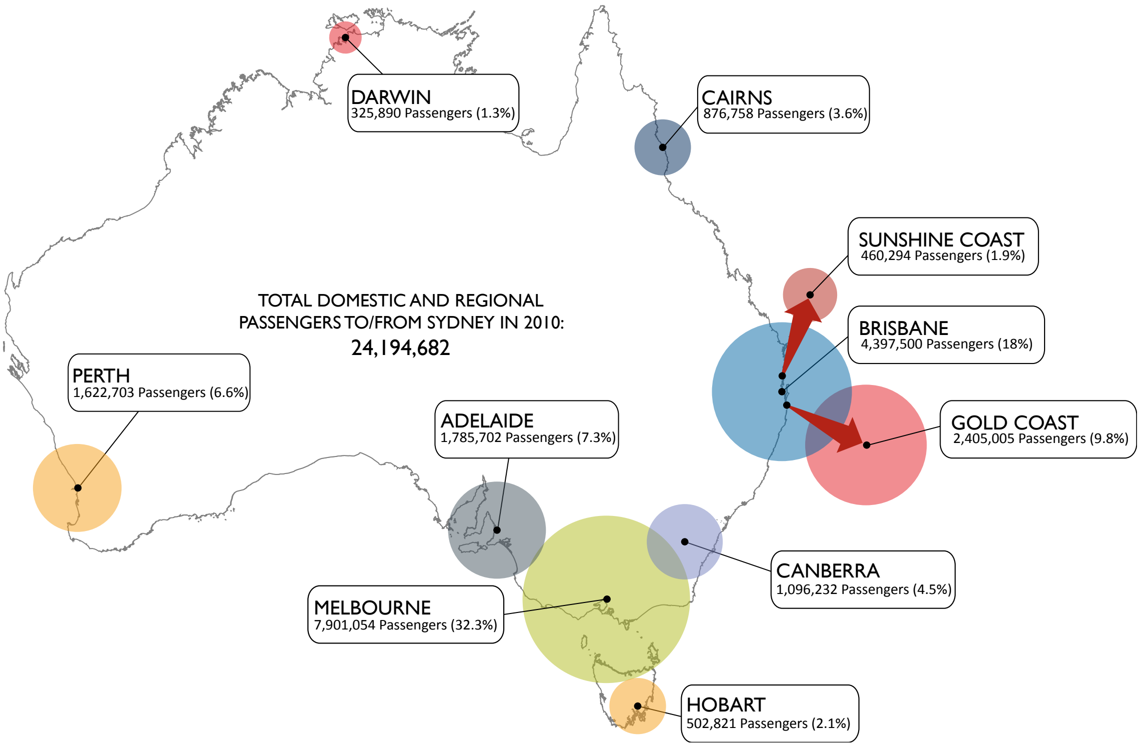
A number of aerodromes, providing a variety of passenger and freight services, flight training, emergency services and/or leisure/tourism operations serve the Sydney region. In 2010, these aerodromes facilitated the movement of 30 million visitors and tourists and 10.1 million business passengers, approximately half a million tonnes of freight and more than 400,000 General Aviation (GA) movements.[24]

21 ABS Cat. 5206.0 *Australian National Accounts: National Income, Expenditure and Product and ABS Cat. 6291.0.55.003 Labour Force, Australia, Detailed, Quarterly.* 'Air and space transport' includes those mainly engaged in operating aircraft for transportation of passengers and freight; it excludes aerial surveying, aircraft repair, ticket sales / bookings of non-resident airlines, international and domestic freight forwarding and transport by aircraft solely for sightseeing purposes.
22 Tourism Research Australia, Tourism's Contribution to the Australian Economy, 1997–98 to 2009–10. 99 per cent of visitors travel to Australia by air, with a large proportion of domestic tourists also travelling by air.
23 BITRE, *Airport Traffic Data 1985–86 to 2010–11*; supplementary freight data provided by BITRE.
24 Booz & Company analysis of BITRE and Airservices Australia data.

Because Sydney is Australia's largest city and Australia's economic and tourism gateway, Sydney (Kingsford-Smith) Airport is Australia's most linked domestic and international airport. In 2010, there were 107.9 million passenger movements on domestic routes within Australia – an increase of seven per cent on 2009 passenger movements. In this context, Sydney (Kingsford-Smith) Airport remained Australia's busiest airport, with 24.2 million domestic and regional passenger movements,[25] followed by Melbourne Airport with 21.7 million and Brisbane Airport with 15.5 million.[26]

Figure 16 shows the volume and share of domestic passenger movements going to and from Sydney (Kingsford-Smith) Airport.

Figure 16 Domestic and regional passenger movements to and from Sydney (Kingsford-Smith) Airport, 2010



Source: BITRE.

In terms of international aviation, Sydney (Kingsford-Smith) Airport has been traditionally the main gateway for Australia. Sydney (Kingsford-Smith) Airport alone accounts for almost 43 per cent of international passenger movements in Australia and approximately 50 per cent of international air freight tonnage.[27] (In comparison, Brisbane, Melbourne and Perth accounted for 16 per cent, 22 per cent and 12 per cent of international passenger movements respectively.)

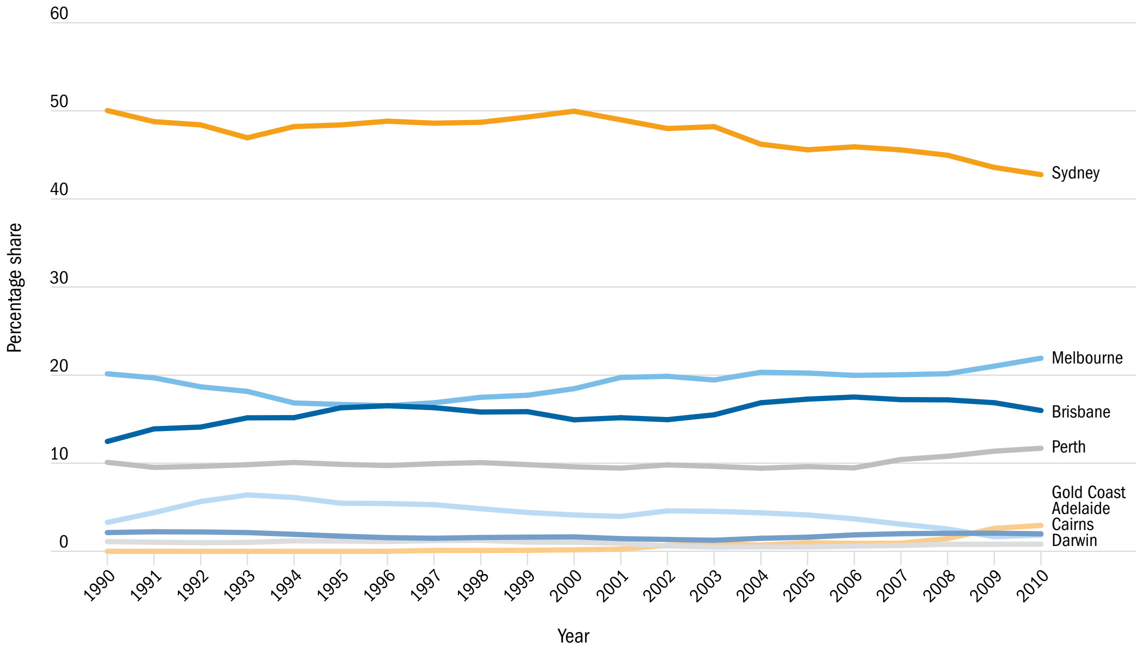
However, this dominance has slowly been reducing in relative terms, as Brisbane and Melbourne airports attract more direct international flights and new services have been introduced in places like the Gold Coast. Figure 17 shows that, in 1990, Sydney (Kingsford-Smith) Airport accounted for 50 per cent of Australia's international passenger movements, while Brisbane, Melbourne and Perth airports accounted for 15 per cent, 18.5 per cent and 9.6 per cent respectively.

25 A small number of passengers who travel on the domestic sectors of international services are not included in this figure. Figures have also been rounded, which may account for some slight variations in aggregated figures.

26 BITRE, *Annual Statistical Report, Aviation: Domestic airline activity*, 2010.

27 Specifically, 39 per cent of Australia's international outbound air freight goes out of Sydney (Kingsford-Smith) Airport, with 54 per cent of inbound air freight coming in through Sydney (Kingsford-Smith) Airport. BITRE, *Statistical Report, Aviation: International airline activity,* 2010.

Figure 17 **Australia's international passenger traffic, share by airport, 1990 to 2010**



Source: BITRE.

Despite this, total passenger and aircraft movement demand at Sydney (Kingsford-Smith) Airport has continued to grow. In 2010, services operated directly between Sydney (Kingsford-Smith) Airport and 84 destinations, comprising 47 domestic and regional destinations (including Perth, Melbourne, Brisbane, Gold Coast, Adelaide and Canberra) and 37 international destinations.

2.3 Planning for growth

The Australian and NSW governments are planning for the future growth of Sydney and its surrounds. Both governments believe a strategic approach to planning that demonstrates integration between land use and key infrastructure needs in order to drive productivity, economic growth and better liveability is required. The Australian Government, together with the states, including NSW, are implementing the Council of Australian Governments (COAG) reform agenda on capital cities and has established Infrastructure Australia as the key body for assessing major national infrastructure investment proposals. The NSW Government has similarly established Infrastructure NSW.

The NSW Metropolitan Plan sets out an integrated planning framework to provide the land use, services and infrastructure required to support future growth throughout Sydney to 2036. The NSW Government has commenced a review to update the Metropolitan Plan to ensure that it responds to current policy settings and integrates with the Government's initiatives for a transport master plan and a 20-year infrastructure strategic plan.

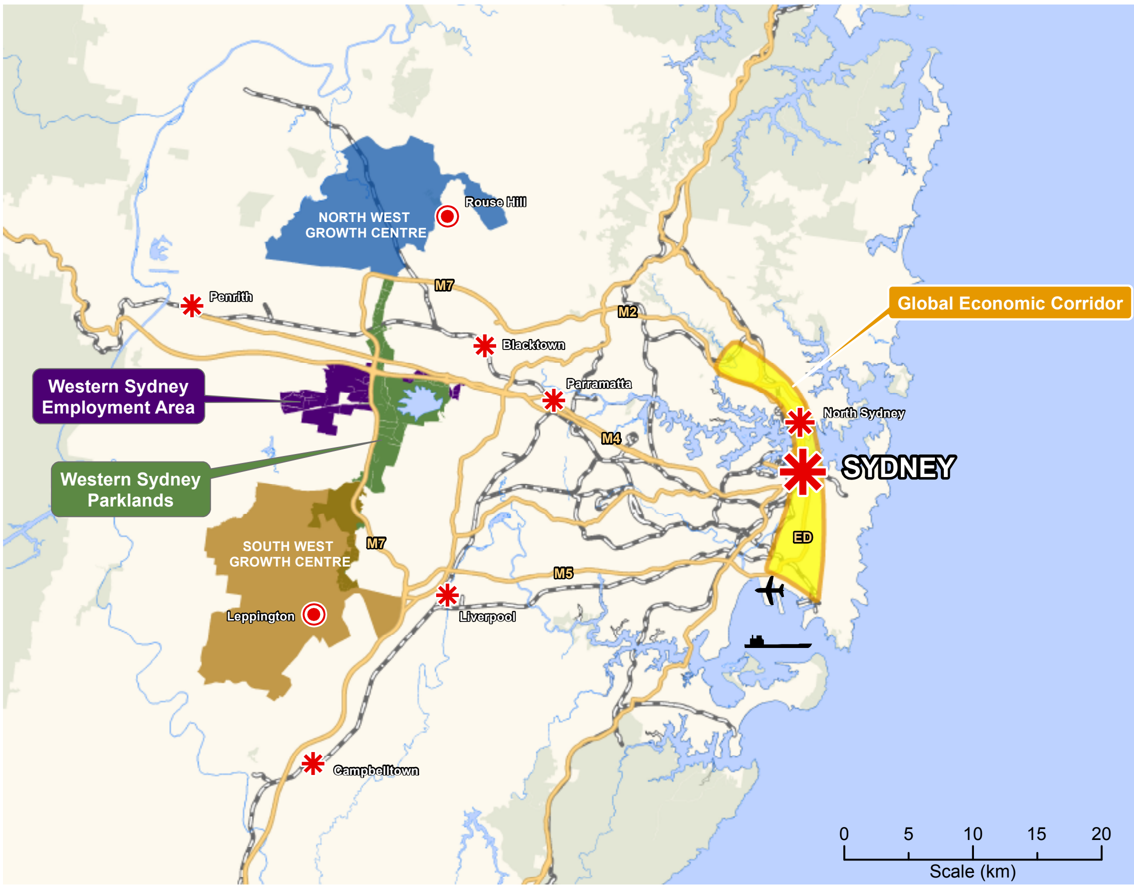
The Regional Strategy for the Lower Hunter considers future growth to 2031.[28]

Employment growth

Employment growth in Sydney over the next 25 years will be focused on a network of existing and new centres, as shown in Figure 18 – the North West and South West Growth Centres, WSEA and the GEC, which extends from Macquarie University through to Sydney (Kingsford-Smith) Airport.

28 The Regional Strategy for the Lower Hunter was last updated in 2006 and forecasts through to 2031. It will be reviewed in 2012. A number of other regional strategies interact closely with the NSW Government's plans relating to metropolitan Sydney.

Figure 18 Map of Sydney's network of existing and new centres



Source: NSW Metropolitan Plan.

Sydney is forecast to require 425,000 additional jobs by 2020 and 760,000 new jobs by 2036 to support anticipated population growth.

The most rapid population growth in the region over the next 25 years is projected to occur in Western Sydney. Approximately 384,000 new jobs will be required in this area by 2036. This represents half of Sydney's expected jobs growth.

The precinct around Sydney (Kingsford-Smith) Airport and Port Botany, the two most important international gateways for NSW, is a critical employment and economic activity zone for Sydney, NSW and Australia. Infrastructure NSW has identified the economic precinct around the airport as an area that will continue to be a principal employment zone.[29]

Key sectors for future economic growth

The NSW Government's *2010 Business Sector Growth Plan* identified key growth and skills requirements in five key sectors:

1. **Services industries** will account for 85 per cent of NSW industry output by 2020. Growth in exports is expected in services such as accounting, tourism, legal, consultancy and education to overseas markets, including growing markets such as India and China.
2. **Finance and insurance services** will remain the largest industry sector within NSW, based on Sydney's position as Australia's 'global city' and its highly educated multinational population.
3. **Health and aged care services** will continue to grow within the NSW economy, driven by increasing complexity, an ageing population and local innovation.

29 Infrastructure NSW is developing an Infrastructure Strategy Statement for the Port Botany – Sydney (Kingsford-Smith) Airport precinct, with the first phase expected to be submitted to the NSW Government in the first half of 2012.

4. **The Manufacturing sector** will become more globally competitive and more technically advanced. Manufacturing contributed $32.8 billion, or 10 per cent, to total industry value added in NSW in 2010 and is forecast to grow by 19 per cent by 2020. Manufacturing is the state's third largest employer, accounting for approximately 300,000 employees.
5. **The Construction industry** is expected to grow its share of the economy because of increased infrastructure requirements and demand for new dwellings.

The NSW Metropolitan Plan commits to maintaining the Sydney Central Business District (CBD) as the primary centre for national and international business, retail, tourism and hospitality. Jobs growth will continue to be driven by the finance, legal and business services sectors. By 2036, a total 454,000 jobs are targeted for the City of Sydney subregion (including the CBD, Ultimo–Pyrmont, East Sydney and a number of major research, health and educational facilities, and residential and industrial areas).

The NSW Government is investing in the development of Barangaroo, a 22-hectare former port site on the western edge of the CBD that will contain 300,000 square metres of new world-class commercial office space housing 22,000 workers; and new exhibition, convention and entertainment facilities at South Darling Harbour, co-located with the existing convention and exhibition centre. This additional capacity will support Sydney's quest to host more major international events to stimulate the visitor economy and NSW economic growth.

A key part of facilitating employment growth is the GEC, identified by the NSW Government as including commercial centres at Macquarie Park, Chatswood, St Leonards, North Sydney, Central CBD and Green Square / Mascot (including Sydney (Kingsford-Smith) Airport and Port Botany). Approximately 40 per cent of Sydney's total jobs and more than 75 per cent of Sydney's information technology and telecommunications jobs are located in this area. By 2036, North Sydney is expected to accommodate 61,000 jobs and will continue to support the Sydney CBD through value-adding economic activities such as communications, finance, insurance and engineering.

The NSW Metropolitan Plan sets an employment capacity target for Sydney (Kingsford-Smith) Airport, and its environs, that anticipates growth in the workforce from 34,000 in 2006 to 56,000 in 2036.

Within the City to Airport Corridor, significant urban renewal is occurring at Green Square, Mascot and the University of New South Wales, primarily for residential and student accommodation purposes. By 2036, Green Square in particular is expected to provide housing for more than 40,000 people and 16,000 jobs in the Green Square Town Centre alone.

Parramatta is Sydney's oldest regional city. While it is considered to be the centre of Western Sydney, it is geographically closer to the heart of the entire Sydney area. It is Western Sydney's most densely populated and job-rich centre, with 43,200 jobs and 167,400 people. It is also a major hub for transit links connecting to the key economic and growth centres. The NSW Metropolitan Plan targets an employment capacity of 70,000 jobs for Parramatta by 2036, primarily led by high growth in the corporate role of the centre and consequent demand for professionals.

Other regional cities include Penrith and Liverpool, which serve large North Western Sydney and South Western Sydney catchments. These centres are expected to support a long-term strategy of decentralisation from the central CBD by creating more jobs closer to homes to alleviate road congestion. The South West subregion in particular is expected to target a growth of more than 100 per cent on its 2010 employment level by 2036 (from 133,000 to 274,000). The second fastest growing employment area is targeted to be the North West subregion, with more than 50 per cent growth on 2010 figures (from 266,000 to 411,000).

The Central Coast and Lower Hunter are also key areas within the Sydney region. The Central Coast incorporates both the Gosford and the Wyong Local Government Areas (LGAs), which are situated to the north of Sydney. The population of the region is expected to grow from 304,700 in 2006 to more than 400,000 people by 2036.

As with the other areas already highlighted, a key focus in this area will be to encourage local job opportunities by providing capacity for more than 54,000 new jobs with the aim of reducing the proportion of people commuting outside the area for work. Most of these jobs are targeted for Gosford and Tuggerah–Wyong.

The Lower Hunter region begins 130 kilometres north of Sydney and includes the Cessnock, Maitland, Port Stephens, Newcastle and Lake Macquarie LGAs. The population of the region is expected to increase by 160,000, from 515,000 in 2006 to 675,000 persons by 2031. The NSW Government currently plans to accommodate a projected 66,000 new jobs in the region by 2031. Capacity for 85 per cent of these new jobs would be provided within identified employment zones and larger centres such as Newcastle, Charlestown, Maitland, Raymond Terrace, Cessnock, Glendale (emerging) and Morisset (emerging). The expected jobs growth by subregion is highlighted in Table 44.

Table 4 Sydney's expected employment growth, 2006 to 2036

Subregion	Base employment 2006	Employment growth 2006 to 2036	Employment growth 2006 to 2036 (%)
City of Sydney	429,000	+114,000	27%
East	136,000	+31,000	23%
Inner North	238,000	+62,000	26%
Inner West	99,000	+25,000	25%
North	83,000	+15,000	18%
North East	89,000	+23,000	26%
North West	266,000	+145,000	55%
South	193,000	+52,000	27%
South West	133,000	+141,000	106%
West Central	322,000	+98,000	30%
Central Coast	104,000	+54,000	52%
Total	2,092,000	+760,000	36%

Source: NSW Metropolitan Plan.

Land use to meet employment and population growth

To facilitate forecast employment growth, the NSW Department of Planning and Infrastructure estimates Sydney may need a further 10 million square metres of commercial floor space, five million square metres of retail floor space and 8,500 hectares of employment lands.

The NSW Government estimates an additional 770,000 homes will be required over the next 25 years in Sydney.

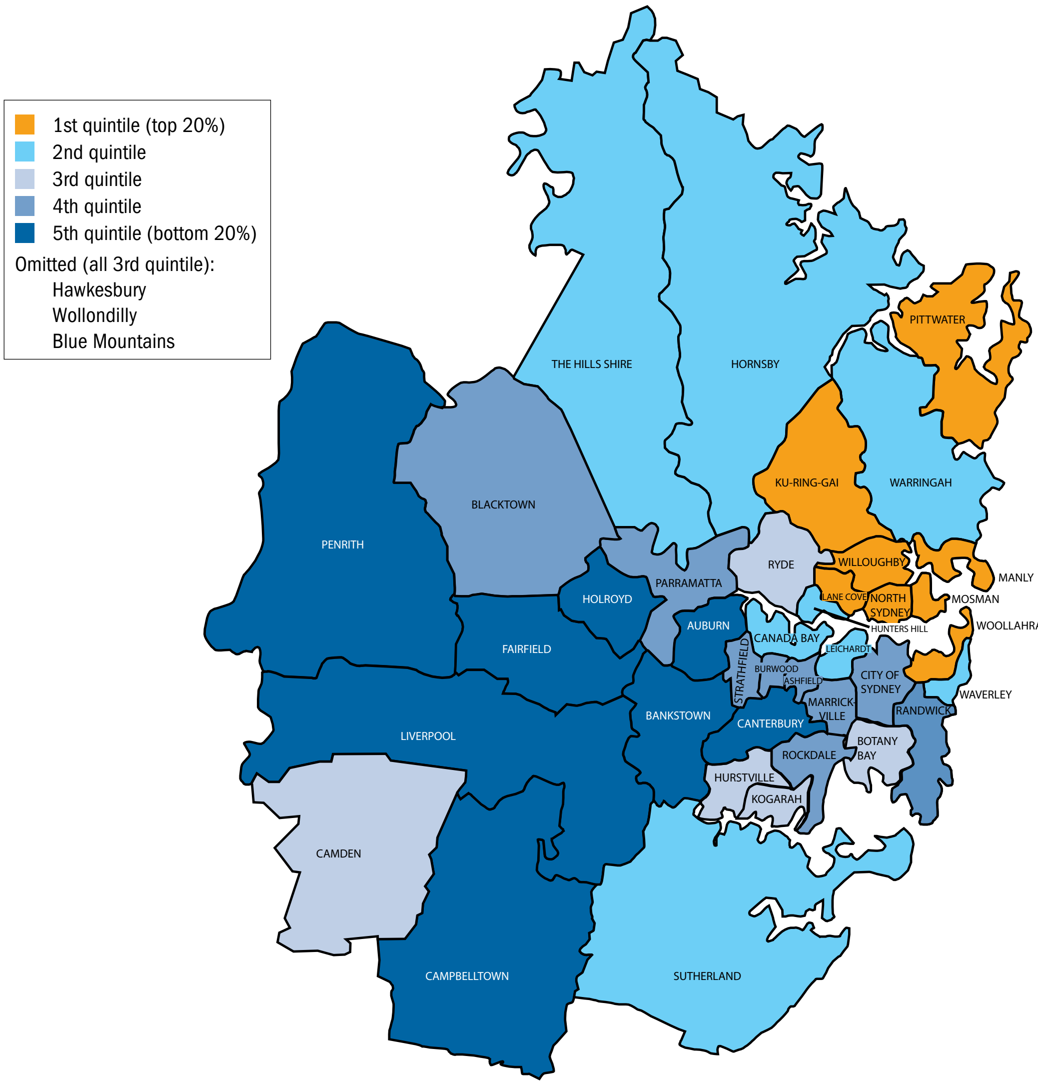
The Central Coast will require an additional 56,000 dwellings, which will be distributed between centres (33,000), infill of existing urban areas in the region (7,000) and greenfield sites (16,000). The Lower Hunter region will require an additional 115,000 dwellings.

In planning for these developments, it is important to make sure that employment growth can be integrated with population growth and residential opportunities. This promotes economic development while creating new jobs closer to home and improves the standard of living of employees by reducing travel times and distances, thus increasing time at home as well as supporting 'greener' community objectives. This approach currently underpins planning practice across metropolitan Sydney by way of managing growth between infill and greenfield areas and balancing the various environmental, social and economic impacts.

Another objective relates to the provision of sustainable employment and incomes in areas of need. The unemployment rate across Sydney in 2010 was 5.2 per cent; however, joblessness was highest in Western Sydney, with the West Central region having the highest at 8.7 per cent. The unemployment rate in specific LGAs in the region was as high as 11.5 per cent in Auburn and 8.8 per cent in Bankstown.[30]

Employment status, undersupply of housing and a mismatch between housing preferences and availability; poor access to local community and transport infrastructure; and a decline in social capital are all factors that influence liveability. Figure 19 shows the relative low liveability in LGAs in Western Sydney.

Figure 19 Liveability clusters in Western Sydney, 2011

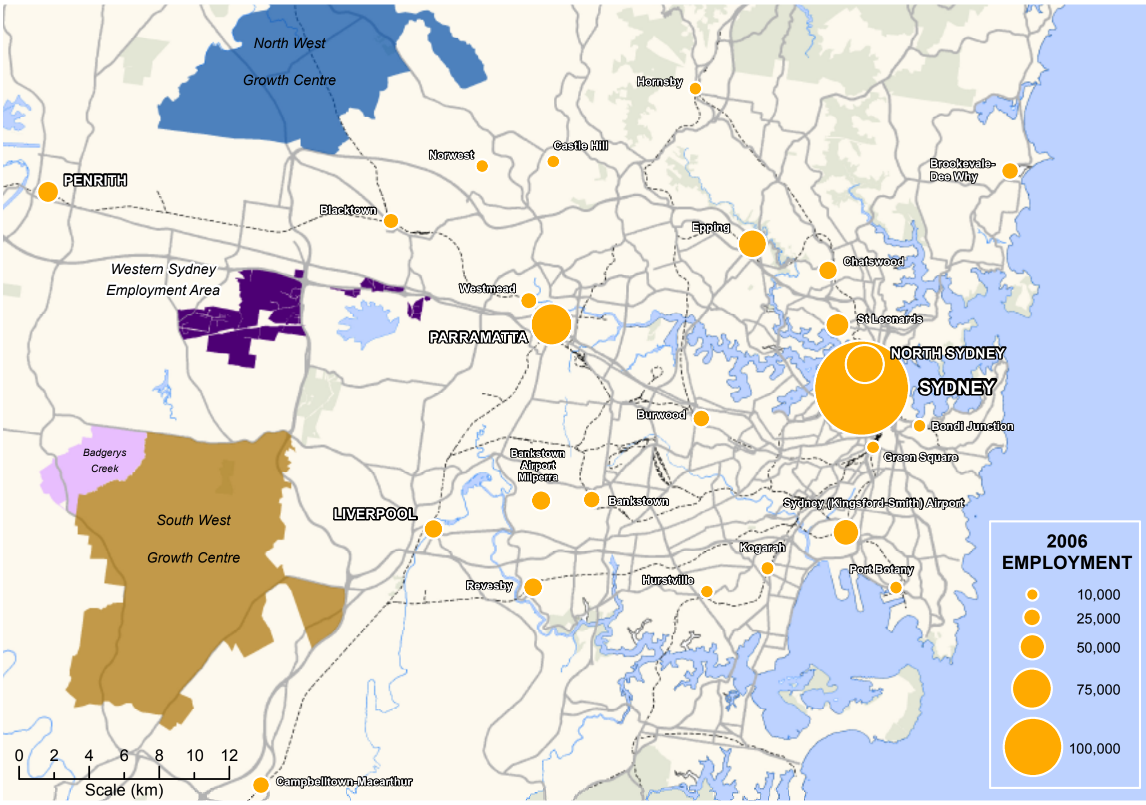


Source: Australian Department of Infrastructure and Transport.

30 Regional Development Australia, *Regional Plan for Sydney,* from ABS 2006, DEEWR Small Area Labour Market, 2010.

In order to cater for the significant employment demand in Western Sydney, WSEA is being investigated for progressive development such as warehousing, distribution, freight transport, and high-technology and research facilities. The WSEA is a 2,200-hectare piece of land near the intersection of the M4 and M7 motorways and is targeted to accommodate some 40,000 workers. In addition, the South West Growth Centre and North West Growth Centre are also being developed, with further zoning and development planned for these areas in the long term. Figure 20 shows the location of the growth centres relative to existing employment centres.

Figure 20 **Sydney region growth and employment centres**



Source: NSW Metropolitan Plan.

The South West Growth Centre is an area of approximately 17,000 hectares in size adjacent to the Commonwealth-owned site at Badgerys Creek. It is planned with an employment centre and transport line integrating the suburb of Leppington. It is estimated to provide 80,000 square metres of commercial floor space and employment for 13,000 people by 2036, with capacity for around 110,000 new dwellings to accommodate 300,000 residents. The NSW Government anticipates employment opportunities will be created in a range of sectors including retail, commercial office or business park developments, government services and service industries.

The NSW Metropolitan Plan has broadly identified areas between the northern boundary of the South West Growth Centre and the WSEA as providing an opportunity for long-term (25+ years) employment lands to support the economic development of Western Sydney. This area will be subject to structure planning that will define the need for long-term employment lands and supporting infrastructure.

The North West Growth Centre is a site of approximately 10,000 hectares in size that is expected to cater for about 70,000 new dwellings for 200,000 people. To date, the North West Growth Centre has developed more quickly than the South West Growth Centre, because it is an extension of a pre-existing growth area where homes were first constructed in 1993–94. Both areas are planned for developments over the next 30 to 40 years as needs are identified in the long term.

The NSW Metropolitan Plan distributes growth across established and greenfield areas. Decisions on the appropriate levels of greenfield and infill will impact on government policies for land release, especially timing and possible uses for that land (or surrounding land) over time. The NSW Government notes some long-established employment areas are already coming under pressure to be rezoned for other uses.

Up until 2036, greenfield development within the Sydney Metropolitan Area will be focused within the North West and South West Growth Centres. Additional greenfield sites will be considered over time outside of the growth centres; however, these will be considered on a site-by-site and merit basis, and in light of infrastructure availability. No major new growth greenfield areas are anticipated in the medium term.

Beyond 2036, growth of the Sydney Metropolitan Area beyond the growth centres and those areas identified for future employment will become more heavily constrained. Expansion to the north is limited by environmental constraints, including national parks, flood-prone areas and topography, and expansion to the west is largely limited by the Blue Mountains and similar topography.

At a highly strategic level, the South Western Corridor (Macarthur South region) presents less significant constraints on long-term growth. Macarthur South provides scope to meet the long-term growth needs for Sydney with potential to accommodate land for a range of urban activities, including residential, employment, open space, conservation and industry. However, there is currently no endorsed strategy for such expansion. The metropolitan planning review process will provide the context for investigating areas for future urban expansion.

However, as land becomes more constrained, it will become more important to balance changing economic conditions and the provision of infrastructure with the availability of existing and additional employment land to support key industries in the future.

Transport infrastructure to support growth

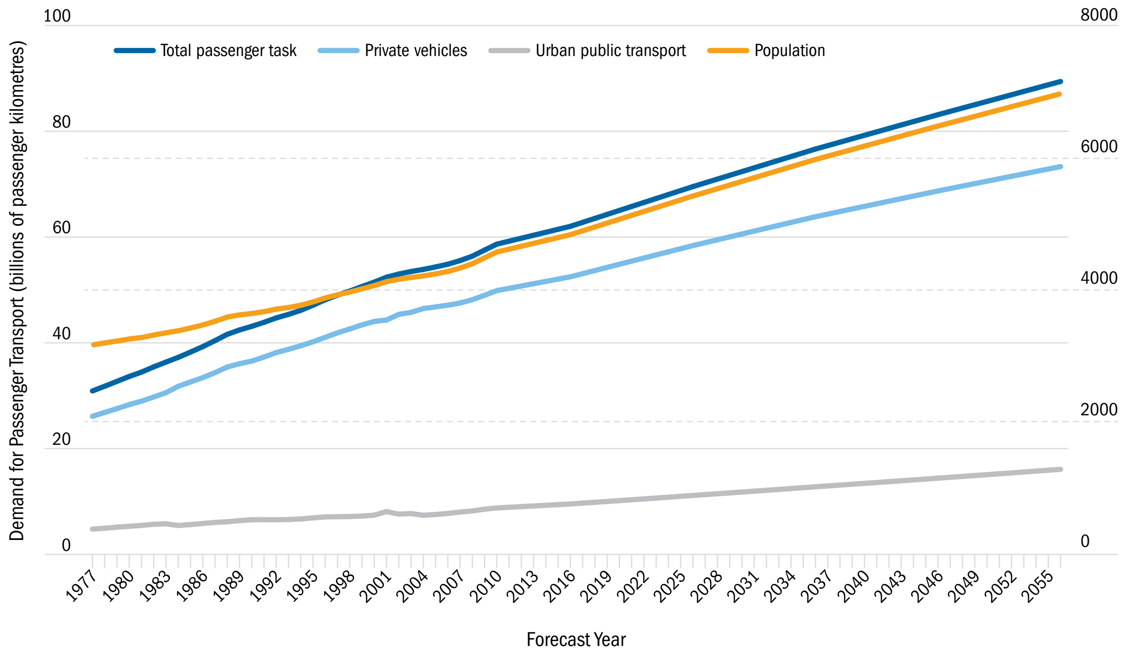
Surface transport facilitates growth in the economy by ensuring people and goods can be transported to places of employment, business, leisure activities and trade centres.

Analysis of transport needs typically considers the number and distance of trips travelled by individuals, taking into account the modes of transport used, the capacity utilised on those modes and the routes taken. The time of day that transport is required may also be considered, although usually peak and off-peak is the main distinction, with the need to cater for the peak times is a key consideration.

By 2056, the surface transport task in Sydney is projected to grow to almost 90 billion passenger kilometres (Figure 21).[31] This represents a compound annual growth rate of 0.9 per cent per year from 2010 to 2056. Private vehicles will account for 82 per cent and urban public transport for 18 per cent of the share of traffic.[32]

31 Passenger kilometres are a measure of the total distances travelled by all passengers on all trips on a given route.
32 ABS Cat. 3222.0 *Population Projections, Australia, 2006 to 2101,* Series B, released in 2008.

Figure 21 **Sydney's historical and expected surface transport task, 1977 to 2056**



Source: ABS Cat. 3222.0 Population Projections, Australia, 2006 to 2101, Series B, released in 2008; and BITRE Public transport use in Australia's capital cities: Modelling and forecasting (forthcoming).

Increased transport congestion

Growth in population and economic activity drives demand for transport. Under most growth scenarios, transport and traffic modelling for Sydney indicate potential for more congestion, slower travel times and increasing economic costs.

The Australian Government's *State of Australian Cities 2010* report indicated the level of car dependency in Australian cities had increased at a faster rate than population growth, creating traffic congestion problems as infrastructure and public transport failed to keep pace with population growth. While public transport use has been rising significantly in most capital cities since 1991, the *State of Australian Cities 2011* report suggests that this is now also resulting in congestion on public transport, reducing reliability.

It is estimated that the avoidable cost of congestion for Australian capital cities was approximately $9.4 billion in 2005, with projections increasing to $20.4 billion by 2020.[33] For the Sydney region for the same period, estimates in the NSW Metropolitan Plan suggested congestion in Sydney had a cost of around $3.5 billion in 2005, with potential to increase to $7.8 billion by 2020.

Congestion, if not addressed, will continue to grow as a serious negative impact on economic and social wellbeing. Mitigation of this congestion will represent a key planning challenge for both governments.

To meet growth in population and support new employment opportunities, a range of short to medium transport infrastructure enhancements has been planned for Sydney. This includes expanding the Sydney rail network with several key projects, such as the South West Rail Link between Glenfield and Leppington (serving the South West Growth Centre) and the North West Rail Link between Epping and Rouse Hill (linking to the North West Growth Centre). In addition, the Commonwealth Government has committed funding to the Epping to Parramatta line. There are also plans to expand capacity at a number of other locations across the rail network with additional tracks and other enhancements such as turnbacks.

33 Australian Government, *State of Australian Cities 2011* (citing BITRE 2007 estimates), 2011.

Other major projects include new roads and upgrades to existing corridors, such as the widening of the M5 and M2 motorways, and an expanded bus network including key strategic bus corridors.

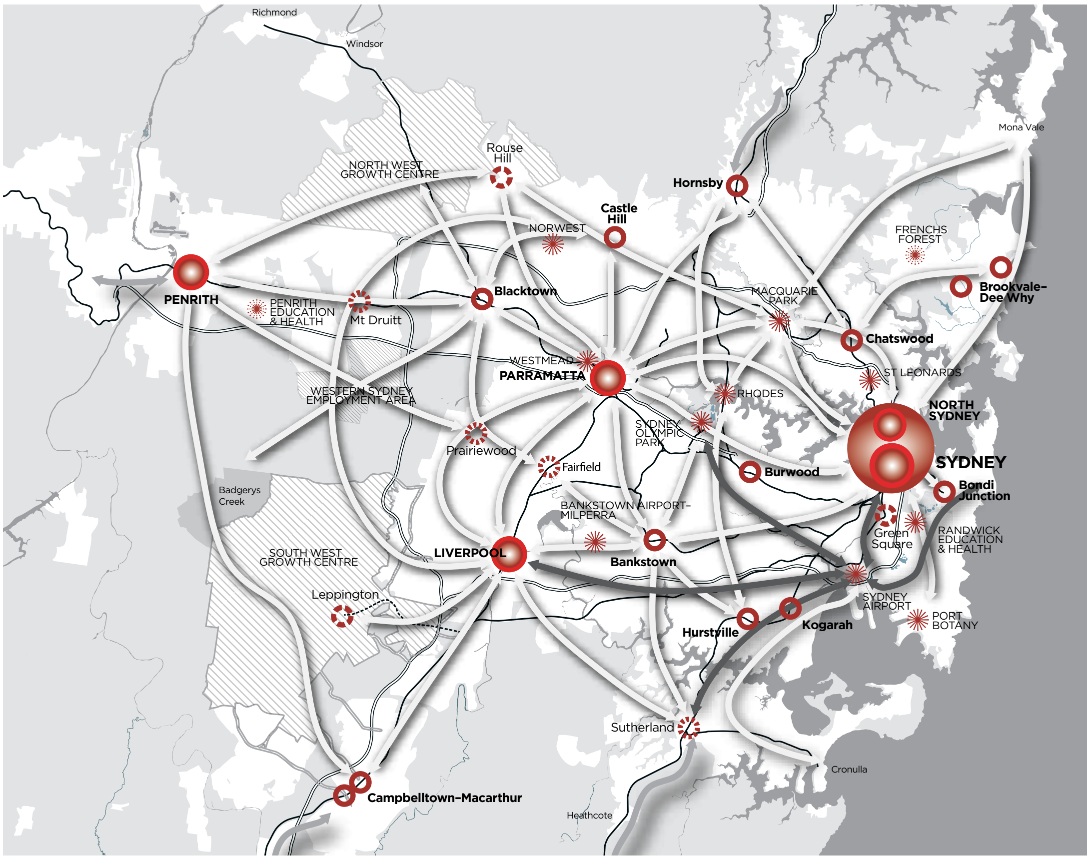
Key transport corridors

Based on the NSW Metropolitan Plan hierarchy of centres, along with employment and housing trends and travel patterns, 46 existing and emerging multimodal transport corridors have been identified, including:

- primary transport movement to and from the CBD, the GEC (including Sydney (Kingsford-Smith) Airport) and other major centres;
- development of major employment areas in Western Sydney, including the WSEA;
- urban renewal of existing developed areas; and
- land release areas, including the North West Growth Centre and South West Growth Centre.

These corridors are outlined in Figure 22.

Figure 22 Sydney's 46 key transport corridors

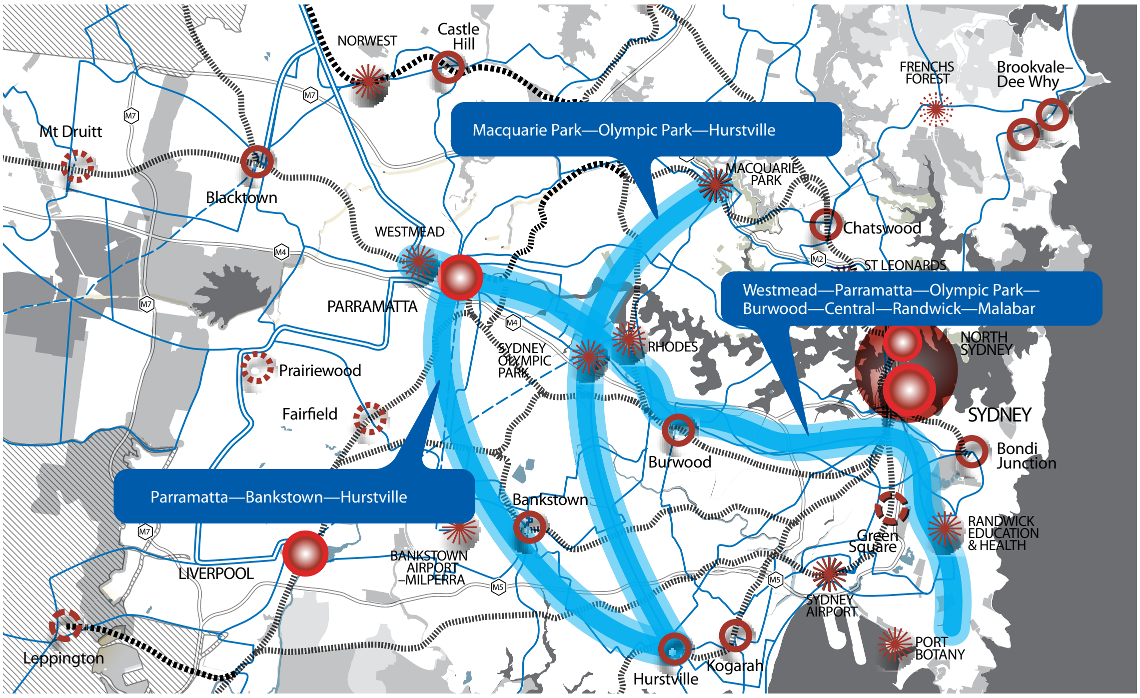


Source: NSW Metropolitan Plan.

Analysis of the demands of these corridors informs the NSW Government's immediate transport priorities, including the North West and South West rail links and progressing the M4 and M5 duplication.

Under the NSW Metropolitan Plan, the corridors shown in Figure 23 have been assessed as being critical over the long term to ensure a connected city with efficient travel options.

Figure 23 **Long-term transport and urban renewal corridors for investigation**



Source: NSW Metropolitan Plan.

The NSW Metropolitan Plan also identifies a number of corridors that may be used to unlock urban renewal potential in established areas. These short-, medium- and long-term corridors are:

- North West Rail Link (and extension);
- City Relief Line;
- Haymarket to Circular Quay light rail corridor;
- Westmead to CBD corridor;
- M5 East duplication corridor;
- M4 East corridor; and
- F3–M2 corridor.

An Outer Sydney Orbital, serving Western Sydney and linking to the Central Coast, is also being investigated in the long term.

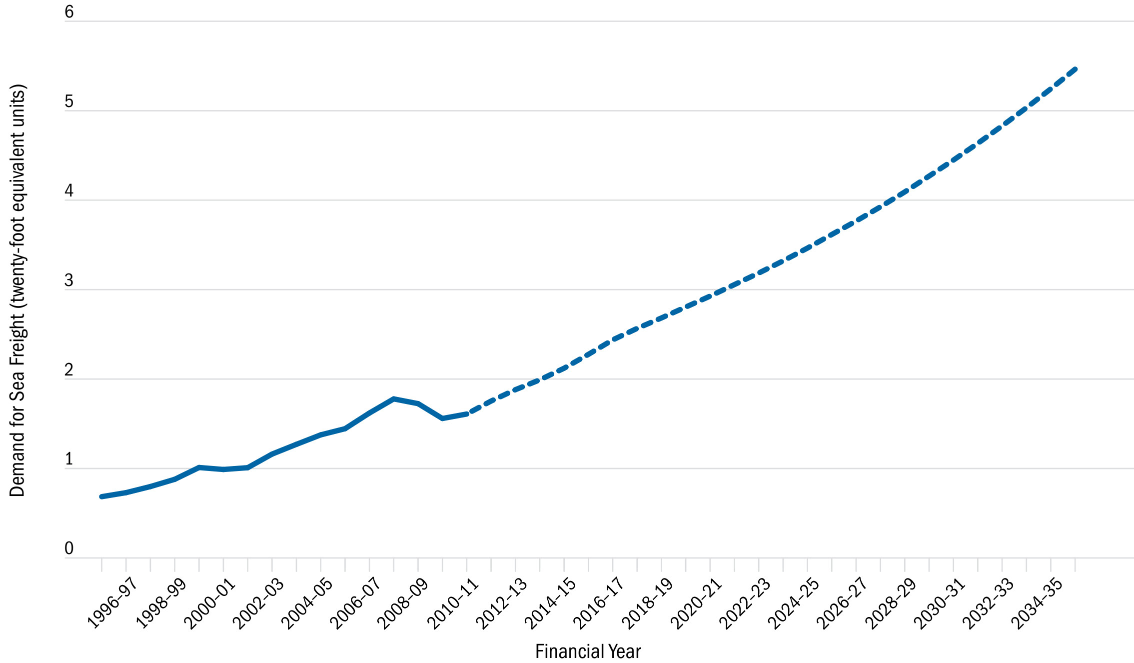
It is noted in the NSW Metropolitan Plan that the M5 Motorway corridor, linking Sydney (Kingsford-Smith) Airport and Port Botany, is already operating near capacity, with peak hour vehicle trips anticipated to increase by more than 50 per cent by 2036. This is a priority corridor for future investment, as it is becoming one of the key bottlenecks in the Sydney and national economic transport network. In addition, rail improvements are planned to provide additional services to the North West Growth Centre. The North and South West Rail Links have been identified by the NSW Government for development to extend public transport to these areas. Notably, the South West Rail Link will also connect passengers to key employment centres such as Liverpool, Sydney CBD and the Sydney (Kingsford-Smith) Airport/Port Botany area.

Freight

The precinct containing both Sydney (Kingsford-Smith) Airport and Port Botany is a major economic gateway for Sydney and Australia. In 2009–10, Port Botany (including Kurnell) imported $41.3 billion worth of freight, making it the second largest port for sea freight imports by value in Australia, behind Melbourne.[34] However, the growing congestion in and around this area as industrial activity and residential development intensifies is placing greater pressure on the precinct's ability to distribute goods efficiently.

Figure 24 shows an unconstrained projection of sea freight demand at Port Botany to 2036. The NSW Metropolitan Plan notes the container freight task through Port Botany has been growing at an average of seven per cent per year for the last 15 years.

Figure 24 **Port Botany historical and expected sea freight demand, 1995–96 to 2035–36**



Source: BITRE Statistical Report, Australian maritime activity to 2029–30, 2010.

Upgrades to the road network along key economic corridors will assist the movement of freight, including distribution through Sydney (Kingsford-Smith) Airport and Port Botany. Dedicated freight routes are also planned to alleviate pressure on tracks where there is shared use by passenger and freight train services. This is expected to extend to the establishment of intermodal terminals in Western Sydney. The Australian Government is committed to the establishment of a major intermodal freight facility on the current Defence site at Moorebank in South West Sydney. The growing freight task will be supported by strategies to encourage mode shift to rail, maximising road capability.

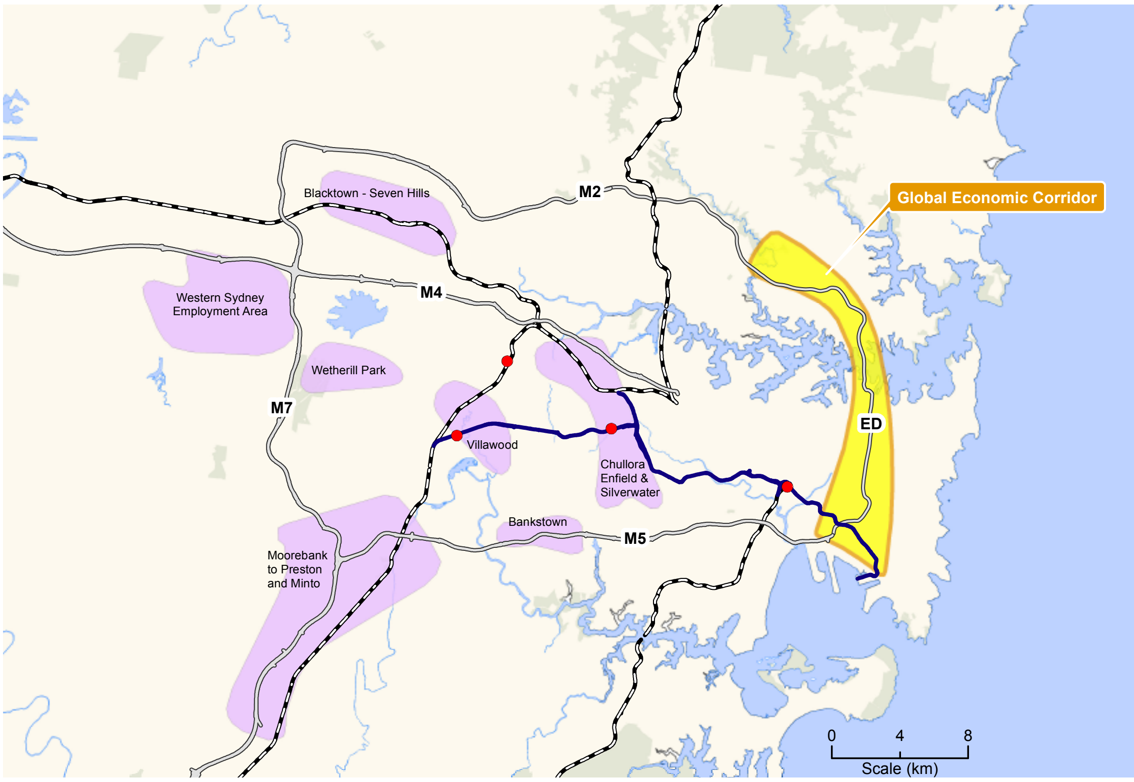
Improvements to rail infrastructure are key to reducing capacity constraints for the handling of freight to and from Port Botany and will ease some congestion around the airport. The Australian Rail Track Corporation is constructing the Southern Sydney Freight Line between Glenfield and Port Botany so that passenger and freight trains can be separated, thereby improving reliability and capacity. The Australian and NSW governments are currently funding a joint investment program for the Northern Sydney Freight Corridor to improve freight capacity and reliability in the Strathfield to Broadmeadow section of the rail network.

34 BITRE, *Australian Sea Freight*, 2009 to 2010.

The NSW Government is also developing a long-term State Freight Strategy and a Port Botany and Sydney Airport Transport Improvement Program that will outline a suite of projects and measures to ensure the transport system around the Airport/Port precinct responds to the growing freight tasks. The outcomes of this Joint Study should be a key input into the Program. Currently the ability of the Port to tranship containers is higher than the ability of the surface transport system to clear the cargo from the terminals. The NSW Government, through its state plan *NSW 2021*, has a target to double the proportion of container freight movements by rail through NSW ports by 2020.

The key existing and planned freight clusters, intermodal terminals and freight corridors across the Sydney Metropolitan Area are illustrated in Figure 25.

Figure 25 Key economic existing and planned freight clusters, intermodal terminals and freight corridors



Source: NSW Metropolitan Plan.

Strategic planning

Sydney's population is expanding west. As stated earlier in this section, by 2036, half of the city's population will live in Western Sydney, up from 43 per cent in 2006. After 2036, growth is likely to be in the south west as opportunities to expand further west and north west become constrained. The key is to ensure employment and transport systems support this expansion of housing and population.

Achieving Sydney's forward economic growth targets will be challenging. Productivity growth levels have slowed considerably over the last decade to an average of 0.9 per cent per year. While the long-term productivity growth rate for both NSW and Australia is forecast at 1.6 per cent per year, this has been the average for the last 30 years.[35]

35 NSW Treasury, Budget Paper 6, *NSW Long term Fiscal Pressures Report,* 2011–12.

Reducing delays due to congestion will be a key part of increasing productivity.[36] Congestion imposes significant costs on the community and business in the form of longer trip travel times, increased greenhouse gas emissions, high transport running costs and reduced family and leisure time.

High travel times and costs will be compounded by the expected decrease in overall labour force participation arising from the ageing population (estimated at a decrease of seven per cent from 66 per cent to 59 per cent by 2045), and will impact on skills and the range of services that can and need to be provided.[37]

These issues can make it very difficult to plan for the long term. Future planning must be strategic and integrated. In particular, it will be important to ensure that investment in transport infrastructure, including aviation infrastructure, is integrated with the spatial growth of Sydney. The focus of planning for Sydney needs to be:

- integrating residential and employment opportunities with appropriate infrastructure to prevent congestion and improve productivity and the standard of living;
- delivering the type of infrastructure required, when it is required, and ensuring connectivity between these infrastructures. This includes forward planning for when the infrastructure is no longer viable; and
- planning for expected changes in land use, which can have major implications for preserving corridors or large areas for critical infrastructure.

Strategic planning must also consider the need for investment in that infrastructure and be prioritised accordingly. The Australian and NSW governments have acknowledged the importance of investment in critical infrastructure and that it will be a major determinant in driving productivity, reducing congestion and generating long-term economic growth.

This will be particularly important in Western and South West Sydney, where the NSW Metropolitan Plan has identified a development need consistent with the region's population and employment trends. It will also be important both in Sydney and around the Lower Hunter, where it is necessary to ensure connections throughout the region provide access to key points, such as major employment and growth centres, airports and ports.

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36 BITRE estimated congestion costs in Australia's capital cities would rise from $12.9 billion in 2010 to $20 billion per year by 2020.

37 *NSW 2021* (NSW Government State Plan), citing the Productivity Commission, 2011.

PART THREE
DEMAND FOR AVIATION IN THE SYDNEY REGION

P3

Key points

- Aviation activities in the Sydney region have been growing over the past decade. As at 2010, the sector consisted of:
  - 40.1 million Regular Public Transport (RPT) passenger movements and 344,000 RPT aircraft movements accommodated through Sydney (Kingsford-Smith) Airport, Canberra Airport and Newcastle Airport;
  - 400,000 tonnes of international freight and more than 100,000 tonnes of domestic freight, accounting for 50 per cent and 30 per cent of Australia's international and domestic air freight tonnage respectively;
  - more than 400,000 General Aviation (GA) movements across a number of aerodromes in the region.
- With the continued economic and population growth, there will be increased aviation demand in the region. On an unconstrained basis (presuming all necessary capacity is provided to meet growth), estimated demand in the Sydney region would be for:
  - 57.6 million passenger and 421,200 RPT aircraft movements by 2020;
  - 87.4 million passenger and 528,600 RPT aircraft movements by 2035; and
  - 165 million passenger and 800,800 RPT aircraft movements by 2060.
- This exceeds the total number of current domestic and international passenger movements across Australia (135 million in 2010).
- It is estimated that unconstrained demand for air freight tonnage would quadruple between 2010 and 2060.
  - Demand for international and domestic air freight tonnage in the region is forecast to grow rapidly by approximately 3.2 per cent per year between 2010 and 2060.
  - The majority of air freight demand in the Sydney region is expected to continue at Sydney (Kingsford-Smith) Airport. However, the roles of Bankstown, Newcastle and Canberra airports in serving air freight demand are expected to increase.
- GA growth in the Sydney region has been modest compared to RPT but is expected to increase by 50 per cent between 2010 and 2060.
  - Bankstown Airport is forecast to continue to provide the largest volume of GA activity in terms of aircraft movements, with modest growth expected at Canberra and Camden airports and RAAF Base Richmond.
- With the exception of RAAF Base Williamtown, military movement growth in the region is likely to remain relatively constant throughout the forecast period. It is expected that military operations at RAAF Base Williamtown will rapidly increase as a result of the introduction of the Joint Strike Fighter program from around 2017.
- Sydney (Kingsford-Smith) Airport will continue to be the primary airport in the region in terms of both RPT and freight services.
- While Canberra and Newcastle airports will see continuing growth in demand for RPT services, this is not expected to reduce demand at Sydney (Kingsford-Smith) Airport.

- Unconstrained demand for passenger movements at Sydney (Kingsford-Smith) Airport, which already facilitates 89 per cent of passenger movements in the Sydney region, is forecast to more than double by 2035 and quadruple by 2060, to 76.8 and 145.7 million passenger movements respectively.
  - This correlates with expected unconstrained demand for approximately 430,000 and 650,000 RPT aircraft movements in 2035 and 2060 respectively.
- As Sydney's spatial and economic growth continues to increase population and income growth in Western Sydney, demand for usage of the airport from this area will increase.
- Continued growth in business, the strength of emerging international markets such as China and India and the development of new innovative Low Cost Carrier (LCC) markets will be significant drivers of demand growth which will need to be accommodated in the Sydney region.

Civil aviation activity in the Sydney region includes a diverse range of operations that can be grouped into three main types of activity – regularly scheduled passenger movements available to the public (RPT),[38] the movement of air freight, and GA activity.

Military activity is another relevant component of aviation in the Sydney region, with a number of key aviation bases supporting military-related operations in the area. While examination of military aviation activity is not part of the Terms of Reference for this Joint Study, an estimation of the future operational frequency and types of services within the region is important in understanding the interaction between civil and military facilities and the potential for military facilities to help in meeting civil aviation requirements.

This part of the Report looks at the trends and characteristics of historical and future demand, considering the different types of aviation activity. It also considers the variation in demand for different aerodromes in the Sydney region.

For the purposes of this Joint Study, the Steering Committee has considered a number of key aerodromes across the broader Sydney region, from RAAF Base Williamtown (Newcastle Airport) in the north to Canberra Airport in the south.

Details of these key aerodromes, their physical layout, pattern of operation and scope for development are detailed in greater depth in Technical Paper A1.

Figure 26 shows the location of the key RPT, military and GA aerodromes examined.

38 RPT refers to the movement of passengers or freight on a scheduled basis for a fee. For the purpose of this Report, RPT is limited to the discussion of passenger movements, with passengers on such services referred to as RPT passengers. Freight movements are considered separately.

Figure 26 Location of the key RPT, Military and GA aerodromes examined

Note: Map is not an exhaustive representation of all aerodromes in the mapped area.

Source: Australian Department of Infrastructure and Transport.

3.1 Historical demand for aviation in the Sydney region

Despite some challenging conditions, including the aftermath of September 11, 2001, the collapse of Ansett Australia in September 2001 and the Global Financial Crisis in 2008, Sydney region airports have experienced growth in aviation activity over the past decade (2000 to 2010). This growth was facilitated by a number of key factors including:

- the opening of the domestic market to increased competition with the removal of the 'two airlines' policy in 1990–91 and the associated deregulatory measures;
- widespread liberalisation on a number of major international routes, such as the Single Aviation Market with New Zealand, 'open skies' arrangements with the United States, open capacity arrangements with Singapore and the UK and the substantial expansion of capacity under air services arrangements with China and the Middle East; and
- technological change in the aviation industry, with larger, more fuel-efficient aircraft, greater operating ranges and the introduction of regional jets.

In addition, the emergence of successful LCC business models, first with Virgin Blue (now Virgin Australia) and more recently with Jetstar and Tiger Airways Australia, has stimulated growth in smaller regional airports around Australia, including at Newcastle Airport. As a result, there has been rapid growth in new point-to-point market segments, with LCCs replacing regional or charter services. There is also increasingly a merging between the LCC and traditional full-service carriers, particularly given that the LCC model is increasingly embracing international operations as well as domestic, which will bring growth opportunities to more sectors.

RPT

There are only three airports in the Sydney region at which scheduled RPT services currently operate – Sydney (Kingsford-Smith) Airport, Canberra Airport and Newcastle Airport (located inside the boundary of RAAF Base Williamtown). These airports serve the Sydney region as well as a broader geographical area.

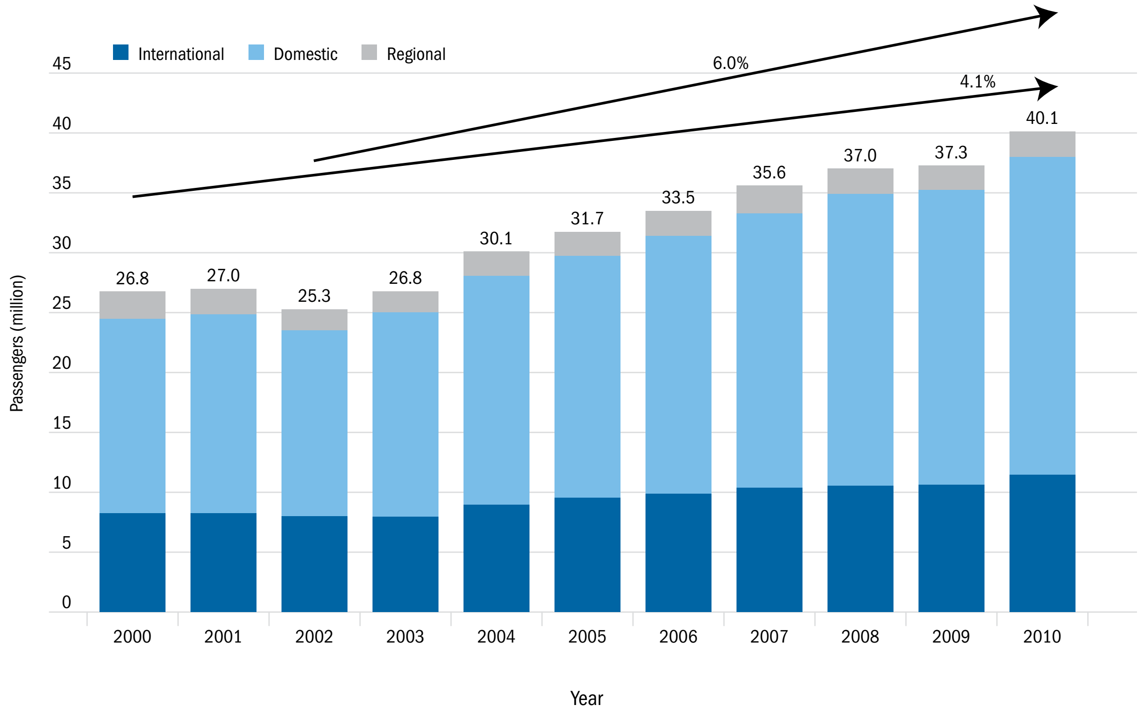
Between 2000 and 2010, together they have experienced passenger growth of a total of 50 per cent, from 26.8 million to 40.1 million passenger movements per year. Strong growth of six per cent per year[39] has been experienced since 2002, driven by the recovery after the events of 2001 and the emergence of the LCCs.

Figure 27 shows the growth over the last 10 years across the region's three RPT airports, broken down by international, domestic and regional (intrastate) markets.[40]

39 Throughout this Report, where a growth rate is presented or discussed it represents a compound annual (or year-on-year) growth rate (CAGR) unless otherwise stated.

40 'Regional' is defined as services to and from destinations within NSW other than Sydney. As such, flights between Canberra and Sydney (Kingsford-Smith) Airport are defined as domestic, but flights between Canberra and the rest of NSW are defined as regional. Additionally, flights between Newcastle and Sydney airports are regional. All other flights to non-capital-city centres outside of NSW are defined as domestic.

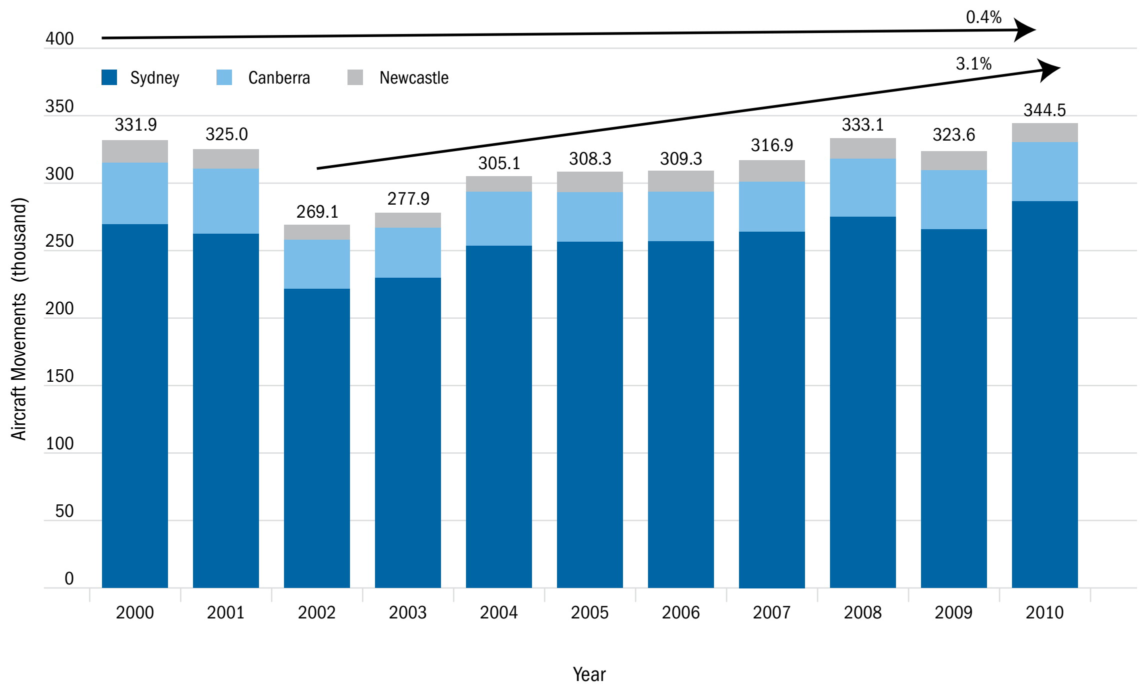
Figure 27 **Sydney region RPT passenger movements by market, 2000 to 2010**



Source: Booz & Company, based on BITRE data.

Aircraft movements in the region decreased more dramatically and have grown less quickly than passenger growth, with the total number of movements only now returning to the levels seen in 2000 before the collapse of Ansett Airlines. This is illustrated in Figure 28.

Figure 28 **Sydney region RPT aircraft movements by airport, 2000 to 2010**



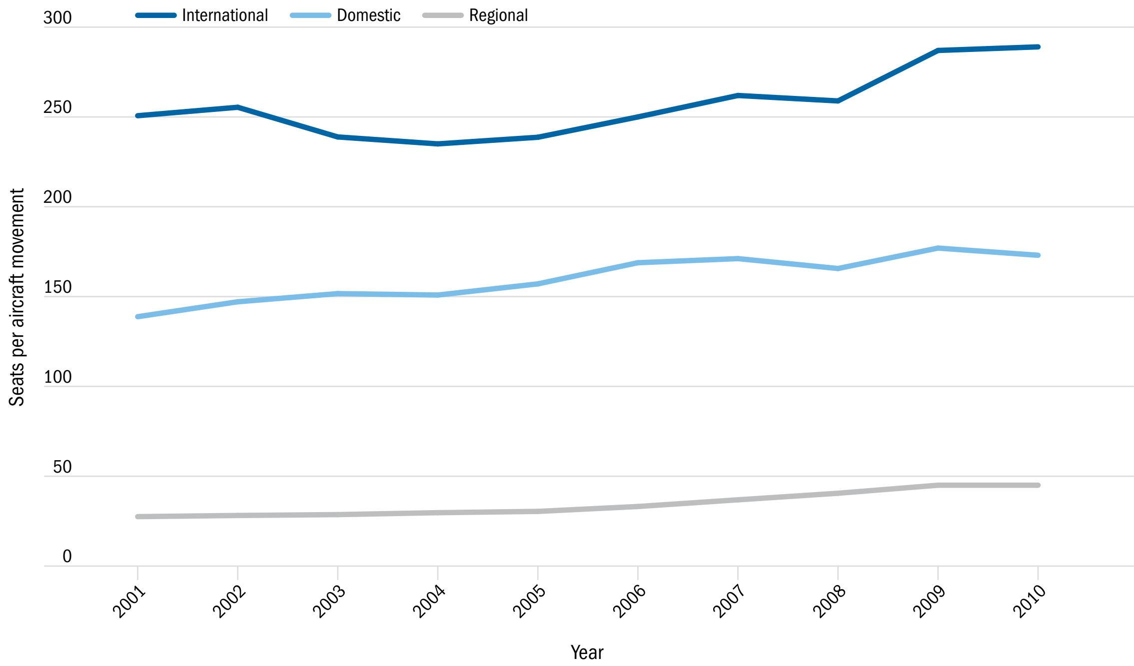
Source: Booz & Company, based on BITRE data.

This is consistent with trends for:

- the use of larger aircraft to operate each service, enabling more passengers to be carried per aircraft movement (aircraft upgauging); and
- airlines employing business practices to ensure a greater proportion of their seats are occupied (or increasing 'load factors').

As shown in Figure 29, between 2001 and 2010 the average number of seats provided on each service across Australia increased from approximately 138 to 173 seats for domestic aircraft, 28 to 45 seats for regional aircraft and 250 to 289 seats for international aircraft. This is reflected in the types of aircraft being operated. For example, in many regional areas jet services have been introduced to replace turboprops, while larger aircraft, including the A380, have also been introduced for international services.

Figure 29 **Seat capacity on aircraft movements in Australia, by market type, 2001 to 2010**

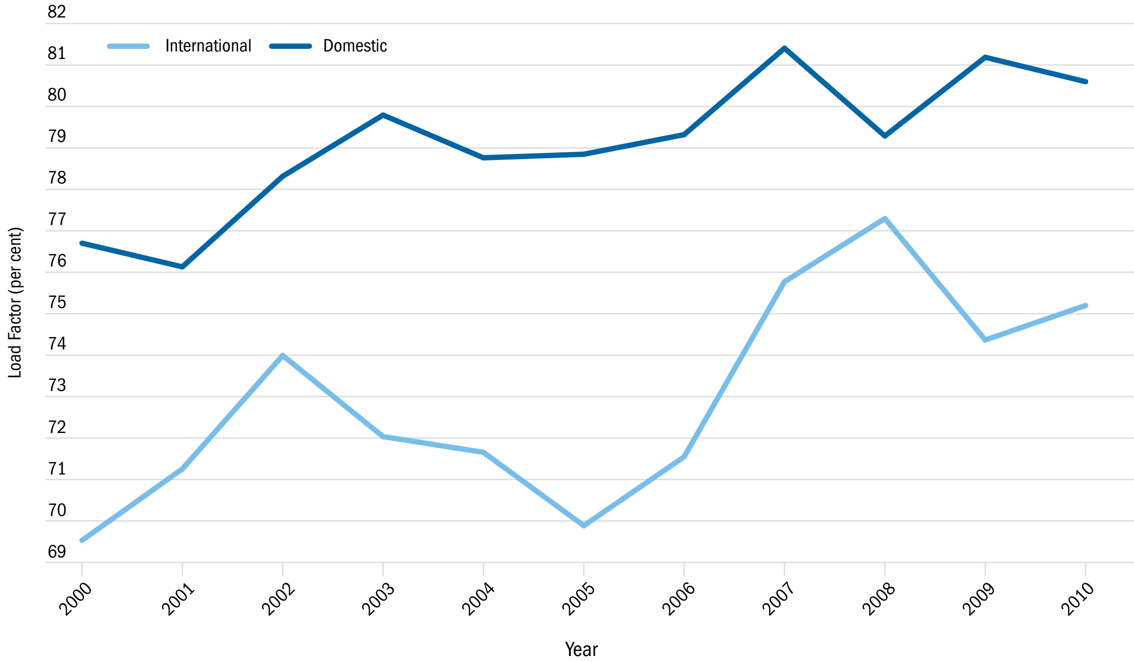


Source: Booz & Company, based on BITRE data.

Figure 30 shows the load factors (percentage occupancy) of services operating domestic and international services to and from Australia from 2000 to 2010. While they fluctuate, they show a general increasing trend: the average domestic passenger load factor increases from 76.5 per cent in 2000 to 80 per cent in 2010 and the average international load factor increases from 69 per cent in 2000 to 75 per cent in 2010.

That means that not only has there been a trend towards the use of larger aircraft with more seats per aircraft movement but also the occupancy is greater, with a higher percentage of seats occupied on average on each service.

Figure 30 **Average load factors on RPT services in Australia, by market type, 2000 to 2010**

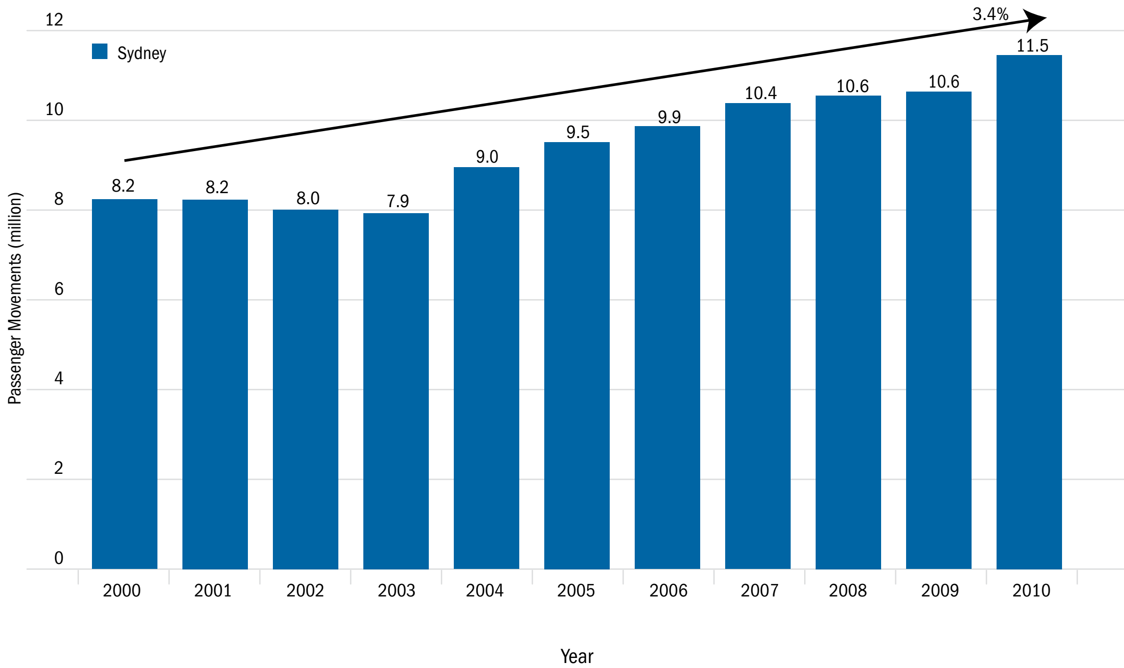


Source: Booz & Company, based on BITRE data.

International, domestic and regional RPT

While there has been overall RPT growth, it has not been uniform across the different parts of the RPT market. As shown in Figure 31, at Sydney (Kingsford-Smith) Airport, the only airport in the region in which international services regularly operate, the number of international passenger movements has increased by more than 40 per cent in total, from 8.2 million to 11.5 million, between 2000 and 2010. This represents a 3.4 per cent increase per year.

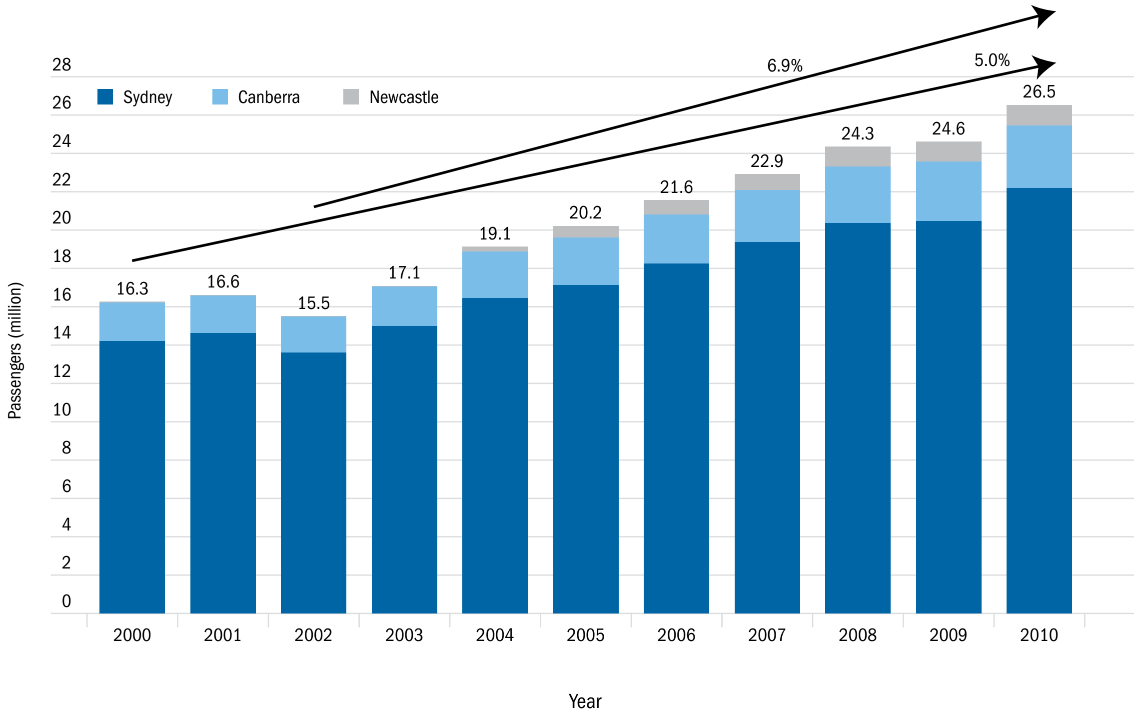
Figure 31 **Sydney region – international passenger movements, 2000 to 2010**



Source: Booz & Company, based on BITRE data.

Figure 32 shows the number of domestic passenger movements in the region between 2000 and 2010 – a total increase of more than 60 per cent from 16.3 million to 26.5 million. This represents a five per cent increase per year.

Figure 32 **Sydney region – domestic passenger movements by airport, 2000 to 2010**

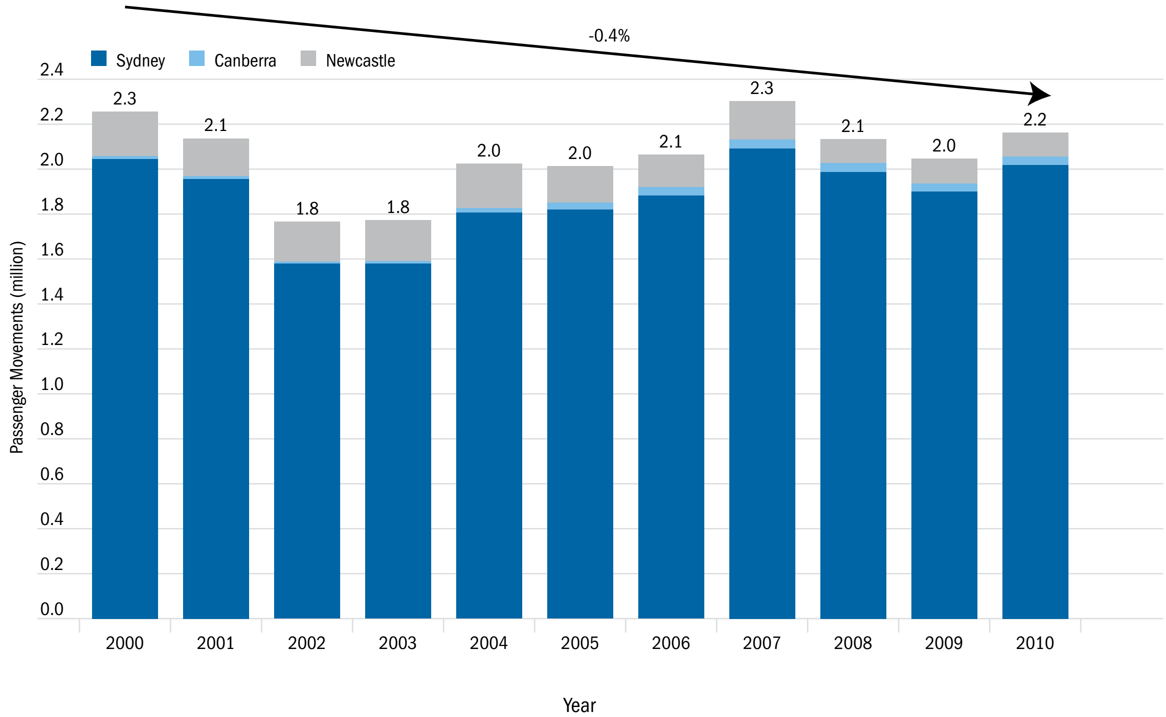


Source: Booz & Company, based on BITRE data.

Unlike the international and domestic passenger movement growth, Figure 33 shows a more fluctuating rate of regional passenger movements. After a peak of 2.3 million passengers in 2000, regional passenger activity dropped to 1.8 million passengers per year for 2002 and 2003 before recovering to levels between 2.0 and 2.3 million per year between 2004 to 2010. Overall, a growth rate of 2.5 per cent per year was experienced from 2002 to 2010, following the loss of services from Ansett Australia; activity for the decade is still slightly lower than the peak in 2001 (or a 0.4 per cent per year decline from 2000 figures).

Some of the fluctuation can be attributed to the changes in intrastate routes. The collapse of Ansett in 2001 resulted in a substantial reduction in regional services. In 2010 a number of the top 10 routes were to leisure destinations such as Ballina, Port Macquarie and Coffs Harbour. Since 2000, seat capacity on these routes has increased by approximately 180, 150 and 140 per cent respectively, indicating a move to larger aircraft. In contrast, five regional routes (Taree, Narrabri, Newcastle, Cooma and Grafton) have reduced seat capacity substantially since 2000, and a further nine services (Belmont, Casino, Cowra, Deniliquin, Forbes, Gunnedah, Inverell, West Maitland, Wollongong) no longer operate.

Figure 33 **Sydney region – regional passenger movements by airport, 2000 to 2010**



Source: Booz & Company, based on BITRE data.

RPT by travel purpose – business and leisure travel

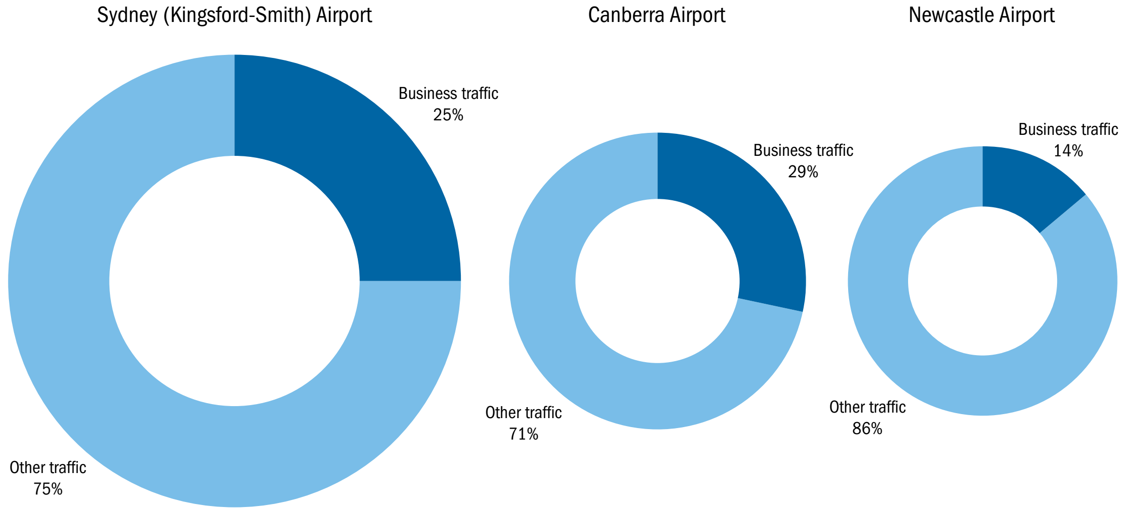
Passengers choose to fly for a range of purposes, including business, leisure, visiting friends and family, education, or for other commercial, sporting or cultural events.

The demands of business and leisure travellers differ. In general, business demand is driven by need, with peak travel times correlating to business hours to enable passengers to arrive in time for morning commitments or depart late in the afternoon. Business travel typically generates a higher yield per passenger and is a key market for full-service carriers. This is demonstrated by the substantial investments in frequent flyer programs, lounges and other services by these airlines.

In contrast, leisure passengers are typically more price sensitive and have more flexibility in service choice. For example, they might be willing to travel further or at a less convenient time for cheaper flights. Budget-conscious leisure travellers are a key market for LCCs, which can offer service times that fall outside of business peak times such as early morning and late evening and which offer lower fares, reflecting lower service levels and operating costs.

Booz & Company's analysis suggests that, in 2010, of the three RPT airports, Newcastle Airport's business traffic constituted a considerably smaller share of total traffic than that of Canberra Airport or Sydney (Kingsford-Smith) Airport (14 per cent, compared with 29 and 25 per cent respectively). The comparison is shown in Figure 34.

Figure 34 **Sydney region – business traffic as a share of passenger movements by airport, 2010**



Note: The analysis aggregates NVS and IVS data on travel purpose such that:

- *business passengers include those travelling for work, to attend conferences, exhibitions or conventions, or as part of employed research, or for work-related training; and*
- *other traffic (broadly, leisure passengers) includes those travelling to visit friends and relatives; for holiday, leisure, relaxation, entertainment or sport; to shop; to attend special events; as an incentive reward provided by an employer; or to accompany someone attending a conference.*

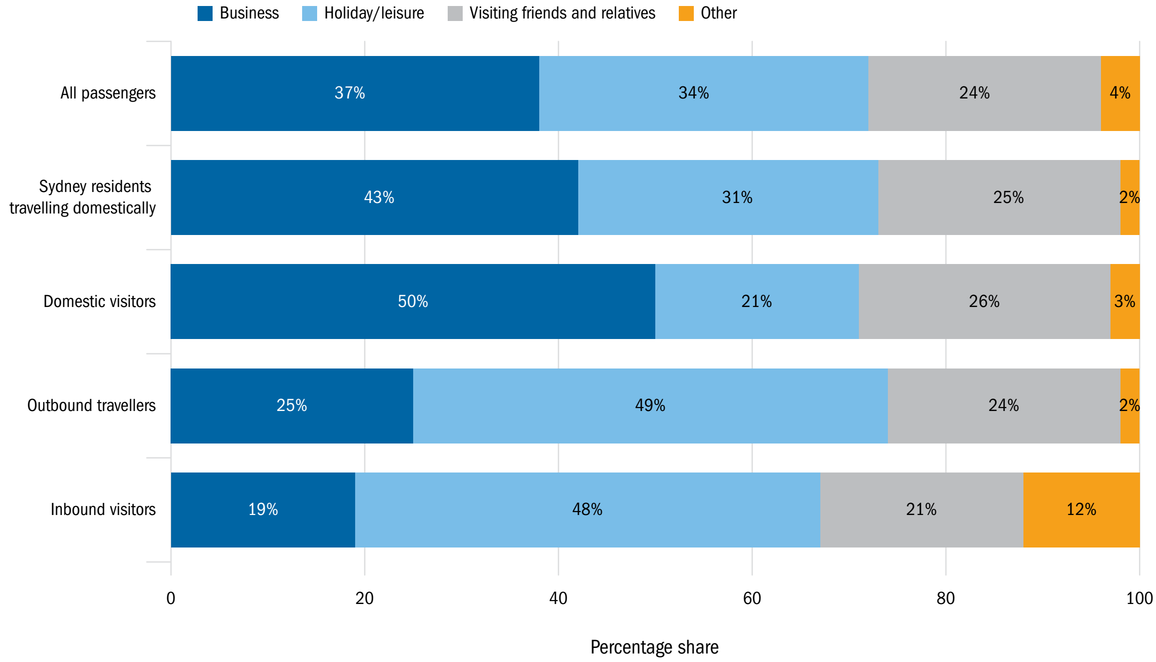
Source: Booz & Company analysis.

In addition, whereas 20 per cent of international traffic in the region was for business purposes, more than 25 per cent of domestic and regional passengers travelled for business.

Data from Tourism Research Australia's National and International Visitor Surveys (NVS and IVS) show an even more significant difference in business and leisure travel between user types. Figure 35 provides a breakdown of RPT by travel purpose (business, leisure, visiting friends and relatives) based on the different origins and destinations of airport users in the Sydney region. It breaks down airport traffic into Sydney residents travelling domestically, other Australian residents travelling to the region (domestic visitors), international (inbound) visitors to the region, and Australian residents travelling overseas (outbound travellers) through Sydney (Kingsford-Smith) Airport.[41]

41 Further information on aviation users can be found in Technical Paper A2.

Figure 35 **Sydney region – passenger types and purpose of trip**



Note: Total percentages may not equal 100 per cent due to rounding. The NVS does not provide information on which airport was used. It is presumed that a majority used Sydney (Kingsford-Smith) Airport, with a small proportion using Newcastle and Canberra airports.

Source: BITRE, analysis of NVS and IVS data for 2004 to 2009 (Tourism Research Australia).

This data shows that half of the domestic visitors travelled to Sydney for business, while a smaller proportion (43 per cent) of Sydney residents travelled to other Australian centres for business purposes. In terms of international movements, a quarter of international outbound travel was for business purposes, as compared with 19 per cent of inbound international travel.

This underscores the importance of Sydney as a business centre for the country and the critical nature of international business travel access for the Sydney economy. It also highlights the importance of business travel peaks in driving demand for use of the airport.

The 'other' category within the inbound international market is also significant, as it partly consists of the large volume of international students arriving in Sydney.

RPT by service type – LCC and full service carriers

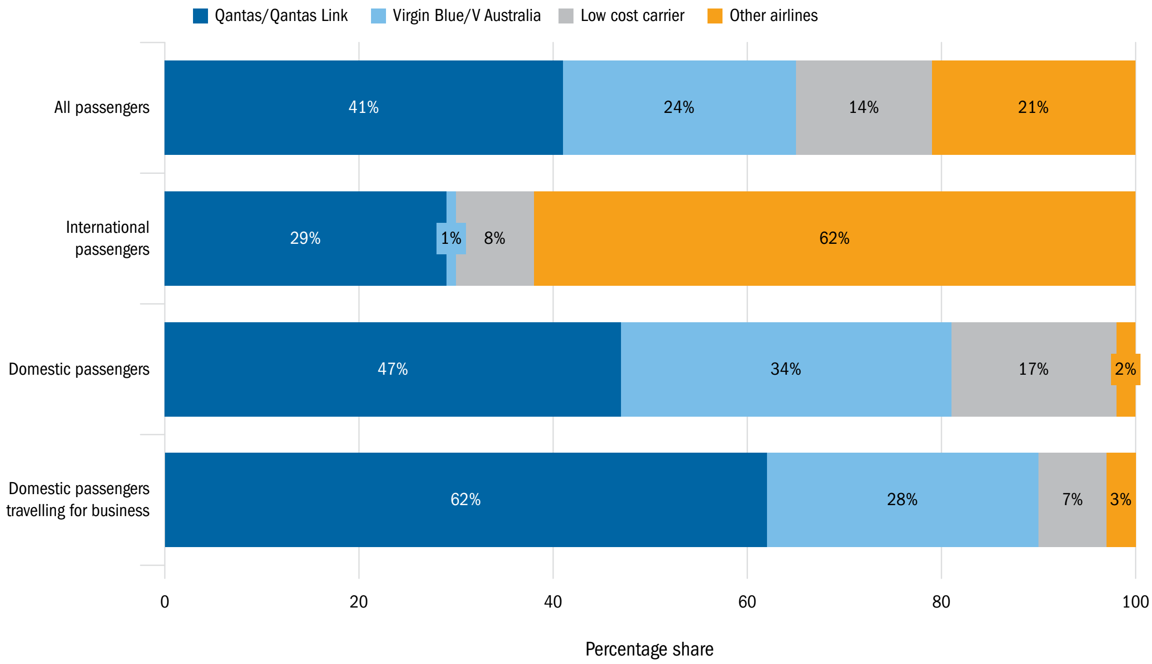
LCCs have further segmented the RPT market beyond the traditional 'full service' first, business and economy class model that previously characterised the RPT market. Typically, full service carriers have provided a price and seating structure based on varying levels of service, food and other facilities. Under the standard LCC model, traditionally such carriers have sought to pare back the benefits of all-inclusive fares in exchange for lower ticket prices.

Figure 36 considers the distribution, from 2006 to 2009, of all passengers (domestic, regional and international) between major Australian airlines, LCCs and other airlines. Qantas (including QantasLink) accounted for the largest proportion of passengers at airports in the Sydney region (41 per cent), followed by the then Virgin Blue / –V Australia (24 per cent). A number of LCCs (including Jetstar, Tiger Airways Australia, the then Polynesian Blue and Pacific Blue, and Freedom Air) accounted for 14 per cent of all passengers, representing a larger share of the domestic sector compared with international sectors.[42]

42 As of December 2011, a number of airlines including Virgin Blue, V Australia and Pacific Blue have been operated collectively under the name 'Virgin Australia'. Polynesian Blue has been renamed Virgin Samoa.

Figure 36 also shows that LCCs captured only a very small share of business-related domestic air trips at Sydney region airports (seven per cent, as compared with 17 per cent for all domestic passengers).

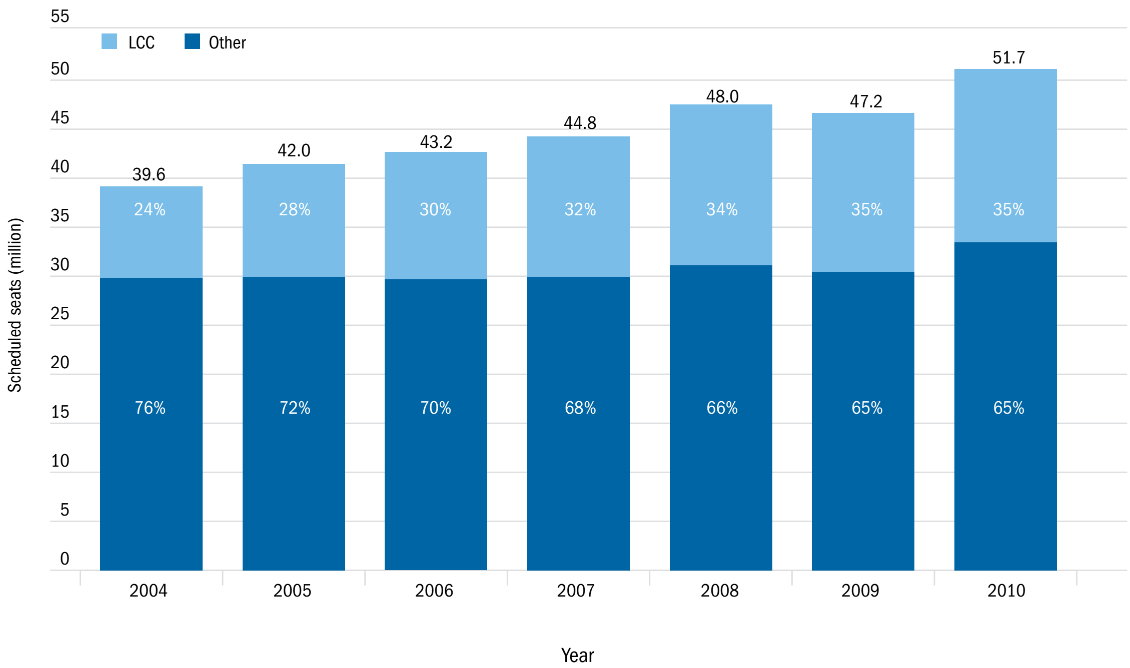
Figure 36 **Sydney region – Airline market shares for passengers**



Source: BITRE, Airport Traffic Statistics 2006 to 2009 and NVS data for 2006 to 2009 (Tourism Research Australia).

Despite a smaller share of passengers, the LCC market has grown markedly in recent years and is expected to continue to grow. Figure 37 shows the increase in share of seats provided by LCCs. As shown, LCCs have been the key to growth in aviation services.

Figure 37 **Sydney region – LCC share of scheduled seat capacity, 2004 to 2010**



NOTE: Shows seats available for sale by airlines (rather than actual movements discussed in other sections of this Report). Includes services provided by Virgin Australia (then called Virgin Blue), which at the time was branded as an LCC.

Source: Booz & Company, analysis of SRSanalyser.

This is likely to continue as the division between LCCs and full service carriers becomes increasingly blurred. Full service carriers are seeking to reduce operating costs and are using yield management practices in an effort to remain competitive in terms of cost. Some LCCs are also diversifying their service offerings, providing premium economy or business class options for some segments and other services such as terminal lounge access. LCCs are now offering long-haul low-cost options.

To meet the future aviation demand, it will be important to address the requirements of carriers across all service options.

RPT by aerodrome

Levels of operations have also grown at each of the region's three RPT airports but at different rates, reflecting the different mix of activity provided at each airport.

Sydney (Kingsford-Smith) Airport

Sydney (Kingsford-Smith) Airport is Australia's most connected domestic and international airport and is currently Australia's busiest domestic and international airport in terms of passengers. Total passenger movement numbers continue to increase despite the growth of services at other airports, including the growth of international services to other locations.

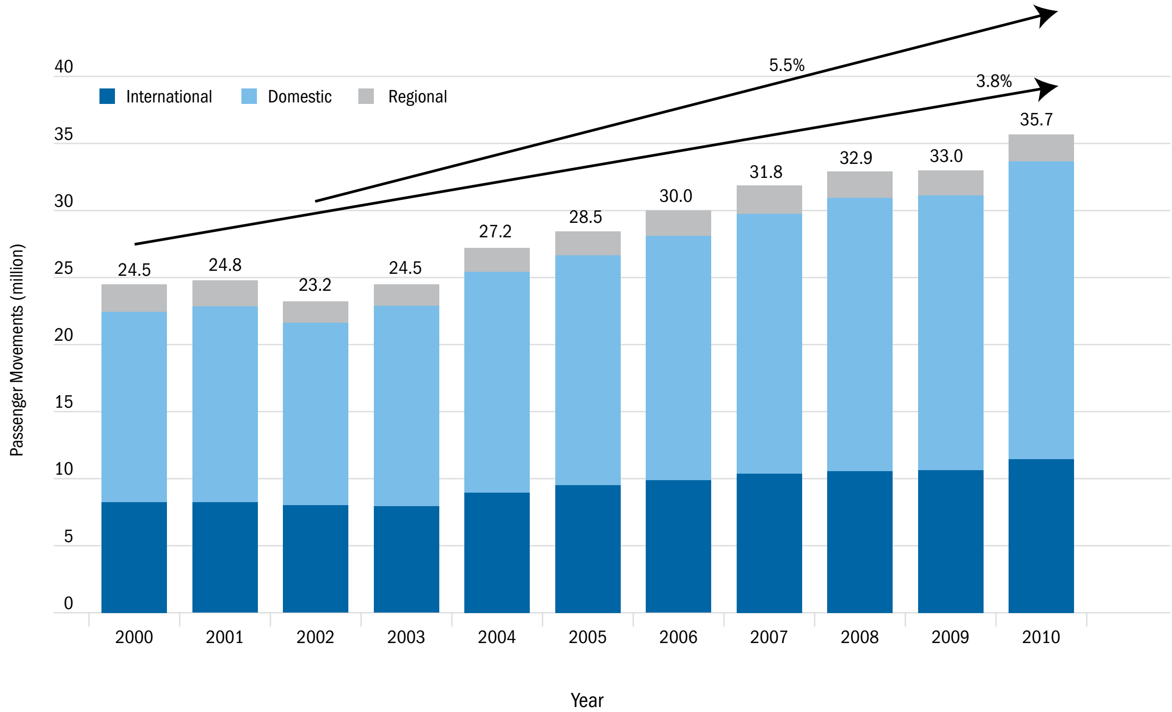
In 2010, Sydney (Kingsford-Smith) Airport handled the vast majority (89 per cent) of the region's RPT traffic, facilitating throughput of 35.7 million passenger movements (including all of the region's international passenger movements) and 286,600 RPT aircraft movements. It was the world's 27th busiest international airport in terms of international passenger numbers.[43]

To put this in context, just the last five years of growth at Sydney (Kingsford-Smith) Airport, 7.2 million passengers, is the equivalent of all the activity in 2010 at Adelaide Airport, the fifth busiest airport in Australia (at 7.3 million passenger movements in 2010).

As shown in Figure 38, the largest contributor to passenger growth at Sydney (Kingsford-Smith) Airport was domestic traffic, which comprised just over 60 per cent of the airport's passenger market. There were 22.2 million domestic passenger movements in 2010.

43 Airports Council International.

Figure 38 **Sydney (Kingsford-Smith) Airport passenger movements by market, 2000 to 2010**



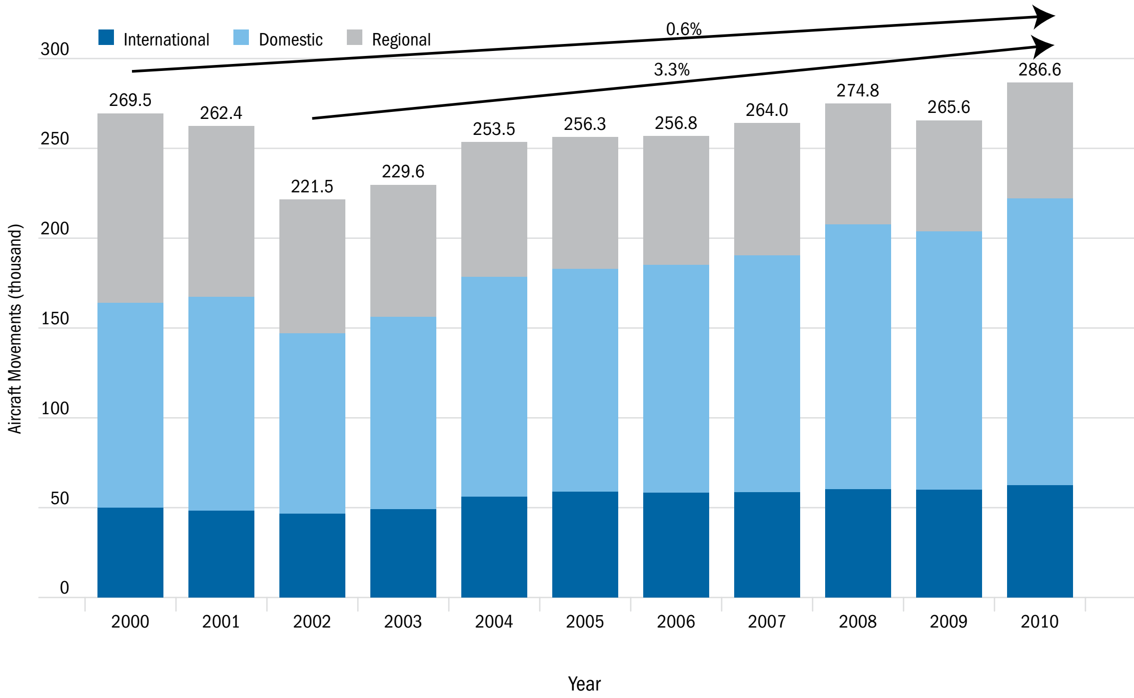
Source: Booz & Company, based on BITRE data.

As discussed earlier, international services also continued to grow. In contrast, regional passenger movements at Sydney (Kingsford-Smith) Airport have only recently returned to levels comparable to those before 2001 (2.01 million passenger movements in 2010 compared with 2.04 million passenger movements in 2000).

Growth in the number of aircraft movements at Sydney (Kingsford-Smith) Airport has been slower than growth in the number of passengers because of fleet upgauging. As shown in Figure 39, the number of RPT aircraft movements at Sydney (Kingsford-Smith) Airport (excluding dedicated freight services and GA) grew from 221,500 in 2002 to 286,600 in 2010. Total aircraft movements at Sydney (Kingsford-Smith) Airport did experience a sudden drop following the collapse of Ansett in September 2001 before a period of strong recovery.

Regional aircraft movements comprised a relatively large share of movements, despite the aircraft having significantly lower passenger numbers due to the smaller aircraft size.

Figure 39 Sydney (Kingsford-Smith) Airport RPT aircraft movements by market, 2000 to 2010



Source: Booz & Company, analysis of BITRE data.

Canberra Airport

Canberra Airport is the region's second largest airport, supporting eight per cent of its RPT passenger movements. As shown in Figure 40, in the decade between 2000 and 2010, the number of passenger movements at Canberra Airport increased from two million to 3.3 million (a total 65 per cent increase between 2000 and 2010 or 4.9 per cent per year).

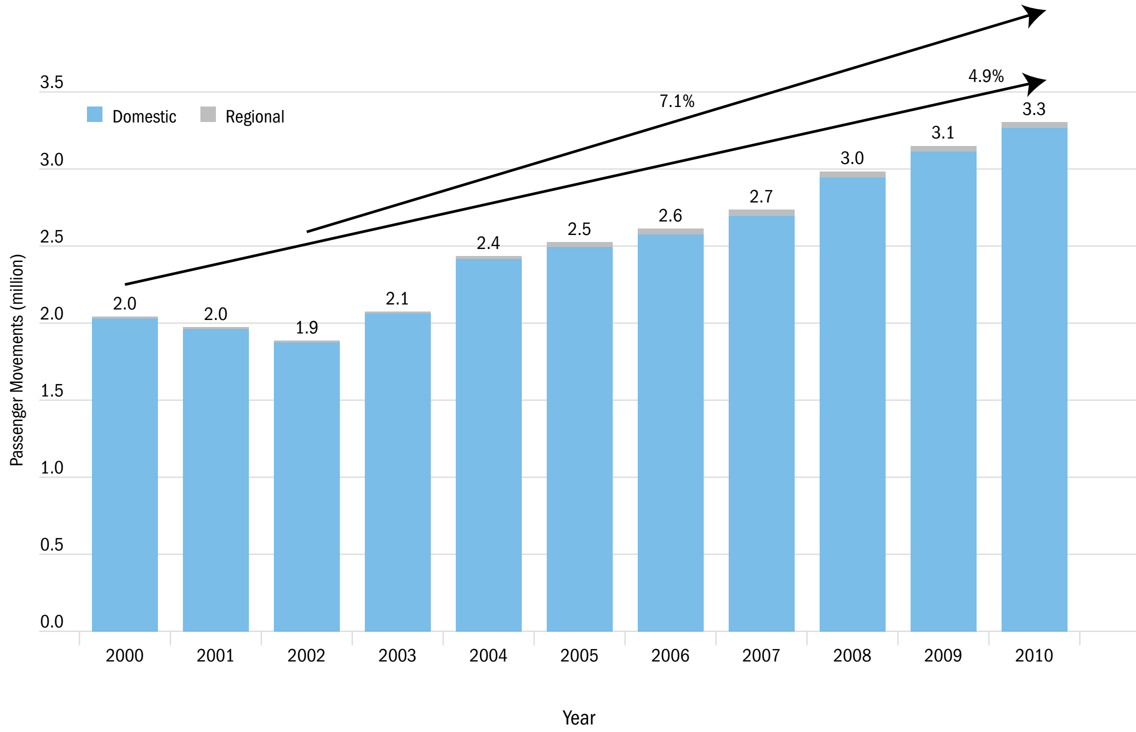
Canberra Airport currently provides direct passenger services to 12 domestic destinations, including all capital cities, the Gold Coast, Townsville, Newcastle, Tamworth and Albury.

The focus of services to and from Canberra Airport continues to be domestic services, consistently accounting for 99.9 per cent of all passenger movements, even though regional passenger activity at the airport has tripled from 11,900 to 38,000 passenger movements in the same period. One-third of all Canberra Airport's passenger movements in 2010 involved traffic to and from Sydney.

Canberra Airport had a small number of international RPT movements in 2004, when Air Pacific offered a service between Canberra and Fiji for a number of months.[44] However, no regular international services have since operated to the airport.

44 Australian Department of Infrastructure and Transport

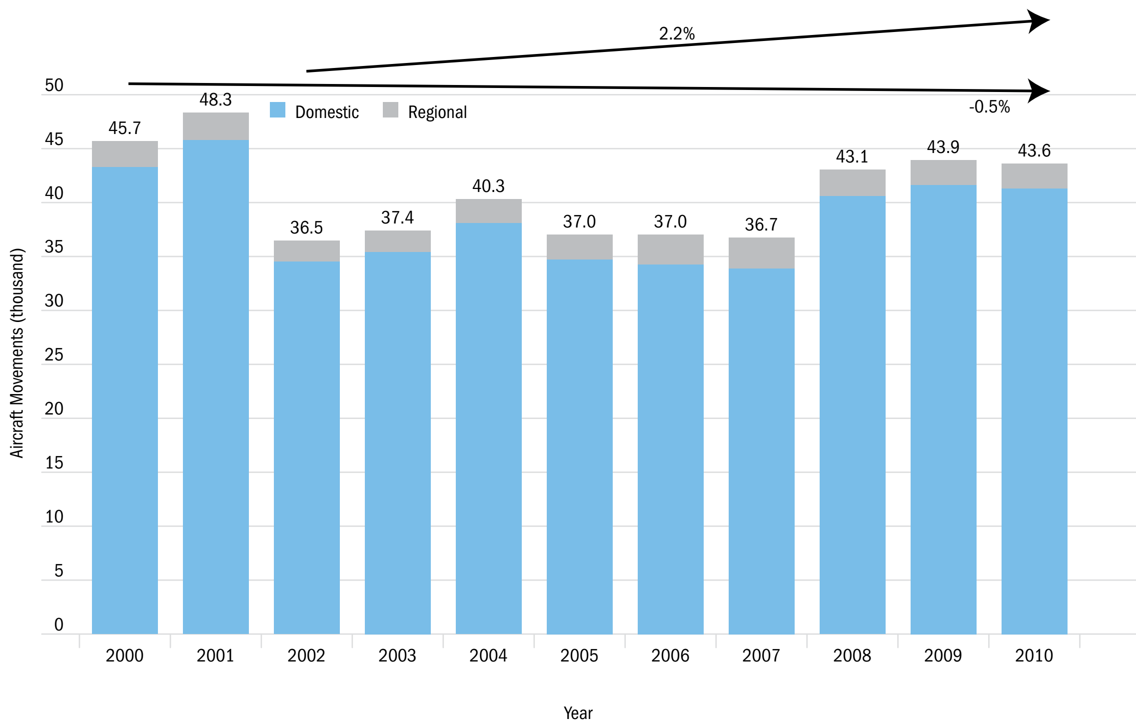
Figure 40 **Canberra Airport passenger movements by market, 2000 to 2010**



Source: Booz & Company, based on BITRE data.

In terms of aircraft movements, following a decline after the events of September 11, 2001, and the collapse of Ansett, Canberra Airport returned to growth from 2002 driven by the introduction of services by Virgin Blue (now Virgin Australia). The number of aircraft movements has still not returned to the peaks of 2000 and 2001, as shown in Figure 41. Analysis shows a significant factor influencing this is the use of larger aircraft; load factors have remained comparatively consistent, averaging around 66.5 per cent over the last 10 years.

Figure 41 **Canberra Airport RPT aircraft movements by market, 2000 to 2010**



Source: Booz & Company, based on BITRE data.

Newcastle Airport

Newcastle Airport operates with limited civil capacity as part of RAAF Base Williamtown. In 2010, it was the fifth largest non-capital city airport in Australia, in terms of passenger movements, after Gold Coast, Cairns, Townsville and Launceston. It currently provides domestic and regional services only, and accounts for three per cent of RPT passengers in the Sydney region.

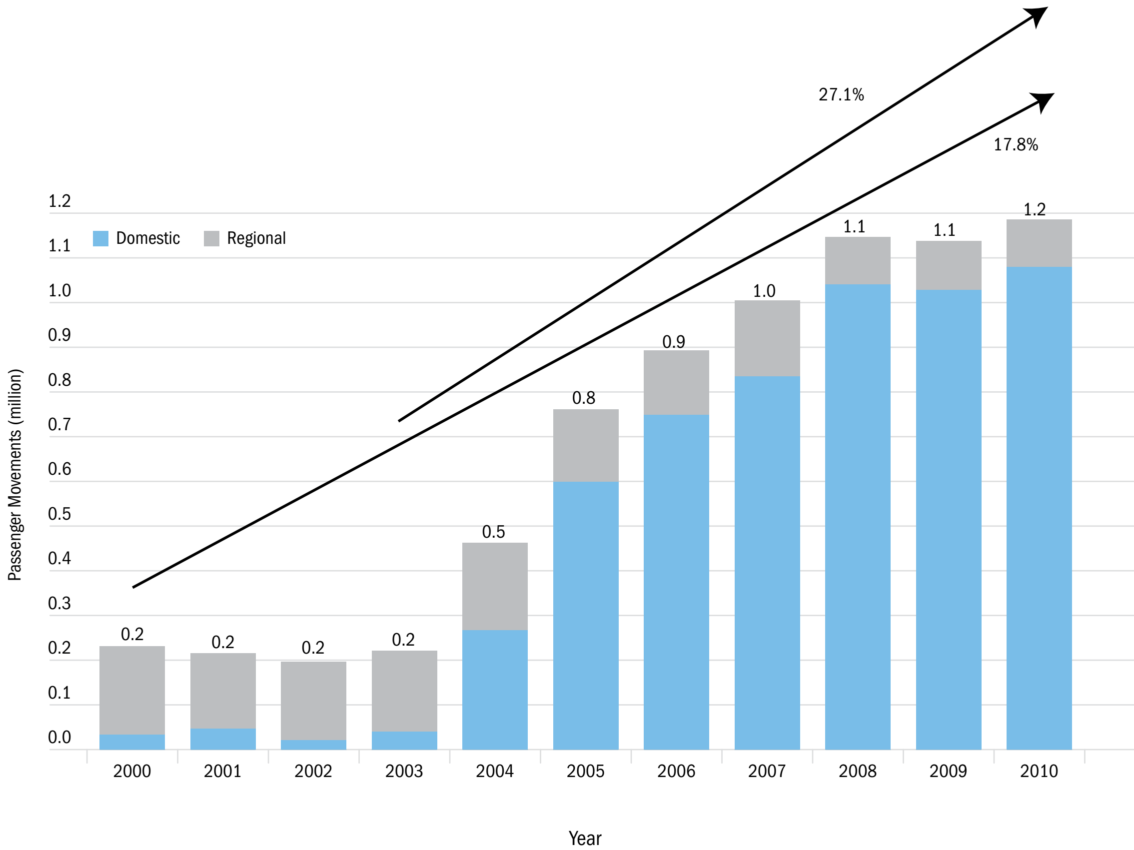
Newcastle Airport has experienced annual growth since 2000 of 17.8 per cent per year, with a particularly rapid increase since 2003 of 27.1 per cent per year. This was driven by the introduction of jet services by Virgin Blue in November 2003 and Jetstar in May 2004.[45]

Excluding regional traffic, the growth in domestic traffic has been even more dramatic, with domestic passenger movement numbers increasing from 32,600 in the year 2000 to more than one million in 2010. A slight plateau has occurred, particularly in domestic passenger movements, since 2008.

In contrast, regional passenger movements declined from 198,500 to 106,300 (a total reduction of 46 per cent or 6.1 per cent per year) over the same period. Figure 42 shows the large increase in interstate passenger movements over a very short period of time, underlining the major shift in the market for the airport.

Traffic at Newcastle Airport is dominated by LCC airlines: Jetstar provided 68 per cent of scheduled seats in 2010, followed by Virgin Australia with 21 per cent. QantasLink, Brindabella Airlines, Aeropelican and Norfolk Air provided the remaining services. Routes to and from Brisbane, Melbourne and the Gold Coast supported the largest share of passenger movements at the airport (50 per cent, 30 per cent and 10 per cent respectively), followed by Sydney with five per cent. Other destinations include Canberra, Narrabri and Norfolk Island.

Figure 42 **Newcastle Airport passenger movements by market, 2000 to 2010**



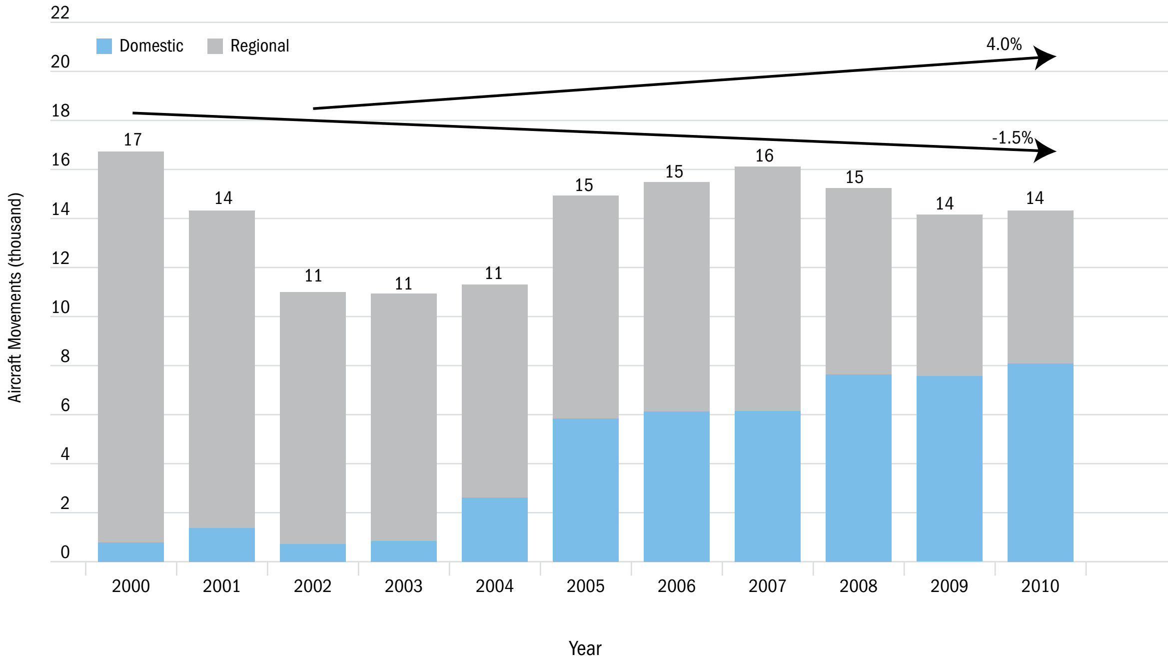
Source: Booz & Company, based on BITRE data; actual movements may vary slightly due to rounding.

45 Newcastle Airport Limited, *Newcastle Airport Master Plan*, 2007.

Aircraft movement numbers fell from a peak of 17,000 in 2000 to 11,000 in 2003, mainly due to the collapse of Ansett and the impact on air travel of the events of September 11, 2001.

Figure 43 shows the change in aircraft movement numbers since 2000, with overall decline from the peak in 2000. The decline has been in regional movements (a decline of nine per cent per year between 2000 and 2010). The number of domestic movements has continued to increase over the 11-year period, with only a temporary reduction in 2002 and 2003.

Figure 43 **Newcastle Airport RPT aircraft movements by market, 2000 to 2010**



Source: Booz & Company, based on BITRE data.

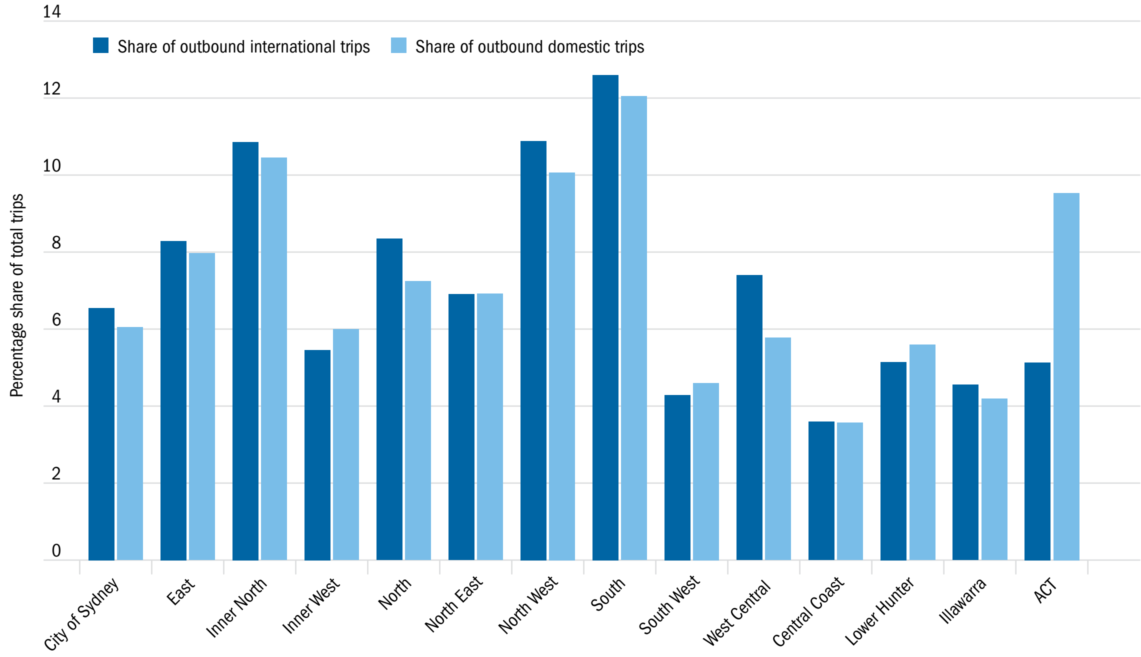
Sources and locations of RPT demand in the Sydney region

The Steering Committee sought advice on the location of people who are more likely to use aviation services so that it understood where demand is primarily generated within the Sydney region.

Analysis of NVS data shows that residents from some Statistical Local Areas (SLAs) had a noticeably higher propensity to travel than others. A larger number of aviation trips were undertaken by residents in Warringah, Ku-ring-gai, Randwick, North Sydney, Sutherland Shire West and Baulkham Hills Central. In contrast, residents in the Fairfield West, Bankstown North West, Parramatta South and Wollondilly SLAs took relatively fewer trips.

The patterns remain consistent when comparing domestic and international outbound trips by Sydney region residents. Figure 44 shows that, of the NSW planning subregions, residents of the South (including Sutherland (East and West) and Marrickville) have the largest share of use (12.5 and 12 per cent each of domestic and outbound trips) followed by those in the North West (10.9 and 10.1 per cent of outbound domestic and international trips respectively) and Inner North (10.9 and 10.4 per cent respectively). Illawarra and the Lower Hunter accounted for between four and six per cent of each type of trip.

Figure 44 **Share of outbound trips made by residents in the Sydney region, 2004 to 2009**

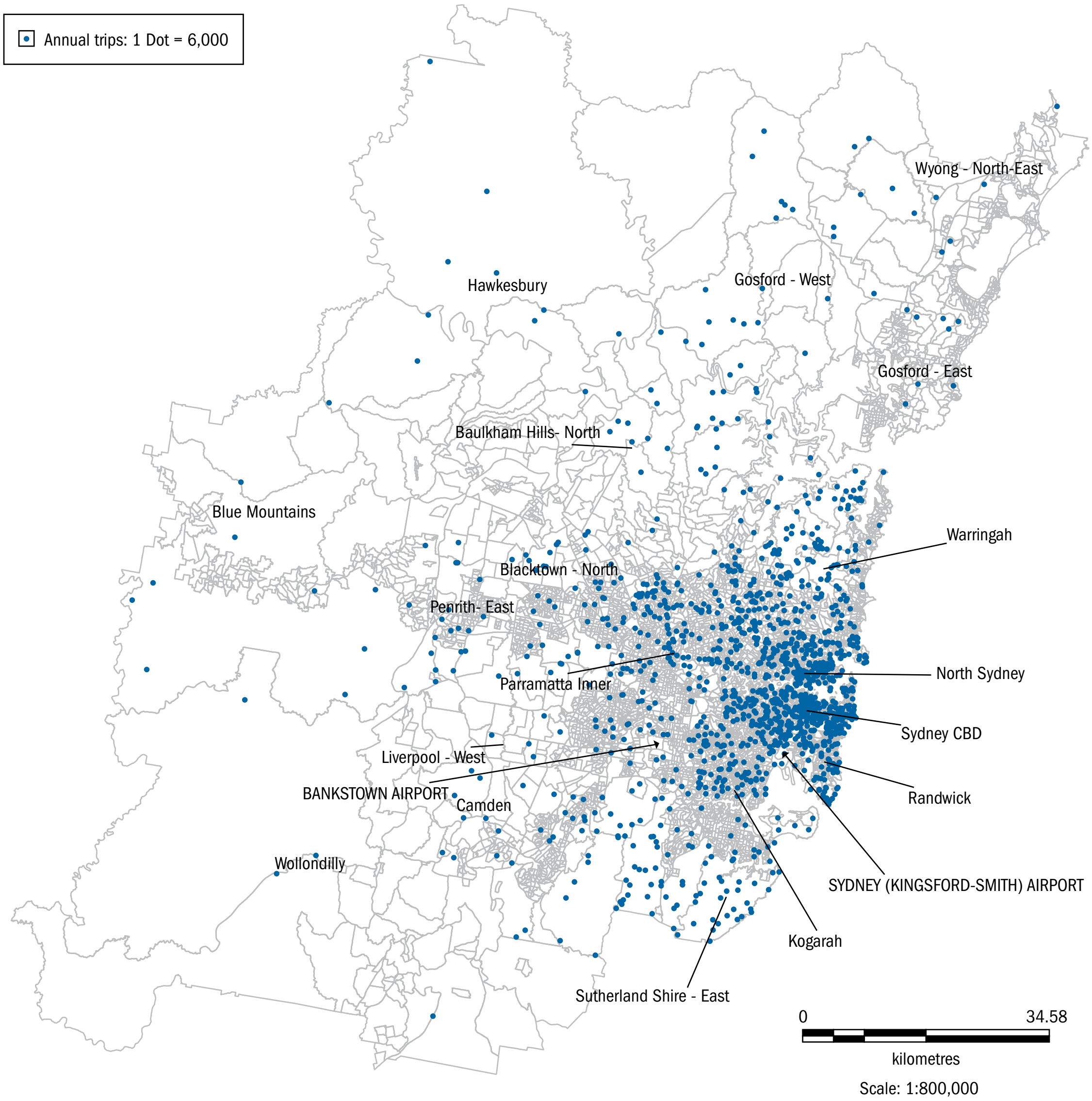


Note: Figure shows information from residents of the Sydney region in response to the question: 'where do you live'. It excludes trips made by international visitors and those travelling domestically from other parts of Australia to Sydney. Sydney subregions may vary in population or land area.

Source: BITRE analysis of NVS data for 2004 to 2009 (Tourism Research Australia) aggregated into NSW planning subregions.

Figure 45 maps out this information in more detail using aggregated NVS data and deidentified frequent flyer data from major airlines.

Figure 45 Distribution of air trips in the Sydney region, by suburb



Source: BITRE analysis of NVS data for 2004 to 2009 (Tourism Research Australia) and deidentified frequent flyer data from major airlines. Dots show the centroids of the suburbs identified.

Data published by Sydney Airport Corporation Limited (SACL) from 2006 is aggregated slightly differently but, similarly, it shows the highest usage in Inner Sydney, Lower Northern Sydney, St George–Sutherland, Northern Beaches and the Eastern Suburbs areas, with less usage from the Illawarra to Wollongong, outer South West and Newcastle areas.

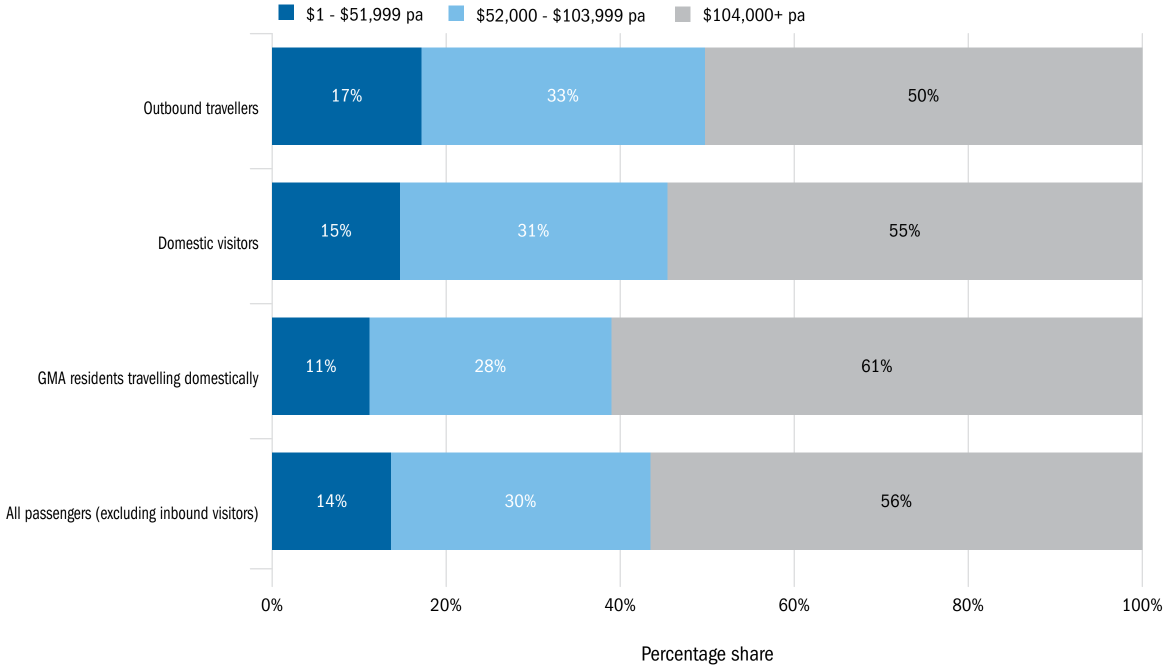
Location is not the only factor that impacts on access to air services. The use of air travel varies a great deal across different demographic and socio-economic groups. In particular, research has shown that there is a higher representation by high income earners among air travellers. This is demonstrated in Figure 45: those from inner city regions are the highest income earners and also take the largest number of trips.

Figure 46 shows the incomes identified by Sydney residents travelling domestically, domestic visitors (other Australian residents travelling to Sydney) and outbound passengers (residents travelling overseas).[46] In particular, 28 per cent of Australians lived in a household earning more than $104,000 per year, with this group accounting for between 50 per cent and 61 per cent

46 Data on inbound international passengers was not available.

of passenger trips. In contrast, 39 per cent of the population, earning less than $52,000, only accounted for 11 per cent to 17 per cent of trips.[47]

Figure 46 **Passenger type at Sydney region airports by household income, 2004 to 2009**



Note: Greater Sydney Metropolitan Area (GMA) covers the Sydney and Illawarra Statistical Divisions and the Newcastle (or Lower Hunter) Statistical Subdivision. Income information was not available for international visitors. 'Don't know' and 'refused responses' to the income question were also excluded (18 per cent of visitors).

Source: BITRE analysis of NVS data for 2004 to 2009 (Tourism Research Australia).

In terms of purpose of travel, the NVS suggests high income earners (defined as having a household income of more than $104,000 per year) also dominate business travel, with 71 per cent of passengers travelling for business purposes in 2004 to 2009. This income category is also overrepresented among passengers travelling for non-business purposes, with a 46 per cent market share. The trend towards increased outbound travel by Australians since 2005, however, was largely driven by middle income households taking outbound trips for leisure purposes, as NVS data shows a greater increase in outbound travel by these households.

Age, gender, employment status, education and household status and structure showed similar relationships with income and business travel. Regression analysis undertaken by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) found there was noticeable correlation between the age of a person and their frequency of travel. Australians aged 15 to 19 years and those over 65 were found to have the lowest rate of air travel per capita, while males aged between 35 and 54 were found to be the most prolific air travellers.

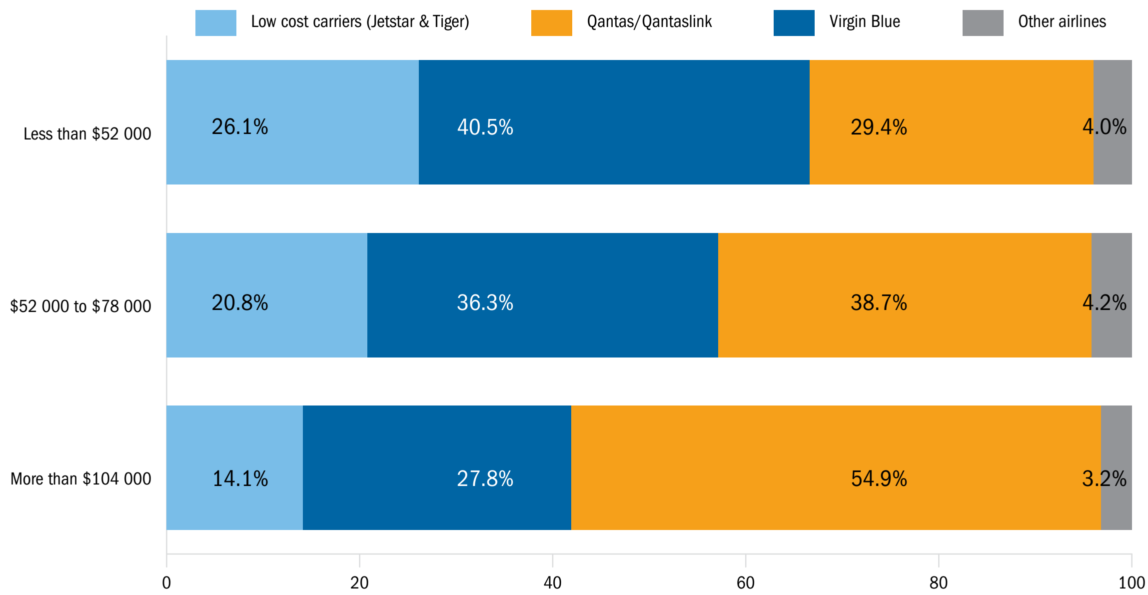
The use of LCCs generally follows the same broad patterns across demographic categories as overall airline usage. However, the limited penetration of the business travel market by LCCs means they capture a relatively small proportion of high-income domestic air travellers (14 per cent of households earning over $104,000 per year) and the full-time employed (15 per cent). In contrast, they capture a much higher share of students travelling domestically by air (27 per cent) in Australia.

As shown in Figure 47, there is a relationship between passenger incomes and the types of airlines on which they travel: 26 per cent of low income earners travelled on the LCCs Jetstar and Tiger in 2006–09 compared with 14 per cent for high income earners. Similarly, 55 per cent of high income earners travelled on Qantas compared with 14 per cent on LCCs. The share of

47 BITRE analysis of ABS *Survey of Income and Housing* data 2008 and National Visitor Survey income data 2005 to 2009.

usage of Virgin Blue (now Virgin Australia) remained consistent with this trend as it evolved from its LCC origins to more recent times.

Figure 47 **Domestic air trips by household income and airline, Australia, 2006 to 2009**



Note: Data analysed responses from around Australia, not just the Sydney region, for domestic overnight stays. Airlines in the 'other' category include Regional Express and Skywest. Excludes trips with unknown airlines. Income information was not available for international visitors. 'Don't know' and 'refused responses' to the income question were excluded from the chart.

Source: BITRE analysis of NVS data for 2006 to 2009 (Tourism Research Australia).

These factors are indicative of the demographic characteristics which may be associated with air travel. In addition to demographic characteristics, airlines' services offering (such as pricing, frequency of services and destinations) was considered to have the largest influence on demand for certain airports. This is particularly the case for international travellers, as the range of services available tends to vary between airports.

Whereas most capital cities provide a variety of domestic services, international services may be more limited. Sydney (Kingsford-Smith) Airport is a connection point for:

- 65 per cent of Canberra's international passengers, 22 per cent of Adelaide's international passengers and nine per cent of Melbourne's and Brisbane's international passengers; and
- five per cent of Perth's international passengers.[48]

From a domestic perspective, the proportion of passengers at other airports which connected via Sydney (Kingsford-Smith) Airport was slightly smaller (between four per cent and nine per cent). Put another way, while the domestic catchment may be considered to be the airport's surrounding region, international air travel draws its demand from across the country.[49]

Air freight

Aviation plays an important role in moving freight, especially low-volume, high-value freight. The average value of air cargo, by weight, is in the order of 300 to 350 times that of sea cargo.[50] While air freight represents one-tenth of a per cent of total Australian international trade by volume, it represents approximately 24 per cent of Australia's total international trade by value.

48 Booz & Company analysis.
49 Booz & Company analysis.
50 The average value of air cargo is $117.90 per kg versus 36c per kg for sea cargo (Booz & Company analysis of Australian Transport Statistics 2007, BITRE 2005–06).

Air freight is particularly important for same-day and overnight transport for time-critical or perishable goods such as seafood, medical supplies, newspapers, banking and express post. Increasingly, it supports new manufacturing and trade models – for example, 'just-in-time' business, where component parts or stocks are maintained in a limited number of central depots and dispatched to the point of need as required. The quicker transit times also allow businesses, including importers and exporters, to be more responsive to immediate market needs, taking advantage of market and price (including exchange rate) opportunities.

The majority of freight is carried in the cargo hold of passenger aircraft and the major air freight-handling facilities are co-located with passenger operations at major airports. Consequently, Sydney (Kingsford-Smith) Airport, as the main international airport and domestic hub, dominates international and domestic air freight. In 2010, the Sydney region's airports handled approximately half a million tonnes of air freight, with the bulk (more than 95 per cent) being handled by Sydney (Kingsford-Smith) Airport.

There is currently no freight-only civil airport in the Sydney region. However, a number of airlines provide dedicated freight transport services. At Sydney (Kingsford-Smith) Airport, this includes Qantas, Australian air Express (a Qantas Freight joint venture with Australia Post), and Virgin Australia working with Toll Air Express and Tasman Cargo Airlines/DHL. Emirates, Cathay Pacific Airways, Federal Express, Korean Air, Malaysia Airlines, Singapore Airlines, Cargolux and United Parcel Service also operate dedicated international freight services to and from Sydney (Kingsford-Smith) Airport.[51]

Six of the top 10 international air freight flows for Australia occur through Sydney (Kingsford-Smith) Airport, including routes to and from Auckland, Hong Kong, Singapore, Los Angeles and Bangkok. In particular, Sydney (Kingsford-Smith) Airport plays a significant role in air freight flows from New Zealand to Asia and Europe. (As a comparison, it handles almost twice the volume of air freight from New Zealand than that being moved through Melbourne).[52]

Dedicated freight services currently account for 30 per cent of inbound international and 20 per cent of outbound international freight tonnage at Sydney (Kingsford-Smith) Airport; they also account for 25 per cent of domestic freight. More recent data suggests this may be increasing slightly, although it is unclear yet whether this will develop into a long-term trend given the economics of dedicated air freight services vis-à-vis freight carried in the cargo hold of passenger aircraft.

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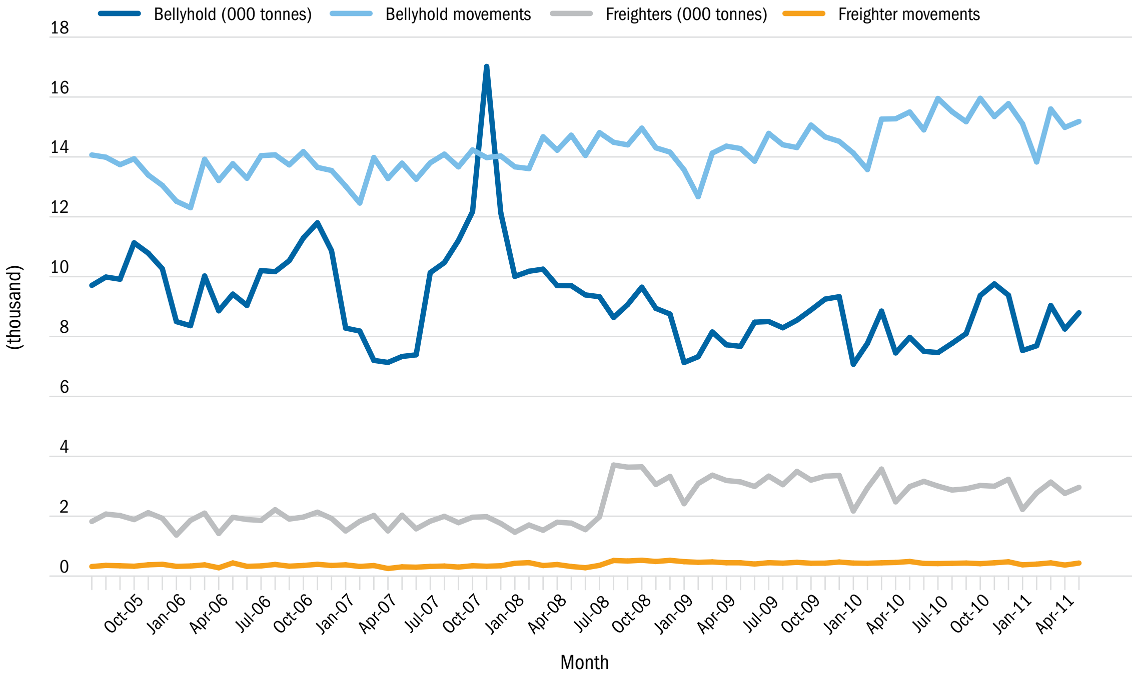
51 Australian Department of Infrastructure and Transport, *International Airlines Timetable Summaries Northern Winter 2011–12,* 2011
52 Booz & Company analysis of BITRE data.

Figure 48 **Freight carried in dedicated aircraft or in the cargo hold of passenger aircrafts, 2005 to 2010 (historical estimation)**



Note: Peak for freight in cargo hold was due to an incidental spike in commercial opportunity.
Source: BITRE.

In terms of aircraft movements, dedicated international and domestic freight accounts for approximately 2.4 per cent of movements throughout the year at Sydney (Kingsford-Smith) Airport.

Canberra Airport is seeking to expand its dedicated freight capacity, including as a centre for freight services in the region, having already built significant air freight hangar and distribution facilities for Australian air Express and also supporting Toll and Corporate Air services. In addition, both Newcastle and Bankstown airports anticipate that they will handle increased air freight volumes.

International air freight

A significant portion (approximately 400,000 tonnes) of freight in the Sydney region in 2010 was international. This represented approximately 50 per cent of Australia's international air freight. As the only current provider of international air freight in the region, Sydney (Kingsford-Smith) Airport is particularly important.[53]

According to Customs clearance data obtained through the ABS, in 2010 air freight imports through Sydney (Kingsford-Smith) Airport were valued at $33.3 billion, while air freight exports were valued at $13 billion. Compared with 2009, the value of air freight imports in 2010 increased by 0.6 per cent and the value of air freight exports increased by 1.4 per cent.

Nearly all (96.9 per cent) of the imported air freight cleared at Sydney (Kingsford-Smith) Airport was destined for NSW, while half of the exports departing from the airport originated in NSW. Another 15 per cent of exports originated in Victoria, while 23 per cent was identified as Foreign Origin (for example, re-exported after arriving into the country by air).[54]

53 Melbourne Airport provides the next largest share of inbound and outbound freight of 25 and 30 per cent respectively.
54 Data analysis by BITRE. Note that the data does not distinguish the ultimate point of origin or destination of the goods or the most immediate stop (for example, a redistribution facility to other destinations in the region or across the country).

Domestic and regional air freight

Airports in the Sydney region handled more than 100,000 tonnes of domestic air freight in 2010, representing between 25 and 30 per cent of Australia's domestic freight.[55] Again, Sydney (Kingsford-Smith) Airport handled approximately 95 per cent of this.

The limited data available on domestic freight suggests that movements through Sydney (Kingsford-Smith) Airport decreased by 5.6 per cent in tonnage between 2006 and 2010.

More than 90 per cent of the domestic freight moved from Sydney (Kingsford-Smith) Airport to other areas of Australia originated from the Sydney area. In terms of inbound domestic freight, more than 85 per cent of domestic freight arriving at Sydney (Kingsford-Smith) Airport was shipped from other capital cities (Melbourne–Sydney, Brisbane–Sydney and Perth–Sydney).

In terms of other airports in the region, BITRE estimates that Newcastle Airport handled more than 100 tonnes of domestic freight, while between 2,500 and 3,500 tonnes of domestic air freight was carried to and from Canberra Airport in 2010–11 (approximately 22 per cent of this was to and from Sydney (Kingsford-Smith) Airport). Melbourne and Brisbane are the other key freight routes to and from Canberra Airport.

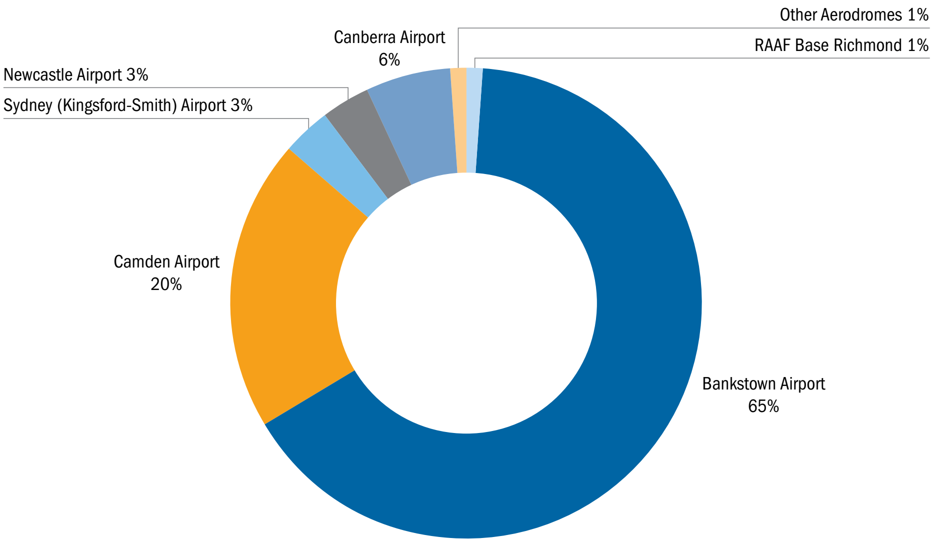
Bankstown Airport supported one dedicated freight operator, which moved approximately 2,400 tonnes of freight in 2010. The majority of this was carried by small aircraft in the late evening and early morning.

General Aviation

GA is often used as a catch-all term for the range of aviation activity that is not commercial (passenger or freight), state or military operations. This includes activities such as private leisure flying or sightseeing operations, emergency (aero-medical, search and rescue, fire fighting) services, pilot training, surveying and aerial photography, and aero-agriculture services. It usually also refers to niche charter services (passenger or freight) operated on an ad-hoc basis.

Currently, a level of GA operations take place at all major airports in the Sydney region and are also accommodated at several aerodromes that provide services solely for GA. Together, at these airports there were more than 400,000 aircraft movements in 2010, at facilities ranging from small grass strips and privately-owned clubs to larger commercial operations such as Bankstown Airport.

Figure 49 **Sydney region, share of GA movements, 2010**

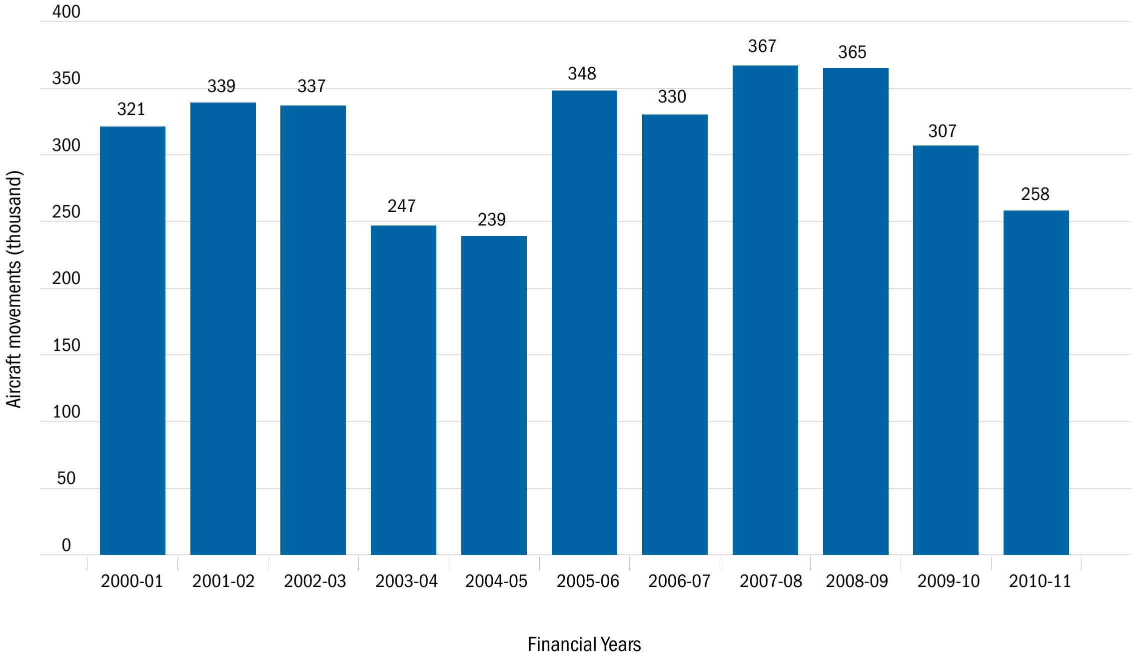


Source: Booz & Company analysis, BITRE and Airservices Australia data.

55 Share consistent over the last five years.

Bankstown Airport is one of Australia's two busiest airports in terms of aircraft movements.[56] Despite a number of fluctuations (as shown in Figure 50) resulting from the difficult business environment for some GA operations (particularly smaller flight training schools), it has supported an average 310,000 movements per year over the last 10 years. These movements are predominantly flight training (including for large numbers of international student pilots), freight, emergency services and charter. Approximately 260 aircraft are permanently based at the airport. The majority of aircraft are single-engine piston aircraft (nearly 70 per cent) and twin-engine piston aircraft (nearly 22 per cent).

Figure 50 Bankstown Airport, total GA movements, 2000–01 to 2010–11



Source: Booz & Company, from Bankstown Preliminary Draft Master Plan 2010 for data 2000–08, Airservices Australia data 2008–11.

Camden Airport is the next busiest airport, accommodating approximately 20 per cent of the region's GA movements. Camden Airport is predominantly used for sport aviation, private flying, flight training and hot air ballooning activities. It also serves as Sydney's main glider facility.

The RPT airports also provide a level of GA services. These are usually business jet services, which often require larger runway capacity (length and strength) than the piston and turboprop aircraft primarily used in the GA market. For example, analysis of the planning day profile[57] for Sydney (Kingsford-Smith) Airport shows that 60 per cent of GA movements (24 of the total 40 GA movements on that day) were by corporate charters operating Code B/C aircraft (such as Beechcraft Super King Air 200) and business jets (such as the Dassault Falcon 2000 and the Learjet 60). GA also accounts for approximately five per cent of the airport's aircraft movements.

Canberra and Newcastle airports provide for approximately six per cent and four per cent respectively of the GA movements in the region. Beside RAAF Base Williamtown, some military aerodromes in the region are also open, on a limited basis, to GA services. They include HMAS Albatross and RAAF Base Richmond.

56 The other airport is Jandakot Airport in Western Australia; Bankstown Airport's relative primacy is subject to the fluctuations discussed in this section.
57 Chosen by convention as the 30th busiest day.

Summary of current demand

- Aviation activities in the Sydney region are diverse and have been growing over the past decade.
- An analysis of historical information shows aviation activity in the Sydney region in 2010 consisted of:
  - 40.1 million RPT passenger movements and 344,000 RPT aircraft movements provided by Sydney (Kingsford-Smith) Airport, Canberra Airport and Newcastle Airport;
  - approximately 400,000 tonnes of international freight and more than 100,000 tonnes of domestic freight; this accounted for 50 per cent and 30 per cent of Australia's international and domestic air freight tonnage respectively;
  - more than 400,000 GA movements across a variety of aerodromes in the region.
- Sydney (Kingsford-Smith) Airport was the dominant airport in the region, supporting 89 per cent of RPT passenger movements and 95 per cent of freight tonnage.
- While there has been significant growth at both Canberra and Newcastle airports, aviation demand at these airports represents eight and three per cent of RPT passengers in the Sydney region respectively.
- As a large proportion of freight is carried in the cargo hold of passenger aircraft, demand for freight is linked to the provision of RPT services. GA growth has been modest compared with RPT. Bankstown Airport is the predominant airport for GA movements.

3.2 Future demand for aviation in the Sydney region

Over the next 50 years, projected population and economic growth in Sydney is expected to result in continued strong demand for aviation in the Sydney region.

Developing a forecast for unconstrained aviation demand

Booz & Company was engaged to develop an econometric model to assess future aviation demand. The forecasts were developed, based on historical trends and taking into account factors including economic growth, airfares and inbound visitor trends, to present an understanding of the level of demand for aviation over the short, medium and long term (10, 10–25 and 25+ years respectively). The forecasts also considered the sensitivities of demand to rising fuel prices as a result of future scarcity and carbon pricing objectives.

This part of the Report presents unconstrained forecasts – that is, forecasts that assume no capacity limitations, presuming factors such as aerodromes, terminal and air traffic space are adequately provided to meet demand.[58] The forecasts presented are based on historical actual movement data as opposed to scheduled data.

Other key assumptions for the model can be found at Technical Paper A3.

Total unconstrained demand in the region

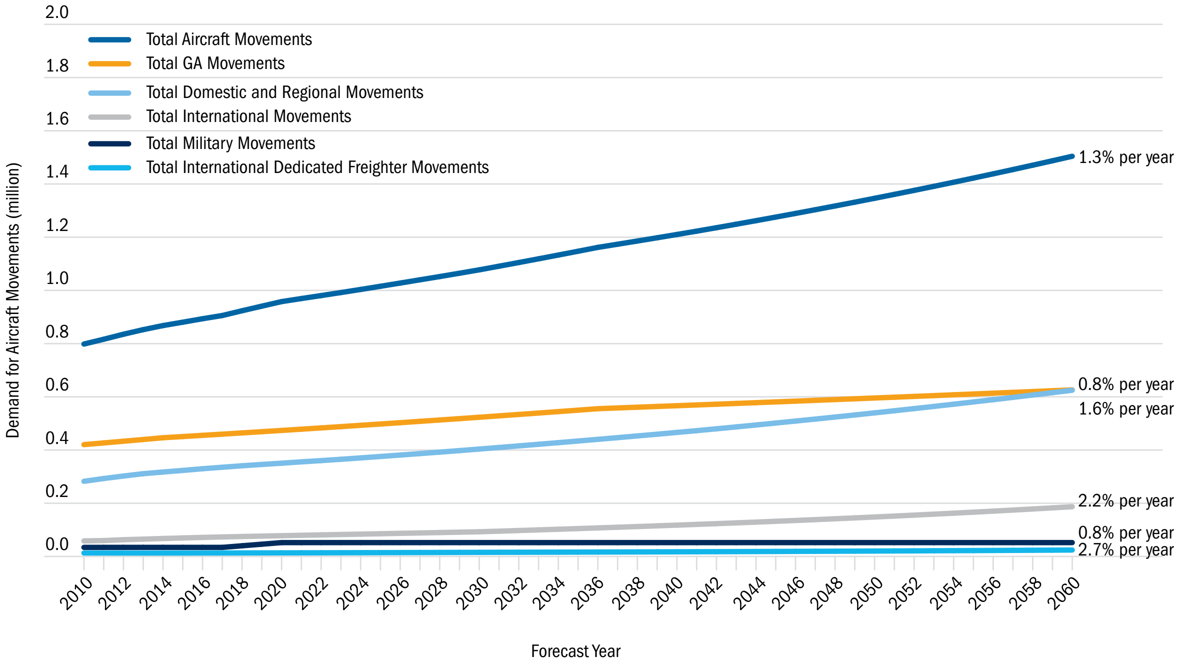
Future demand for aviation in the Sydney region is expected to reflect a continuation of historic growth. As shown in Figure 51, unconstrained demand for aircraft movements for all air segments is projected to show steady growth over the next 50 years.

58 Part Four of this Report compares the level of unconstrained demand with the capacity of existing infrastructure to establish where, and in what time frame there may be a shortfall in capacity over the period.

The fastest-growing segment is projected to be in RPT passenger movements. RPT aircraft movements are also forecast to increase although at a lower rate, given the trend towards the upgauging of aircraft is expected to continue.

Air freight tonnes carried in the cargo hold of passenger aircraft and in dedicated air freight aircraft are also expected to have relatively strong growth. Military and GA movement growth is projected to be comparatively more stable.

Figure 51 **Sydney region – unconstrained aircraft movement demand, 2010 to 2060**



Source: Booz & Company forecasts.

Regular Public Transport demand in the future

RPT is expected to grow substantially over the short, medium and long term.

In unconstrained conditions, RPT passenger demand in the region is forecast to rise from 40.1 million passenger movements in 2010 to:

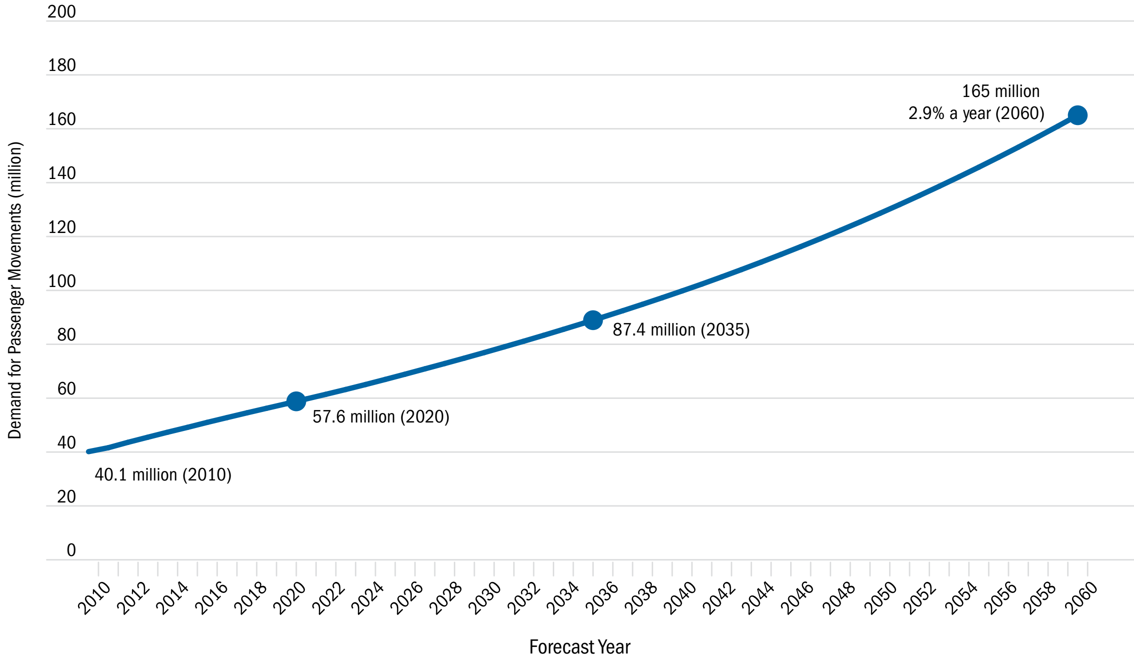
- 57.6 million passengers in 2020;
- 87.4 million passengers in 2035; and
- 165 million in 2060 (as shown in Figure 52).

This exceeds all current domestic and international passenger movements throughout Australia (at 135 million in 2010).[59]

Forecast growth represents a total increase of approximately 43 per cent, 120 per cent and more than 310 per cent on current passenger movement levels, or nearly three per cent per year over the next 50 years.

59 Forecasts by Booz & Company; Australian figure from BITRE, *Airport Traffic Data 1985–86 to 2010–11*.

Figure 52 **Sydney region – expected unconstrained passenger movement demand, 2010 to 2060**



Source: Booz & Company forecasts.

Consistent with historical trends, it is expected that aircraft sizes will increase. Average seat capacity on domestic and international services in the forecasts was assumed to increase according to Table 5. Forecasts were developed based on an analysis of historical trends in aircraft seat capacity, together with the fleet mix, aircraft orders and aircraft retirement plans of the main airlines currently operating in, to and from Australia.[60]

Table 5 **Average aircraft seat capacity, unconstrained forecast, 2010 to 2060**

Market	2010	2015	2020	2030	2060
Domestic					
Sydney (domestic)	173	180	188	203	248
Sydney (regional)	45	50	55	65	95
Canberra	109	114	119	129	159
Newcastle	103	110	126	128	166
International	289	301	314	339	414

Source: Booz & Company analysis.

Load factors are also expected to increase for Sydney international, Canberra and Newcastle domestic and regional services while remaining constant for the other market types. As a result, RPT aircraft movements are also expected to grow between 2010 and 2060 but at a slower rate than passenger movements.

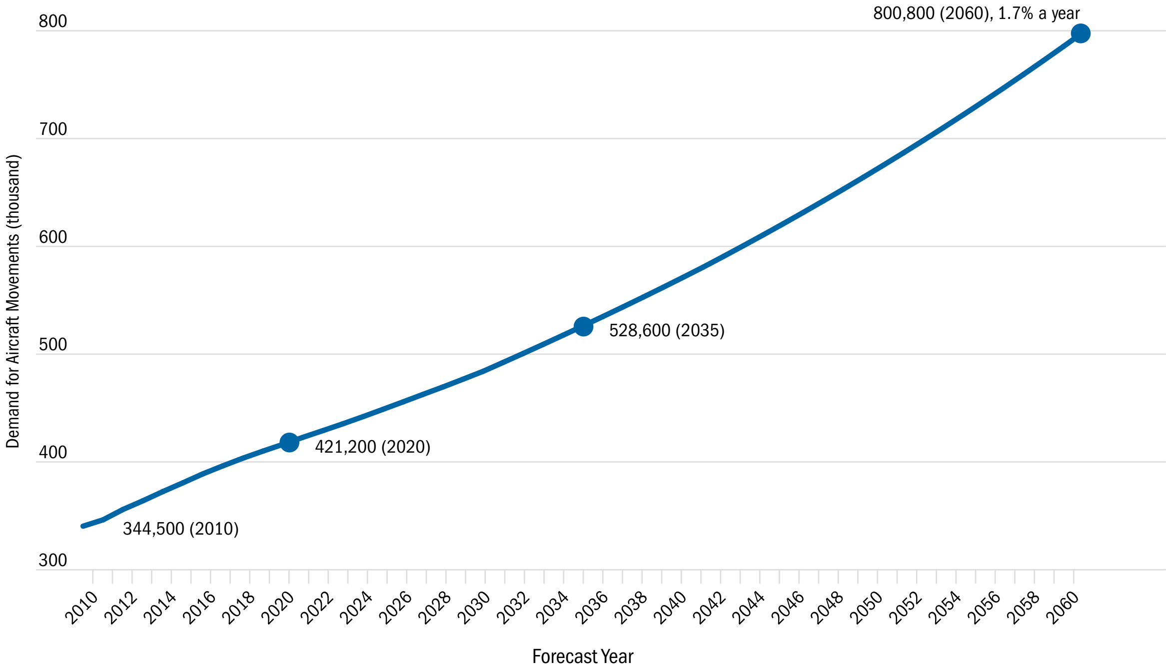
60 Further details are in Technical Papers A3 and B3.

Despite the anticipated upgauging of aircraft and associated increased passenger numbers per movement, demand for aircraft movements is expected, on an unconstrained basis, to increase from 344,500 movements in 2010 to:

- 421,200 movements in 2020;
- 528,600 movements in 2035; and
- 800,800 movements in 2060 (as shown in Figure 53).

This represents a total increase of more than 20 per cent, 50 per cent and 130 per cent respectively on current movement levels, or 1.7 per cent per year, over the next 50 years.

Figure 53 **Sydney region – expected unconstrained RPT aircraft movement demand, 2010 to 2060**

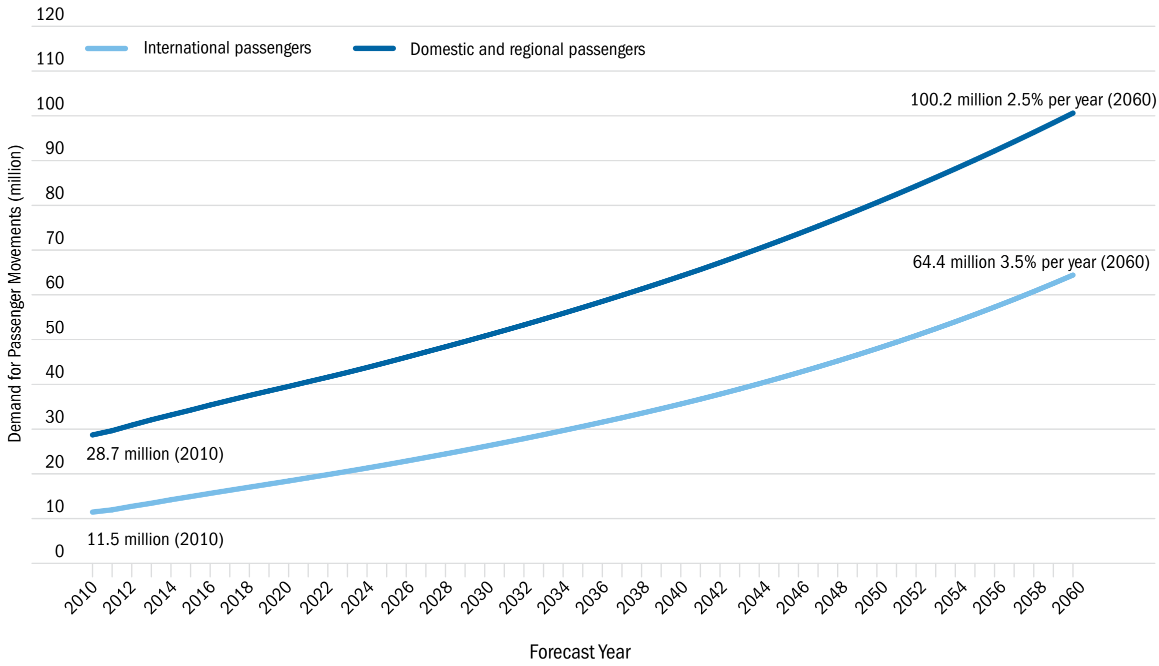


Source: Booz & Company forecasts.

Domestic and regional RPT demand in the future

The projections identify a shift in the future passenger mix towards international services, relative to domestic and regional demand. As shown in Figure 54, domestic and regional markets together currently comprise the largest segment in terms of passenger movements.

Figure 54 **Sydney region – expected unconstrained passenger movement demand by market, 2010 to 2060**



Note: 2010 total movements do not add to 40.1 due to rounding.

Source: Booz & Company forecasts.

Domestic and regional demand in the region is projected to increase on an unconstrained basis from 28.7 million passenger movements in 2010 to:

- 39.2 million passenger movements in 2020;
- 56.8 million passenger movements in 2035; and
- 100.2 million passenger movements in 2060.

This represents total growth of nearly 40, 100 and 250 per cent respectively or 2.5 per cent per year between 2010 and 2060.

Demand for associated domestic and regional RPT aircraft movements in the region is projected to increase from approximately 282,000 in 2010 to 613,600 movements in 2060 (a total increase of more than 115 per cent, or 1.6 per cent per year).

International RPT demand in the future

In contrast, international passenger movements are expected to grow at a rate of 3.5 per cent per year between 2010 and 2060. Consequently, the unconstrained share of international traffic is projected to increase from 28.5 per cent of total passenger movements to 35 per cent in 2035 and to 39.1 per cent in 2060.

This trend is expected in part to be driven by increased economic activity in key international inbound markets, including China and India. In 2010, approximately:

- 56 million Chinese travelled overseas. This is projected to increase to 100 million in 2020;[61]
- 12 million Indians travelled overseas. This is forecast to rise to 50 million by 2020.[62]

61 Tourism Australia, *China Market Profile 2011.*
62 Tourism Australia, *India Market Profile 2011.*

Australia has historically captured a portion of this market, being China's 14th and India's 18th largest outbound markets.

China

China is currently Australia's fifth largest international market, with 1.7 million passenger movements in 2010. This represented a growth of 22 per cent on the previous year. Trips to Sydney comprised nearly 50 per cent of these movements (857,000 out of 1.7 million passenger movements).[63]

In terms of international visitor arrivals, the Tourism Forecasting Committee expects demand from China to grow a total 110 per cent (or eight per cent per year) between 2010 and 2020. Key growth areas will be in family visits and education.[64]

A comparison of services scheduled between Australia and mainland China between 2000 and 2010 shows a substantial increase in demand for and supply of services. In particular:

- in 2000, a total of four Australian and Chinese carriers provided 18 return services a week to Sydney (Kingsford-Smith) Airport; five of these also landed at Melbourne Airport en route; whereas
- in 2010, a total of four Australian and Chinese carriers provided 63 return services a week, including 39 to Sydney (Kingsford-Smith) Airport, 21 to Melbourne Airport and three to Brisbane Airport.[65]

China Southern Airlines has introduced direct services to Perth and expanded its existing services to Melbourne and Brisbane. It has also made numerous public statements about its intention to grow Australian services to 110 services per week by 2015 – more than triple its current operations. Assuming Sydney maintains its market share, this would mean the equivalent of up to seven daily services to and from Sydney. The airline also recently announced that it hopes to establish a new 'Canton route' between Australia and Europe, via its base in Guangzhou, from June 2012, subject to slot availability.

In 2010, Chinese visitors replaced the Japanese as Australia's fourth largest inbound visitor market. Growth is expected to continue following a Memorandum of Understanding signed between the two countries to extend Australia's Approved Destination Status beyond leisure travellers to corporate incentives and education markets.[66]

India

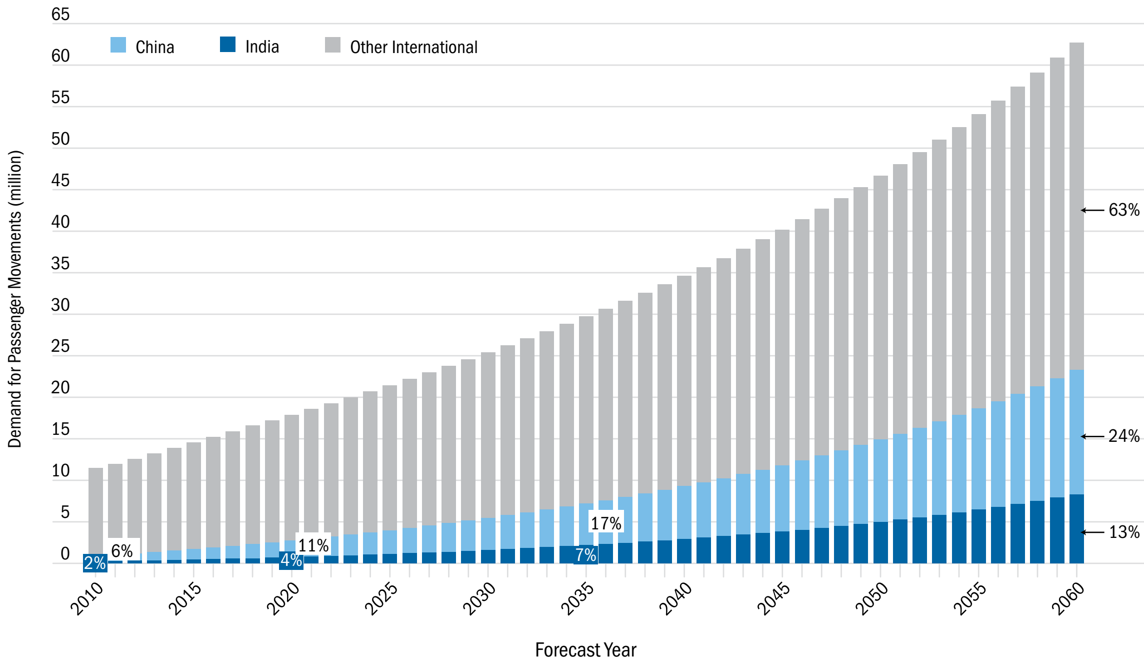
India is currently Australia's 10th largest international market. In 2010, there were 0.7 million passenger movements – an 8.6 per cent increase on the previous year. Nearly 40 per cent were to and from Sydney.

Forecasts from the Tourism Forecasting Committee suggest that this trend is expected to continue. Similarly, the number of visitors from India is expected to increase a total 115 per cent (or eight per cent per year) from 2010 to 2020, although from a substantially smaller base than the Chinese market. Key growth areas will be in family visits and business.[67]

Figure 55 demonstrates the expected aviation demand in these two key markets as forecast by Booz & Company.

63 BITRE, based on Australian Department of Immigration and Citizenship air passenger card data and ABS Overseas Arrivals and Departures.
64 Tourism Forecasting Committee, *Forecast 2011 Issue 2,* October 2011.
65 Australian Department of Infrastructure and Transport, *International Airlines Timetable Summaries Northern Winter 2000 and 2010,* 2011.
66 Tourism Research Australia, *Snapshots 2011 – China Inbound and Outbound Travel;* Tourism Australia, *China Market Profile 2011.*
67 Tourism Forecasting Committee, *Forecast 2011 Issue 2,* October 2011.

Figure 55 **Sydney (Kingsford-Smith) Airport – share of expected international passenger movement demand to and from China and India, 2010 to 2060**



Source: Booz & Company analysis.

Providing for the growth of air services will be of great importance because, as demand increases, so do the associated benefits to the wider Australian economy. In 2010:

- nearly 460,000 Chinese visitors spent almost $3 billion in Australia. Based on historical trends, the Tourism Forecasting Committee expects this to grow to $6.4 billion by 2020;
- visitors from India generated $870 million in total expenditure in 2010. This is expected to nearly double by 2020.[68]

Approximately 43 per cent of Australia's Chinese community and 36 per cent of Australia's Indian community, approximately 40 per cent and 60 per cent of whom were born overseas, lived in Sydney in 2006.[69] With residents born overseas more likely to travel, outbound growth on these routes is also expected to continue. Demand from markets that are currently the source of a greater number of visitors, such as New Zealand, the United States (US) and the UK, is still expected to grow but at a slower pace.

Within the Sydney region, Sydney (Kingsford-Smith) Airport is currently the only airport to and from which international RPT regularly operate. A small number of international services are planned to commence operating from Canberra and Newcastle airports in the near future.[70] If successful, these additional services could provide important injections for regional business and tourism. However, it is considered unlikely that Canberra and Newcastle airports will capture significant amounts of the emerging markets, as the owners of both plan to target existing markets (for example, New Zealand and Singapore). In particular, it is not expected over the long term that such operations will diminish the total demand at Sydney (Kingsford-Smith) Airport but, rather, add to growth in the overall international sector.

68 Tourism Forecasting Committee, *Forecast 2011 Issue 2,* October 2011.
69 BITRE, analysis of ABS *2006 Basic Community Profile*.
70 A possible profile of forecast international services for Canberra and Newcastle airports is detailed further in Technical Paper A3.

In the Sydney region, unconstrained international RPT passenger demand is forecast to increase from 11.5 million movements in 2010 to:

- 18.4 million passenger movements in 2020;
- 30.6 million passenger movements in 2035; and
- 64.4 million passenger movements in 2060.

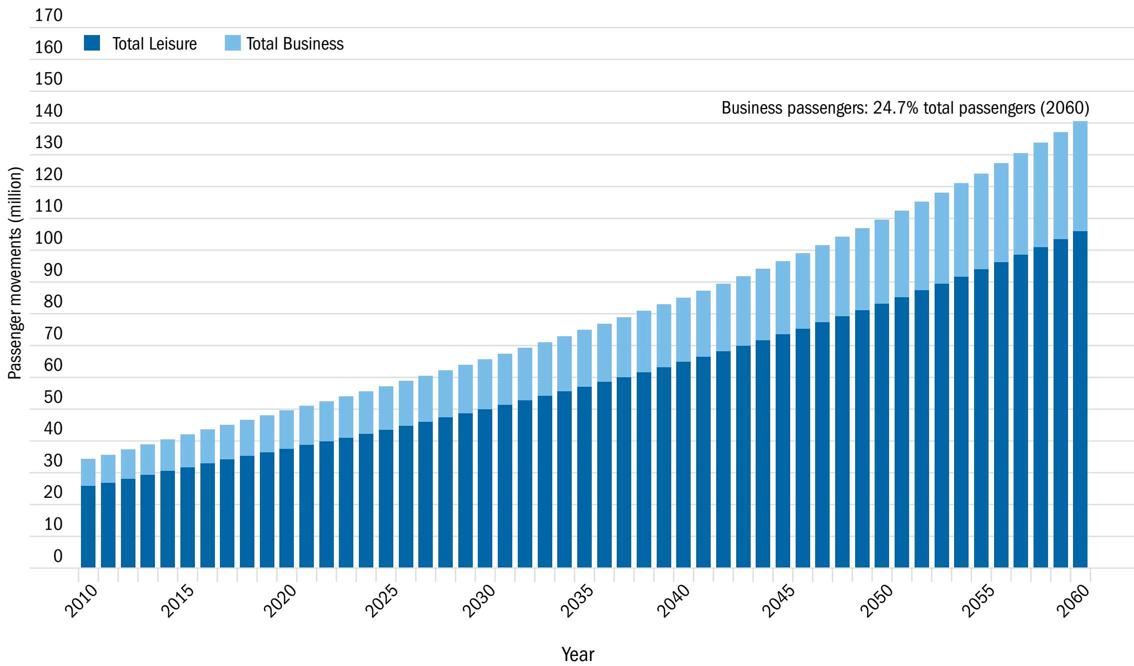
That represents a total increase of more than 60 per cent, 165 per cent and 460 per cent respectively from 2010 figures, or 3.5 per cent per year between 2010 and 2060. The forecast indicates that, in 2060, unconstrained demand for international RPT passenger movements at Sydney (Kingsford-Smith) Airport will still account for at least 97 per cent of international passenger demand in the Sydney region.

Associated demand for aircraft movements is expected to increase from 62,500 aircraft movements in 2010 to 80,500 movements in 2020; 105,000 movements in 2035; and 187,100 movements in 2060 (a total increase of 200 per cent, or 2.2 per cent per year between 2010 and 2060).

Future RPT demand by travel purpose – leisure and business travel

In an unconstrained setting, business passenger demand in the region is forecast to grow from 10.1 million to 40.5 million passenger movements between 2010 and 2060, whereas leisure passenger demand is forecast to grow from 30 million to 124.1 million passengers over the same period. As is currently the case, the largest share of business traffic will travel through Sydney (Kingsford-Smith) Airport. Travel for leisure is a larger market than business travel, as shown in Figure 56 and is projected to grow slightly faster than business travel (at 2.9 per cent per year compared with 2.8 per cent per year for business). As a result, business travel will represent a smaller share of total traffic (24.6 per cent in 2060 compared with 25.2 per cent in 2010).

Figure 56 **Sydney region – expected unconstrained passenger demand by purpose of travel, 2010 to 2060**



Source: Booz & Company forecasts.

When considering the different levels of business and leisure demand across international and domestic and regional traffic, or between airports, the profile becomes more complex. In particular, at Sydney (Kingsford-Smith) Airport demand for business traffic as a share of the total domestic and regional forecast is expected to decline from 27.9 per cent in 2010 to:

- 25.8 per cent of the total domestic and regional forecast in 2020;
- 24.1 per cent of the total domestic and regional forecast in 2035; and
- 23.3 per cent of the total domestic and regional forecast in 2060.

In contrast, demand for business traffic on international routes is expected to increase from a share of 19.8 per cent of total international traffic to:

- 21.0 per cent of the total international traffic forecast in 2020;
- 22.9 per cent of the total international traffic forecast in 2035; and
- 26.2 per cent of the total international traffic forecast in 2060.

This can be attributed to the greater penetration of LCCs in the domestic market, stimulating local leisure travel, and to the growing importance of Sydney business in the international context.

Similarly, the domestic and regional business share of passenger demand to and from Canberra Airport is expected to increase from 28.5 per cent in 2010 to 31.4 per cent in 2060, while that at Newcastle Airport will decline from 14.1 to 13.2 per cent share of traffic over the same period. This demonstrates the different mixes of travel at the two airports, with Canberra facilitating volumes of government and parliamentary business travel and Newcastle facilitating a high proportion of leisure travel.

Future RPT demand by service type – LCC and full service carriers

The rise of LCCs is a significant driver of growth in the domestic tourism sector. This market is expected to continue to grow as increased competition encourages further reduction in fares.[71]

With LCCs now emerging in the international market, this is likely to provide similar growth opportunities for inbound and outbound tourists, as well as international business, as was experienced in the domestic sector. The Jetstar Group of Airlines are expanding to a wide range of destinations; its entry into the Japanese market demonstrated the potential to stimulate rapid growth in the tourism market, and this is likely to continue as its individual airline franchises explore growth in their local areas. The Pacific Blue and Polynesian Blue ventures (now Virgin Australia and Virgin Samoa) have similarly provided additional competition in the tourist and family visitation markets in the Pacific region.

The growth prospects for LCC operations are reflected in the expansiveness of their forward commercial plans. For example:

- the continued expansion of franchised LCCs (e.g. Tiger Airways/Tiger Airways Australia/Thai Tiger; Air Asia Indonesia/Air Asia/Air AsiaX; Jetstar Japan/Jetstar Asia/Jetstar Australia);
- new LCC services are being introduced – the Malaysian LCC Air AsiaX, which currently operates to the Gold Coast, Melbourne and Perth, will begin daily services to Sydney (Kingsford-Smith) Airport from mid-2012; and
- other airlines (such as Qantas Airways and Singapore Airlines) have developed so-called ‘two-brand’ strategies, investing in low-cost offshoots (Jetstar for Qantas, and more

71 In the forecasts presented in this Report, there is an assumption of continued reduction of airfares in the short term. It was assumed that, in the medium to long term, a continued decline in real airfares will become unsustainable and, therefore, airfares will stabilise in real terms.

recently Scoot Airlines for Singapore Airlines) to capture the benefits of both types of operations.

Airlines are also seeking to provide business service options (for example, flat beds and premium economy services) from a low cost base. The inclusion of business style offerings on these services is also providing new diversity in the market for international business travellers. It will be important to ensure that growth opportunities from these business models are catered for so that Australian airlines can remain competitive amidst these global trends.

Future RPT demand by aerodrome

Sydney (Kingsford-Smith) Airport

Sydney (Kingsford-Smith) Airport is expected to remain the most significant RPT airport in the region. Forecasts suggest unconstrained demand is expected to grow from 11.5 million international and 24.2 million domestic and regional passenger movements in 2010 to:

- 17.9 million international and 32.7 domestic and regional passenger movements in 2020;
- 29.7 million international and 47.1 domestic and regional passenger movements in 2035; and
- 62.7 million international and 82.9 million domestic and regional passenger movements in 2060.

This represents a total increase in all passenger numbers of approximately 40 per cent, 115 per cent and 310 per cent over the different time periods, or 2.9 per cent per year respectively between 2010 and 2060. This is consistent with historical growth patterns.

It is expected that demand at Sydney (Kingsford-Smith) Airport will be more than four and a half times the current number of passengers by 2060.

In terms of aircraft movements, unconstrained demand is expected to grow from 62,500 international and 224,000 domestic and regional aircraft movements in 2010 to:

- 76,900 international and 266,400 domestic and regional RPT aircraft movements in 2020;
- 99,700 international and 329,200 domestic and regional RPT aircraft movements in 2035; and
- 178,400 international and 474,300 domestic and regional RPT aircraft movements by 2060.

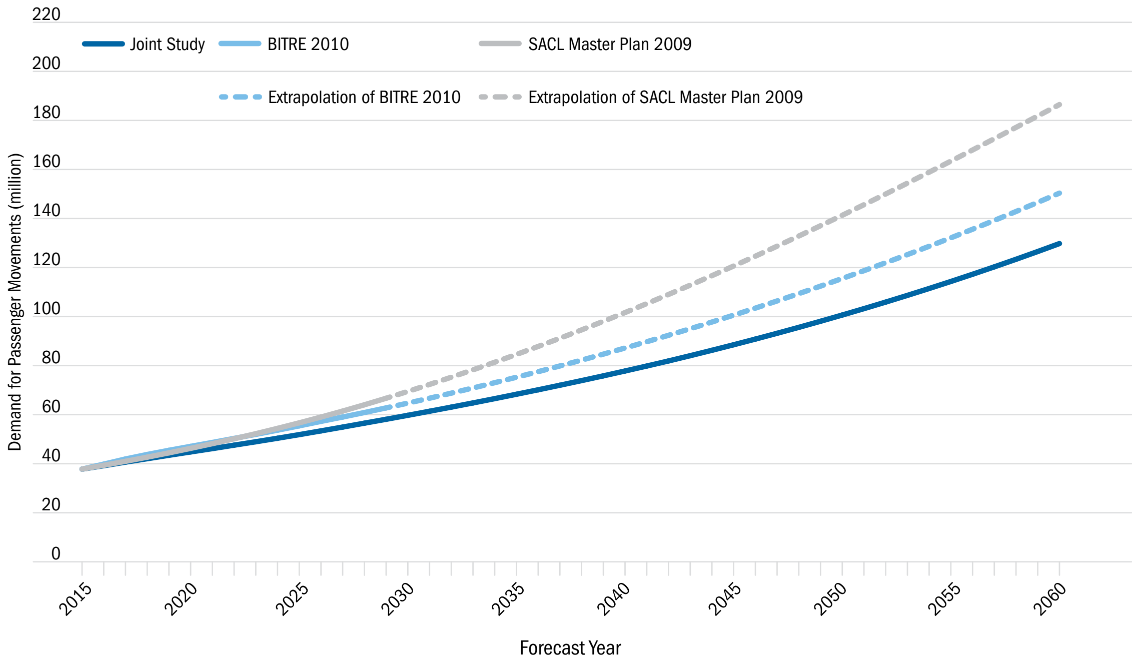
This represents more than 185 per cent and 110 per cent total increases respectively between 2010 and 2060.

There is a variety of forecasts available on Sydney (Kingsford-Smith) Airport. Both BITRE and SACL undertook forecasts up to 2029–30 (for SACL In the context of the consideration of SACL's *Sydney Airport Master Plan 2009*).[72] For illustrative purposes Booz & Company have extrapolated these from 2029–30 to 2060 (as shown in Figure 57). [73]

72 *Aircraft movements through capital city airports to 2029-30,* Research Report 117, 2010; currently approved Sydney Airport Master Plan 2009.

73 Forecasts were undertaken from different base years with BITRE forecasting from financial year 2008-09; SACL from 2007 and the forecasts for this Report from 2010. These were rebased to 2015 so that comparison could be made from the same start point. For consistency, long-run growth rates were also assumed to moderate in all cases, in line with the forecasts of this Report. Further information can be found in Technical Paper A4.

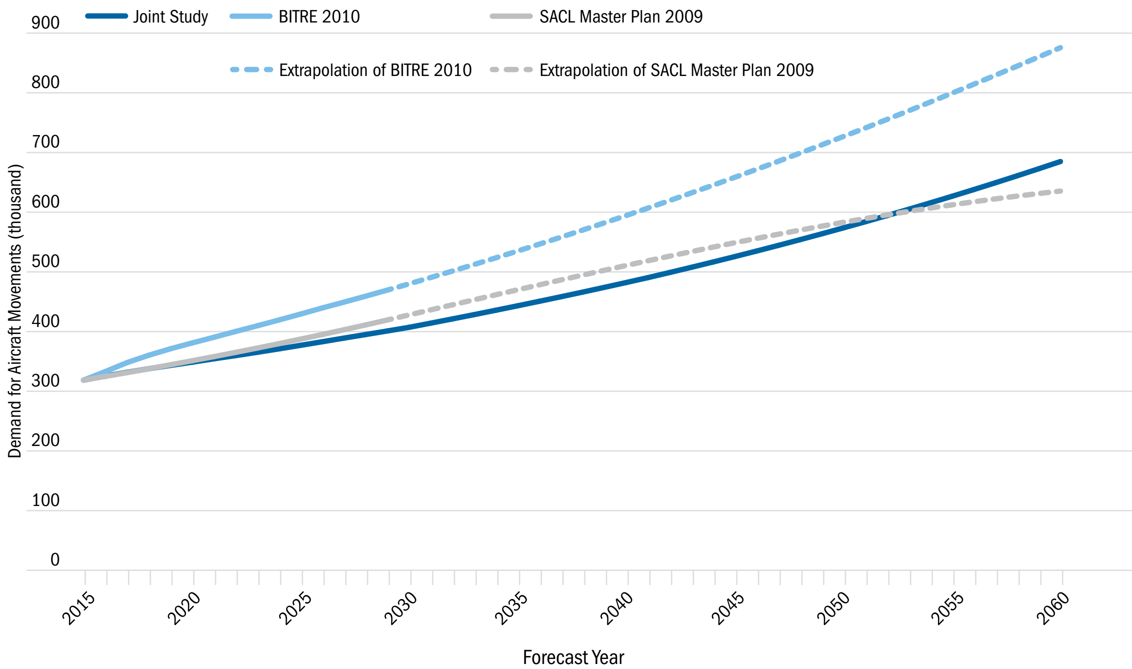
Figure 57 **Comparison of expected unconstrained passenger movement demand against extrapolations of SACL and BITRE forecasts and assumptions**



Source: Booz & Company forecasts for Joint Study, and analysis of BITRE Research Report 117 and SACL Master Plan 2009

Figure 58 compares the Joint Study's forecasts of aircraft movement numbers with BITRE and SACL forecasts as extrapolated by Booz & Company. Comparing unconstrained aircraft movement forecasts show little variation between the forecasts for the short to medium term, especially between the Joint Study and the SACL Master Plan forecasts. There is larger divergence in the long term with BITRE forecasts; mainly because it assumes slower upgauging of aircraft, particularly for international passenger aircraft.

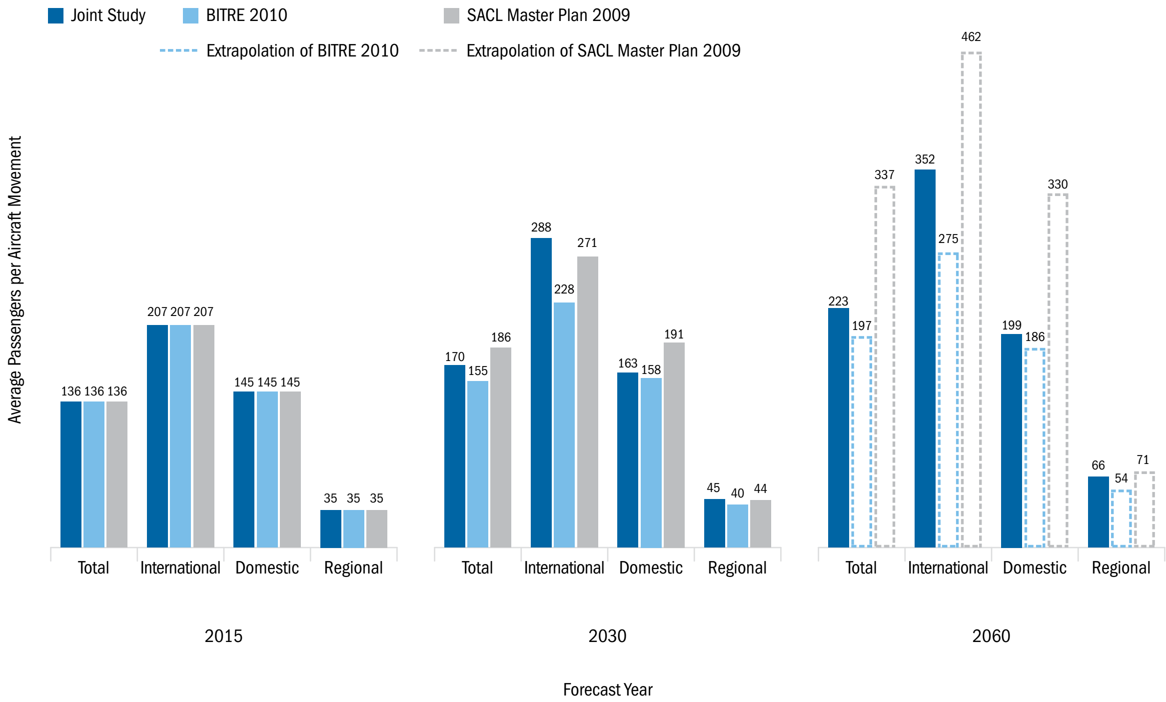
Figure 58 **Comparison of expected aircraft movement demand against extrapolations of SACL and BITRE forecasts and assumptions**



Source: Booz & Company forecasts for Joint Study, and analysis of BITRE Research Report 117 and SACL Master Plan 2009

Indeed, aircraft size and load factors drive the relationship between passenger and aircraft movements. The assumptions about passengers per aircraft movement over the forecast period used in this analysis, including the extrapolation to 2060, are shown in Figure 59.[74] The Booz & Company extrapolations of SACL and BITRE forecasts suggest that by 2060, in the most extreme case, an expectation that an aircraft averaging the size of an A380 will be operating the average international service, while an A330-sized aircraft will be operating the average domestic service.

Figure 59 **Comparison of expectations about average passengers per movement by market, against extrapolations of SACL and BITRE forecast assumptions (unconstrained)**



Note: Average passengers per movement are a reflection of both aircraft size and load factor expectations. BITRE's definition of 'regional' differs from this Joint Study and is based on aircraft and airline type. The dotted lines in the 2060 graph reflect the extrapolation of the BITRE and SACL forecasts.

Source: Booz & Company forecasts for the Joint Study and analysis of BITRE Research Report 117 and SACL Master Plan 2009

Key inputs to these forecasts are assessments of the expected size of aircraft, load factors and number of passenger movements.

In developing the forecast Booz & Company examined the fleet orders for the major airline groups operating at Sydney (Kingsford-Smith) Airport and the likely make-up of their fleets over the forecast period. SACL have advised the Steering Committee that this step was also undertaken in 2008 to inform preparation of their Master Plan.

Although it is anticipated that average fleet size will slowly increase, both Boeing and Airbus anticipate a continued reliance on single-aisle narrow body aircraft. For example, in the Asia Pacific Region, Boeing has forecast that the total fleet size will increase from 3,910 aircraft in 2008 to 11,170 aircraft in 2028 (an increase of 186 per cent). However, the proportion of narrow body aircraft in the total fleet is expected to increase from 60 to 65 per cent over this period. Over this same period the number of "large" Boeing aircraft in the Asia Pacific fleet is only forecast to grow marginally (from 400 to 500 aircraft).[75] Airbus projections suggest a similar outcome. Although regional forecasts are not published, some 69 per cent of Airbus deliveries globally over the 20 years from 2010 are forecast to be single-aisle aircraft.[76]

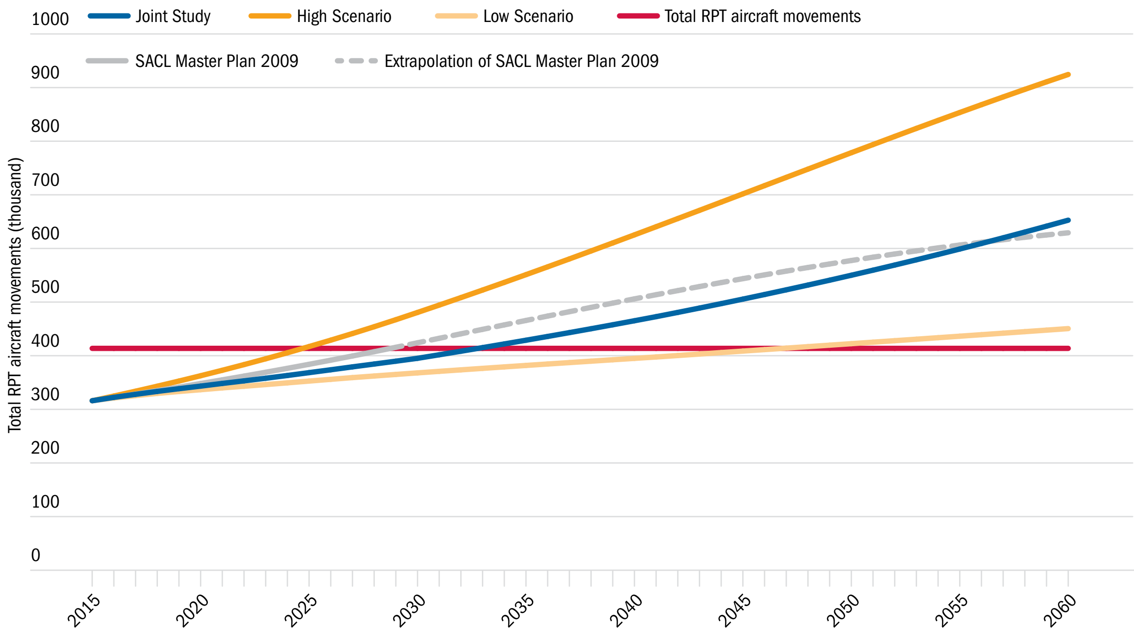
74 Load factors can also affect the number of aircraft movements. Assumptions on load factors are set out on the next page.
75 Boeing *Current Market Outlook 2009–2028*
76 Airbus *Global Market Forecast 2009–2029*

Booz & Company factored in an expectation for load factors for international services of an increase from 64 to 85 per cent, over a 20 year period; load factors for domestic services (80 per cent) and regional services (69 per cent) remaining unchanged.

Airlines will generally move to larger aircraft only when supported by growth in passenger demand. Other factors will also impact such decisions including aircraft technology reducing costs per Available Seat Kilometre, or alternatively the limited availability of slots. This means that there will be a degree of correlation between passenger growth rates and the rate of increasing average aircraft size. There is also a degree of correlation between the level of aircraft movements and the rate of increasing average aircraft size, particularly when the level of aircraft movements approaches the capacity of an airport. When additional flights cannot be added, meeting growth in passenger movements becomes significantly more dependent on the use of larger aircraft.

To illustrate the sensitivity of these forecasts to changes in these assessments, Booz & Company modelled the impact if passenger numbers from one forecast were paired with upgauging rates from another, without sensitivity to the interdependence of these factors.[77] Figure 60 illustrates this point. It shows aircraft movements over time for Joint Study forecasts, and for SACL's Master Plan forecasts with Booz & Company extrapolation, and the highest and lowest scenarios resulting from pairing different assumptions. The high scenario pairs passenger movement numbers from the Master Plan with Joint Study assumptions on aircraft size. The low scenario shows the Joint Study passenger movement numbers with the Master Plan assumptions on aircraft size.

Figure 60 **Aircraft movement scenarios**



Source: Booz & Company forecasts for Joint Study, and analysis of BITRE Research Report 117 and SACL Master Plan 2009

All show that the airport will reach 414,000 RPT movements in the long term, the level of RPT activity estimated when the airport reaches 440,000 overall movements, the likely capacity of the airport as discussed in Part Four of this report. For instance the Joint Study line exceeds 414,000 RPT movements around 2033, but this would occur around 2025 under the high scenario, or 2047 under the low scenario.

The high scenario reaches this level so quickly because it applies the Joint Study's expected aircraft size assumptions to a level of passenger growth which would see over 29 million more forecast cumulative passenger movements in the period 2015 to 2025.

77 This covered forecasts by BITRE, SACL and Booz. Further details are in Technical Paper A4.

The low scenario does not reach 414,000 RPT movements until 2047 because it retains SACL's Master Plan aircraft size assumptions, despite a reduction of more than 55 million in forecast cumulative passenger movements in the period 2015 to 2029, and over 420 million in the period 2015 to 2047. At 2047 this scenario would require the 414,000 movements (which would be mix of international, domestic and regional services) to carry over 105 million passengers, or an average of over 250 passengers on every flight. This kind of average for each movement would require aircraft averaging the size of an A380 to be operating the large majority of international services, while an A330-sized aircraft would need to be operating the large majority of domestic services. This would see the extrapolations contained in Figure 60, brought forward from 2060 to 2047.

It is important to note that the two scenario lines are not forecasts, but are included solely to illustrate the importance of recognising the relationship between passenger numbers and assumptions concerning aircraft size.

SACL have advised the Steering Committee that, linked with their concept for changed terminal usage, they are in the process of preparing updated long term forecasts – particularly in the light of the impacts of the global financial crisis and other industry changes. SACL have advised that their expectation is that revised passenger forecasts will more closely reflect those of Booz & Company, though how close the two forecasts will be is not known.

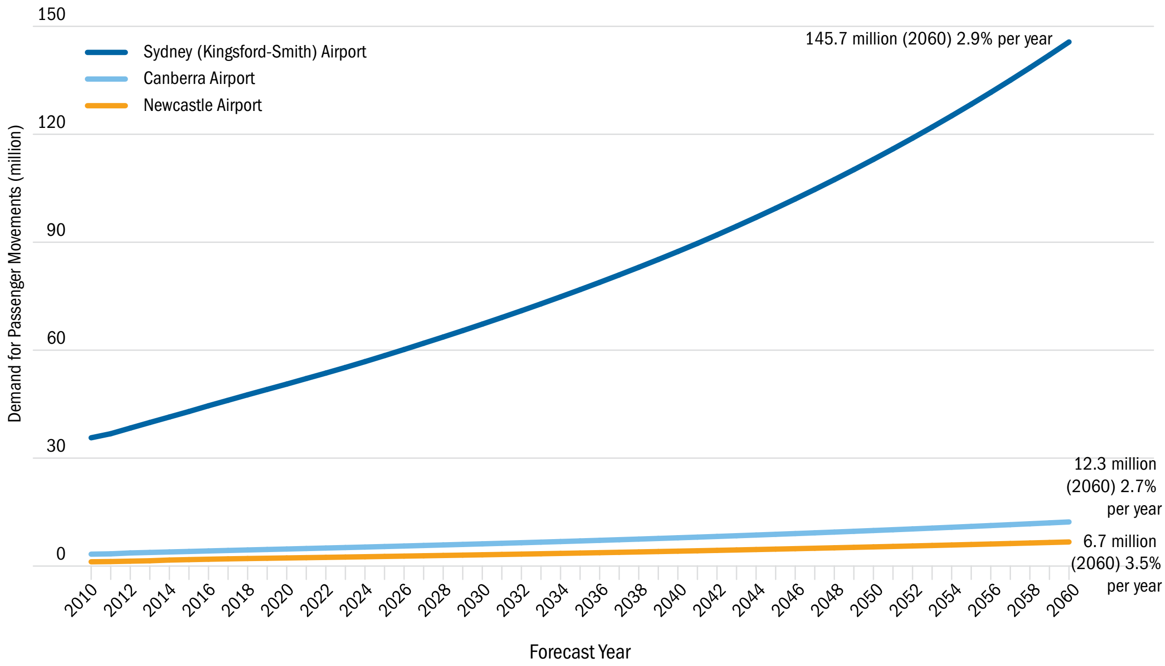
The Committee notes preliminary analysis by BITRE which suggests that growth in average aircraft size since 2009 has been significantly below the forecasts in SACL's Master Plan. Despite this, and the expectation of revised passenger forecasts, SACL have advised that they do not anticipate their revised forecasts will adjust assumptions regarding increases in aircraft size. Consequently, SACL expects that its amended long-term aircraft movement forecasts will be closer to the low scenario in Figure 60 than to the Booz & Company extrapolation of their Master Plan, though how close the two will be is not known.

The Committee notes this advice, but has based assessments in this Report on the independent advice from Booz & Company indicating a level of around 414,000 RPT aircraft movements by around 2033.

Canberra and Newcastle airports

Both Canberra and Newcastle airports are also expected to have increased passenger demand. However, as shown in Figure 61, the proportion of RPT catered for by these airports is not expected to represent a major proportion of the demand in the region.

Figure 61 **Sydney region – expected unconstrained RPT passenger movement demand by airport, 2010 to 2060**



Source: Booz & Company forecasts.

Domestic (including regional) aviation demand at Canberra Airport is forecast to grow from 3.3 million passenger movements and 43,600 aircraft movements in 2010 to:

- 4.5 million passenger movements and 54,000 aircraft movements in 2020;
- 6.5 million passenger movements and 64,500 aircraft movements in 2035; and
- 11.2 million passenger movements and 93,600 aircraft movements in 2060.

This represents 2.5 per cent and 1.5 per cent per year growth respectively between 2010 and 2060.

In comparison, in its currently approved Master Plan, Canberra Airport forecasts a mid-range growth of nearly 7.25 million passenger movements and 82,700 aircraft movements per year by 2029–30 (a compound annual growth rate of 4.2 per cent and 3.4 per cent respectively).[78] This is based on 2007–08 passenger movement figures, prior to the impact of the GFC. In its estimate, Canberra Airport noted that historical trends analysed were significantly higher than the forecasts, with passenger numbers in 2007–08 growing by 5.9 per cent, and that it did not take into account the significant capacity increases by both Virgin Blue (now Virgin Australia) and Qantas on their Canberra routes from early 2008 and the commencement of services by Tiger Airways.

At Newcastle Airport, demand for domestic (including regional) passenger movements is expected to increase from 1.2 million passenger movements and 14,300 aircraft movements to:

- 2.0 million passenger movements and 21,300 aircraft movements in 2020;
- 3.2 million passenger movements and 29,900 aircraft movements in 2035; and
- 6.1 million passenger movements and 45,700 aircraft movements in 2060.

This represents a 3.3 per cent and 2.3 per cent per year increase respectively between 2010 and 2060.

78 *Canberra Airport 2009 Master Plan.*

In comparison, Newcastle Airport's Master Plan[79] forecasts approximately 1.5 million passenger movements and more than 25,000 aircraft movements per year by 2024.

As previously mentioned, a small volume of international traffic is also planned by these airports.

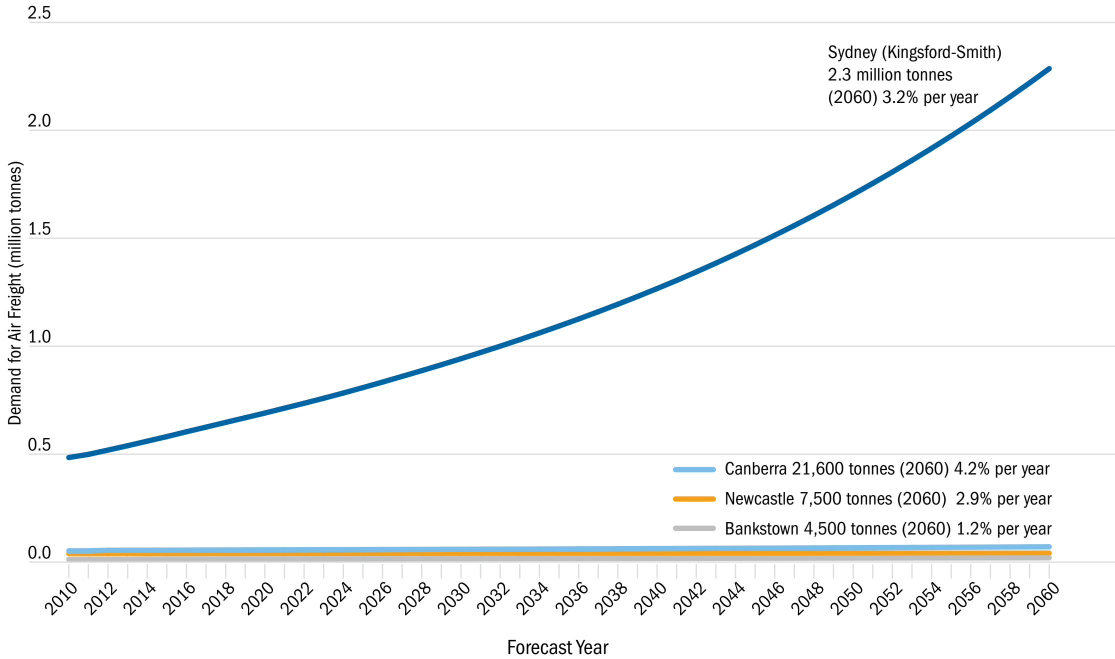
Air freight

The majority of air freight demand in the Sydney region is expected to continue to occur at Sydney (Kingsford-Smith) Airport. However, air freight demand at Newcastle and Canberra airports is expected to increase and Bankstown is expected to continue to have a niche role. Air freight is expected to continue to be carried primarily in the cargo hold of passenger aircraft. As shown in Figure 62, demand for international and domestic air freight tonnage in the Sydney region is forecast to grow from approximately half a million tonnes in 2010 to:

- 0.7 million tonnes in 2020;
- 1.1 million tonnes in 2035; and
- 2.3 million tonnes in 2060.

This represents a total growth of 375 per cent, or 3.2 per cent per year between 2010 and 2060. The share of international freight of the total is expected to remain relatively consistent at approximately 80 per cent.

Figure 62 Sydney region – expected unconstrained air freight demand by airport, 2010 to 2060

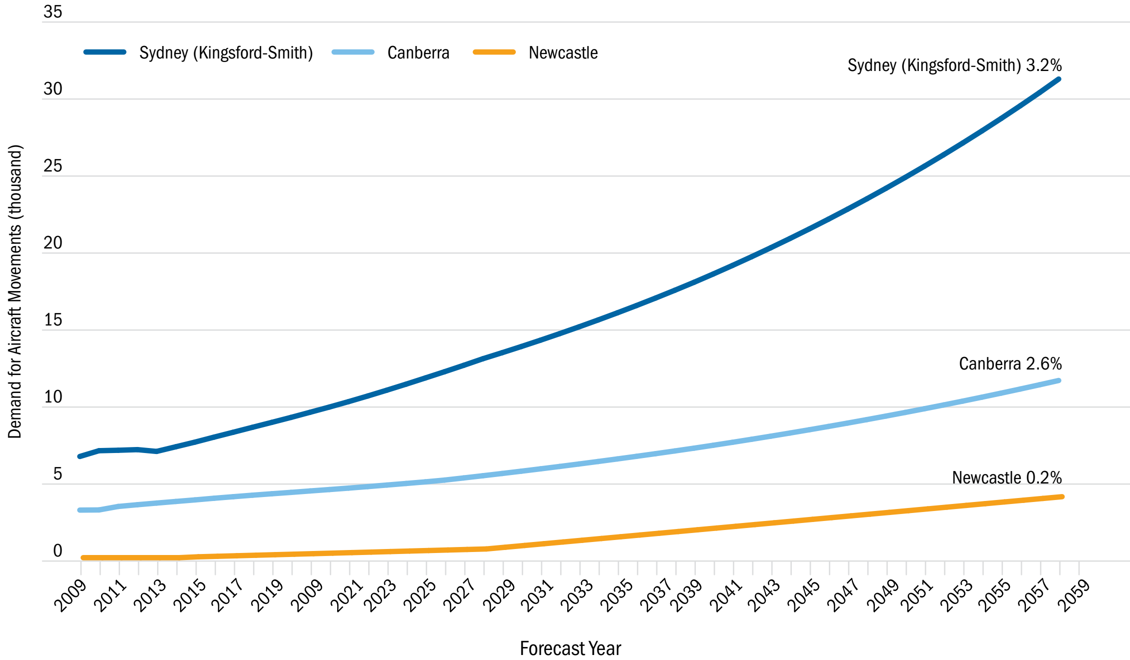


Source: Booz & Company forecasts.

As shown in Figure 63, demand for dedicated air freight (both international and domestic) is expected to increase modestly in the short term as trade stabilises in the aftermath of the Global Financial Crisis. It is then forecast to increase more rapidly. Demand by 2060 is expected to be approximately 14,000 international freight movements per year and 33,000 domestic freight movements per year, increasing from nearly 3,000 international and 7,600 domestic movements in 2010 (this is a total increase of nearly 395 and 330 per cent, or 3.1 and three per cent per year respectively). This includes the estimated demand for international air freight handling at both Newcastle and Canberra airports.

79 *Newcastle Airport Master Plan 2007.* Note that Newcastle Airport is not a leased federal airport and, as such, its Master Plan does not require approval by the Australian Government.

Figure 63 **Sydney region – expected unconstrained demand for dedicated freight movements by airport, 2010 to 2060**



Source: Booz & Company forecasts.

General Aviation

The overarching trend projected for GA demand in the region is for relatively flat growth in movements, below projected gross domestic product (GDP) or population for the region.

GA demand in the Sydney region is projected to increase from more than 400,000 movements to approximately 630,000 movements between 2010 and 2060 – a total increase of more than 50 per cent (or 0.8 per cent per year).

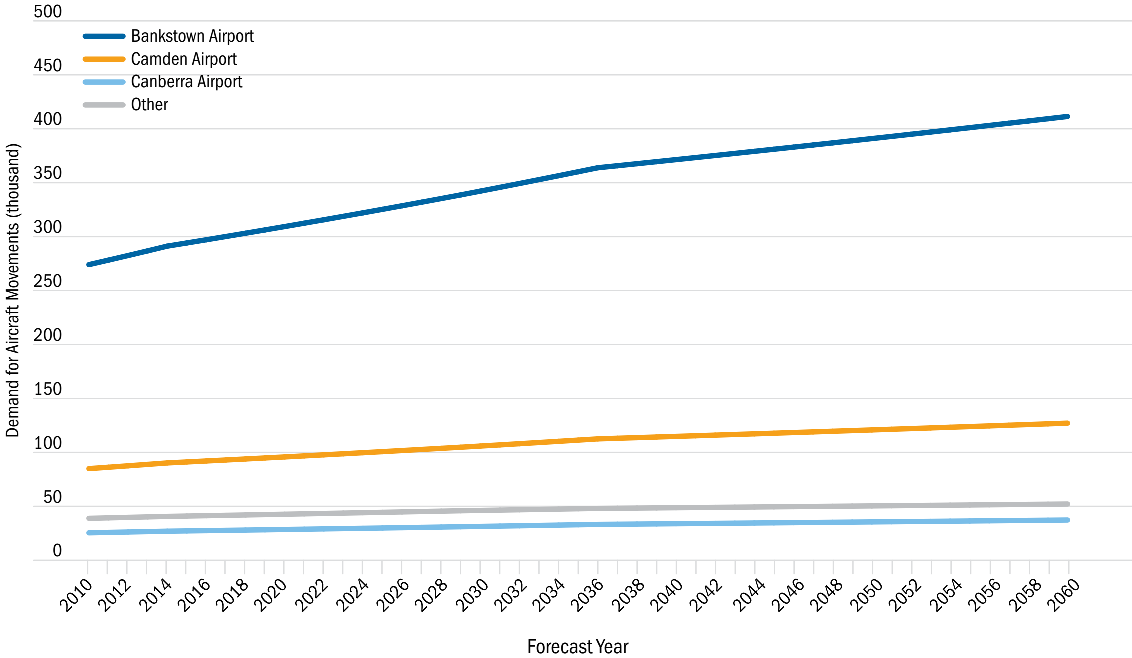
Bankstown Airport is expected to continue to provide the largest volume of GA activity in the region in terms of aircraft movements (as shown in Figure 64). Demand for the airport is projected to grow to 416,200 movements in 2060 (a total increase of 50 per cent, or 0.8 per cent per year).

At Canberra Airport, GA movements are forecast to grow modestly in line with historical trends (0.8 per cent per year between 2010 and 2060).

Camden Airport's GA demand is forecast to grow by more than 50 per cent from 84,000 movements in 2010 to 127,700 in 2060 (0.8 per cent per year), while GA demand at RAAF Base Richmond is forecast to grow from 5,400 to 8,200 movements between 2010 and 2060 (a total 50 per cent or 0.8 per cent per year).

GA movement demand at RAAF Base Williamtown (Newcastle Airport) is forecast to remain constant at approximately 14,500 movements per year, as operations such as extensive light aircraft training at the airport are considered by Defence to be incompatible with RAAF Base Williamtown operations.

Figure 64 **Sydney region – expected unconstrained GA demand by airport, 2010 to 2060**



Source: Booz & Company forecasts.

Military

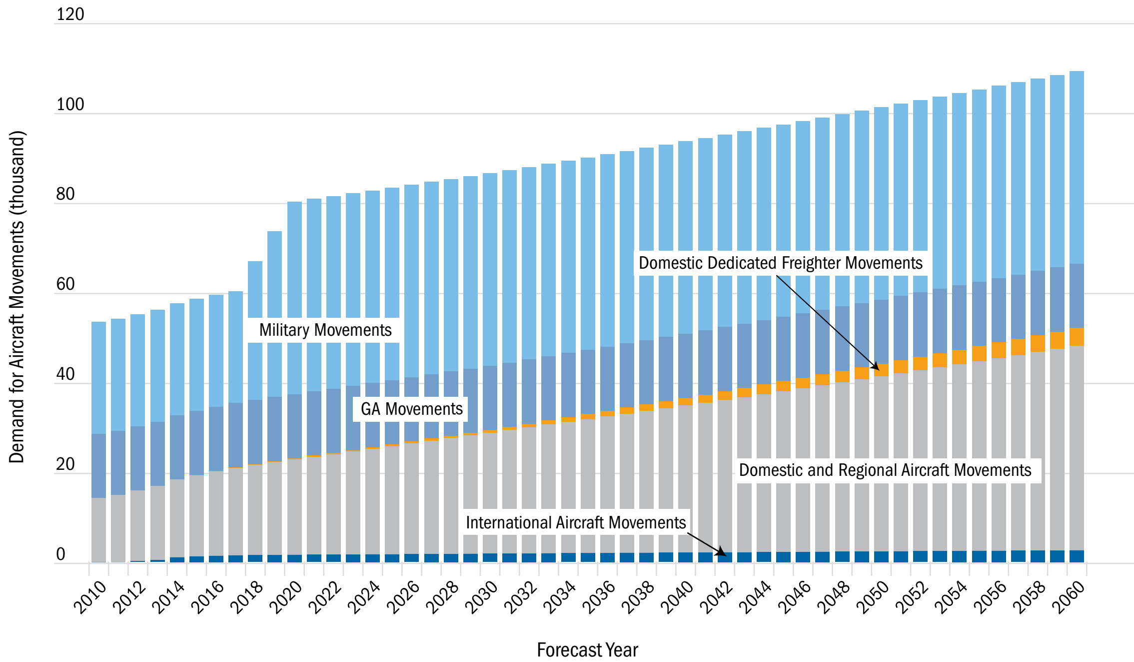
With the exception of RAAF Base Williamtown, military movement growth is assumed to remain relatively constant throughout the forecast period.

RAAF Base Williamtown will see the introduction of the Joint Strike Fighter (JSF) program from around 2017. It is expected that this will rapidly increase military operations at that aerodrome. The JSF will also require significantly different operational requirements, including larger restricted airspace access for active training operations and greater separation distances from other aircraft than the current RAAF operations at the base require.

Airlines have already indicated challenges in meeting their operational needs at Newcastle Airport while respecting the broader operations at RAAF Base Williamtown.

Demand for military movements in the aerodrome generally is forecast to grow from 25,000 movements per year in 2010 to 43,000 movements by 2060. Aircraft activity at RAAF Base Williamtown (Newcastle Airport) is shown in Figure 65.

Figure 65 **RAAF Base Williamtown (Newcastle Airport) expected unconstrained aircraft movement demand by market type, 2010 to 2060**



Source: Booz & Company forecasts.

Reliability of forecasts

Many public and private sector organisations have published forecasts of air passenger movements through Australian airports to inform planning and investment decisions in the aviation sector.

BITRE undertook an evaluation of such forecasts to test their accuracy in light of actual movement numbers experienced in the meantime. This analysis of past forecast work highlighted some of the challenges of forecasting over long time periods and, in particular, indicated the following main reasons for inaccuracies:

- **Shocks and longstanding changes to the industry:** shocks such as the 1989 pilot strike, the Asian Financial Crisis, the events of September 11, 2001, the collapse of Ansett Australia and the Global Financial Crisis were found to have had a significant impact on air passenger movements. Since these shocks were not known to forecasters at the time of preparing the forecasts, their influences were not adjusted for and often no provision was made to capture the likelihood of some shock event during a forecast period.
- **Challenges to estimates for inbound travel:** BITRE's comparative analysis suggests it is more difficult to predict inbound international travel than outbound or domestic and therefore forecasts containing assumptions about inbound sectors were found to be less accurate.

To ensure such factors were taken into account, historical information used to identify trends for this Joint Study was taken over a decade-long time frame or more to include some shocks. In addition, less reliance was placed on the likely accuracy of short-term forecasts that could be significantly impacted by shocks, with more reliable long-term trend information preferred.

Booz & Company drew attention to the following factors that could result in actual aviation activity outside the forecast range:

- actual economic growth rates in Australia and/or those countries expected to provide a significant source of inbound international air passengers turning out to be substantially different from those assumed;
- shifts in government policy that directly, or indirectly, impact on Sydney region aviation activity;
- aviation industry developments that impact on Sydney region aviation activity;
- a significant shift in the distribution of aviation traffic between Sydney region airports and competing international and domestic airports;
- significant changes in airline costs (which could affect airfares for passengers);
- external factors including, for example, natural disasters, political unrest, acts of terrorism and associated security concerns, and labour disputes.

Forecasts are by their nature only estimates, based on an expectation that historical information can best inform future trends. Compared with the variety of available forecasts, the Steering Committee opted for a conservative approach.[80]

Sensitivities

There are a number of factors that may affect the realisation of this expected demand, including economic growth rates; airfares and cost of air operations; and commercial decisions by airlines and others, including in relation to the level of upgauging of aircraft size. The forecasts were tested against more than 10 sensitivities over the 50-year period.[81] The impact of some of the more significant of these is illustrated against the base case in Figure 66.

These resulted in a small amount of variance in the forecasts in the short to medium term, while, over the long term, the impact on forecasts appeared more pronounced.

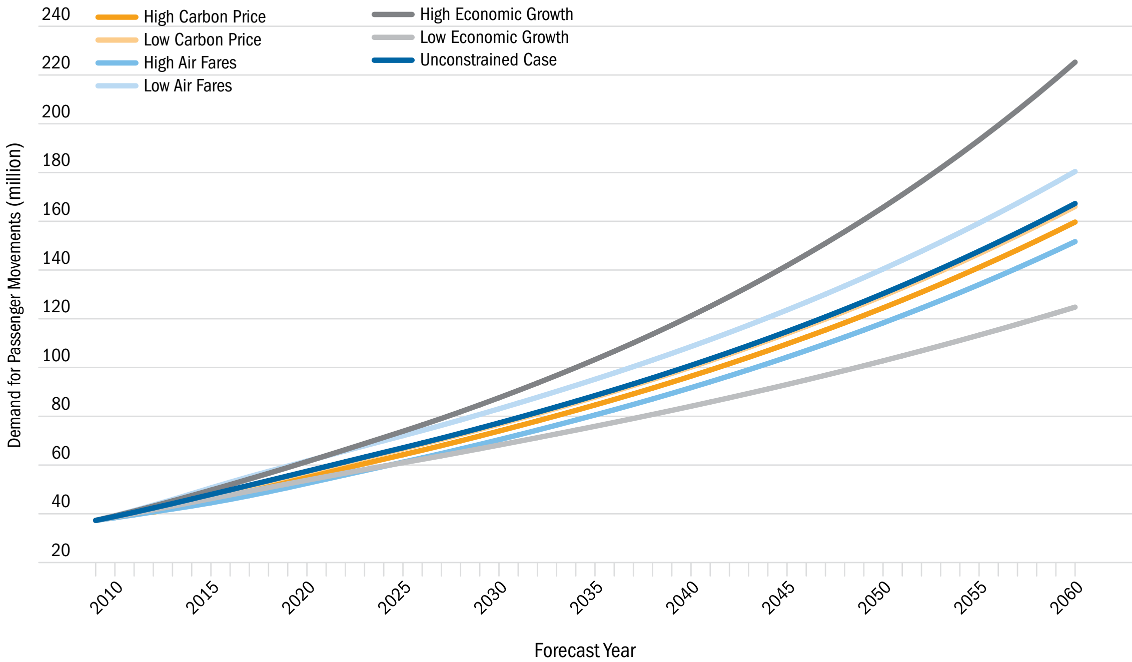
For example, for:

- **economic growth,** the most pronounced impact on long-term economic growth is shown in the difference between higher or lower than expected economic growth rates in Australia or with its key inbound partners;
- **exchange rates,** it is generally cheaper for Australians to travel overseas when the Australian dollar is high against the foreign currency of that country, as is the case now, whereas it is cheaper for tourists to travel to Australia when the Australian dollar is weaker (lower) against their currency; and
- **increased costs,** such as through higher fuel prices or carbon price mechanisms impact more significantly on LCC operating costs and margins than on those of legacy airlines.

A combination of all these factors could have a cumulative impact on forecast growth. However, the modelling assumes that such factors are sustained over the long term and are pervasive across all markets, and this may not necessarily result (for example, rates of economic growth tend to fluctuate less than airfares or exchange rates, with low economic growth in one area being offset by higher economic growth elsewhere).

80 A more detailed comparison of existing forecasts can be found in Technical Papers A3 and B3.
81 Information on parameters tested can be found in Technical Paper A3.

Figure 66 **Sydney region – sensitivity of unconstrained RPT passenger demand to different factors**



Source: Booz & Company forecasts.

One factor frequently cited as being able to change the level of demand for aviation services is the operation of a High Speed Rail (HSR) system between the Sydney region and other cities. However, the extent to which HSR could reduce the demand for air travel will depend on the relative attractiveness (in terms of price, frequency and travel times) of the services offered, routes served (including the station locations) and the timing of its construction. Internationally, many nations build or extend HSR networks while also expanding their aviation capacity – the two should not be considered in a mutually exclusive manner.

In this context, a study is currently underway on the feasibility of implementing an HSR system along the east coast of Australia, with a view to potentially linking Sydney to large cities such as Melbourne and Brisbane.[82] This study identifies that early stages of HSR development from Sydney will probably involve limited links to either Newcastle or Canberra.

The Newcastle–Sydney route accounted for 0.1 per cent of all passenger movements and 1.1 per cent of all aircraft movements at Sydney (Kingsford-Smith) Airport in 2010.

Canberra–Sydney is a bigger aviation market than Newcastle–Sydney but still only accounts for 3.1 per cent of passenger movements and 6.2 per cent of aircraft movements at Sydney (Kingsford-Smith) Airport. A diversion of most or even all of this volume therefore would not provide significant capacity for growth in other market segments accessing Sydney (Kingsford-Smith) Airport.[83]

More substantial reductions in air passenger demand at Sydney (Kingsford-Smith) Airport would potentially be provided if HSR were linked to Melbourne and Brisbane, particularly if routed via the Gold Coast.

82 The High Speed Rail Phase 1 report, released in August 2011, estimated that HSR would need to carry around 8.0 million passengers on the Melbourne–Sydney route and 3.5 million passengers on the Brisbane–Sydney route by 2036 to be feasible. This would equate to approximately half of the projected air market for both sectors in 2036.

83 BITRE analysis.

However, the level of potential diversion of traffic from air to HSR is heavily dependent on a number of factors that militate against the HSR dealing with the peak capacity gap identified at Sydney (Kingsford-Smith) Airport.

These assumptions and factors include, first, the timing of the availability of any HSR network. The HSR study currently being undertaken by the Australian Government sets out an indicative construction and implementation program for an east coast network being developed over a 25-year time frame. The challenges of constructing and operationalising the HSR should not be underestimated and a full network would inevitably be rolled out in stages over a number of years – meaning that the full impact and diversion from air to HSR would not be realised for some time.

Second, the timetabling, frequency and capacity of services on the HSR system will be critical in determining its ability to attain mode shift from aviation and the extent of that shift. For example, the HSR study is premised on attaining a journey time for non-stop high-speed services between the CBDs of Sydney and Melbourne, and Sydney and Brisbane, within three hours. However, this is for a limited number of peak hour services and the HSR may not provide the frequency of services between the east coast cities that aviation services currently provide to the business peak hour traveller.

Third, the cost to governments of constructing the HSR network is very high in comparison with the cost of providing additional capacity expansion of the aviation system. The Phase 1 report estimates that the total cost of building an east coast HSR network extending from Brisbane to Melbourne could be in the range of $61 billion to $108 billion (in 2011 dollars) depending upon the route and station locations selected. These cost estimates include land acquisition, stations and city access, maintenance and stabling facilities, power infrastructure, civil and rail infrastructure, and information technology and ticketing systems. They exclude planning and procurement management costs (likely to be in the order of 10 per cent to 15 per cent) and operating costs.

This range of estimates reflects the level of uncertainty of the possible costs that is typical of such projects at this stage. For example, the lower figure of $61 billion represents a ‘P10’ estimate, meaning that there is currently a 10 per cent chance that the total cost will not exceed $61 billion (or a 90 per cent chance that it will). Similarly, the upper estimate of $108 billion represents a ‘P90’ estimate, meaning that there is currently a 90 per cent chance that the cost will not exceed $108 billion (that is, a 10 per cent chance that it will). These estimates are likely to be refined as the study continues.

The average and range of costs for the four segments that would make up the network have been estimated to be:

- Brisbane to Newcastle – $28.0 billion (between $20.0 billion and $40.6 billion);
- Newcastle to Sydney – $14.2 billion (between $10.7 billion and $17.9 billion);
- Sydney to Canberra – $17.5 billion (between $10.9 billion and $24.5 billion); and
- Canberra to Melbourne – $22.4 billion (between $19.5 billion and $25.6 billion).

The Phase 1 report also notes that international experience suggests that it is unrealistic to expect the capital cost of the HSR network to be recovered.

One factor influencing the cost estimates of HSR and its ability to compete with aviation is the location of the rail stations. In Sydney, station options and their estimated costs (including city entry construction costs, in 2011 dollars) are:

- Central or Redfern – $13.8 billion;
- Parramatta – $9.5 billion; and
- Homebush – $7.8 billion.

Only the first of these options provides improved access to the Sydney CBD in comparison to Sydney (Kingsford-Smith) Airport without significant transport links being provided.

The location of the HSR stations would affect the capacity of HSR to attract a substantial proportion of airline passengers travelling through Sydney and transferring to or from other flights. HSR services may not attract a significant share of transferring traffic unless there is an HSR at the airport. Analysis of ticketing data by Booz & Company suggests that connecting passengers accounted for approximately 20 per cent of passenger movements at Sydney (Kingsford-Smith) Airport in 2010.[84] However, an extra HSR station at the airport could potentially raise significant issues in relation to costs, route definition and journey times for HSR users. This is being examined further in Phase 2 of the HSR study.

Even under a scenario where HSR is operational, the aviation industry has shown its ability to compete against new alternatives. The introduction of LCCs demonstrates the willingness of airlines to compete based on airfares and a diversification of service offerings. Airlines may also choose to utilise vacated capacity by providing low-volume, high-frequency services in response to passenger demand, which will result in the further uptake of aircraft movements.

Furthermore, HSR would not be a direct substitute for all air travel. There remains a substantial amount of traffic to and from Sydney (Kingsford-Smith) Airport that accesses destinations other than the east coast, especially international services, which are the fastest-growing segment for Sydney (accounting for approximately 22 per cent of aircraft movements to the airport in 2010), but also services to domestic destinations such as Perth and Adelaide (nearly eight per cent of aircraft movements). In this context, HSR can only ever be one of a number of means of accessing the Sydney region.

Most HSR systems in the world providing frequent services are connections less than 500 kilometres in length. In these cases, HSR can provide significant competition in travel time to air services. However, this would not be the case given the distances between Sydney, Brisbane and Melbourne and the travel time and frequency advantages provided by airlines in these travel corridors, particularly for higher value business traffic. Accordingly, the Australian market may be unlikely to see a high level of direct substitution of HSR for air services in the east coast market. The extent of the substitution would be contingent on many factors (some still to be explored as part of the HSR study). It cannot be assumed to be a panacea for aviation capacity challenges.

84 Booz & Company analysis of 2010 MIDT data

PART FOUR

CAPACITY OF EXISTING AIRPORTS TO COPE WITH FORECAST DEMAND

P4

Key points

Sydney (Kingsford-Smith) Airport

- The *Sydney Airport Master Plan 2009* (the Master Plan) includes a program of upgrades to terminals, taxiways, aprons and gates, reflecting Sydney Airport Corporation Limited's (SACL's) assessment that, with those changes, the airport can cope with forecast demand to 2029.
- This Joint Study has identified that a range of capacity pressures will have significant implications well before 2029 and these will continue to increase with growth at the airport.
- Investment in infrastructure upgrades is important to help address the impacts of those capacity pressures, but the constraints of the site mean that the capacity of the airport will not be able to be upgraded to meet the level of demand forecast in the longer term.
- At current demand levels, the existing gates, stands and apron areas are already heavily utilised at each terminal during peak times. Specifically:
  - all available contact gates at the current International Terminal (T1) are utilised during the morning peak period 7.30am to 10.00am;
  - all available contact gates at current Domestic Terminal 2 (T2) are utilised at various times during the day. Some stand-off capacity is available at these times, although much of it is limited to turboprop operations at 'walk out' stands;
  - gates at the current Qantas Domestic Terminal 3 (T3) are consistently in use throughout the day; and
  - individual apron areas are already virtually at full capacity during peak times.
- It is estimated, by 2015, there will be a shortfall of 25 aircraft stands compared to projected demand based on the infrastructure shown in the Master Plan. This shortfall could be reduced if terminal and apron work proposed in the Master Plan is brought forward.
- By 2020, there will be an estimated shortfall of 18 stands, even if works proposed in the Master Plan for 2014 to 2019 have been completed.
- There is already a requirement to tow aircraft off to remote stands, particularly from the International Terminal, to free up gate availability in peak periods. This has flow-on effects to the runways and taxiways.
- Taxiway capacity also becomes an issue where there is congestion and delay arising from a shortage of gates or parking stands or when queues develop as a result of the imbalance between usage of the two parallel runways.
- There are significant limitations on runway 16L/34R due to its shorter length. Standard operating procedures generally preclude aircraft above B767 from using runway 16L/34R. On runway 16L/34R the taxiway fillet design does not cater for long wheel base aircraft such as the B777-300. This creates an imbalance between the two runways and reduces the capacity to operate the parallel runway system efficiently.
- Currently, delays on the taxiways and apron areas are estimated to be approximately six minutes for each arrival and 12 minutes for each departure during peak period movements.
- Capacity pressures at the airport will contribute to increases in these delays. The delays will be exacerbated when the airport experiences reduction in capacity due to factors such as non-visual conditions due to rain, storms, low cloud or fog, or when winds require use of the cross runway.

- Over the Master Plan period, taxiway delays can only be kept within tolerable (but far from ideal) limits if airspace and air traffic management procedures can be changed and the fleet mix allows a more even spread of traffic flow onto the main and parallel north-south runways.
  - Airservices Australia has advised that there remains significant challenges to achieve the required runway rebalancing.
- The site of Sydney (Kingsford-Smith) Airport measures some 907 hectares, small by comparison to other major airports in Australia and overseas.
  - Any further extension of the site is limited by urban development and by Botany Bay to the south, the Cooks River to the west and Port Botany to the south-east.
- The constraints of the small airport site rule out any significant realignment of runways or major rationalisation of the taxiway and apron systems. A change to the movement cap could provide some additional capacity, provided the necessary gate, taxiway and parking capacity can be made available.
  - Analysis by Airservices Australia indicates that, in good weather conditions, the parallel runway system could process between 85 and 87 runway movements per hour and that sustainable capacity of the runway system would be around 85 movements per hour.
  - An increase in the maximum movement rate would require substantial investment in taxiway, apron and gate capacity as the current infrastructure struggles to handle for sustained periods even the current peak movement levels of close to 80 movements per hour.
- The limited space at the airport affects the scope to provide appropriate wingtip clearance for very large aircraft along certain taxiways, which may affect the scope for continued upgauging to those aircraft types in the medium and longer term.
- The scope for operations at the airport to recover following periods of reduced capacity will progressively decrease as movements increase, leading to longer periods of disrupted operations at the airport and flow-on impacts throughout the aviation network.
- Capacity pressures will limit the scope for airlines to schedule new services. Under the Slot Management Scheme operating at Sydney (Kingsford-Smith) Airport, the slot allocations which are a prerequisite for scheduling operations are limited to 80 per hour, consistent with the runway movement cap.
- Allocations for peak periods (7.00am to 9.00am and 5.00pm to 7.00pm) are already at or close to this limit – for example:
  - on Fridays, the allocations for the 7.00am and 8.00am hours are full; and
  - on Thursdays, the allocations for the 7.00am hour are full.
- As demand continues to grow, airlines will increasingly be unable to schedule new services at their preferred times. Assuming the airlines are able to reschedule proposed services to the nearest available slots, the peak will continue to spread.
  - By 2020, all slots on weekdays between 6.00am and 12.00noon and between 4.00pm and 7.00pm would be fully allocated.
  - By 2027, there would effectively be no slots unallocated, with unmet demand for more than 100 flights per day.
- In practice, the scope for airlines to shift proposed services to suboptimal schedules will often be limited and the proposal for new services may be shelved if the preferred slot is not available.

- The impacts of limited capacity will be seen in foregone services well before the projected allocation of all slots. As fewer slots become available, Sydney will increasingly miss out on the benefits from new services.

- The lack of available capacity means that, for the busiest hour (8.00am to 9.00am):
  - demand for an estimated four movements in that hour will not be met by 2015;
  - demand for an estimated 12 movements will not be met by 2020; and
  - demand for an estimated 85 movements will not be met by 2060.
- Demand is likely to increase in all hours of the day.
  - Demand will first exceed the maximum that can be allocated in peak hours, then in the hours around peak times.
  - By 2035, it is unlikely that there will be usable capacity available for new services at Sydney (Kingsford-Smith) Airport.
- As movement numbers grow over time at the airport, the scope to use the noise-sharing modes under the Long Term Operating Plan (LTOP) will decrease. Airservices Australia analysis on the effect of forecast demand on the LTOP suggests:
  - By 2015, nine hours of the day will have scheduled movements above 55 movements per hour, approximately the rate above which the noise sharing modes cease to be viable options for managing the air traffic.
  - By 2035, only two hours in the late evening will operate at less than 55 movements.
- Assessments undertaken for the Sydney Airport Community Forum (SACF) have found the LTOP targets are not being met with the levels of traffic demand now presenting at the airport.
- In the absence of major investment in the surface transport networks serving the airport, continued growth of passenger air services would also lead to overloading of the road and rail systems.
  - Increasingly, road traffic to and from the airport will be subject to substantial delays.
  - At the current train capacity of eight trains per peak hour to the CBD, by 2013 services past the airport in the morning peak will be full before they reach the airport stations.
  - By 2018, even with the increase proposed by the NSW Government to 12 trains per hour, trains would be at capacity during peak hours unless additional rolling stock and train paths can be allocated to the airport rail link.
  - Sometime between 2015 and 2023, the capacity of existing road junctions at the entrance to the Domestic Terminal precinct will be exceeded, resulting in a near constant traffic jam on key roads to the CBD and the motorway (this does not include the impacts on the M5 motorway itself).

Canberra and Newcastle airports

- Canberra Airport and RAAF Base Williamtown (Newcastle Airport) have physical capacity to meet the level of their projected demand, but the scope for growth of civil operations at Newcastle Airport is limited by agreement with RAAF, reflecting the projected requirement of RAAF Base Williamtown as an operational base.
  - The scope for RAAF Base Williamtown (Newcastle Airport) to support the demand in the growing Hunter and Central Coast regions over the longer term is unclear.

The anticipated level of economic and population growth of the Sydney region will see unconstrained demand for:

- 57.6 million passenger and 421,000 regular public transport (RPT) aircraft movements by 2020;
- 87.4 million passenger and 528,600 RPT aircraft movements by 2035;
- 165 million passenger and 800,800 RPT aircraft movements by 2060;
- a quadrupling of air freight tonnage by 2060; and
- a 50 per cent increase in General Aviation (GA) activity between 2010 and 2060.

Capturing the economic and social benefits associated with this activity will depend in large part on the ability of existing airports, and their surface transport linkages, to meet this demand.

While Canberra and Newcastle airports will see continuing growth in demand for RPT services, this is not expected to reduce demand at Sydney (Kingsford-Smith) Airport.

Sydney (Kingsford-Smith) Airport will continue to be the largest airport in the region both in terms of RPT and freight services. Unconstrained demand at Sydney (Kingsford-Smith) Airport (which already facilitates 89 per cent of passenger movements in the Sydney region) is forecast to be more than double the current number of passenger movements by 2035 and quadruple the number of passenger movements by 2060.

The Steering Committee considered a wide range of issues that affected the capacity of existing infrastructure and associated surface transport links to determine whether they could meet forecast demand.

4.1 Factors affecting airport capacity

A range of factors affect the capacity of an aerodrome, including the size and location of the site, the standard of airport infrastructure, the standard of air traffic management facilities and services and any regulatory measures implemented to limit social and environmental impacts. The interaction of the various components is also important. For example, the orientation, number and length of available runways, location of gates and aircraft parking areas on an airport can require aircraft to taxi or be towed across runways; similarly, the location of the runway threshold can require extended taxiing. Either case can reduce operational efficiency and capacity of an airport.

> Not only does an adequate level of infrastructure and other capacity elements need to be in place but it must also be of the right type, in the right place and available at the right time.

Physical size and location of the airport

The size and location of an airport will determine the types of services an airport can offer. Surrounding urban development may present obstructions that affect aircraft approach and take-off paths. Equally, airport buildings and installations need to be sufficiently set back to avoid becoming hazards. Taxiways, aprons and parking areas need to allow adequate clearance between aircraft.

In addition, the ability of the airport to grow to meet demand will be limited where there is not adequate suitable space to build new facilities such as gates, taxiways, terminals or runways.

Airport airside infrastructure

Airside infrastructure of an airport includes:

- **aprons:** defined areas for the safe parking of aircraft, where passengers and freight are transferred between aircraft and terminal facilities and where maintenance and parking of aircraft takes place in between flights
- **stands:** the physical location of an aircraft parking position for either passenger or cargo aircraft;
- **gates:** the physical location where passengers depart or arrive at a terminal to access aircraft – either directly via aerobridges for contact stands or via bus or walking for remote stands;
- **taxiways:** the links between the apron areas and the runways that facilitate the movement of aircraft around the surface of the aerodrome; and
- **runways:** the defined areas provided for aircraft to land and take off.

The length, width, strength and configuration of a runway and the supporting taxiway system will determine the type of aircraft able to land and depart at a particular airport. In addition, there must be a corresponding level of available apron, gate and parking space to manoeuvre aircraft around the airport as well as access to facilities, such as terminals or freight-handling areas, to facilitate the transfer of passengers, baggage and freight from the airport to transport connections and their onward destination.

Facilities for the maintenance of the aircraft and infrastructure for fuel supply are also required.

The availability of airside infrastructure and how efficiently aircraft can move around an airport are key determinants for how much and what type of traffic an airport can handle.

Airspace management and air traffic control

A key requirement of air traffic management and air traffic control is to ensure an appropriate separation distance between aircraft. The appropriate separation distance is important from a safety perspective to minimise the risk of collision. Also, aircraft travelling at speed create different levels of wake turbulence, with the level depending on their type and size. The wake turbulence separation distances applied by Air Traffic Control (ATC) vary substantially depending on the size of aircraft in front and behind. This has implications for the number of aircraft that can be processed by ATC over a given time period.

Other issues that impact on the capacity of an airport include its proximity to other airports and the type of activity at those airports, due to the potential interaction of the departure and approach flight paths.

Minimising social and environmental impacts

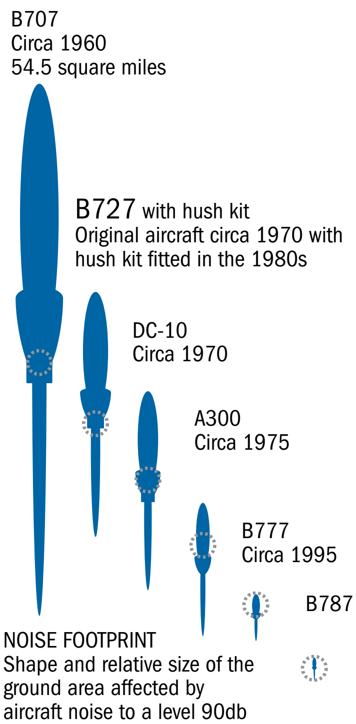
Many airports operate with measures in place to reduce and mitigate the adverse impacts of aircraft noise on communities surrounding the airport. These mitigation controls range from:

- noise abatement controls on types of aircraft operations (for instance, bans in place on noisier, older jet aircraft types);
- preferred flight paths to minimise over-flight of noise-sensitive residential areas;
- controls on night movements, from voluntary limitations (such as no flying training activity at night) through to legislated controls – in particular, curfews; and
- in the case of Sydney (Kingsford-Smith) Airport, a direct control on the maximum number of movements each hour.

While important to protect community concerns, these measures limit the capacity of airport operations. Considerable progress has been made within the industry in reducing noise exposure through technology, including improved air navigation procedures and the introduction of more modern, quieter aircraft. The progressive upgrading of airline fleets has provided a significant improvement in the industry's noise impacts on communities and this trend is expected to continue.

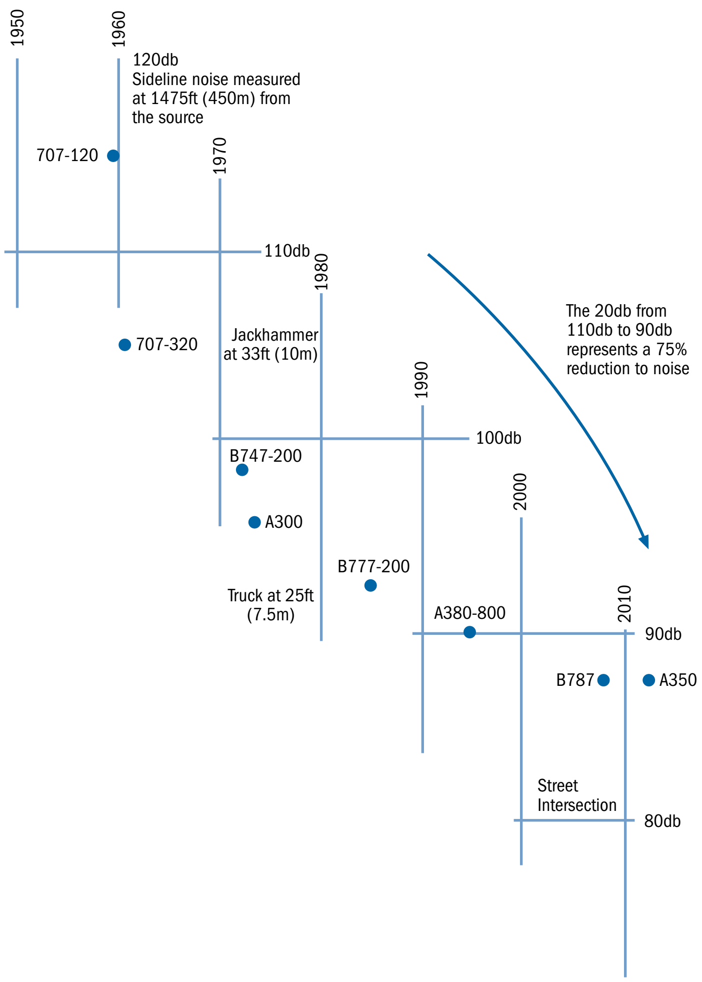
While there has been an increasing number of larger aircraft, the actual noise footprint per passenger has actually reduced. Figure 67 and Figure 68 illustrate historical improvements in noise performance of passenger aircraft. Major aircraft manufacturers continue to pursue aircraft noise reduction as an important marketing feature of new aircraft. However, the reduction in noise across the fleet is often not perceived by the community, especially where there is a countervailing growth in aircraft numbers.

Figure 67 Reductions in noise footprints over time



Source: Australian Government, National Aviation Policy Green Paper, December 2008.

Figure 68 **Comparison of aircraft noise with other activities (decibels)**



Source: Australian Government, National Aviation Policy Green Paper, December 2008.

Weather

Over and above the physical capability of an airport and the policy settings that may affect airport capacity, there are some unpredictable factors that can reduce capacity. Weather conditions may affect the capacity to use the most efficient runway configuration or require greater separation between aircraft. In practice, the effective operating capacity of an airport will always be less than the theoretical capacity of the infrastructure, with the difference arising from impacts of adverse events and the recovery from delays caused by such events.

Surface transport

Adequate capacity in the transport network surrounding airports is necessary to ensure the efficient transportation of passengers, employees and goods to and from those locations. Increasing congestion in the surface transport system serving an airport places pressure upon the road and rail systems. Delays from congestion impact on the airport users, leading to delayed departures or missed flights. Congestion also affects transport in the surrounding areas, placing economic costs on surrounding business and industry.

Peaks in demand

Variation in demand between peak and non-peak periods is a reality for most airports, and is reflected in the scheduling decisions by operators. In large measure, scheduling decisions are driven by commercial factors, with airlines services planned as close as possible to the preferred travelling times of their customers. Operational issues such as planning of rotations for aircraft and crew and restrictions such as curfews or slot limitations at other airports may also limit the window within which services need to be scheduled. The scope for operators to schedule services outside peak periods may in many cases be limited. An airport may need to turn away potential new services if peak period capacity is exhausted, even if capacity is available at other times.

4.2 Current capacity at Sydney (Kingsford-Smith) Airport to meet demand

Sydney (Kingsford-Smith) Airport is the largest RPT airport in the region. As discussed in Part Three, unconstrained demand for the airport is forecast to reach approximately 76.8 million passenger movements and 428,900 RPT aircraft movements by 2035, which is more than twice its current throughput. There would be more than 145 million passenger movements and 652,700 RPT aircraft movements by 2060.

In their submission to the Joint Study, SACL estimated the practical capacity of Sydney (Kingsford-Smith) Airport to be potentially as high as 558,800 annual movements. This is based on modelling which assumes no movement cap and a physical capacity (and achievement) of about 91 movements per hour on the parallel runway modes of operation for all 17 non-curfew hours per day, with a small margin to provide for adverse weather conditions. Alternatively, SACL estimates that, with the retention of the statutory cap of 80 movements per hour and the Long Term Operating Plan (LTOP), the capacity will be 454,546 annual movements.[85]

Airservices Australia has estimated that, with the movement cap, and based on historical analysis of weather and traffic acceptance rates, the practical capacity is approximately 446,000 movements per year. This is based on continual parallel runway operations (except when weather does not allow) to meet growth in traffic demand.

However, a comparison of aircraft movement forecasts with an assessed theoretical capacity of the airport only provides a very broad approximation of an airport's actual operations. In particular, such a broad measure does not indicate how the airport is meeting traffic demand across peak and non-peak periods and whether there is congestion and delays to passengers and aircraft.

In examining the factors which affect capacity, it becomes apparent that the airport, under its current operating framework (including its Master Plan[86]), will over time become unable to meet the forecast demand effectively. The limitations are already evident but will increase with continued growth of services and impact in the medium to long term. While there are measures that can be taken to get the most out of the existing site, these are constrained by a range of factors, as described below.

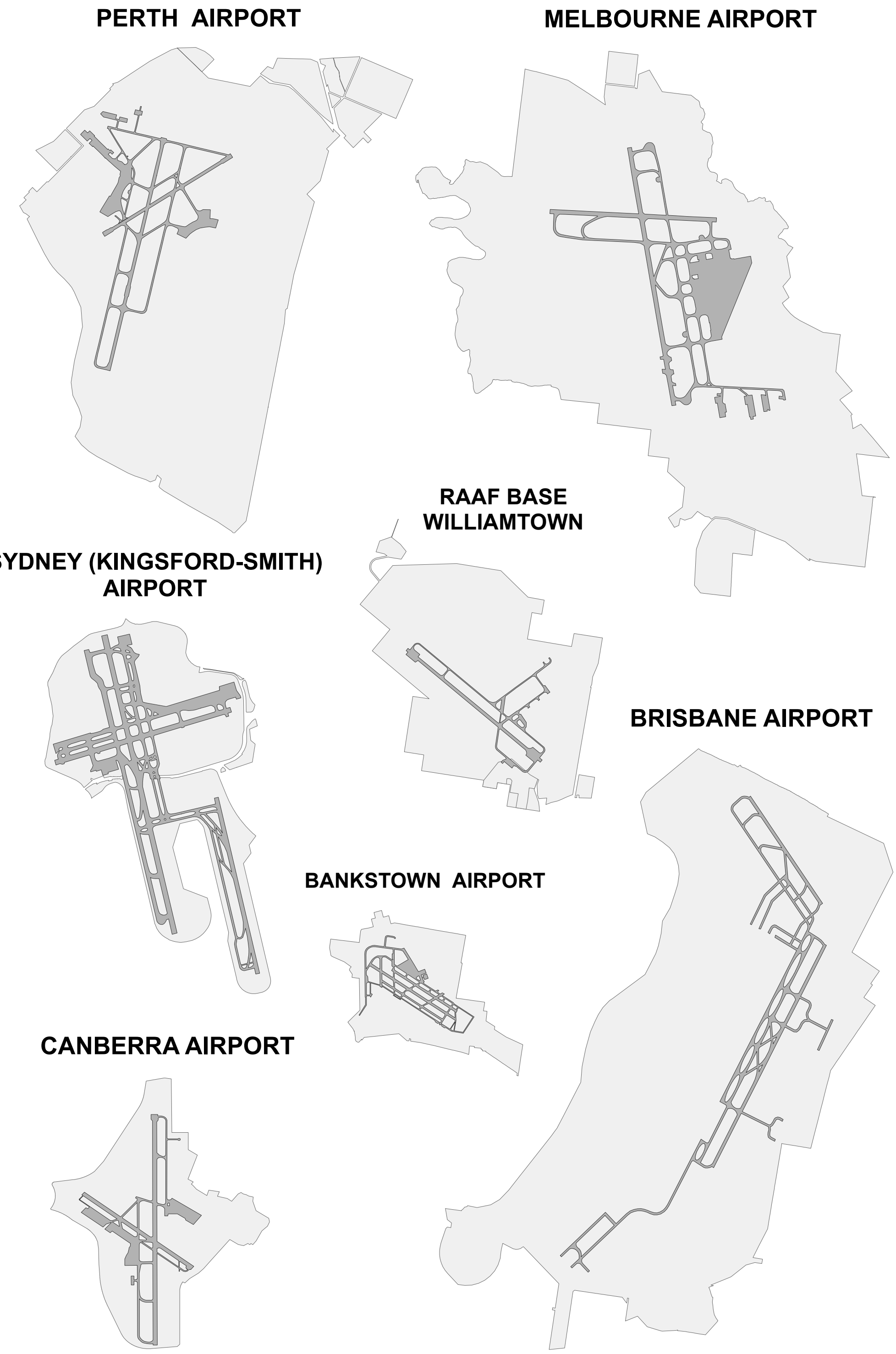
Physical size and location of the airport

While Sydney (Kingsford-Smith) Airport is Australia's busiest airport in terms of international and domestic RPT, the airport occupies a relatively small land area compared with other major Australian RPT aerodromes. This is also small by international standards.

Figure 69 shows the land area of a number of capital city airports, and some aerodromes in the Sydney region.

85 SACL submission to the Joint Study, 2011.
86 SACL's *Sydney Airport Master Plan 2009* (referred in this Report as the Master Plan) provides for the operation and development of the airport to the year 2029, based on no changes to aircraft fight paths, the curfew, the cap as well as no new runways and no change to access arrangements for regional airlines.

Figure 69 Land areas of some Australian aerodromes

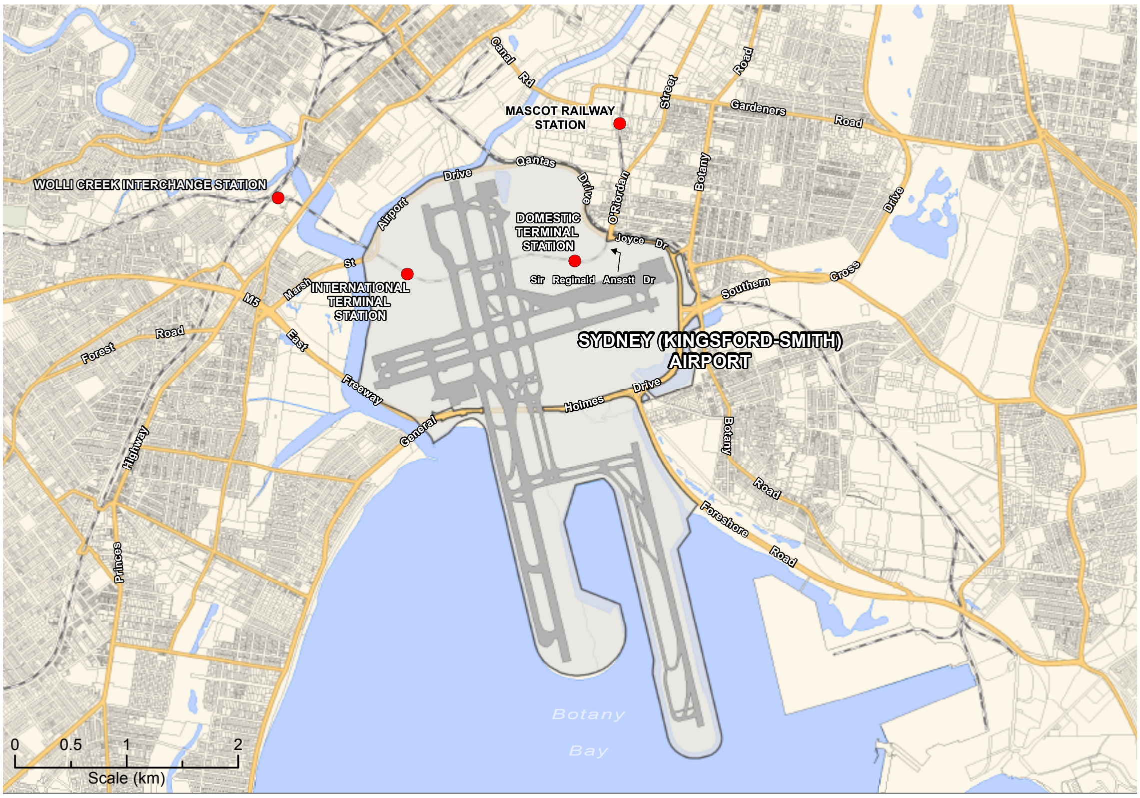


Source: Australian Department of Infrastructure and Transport.

Sydney (Kingsford-Smith) Airport has been an airport since the early 1920s. It has grown and developed to meet the demands and opportunities at different points of time rather than being planned to meet demand in the long term. This is evident in the configuration of the Domestic and International Terminals separated by the main runway and in the location and length of the much shorter medium-spaced parallel runway, which has been built out into Botany Bay. There is limited land to significantly extend terminal facilities, particularly in the International Terminal precinct, and no opportunity to extend existing runways or build another. The land available for additional taxiway and apron capacity is also limited.

Figure 70 shows Sydney (Kingsford-Smith) Airport in relation to the surrounding environment. It is surrounded by Botany Bay on one side and urban development on the other sides. The Cooks River, Alexandria Canal, the Southern and Western Suburbs Ocean Outfall Sewer[87] and M5 tunnel also affect development to the west.

Figure 70 **Sydney (Kingsford-Smith) Airport and its immediate surrounds**



Note: Some sections of the road network around Sydney (Kingsford-Smith) Airport are tunnel roads.

Source: Australian Department of Infrastructure and Transport.

Urban redevelopment in the surrounding area will add to land transport access pressures on the road and rail system to and from the airport. Additionally, greater urban density in the CBD to airport corridor will increase pressure for high-rise developments which may conflict with the Obstacle Limitation Surface (OLS)[88] for the airport and potentially create a level of interference for on-airport infrastructure such as air traffic surveillance equipment and radio navigation aids. Traffic in the vicinity of the airport is also affected by the substantial and increasing traffic to Port Botany and by the volumes of through-traffic accessing the M5 or other arterial roads in the area.

87 A key part of the Sydney Water's Southern and Western Suburbs Ocean Outfall Sewer Main traverses the Sydney (Kingsford-Smith) Airport site, roughly in line with General Holmes Drive and also along the western edge of the airport between the Cooks River and the western end of Runway 07/25.

88 Obstacle Limitation Surfaces (OLS) protects the airspace and sets the maximum height of buildings to prevent interference with aircraft operations.

Airport airside infrastructure

Sydney (Kingsford-Smith) Airport Master Plan

Under the Commonwealth *Airports Act 1996,* an airport's operator or lessee is required to provide the Australian Government with a Master Plan every five years. The Master Plan sets out the airport lessee's proposals for operation and development at the site over the next 20 years, including proposals for investment and infrastructure development. The most recent Master Plan for Sydney (Kingsford-Smith) Airport was approved in 2009.

While SACL acknowledged in its Master Plan that the historical development of the airport had impacted on the investment and infrastructure decisions that can be made under the Master Planning process, it stated that, with the proposed changes under the Master Plan, the airport would be able to cater for forecast demand to 2029 in accordance with existing regulatory settings.

To meet the demand, SACL planned to undertake extensive redevelopment of all three terminals in addition to the development of a new remote aircraft parking apron to the south-east corner of the cross runway. A number of new taxiway elements would also be required to meet demand. These developments are intended to cater for the growth in aircraft movements, including the projected upgauging of aircraft types, such as a move to greater use of Code E and F aircraft types.

Aprons, stands and gates

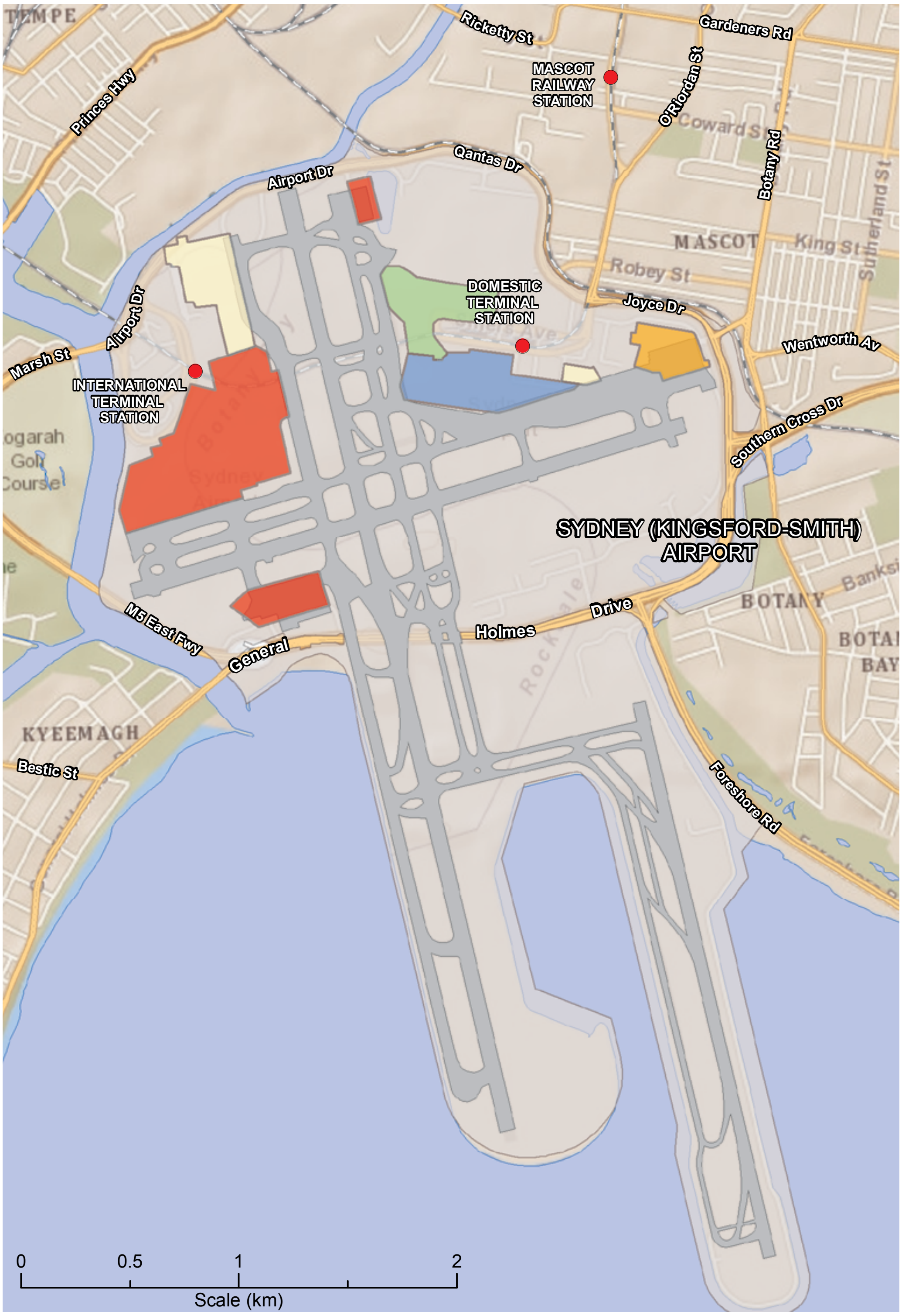
The current apron, stand and gate provisions are outlined in Table 6. These are located on the airport site in the corresponding colours, as highlighted in Figure 71.

Table 6 Current apron, stand and gate provisions

	Passenger						Freight		
	T1		T2		T3				
AC Type	Contact	Remote	Contact	Remote	Contact	Remote	International	Domestic	General Aviation
B1900	-	-	-	2	-	-	-	-	6
B737-800	3	1	15	14	7	-	-	5	2
B767-300	-	1	3	-	7	-	-	-	-
B747-400	17	6	-	-	2	-	4	-	2
A380-800	5	1	-	-	-	-	1	-	-
Total	25	9	18	16	16	-	5	5	10

Source: Landrum & Brown (L&B).

Figure 71 **Existing airfield gate layout**



Note: Highlighted areas in the map are indicative of key features only; a more detailed representation of the layout is in the following figure.

Source: L&B.

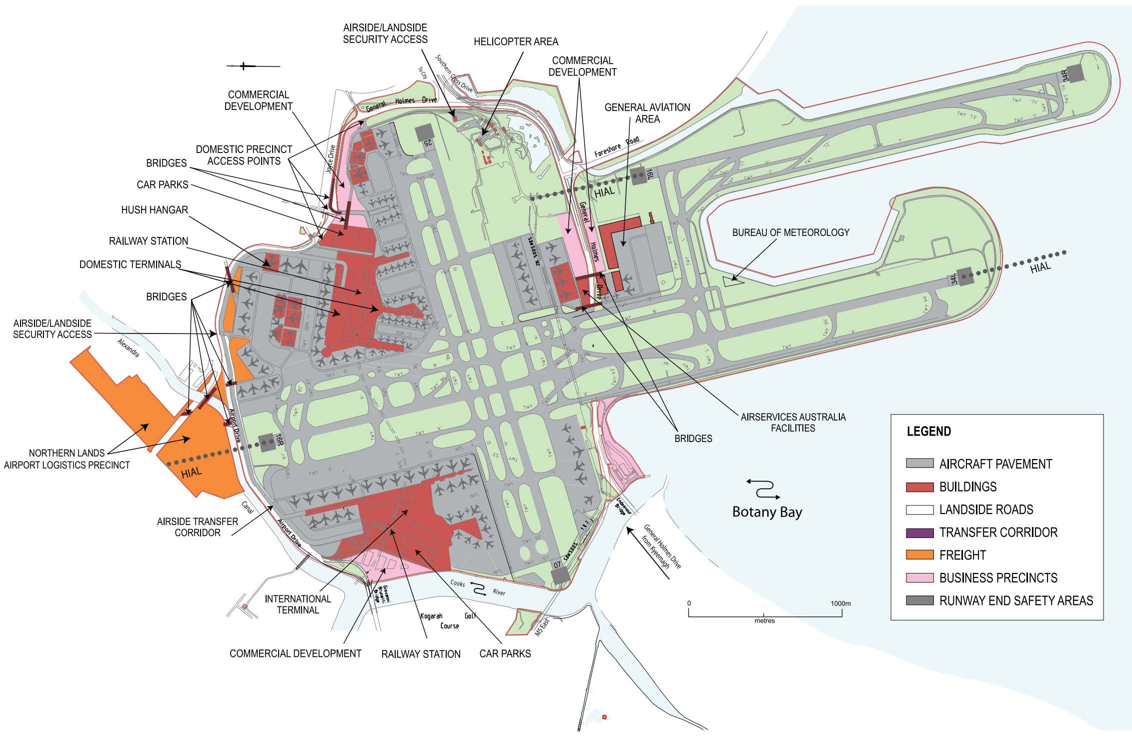
Under the Master Plan additional apron, stand and gate areas are to be provided to meet projected demand. This includes completion of apron development in the south-west sector by 2014, which would require towing across the cross-runway 25/07 and new apron development in the south-east and north-east sectors by 2024. The current GA facilities are relocated to the south-east sector and displace the domestic freight precinct to the northern sector. The north-east sector will be part of a reconfiguration of the Qantas Jet Base maintenance area.[89]

Figure 72 and Figure 73 outline the airport layout in 2009 and the 2029 Master Plan concept.

Figure 72 Layout of Sydney (Kingsford-Smith) Airport, 2009

Source: SACL Sydney Airport Master Plan 2009

Figure 73 Proposed Master Plan layout of Sydney (Kingsford-Smith) Airport, 2029



Source: SACL Sydney Airport Master Plan 2009

89 It is worth noting that Qantas's long-term lease of the maintenance area expires during the Master Plan period.

The proposed number of stands for aircraft types to meet the forecast demand, as outlined in the Master Plan, is shown in Table 7.

Table 7 Master Plan stand demand forecast, 2029

Category[1]	International	Domestic[2]	Freight[3]
Active[4]			
Code F	17	0	0
Code E	19	11	3
Code C	2	36	0
Subtotal	38	47	3
Layover[5]			
Code F	7	0	0
Code E	11	3	0
Code C	0	13	0
Subtotal	18	16	0
Total	56	63	3

Note 1: The stand demand for each category was determined on the basis of the largest aircraft type using a stand. Larger stands should be able to cater for smaller aircraft codes subject to detailed project planning.

Note 2: Domestic stand demand includes regional aircraft types. For the purposes of land use planning and to maintain future flexibility, domestic Code C regional stands were sized to accommodate the largest code aircraft type.

Note 3: This is the demand for freight stands occurring concurrently with passenger peak stand demand. Dedicated freight aircraft will operate from common use passenger stands.

Note 4: Active stands are those used for actual passenger processing. They can be a contact stand or passengers can be bussed from other locations.

Note 5: Layover stands are those where aircraft, not carrying out immediate turnaround, are towed and parked prior to being towed back for departure.

Source: SACL Sydney Airport Master Plan 2009

For the purposes of this Joint Study, Airservices Australia commissioned Landrum & Brown (L&B) to undertake a review and modelling of the airport's airside infrastructure capacity as outlined in the Master Plan against the airport's current and forecast demand.[90] The analysis was considered against the same time frames as the demand forecasts, taking into account expected aircraft sizes and movement schedules. It highlighted the difficulty of sustaining the current movement and handling rates, let alone catering for the projected growth in traffic, given the constraint of the existing airfield layout and the interaction between taxiways, runways, gates and apron parking slots.

The analysis does not address a new concept SACL has started to develop, which SACL expect will provide scope for additional gates and apron; and support more efficient use of the terminal infrastructure. This new concept is discussed in Part Six of this Report.

L&B's analysis found that it was unlikely the current apron, stands and gates infrastructure plans under the Master Plan would be sufficient to meet future demand, with particular challenges created by the timing set out in the Master Plan.

90 L&B undertook its analysis based on an example of possible forecast schedules developed by Booz & Company.This included likely arrival and departure times, aircraft types, service destinations and other criteria, consistent with Booz & Company's annual forecast demand and constrained planning day profiles, as discussed in Technical Papers A3 and B3. The full L&B report can be found at Technical Paper B1.

At current demand levels, the existing gates, stands and apron areas are already heavily utilised at each terminal during peak times. Specifically:

- all available gates at the current International Terminal 1 (T1) are utilised during the early morning peak between 7.30am and 10.00am;
- all available gates at the current Domestic Terminal 2 (T2) are utilised at various times during the day but some stand capacity is available, although much of this is limited to turboprop aircraft at 'walk out' stands;
- gates at the current Qantas Domestic Terminal 3 (T3) are consistently utilised throughout the day; and
- individual terminal apron areas are already virtually at capacity.

Individual terminal areas are already at maximum capacity in terms of aircraft stand utilisation during peak times, although additional aircraft can be accommodated at other times of the day, mainly on uncovered 'walk out' stands. Growth in aircraft sizes, particularly in peak times, will require additional aircraft gate capacity in the near to medium term future.

In many cases, there is already a requirement to tow aircraft off to remote stands, particularly from the International Terminal, to free up gate availability. This has flow-on effects to the runways and taxiways, as often aircraft tows crossing the main runway cause congestion, delays and flow complications on the taxiways.

By 2015, without the bringing forward of planned terminal and apron work identified in the Master Plan, it is estimated there will be a shortfall of 25 aircraft stands to meet projected demand.

Table 8 below shows the stand allocation and usage outcomes in 2015.

Table 8 **Expected stand allocation and usage outcomes, 2015**

Stand	Average Flight Turnaround Time[1]	Average Turns per Stand[2]	Maximum Turns per Stand[2]	Aircraft Turns Not Accommodated	Additional Stands Required
T1	3hr 13 min	4	6	12	8
T2	1hr 20 min	7	11	19	9
T3	1 hr 32 min	6	8	28	8
Total	n/a	n/a	n/a	59	25

Note 1: Turnaround (paired) flights only. Does not include arrival-only or departure-only flights.

Note 2: Does not include remote stands for aircraft tow-off.

Source: L&B based on forecast schedules by Booz & Company.

This lack of gates will mostly impact on international arrivals in the morning peak hours, as there will not be any available stands at the International Terminal to accept any additional flights after 2015. There will also be a similar constraint at T2 and T3 in peak periods. This shortfall will especially impact on the larger Code E aircraft, with no available stands at T2 and T3.

Part of this shortfall is the result of upgauging of aircraft for domestic services to meet the anticipated demand when there has not been a similar increase in the size of aircraft stands. If airlines deferred upgauging in order to facilitate increased movements at Sydney (Kingsford-Smith) Airport, this could reduce the number of additional stands required by approximately five stands. However, the use of smaller aircraft would result in reduced passenger throughput, and therefore less of the total amount of passenger demand would be met.

By 2020, there will be an estimated shortfall of 19 stands, assuming all infrastructure development is achieved in accordance with the schedule foreshadowed in the Master Plan. Of this, a shortfall of five stands could potentially be mitigated if airlines operated services with a smaller aircraft size to cope with the constraint; however, as described above, this has other negative implications. Aircraft at T3 as well as those at T1 will still be unaccommodated.

By 2035, the planned gate provisions, as detailed under the Master Plan, will be insufficient by a shortfall of 16 stands. The reduction in the shortfall compared to 2020 is likely to be due in part to an increased percentage of larger aircraft in the forecast fleet mix, and completion of the foreshadowed work.

Table 9 **Expected stand allocation and usage outcomes, 2035**

Gate	Average Flight Turnaround Time[1]	Average Turns per Stand[2]	Maximum Turns per Stand[2]	Aircraft Turns Not Accommodated	Additional Stands Required
T1	2hr 58 min	4	7	7	6
T2	1hr 11 min	9	12	27	8
T3	1hr 24 min	9	10	5	2
Total	n/a	n/a	n/a	39	16

Note 1: Turnaround (paired) flights only. Does not include arrival-only or departure-only flights.

Note 2: Does not include remote stands for aircraft tow-off.

Source: L&B based on forecast schedules by Booz & Company.

It should be noted the shortfall in gates includes a number of gates which will only be required in peak periods and may have only one projected aircraft turnaround per day. It is unlikely providing gates for one turnaround will be commercially viable for either the airlines or the airport. In addition, the analysis shows that, by 2035, with a spreading of movements, half of the airport hours of operation (eight hours) will be at the 80 movements per hour cap and another five hours will be at 75 movements or higher. This peak spreading creates a consistent high demand for tight turnaround times for all aircraft movements.

Even with the projected Master Plan investments, a significant number of aircraft turnarounds will not be able to be accommodated at T1, T2 and T3. The reaction of the airlines and the airport to the constraints could be to seek to organise schedules to reduce the need for some of these gates. However, there is limited scope for this without changing routes or aircraft types (especially using smaller aircraft to better utilise the gates available) and therefore this could result in redistribution or suppression of demand. This will limit the scope for upgauging of the airlines' aircraft fleet – one of the key coping strategies the airlines and the airport will seek to adopt as scheduling slots become further constrained.

Airlines could be under pressure to reduce the time allowed for turnarounds between arrivals and departures of subsequent services by the same aircraft; however, this may lead to more frequent schedule disruptions, as it reduces the margin for managing unexpected hitches in the operations and the flexibility to manage any delays from previous sectors.

The Master Plan layout needs to be developed by 2020 to accommodate the forecast schedule demand, especially during peak morning, evening and overnight periods.

Taxiway network

Under the Master Plan, SACL proposes a number of changes to the existing taxiway network – in particular, the:

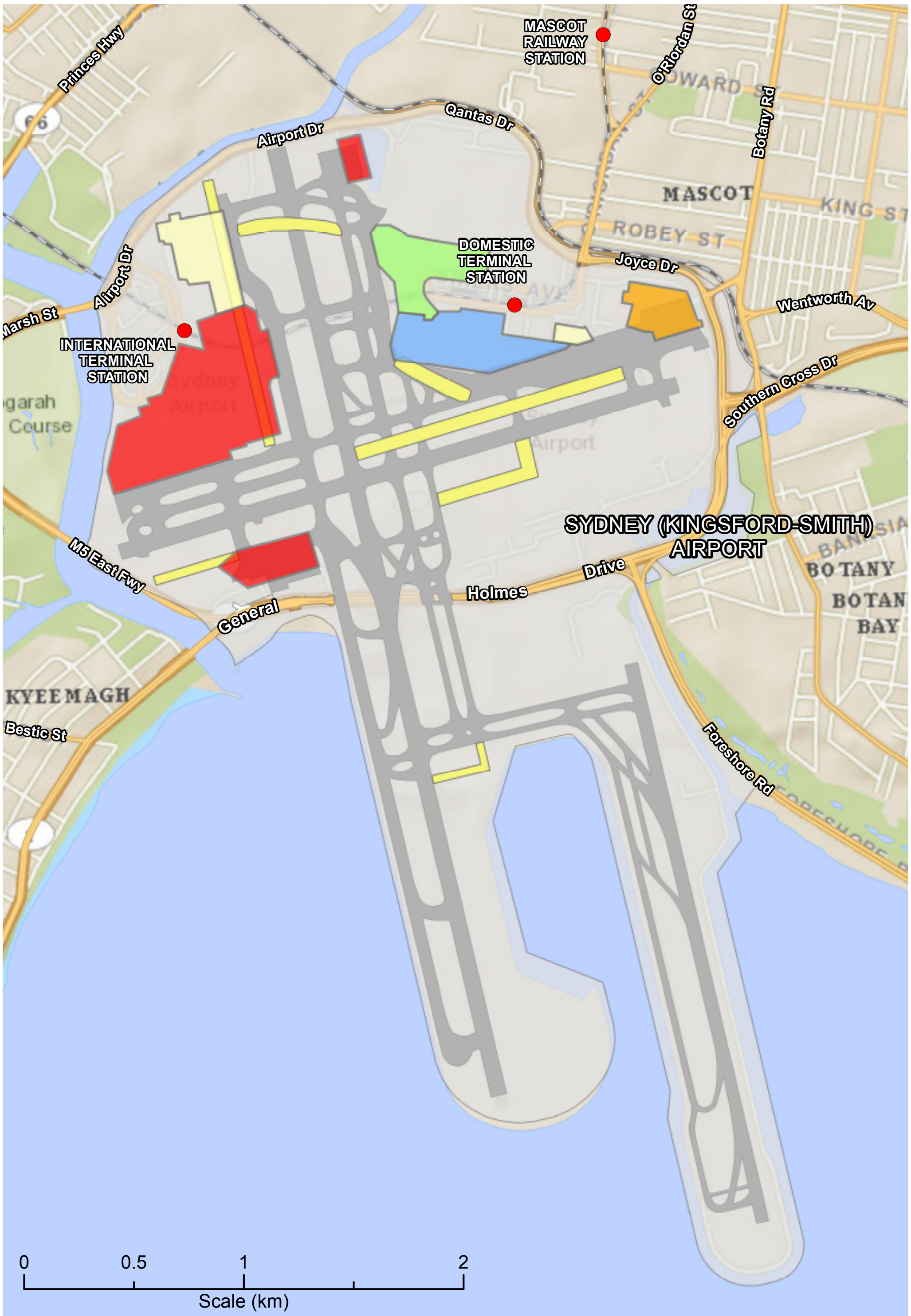
- taxiway J extension;
- taxiway C extension;
- straightening of taxiway A;
- new parallel taxiway east of the current International Terminal (T1);
- additional northern taxiway across the main runway; and
- taxiway H extension.

These can be seen schematically in Figure 74, delineated in yellow. (A more detailed explanation of the current and planned taxiways can be seen in Figure 72 and 73.)

The airport layout has some restrictions which prevent certain aircraft movements in particular areas. Large aircraft such as A380, B777 and A340, for example, must use specific taxi routes. There are also restrictions due to clearance issues, requiring holding on the taxiways. This means that greater than anticipated upgauging of aircraft, which might help increase capacity, will place greater pressure on the taxiway system, potentially causing it to become a limiting factor.

L&B advises that, with the works foreshadowed by SACL in its Master Plan, it is possible that taxiways have sufficient capacity to 2035. Delays would be within tolerable (but far from ideal) limits, but only if sustained movement rates do not exceed the capacity of gates and there is a more balanced utilisation between the parallel runways than currently occurs. It is noted, however, that there are operational limitations that impede the balancing of traffic flow onto the two parallel runways; hence, L&B considers that inadequate taxiway capacity remains a risk through the Master Plan period.

Figure 74 **Master Plan taxiway network proposed changes**



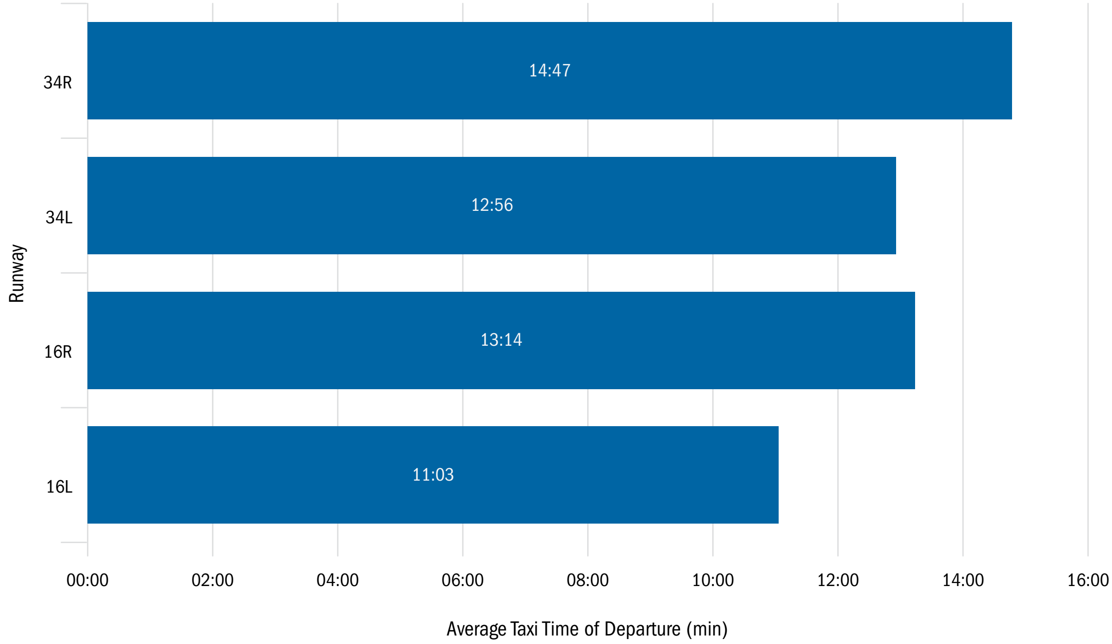
Note: Highlighted areas in the map are indicative of key features only; this should be read in context of other proposed developments in the Master Plan, for example in terms of aircraft parking areas. A more detailed representation of the developments can be seen in the preceding figures.

Source: L&B.

Assessment of the ability of the Master Plan's proposed taxiway infrastructure to support future gate demand and surface movement traffic suggests that the current taxiway layout is less than optimal and is the cause of extended taxiing times and some congestion. Runway crossings and towing operations during peak operating periods negatively affect taxiway operational performance. The fact traffic flow cannot be evenly shared between the two parallel runways is a further cause of taxiway congestion. Many aircraft types are only able to use the western parallel runway due to its longer effective operational length. The airport is already exposed to departure queues for the western parallel runway during peak periods, while the other parallel runway is under-utilised.

Figure 75 highlights current capacity issues on the taxiways. This shows it takes approximately two minutes longer to taxi and depart to the south from the longer parallel runway than the shorter runway, despite a significantly shorter distance travelled. As a result, a queue forms on the taxiways, causing congestion in peak times.

Figure 75 **Average taxi times of departure aircraft by runway, 2010**



Source: L&B.

Runways

There are currently three runways (with six runway ends) at Sydney (Kingsford-Smith) Airport (as shown in Figure 76):

- 16R/34L, which is the longest of the three runways at 3,962 metres (the 'main runway');
- 16L/34R, known as the third runway, at 2,438 metres; and
- the cross (or east-west) runway 25/07 at 2,530 metres.

Runways 16R/34L and 16L/34R are not wide-spaced parallel runways and are not able to operate independently to achieve 80 movements per hour in all weather conditions.

Figure 76 **Runway layout at Sydney (Kingsford-Smith) Airport**

Source: Australian Department of Infrastructure and Transport.

The length and strength of the runways determine the capability to meet aircraft type and movement demand. Runway 16R/34L is able to accommodate all aircraft types, although there can be some issue in accessing the runway due to wing-tip clearance requirements between Code D, E and F aircraft using the adjacent taxiway network, slowing movement along the taxiway. (Aircraft in these codes that could be affected by this include the A380, B767 and B777.)

There are significant limitations on runway 16L/34R. Its taxiway fillet design does not cater for long wheel based aircraft such as B777-300 or larger. Standard operating procedures generally preclude aircraft greater than the B767 from using that runway.

In addition, some services are more likely to use the longer runway. For example, aircraft departing for Melbourne would, under normal circumstances, be required to depart from the long runway (16R) in order to mesh with the adjacent route structures for their destination.

Many of the heavier, larger and/or long-haul aircraft require use of the long runway. Historically, the runway usage split typically averages 67 per cent of operations on the longer runway and 33 per cent on the shorter runway.

There is therefore an imbalance between the utilisation of the two parallel runways and reduces the capacity to operate the parallel runway system efficiently. Sydney (Kingsford-Smith) Airport differs from other airports with parallel runways, such as London's Heathrow Airport, where runways are of similar length, providing for greater flexibility and allowing for more balanced runway utilisation. As the number of movements increase, ATC will be forced to put more aircraft on the shorter parallel runway. This will increase taxiing times for a number of aircraft. However, as the proportion of large aircraft in the overall fleet mix also increases over time (as the airlines upgauge their fleets), the opportunity for a balanced runway utilisation again comes under pressure as the need to use the longer runway increases. The runway configuration is, therefore, a limiter and potential cause of increased delays. While demand pressures will create incentive for a greater use of the third runway, upgauging to larger aircraft which need to use the main runway is likely to counter this.

Analysis of the runway system undertaken by Airservices Australia found that, in good weather conditions, Sydney (Kingsford-Smith) Airport can process between 85 and 87 movements per hour on the parallel runways. This is consistent with international practice, with most runways currently catering for about 40 movements per hour where there is a typical RPT fleet mix and separation standards are applied as specified by the International Civil Aviation Organization (ICAO).

Considering the combined capacity of Sydney (Kingsford-Smith) Airport's runways, airspace, taxiways and gates, Airservices Australia suggests that sustainable capacity is not more than 85 movements per hour.

An increase in the maximum movement rate would require substantial investment in taxiway, apron and gate capacity, as the current infrastructure struggles to handle even the current peak movement levels of close to 80 movements per hour for sustained periods. Achievement of this level of movements is also predicated on good weather, more balanced runway utilisation and a suitable fleet mix given the time required between movements, particularly large aircraft. Separation standards between leading and trailing aircraft are required for safety reasons to ensure there is no risk posed by wake turbulence remaining from the preceding aircraft on the same route. Minimum wake turbulence separations standards to be applied between an A380 and a lighter aircraft range between two and four minutes or between six and eight nautical miles depending on the operational circumstance.

Table 10 and Table 11 outline the minimum separation standards required by the Civil Aviation Safety Authority. These are described in terms of nautical miles (typically for arriving aircraft) and minutes (typically for departing aircraft).

Table 10 Minimum wake turbulence separation standards (nautical miles)

Aircraft Categories		Time Separation Minimums				
Leading Aircraft	Following Aircraft	Arrival	Displaced Landing Threshold	Opposite Direction	Departure (Full Length)	Departure (Intermediate)
Super	Heavy	3	3	3	2	4
	Medium	3	3	3	3	4
	Light	4	3	3	3	4
Heavy	Medium	2	2	2	2	3
	Light	3	2	2	2	3

Source: Airservices Australia Aeronautical Information Service (AIS) Publications.

Table 11 Minimum wake turbulence separation standards (minutes)

		Trailing		
		Heavy	Medium	Light
Leading	Super	6	7	8
	Heavy	4	5	6
	Medium	n/a	n/a	5

Note: ATC apply these standards to aircraft traffic arriving or departing circling an airport. Where the required separation can be determined by distance using an aircraft report or Air Traffic Service Surveillance System, ATC need not apply the time standard.

Source: Airservices Australia Aeronautical Information Service (AIS) Publications.

Increased delay

One of the indications of capacity pressures at an airport is when average delays begin to exceed acceptable levels. The United States Federal Aviation Administration has historically defined the 'acceptable average delay' as approximately four to eight minutes per aircraft.

However, given that each airport is different, a more appropriate level of 'acceptable' delay is one in which the schedule integrity can be maintained and that the operation can recover from periods of high delays quickly – usually within an hour.

Any significant delay to aircraft operations can have the following impact on passengers, airlines and productivity:

- passengers are more likely to miss connecting services or appointments;
- airline crews will miss connecting flight assignments;
- the delay to an arriving aircraft results in a significant delay to the corresponding departure that can then cascade delays throughout the entire network of airline schedules across the country and at overseas ports; and
- in extreme cases, arriving aircraft are diverted to other airports because they do not have sufficient fuel reserves to carry out the required airborne holding.

One key factor in determining an airport's capability of performing at peak performance under all weather conditions is the aerodrome layout – the combination of runways, taxiways, apron areas and gates. L&B examined the capability of the taxiways, aprons and gates at Sydney (Kingsford-Smith) Airport to cope under sustained load as indicated in forecast schedules for 2015, 2020 and 2035. Both existing infrastructure and intended infrastructure, as set out in the Master Plan, were tested under load.

Based on the 2009 daily demand level of 888 arrival and departure operations, the L&B taxiway simulations for the existing airfield layout computed an average peak hour delay of 5.7 minutes (Mode 9) and 5.4 minutes (Mode 10) for arrivals and 12.0 minutes (Mode 9) and 11.1 minutes (Mode 10) for departures.

By 2035, the modelling undertaken by L&B found there would be little change in delay patterns if:

- the airport was able to operate in the parallel runway mode of operation;
- the weather conditions were good;
- the hourly movements did not exceed the 80 movement cap;
- there was a 55/45 percentage split in the utilisation of the two parallel runways;
- SACL brought forward its investment in infrastructure; and
- demand-only gated schedules were considered.[91]

These assumptions presume an optimal operating environment and should be seen as a theoretical minimum. If these assumptions could not be met, L&B found that delay would continue to increase.

Often the recovery from schedule disruption leads to delay and some cancellations. In order to show how delays will worsen over time as capacity at Sydney (Kingsford-Smith) Airport is reached, a scenario was examined which considered the impacts when movements were constrained to 55 movements per hour for a period of two hours in the morning peak. It

91 Demand for gates was based on analysis of forecast passenger and aircraft size trends.L&B did not consider in the modelling any of the aircraft that could not get a stand/gate.This in effect meant that Sydney (Kingsford-Smith) Airport was not tested at the anticipated growth levels, as these extra aircraft were already considered to be suppressed as there was no capacity to cater for them.

assumed that displaced flights would be shifted to the next available operating hour, disrupting all succeeding flights in the hourly profile.

As shown in Table 12, by 2035 runway capacity constraints of 55 movements per hour between 7.00am to 8.59am could cause 75 services to be displaced if flights were shifted to the next hour. The effect of the 75 displaced services will impact the consequent hours for the majority of the day. Aside from the delay between 7.00am and 8.59am, assuming services are moved to the next available hour, there will be 556 movements delayed at Sydney (Kingsford-Smith) Airport alone; the flow-on effects to other airports have not been illustrated in this scenario. All delayed flights will be allocated to an available slot by 9:00pm. At 10.00pm, the normal hourly movement profile will resume without the need to receive delayed services.[92]

Table 12 **Impact of limiting Sydney (Kingsford-Smith) Airport aircraft movements to 55 per hour between 7.00am and 9.00am, 2010, 2015, 2020 and 2035**

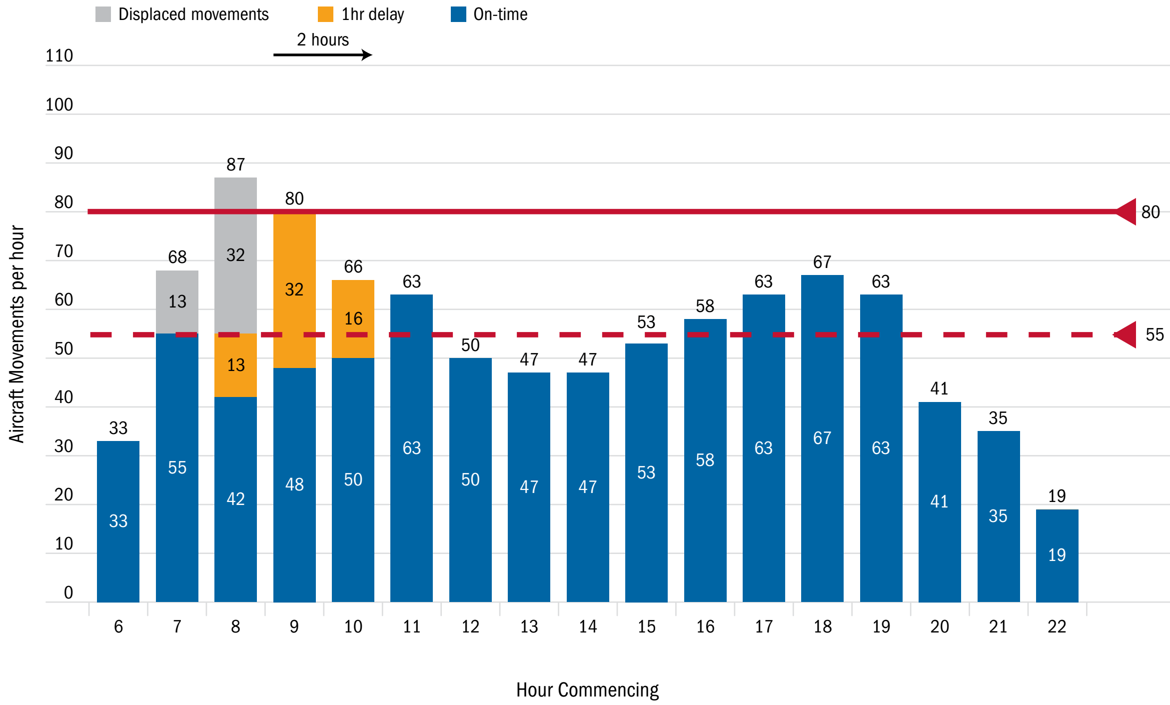
Year	Number of Displaced Movements	Number of Movements Delayed by One Hour[1]	Number of Hours Affected	Time of Day in which Schedule is Recovered
2010	45	48	2	11.00am
2015	69	135	4	1.00pm
2020	75	211	5	2.00pm
2035	75	556	13	10.00pm

1. After 8.59am (when the available runway slots resume to 80 movements per hour). This excludes the construct of delay created by limitation of 55 movements per hour for a two hour period.

Source: Booz & Company analysis.

Figure 77 to Figure 79 show the hourly delay impact for the years 2010, 2020 and 2035 in which Sydney (Kingsford-Smith) Airport's spare capacity is fully utilised.

Figure 77 **Sydney (Kingsford-Smith) Airport total aircraft movements by hour of day, limited to 55 per hour between 7.00am and 8.59am: minimising the delay time of surplus services, 2010**

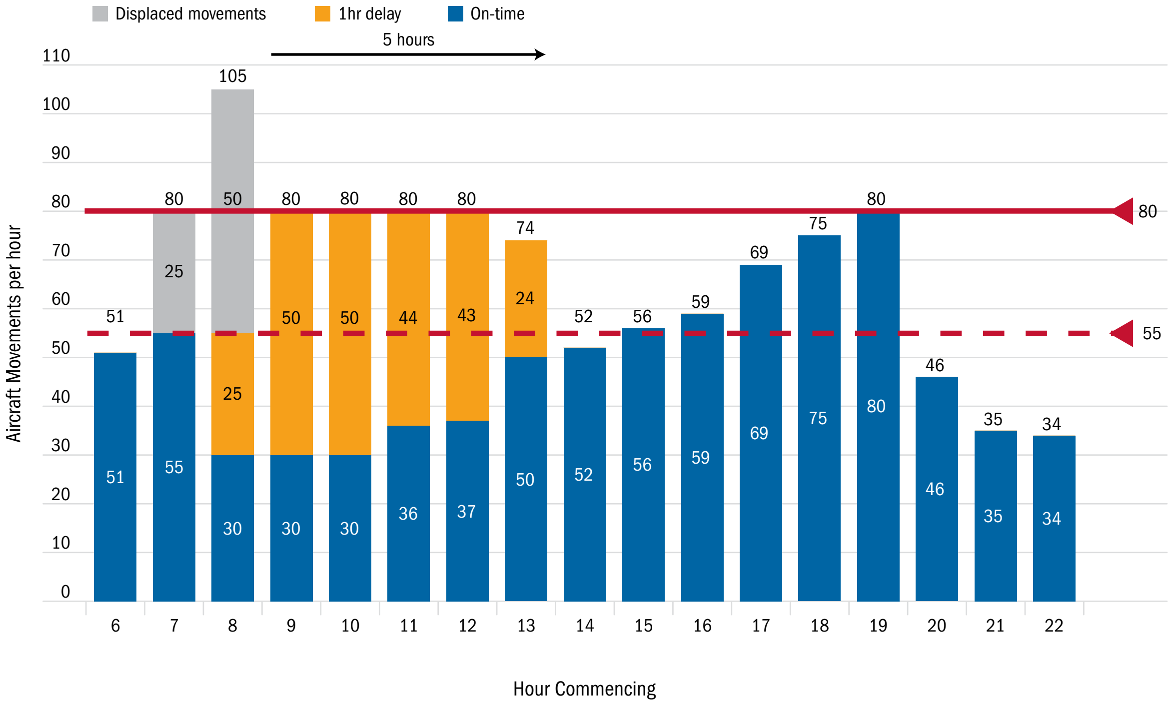


Note: This scenario assumes if the reallocation of movements to the shoulder hour causes movements to exceed 80 per hour, scheduled flights for the hourly profile receiving the delayed flights are moved to the next hour.

Source: Booz & Company analysis

92 Further information can be found in Technical Paper B3.

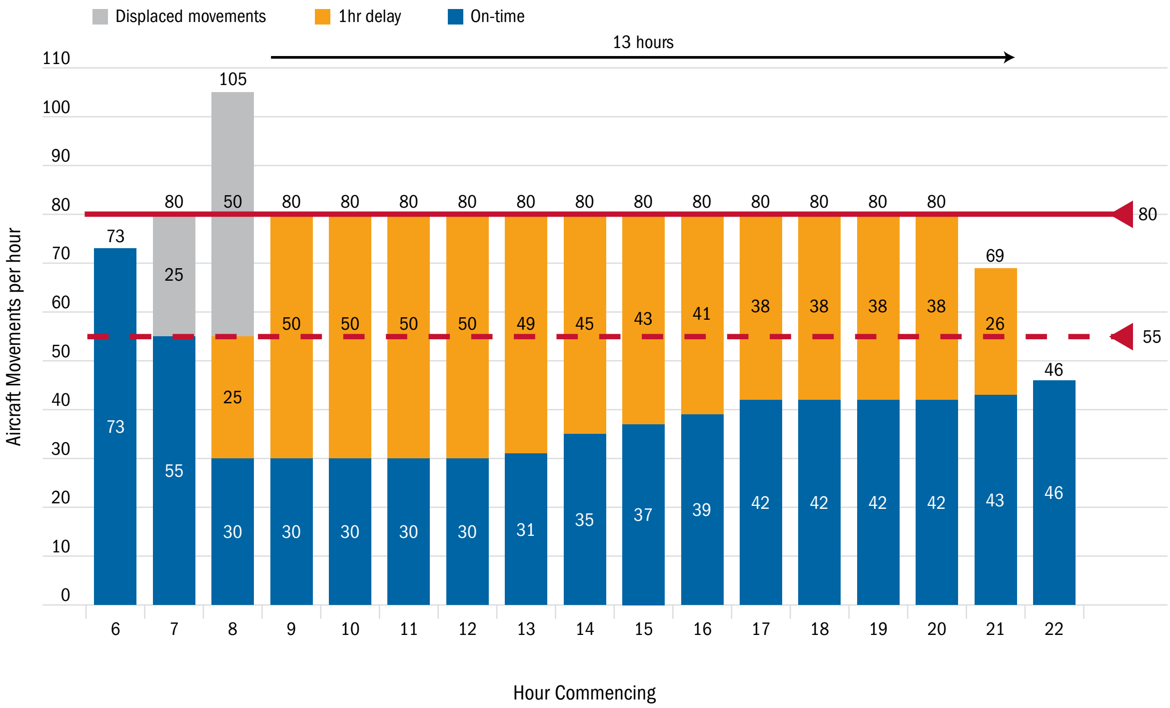
Figure 78 Sydney (Kingsford-Smith) Airport total aircraft movements by hour of day, limited to 55 per hour between 7.00am to 8.59am: minimising the delay time of surplus services, 2020



Note: This scenario assumes if the reallocation of movements to the shoulder hour causes movements to exceed 80 per hour, scheduled flights for the hourly profile receiving the delayed flights are moved to the next hour.

Source: Booz & Company analysis

Figure 79 Sydney (Kingsford-Smith) Airport total aircraft movements by hour of day, limited to 55 per hour between 7.00am and 8.59am: minimising the delay time of surplus services, 2035



Note: This scenario assumes if the reallocation of movements to the shoulder hour causes movements to exceed 80 per hour, scheduled flights for the hourly profile receiving the delayed flights are moved to the next hour.

Source: Booz & Company analysis.

In practice, airlines are likely to seek to ameliorate these impacts by consolidating services where possible by moving passengers to services with remaining seat capacity and cancelling some flights. However, this also has implications for passengers, particularly those on connecting flights or with only a few service options. At Sydney (Kingsford-Smith) Airport the scope for recovery of any backlog of delayed flights is limited to those periods of the day that still have spare capacity. As demand increases in coming years, the peak hours will spread across a longer period of each day and the opportunity for schedule recovery becomes reduced. Modelling suggests that by 2035 almost half of all non-cancelled movements will be late and almost 10 per cent of desired movements will be cancelled.[93]

Growth in traffic has also seen an increase in scheduled flying times between city pairs. For example, an extra 10 minutes has been added to the scheduled timing for flights between Melbourne and Sydney above what was the norm for airlines back in 2006. This increased flying time reflects increased delay, whether it is due to airborne holding or waiting for a gate or waiting to push back or take off.

Delays and increased scheduled flight times not only cause inconvenience but a loss of productivity. Increased delays and increasing scheduled flight times should not be accepted as 'normal'.

Airspace management and air traffic control

Airspace management, including the provision of air traffic control services, is primarily to ensure the safe movement of air traffic. It can also enable the efficient movement of aircraft and reduce the environmental impact of air traffic operations. Improvements in ATC technology and procedures can help in ensuring a more efficient processing of traffic. For example, the expansion of the hours of use of Precision Runway Monitor (PRM)[94] procedures at Sydney (Kingsford-Smith) Airport provides improvements to all weather operations. Wider application of this technology will assist in reducing delay due to poor weather conditions, but it will not increase the overall runway capacity of the airport.

Minimising environmental impacts

Slot capacity

The Commonwealth *Sydney Demand Management Act 1997* (the Act) provides a framework for the regulation of aircraft movements (take-offs and landings) at Sydney (Kingsford-Smith) Airport.

Movement cap

The Act prescribes a maximum of 80 runway movements for every operating hour. This is measured not only in each clock hour but also between any one-hour period measured from each quarter-hour mark – for example, 7.00am to 8.00am, 7.15am to 8.15am, and 7.30am to 8.30am and so on. The maximum movement rate of 80 movements per hour is only achievable when using the parallel runways.

Slot Management Scheme

The Act also provides a framework to authorise movements for aircraft operating to and from the airport at a specified time on a specified day. This is managed by a Slot Manager with responsibility for the day-to-day administration of the Slot Management Scheme. The aim of the scheme is to encourage efficiency of operations by staging the scheduling of aircraft movements to avoid congestion when airlines will otherwise cluster their scheduling times. Allocations of

93 BITRE analysis, 2011.

94 Precision Runway Monitor (PRM) is a radar system that enables ATC to monitor simultaneous close parallel instrument approaches to airports.Under PRM procedures, ATC uses high resolution radar (with accuracy of about one milliradian) to ensure that aircraft on final approach to different runways do not come into conflict.The reduced separation standards enable the best possible movement rates.

slots are required to be consistent with the runway movement cap and no more than 80 slots are allocated per hour.

Slot allocation

The allocation of slots to aircraft operators is reviewed each scheduling season (twice per year).

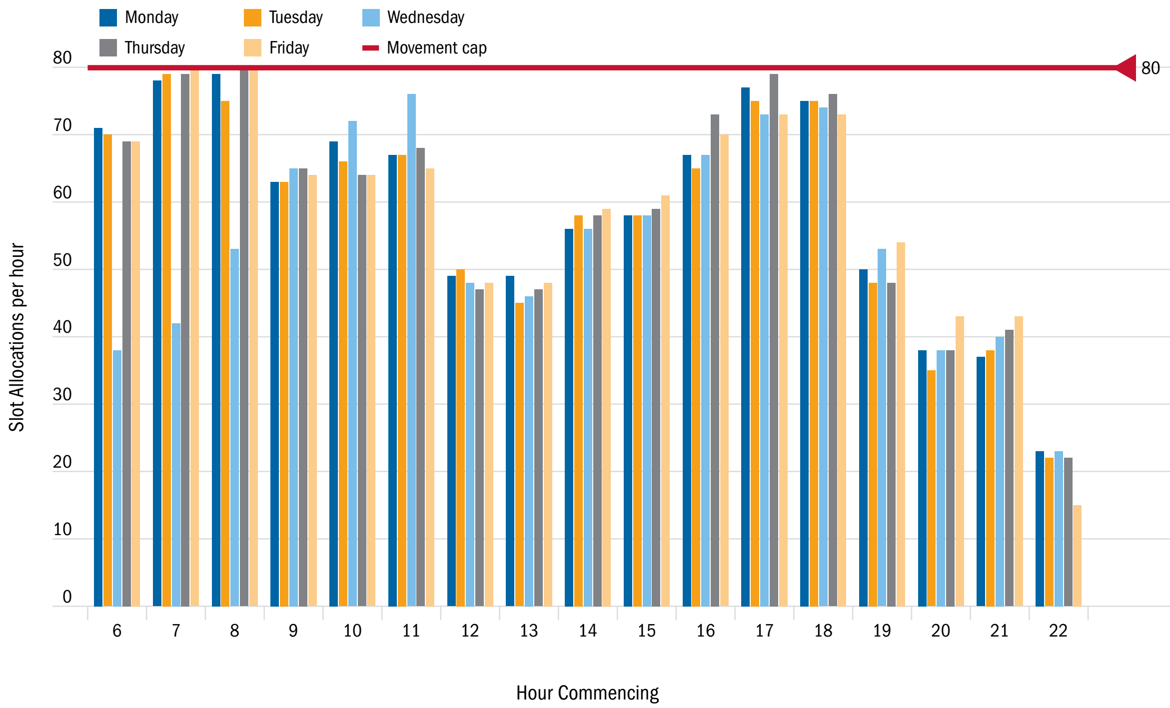
Applications ('filings') for slots by aircraft operators are submitted to the Slot Manager, who assesses them against the rules set out in the Slot Management Scheme and allocates slots accordingly. This slot allocation process is undertaken at two levels. The main allocation of slots is made after filings and a Schedules Conference is held before each scheduling season. Additional allocations of unallocated slots are made in response to more immediate events or requests from airlines.

Penalty action may be taken if an operator carries out a movement without a slot. Penalty action may also be taken if an operator carries out too many off-slot movements and the reasons for operating off-slot are within the operator's control. To date, no penalty action has been taken by the Australian Department of Infrastructure and Transport.

Figure 80 shows the slot allocations for the northern hemisphere winter (30 October 2010 to 26 March 2011) scheduling period. As can be seen, while allocations vary throughout the day, allocations for peak periods (7.00am to 9.00am and 5.00pm to 7.00pm) are already at or close to the 80 movements permitted per hour. Friday slots are fully allocated in both hours commencing 7.00am and 8.00am; Monday slots are nearly fully allocated for the same times; and Thursday slots are fully allocated in the hour commencing 8.00am.

For airlines to be viable, they need slots at the same time on several days of the week. So while there are still a small number of slots available on Wednesday, it is unlikely these will be taken up without other days becoming available.

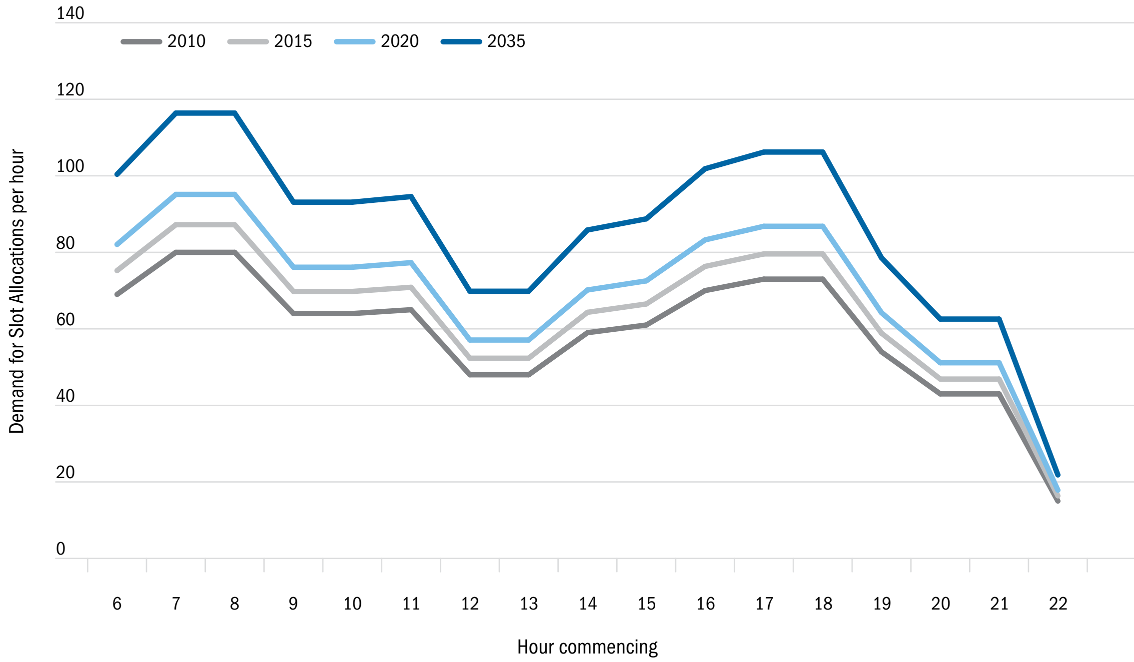
Figure 80 **Sydney (Kingsford-Smith) Airport, weekday slot allocations, 30 October 2010 to 26 March 2011**



Source: Airport Coordination Australia.

Figure 81 shows the expected unconstrained demand for slots at each hour for 2015, 2020 and 2035, based on the current allocations.

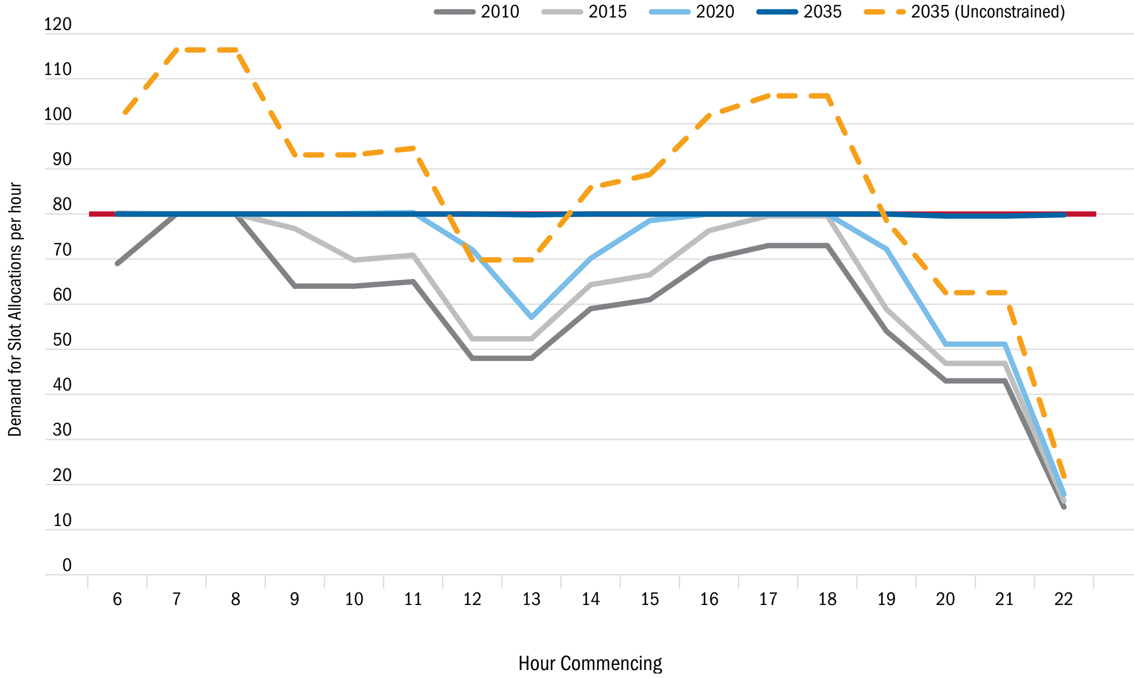
Figure 81 **Demand for slots at Sydney (Kingsford-Smith) Airport, 2010, 2015, 2020 and 2035 (unconstrained)**



Source: Booz & Company analysis of Airport Coordination Australia data.

Figure 82 shows the allocation of slots likely to result, assuming airlines are willing to operate at a less preferred time. When all 80 slots are allocated in one hour, some of the demand will spread or be redistributed to other hours. A level of demand may be suppressed.

Figure 82 **Demand for slots at Sydney (Kingsford-Smith) Airport, 2010, 2015, 2020 and 2035 (constrained)**



Source: Booz & Company analysis of Airport Coordination Australia data. The 2035 (unconstrained) case shows forecast growth in slot allocations, based on 2010 allocation in Figure 80 and forecast growth in aircraft movements. 2010, 2015, 2020 and 2035 constrained forecasts assume that, when more than 80 slots are demanded in an hour, some will be 'peak spread' and be redistributed to other hours of the day, while others will be suppressed and not allocated. This figure shows a 'medium' peak spreading scenario. Outcomes of other scenarios are identified in Technical Paper B3.

The above analysis presumes passengers are able and willing to travel at other available times and that airlines are similarly able (based on their overall network scheduling strategy) to shift from less than optimal times to whatever slot is available. This will not always be the case, especially for international services that are often limited in their scheduling options due to operational or commercial constraints.

Factors which limit the flexibility of an operator to accept a slot at a different time may include:

- a curfew or other operating restrictions at the other airports to be served;
- important flight connections for transferring passengers;
- rotation requirements for aircraft and crew; and
- the need to align the timing of slots across several days to market the service.

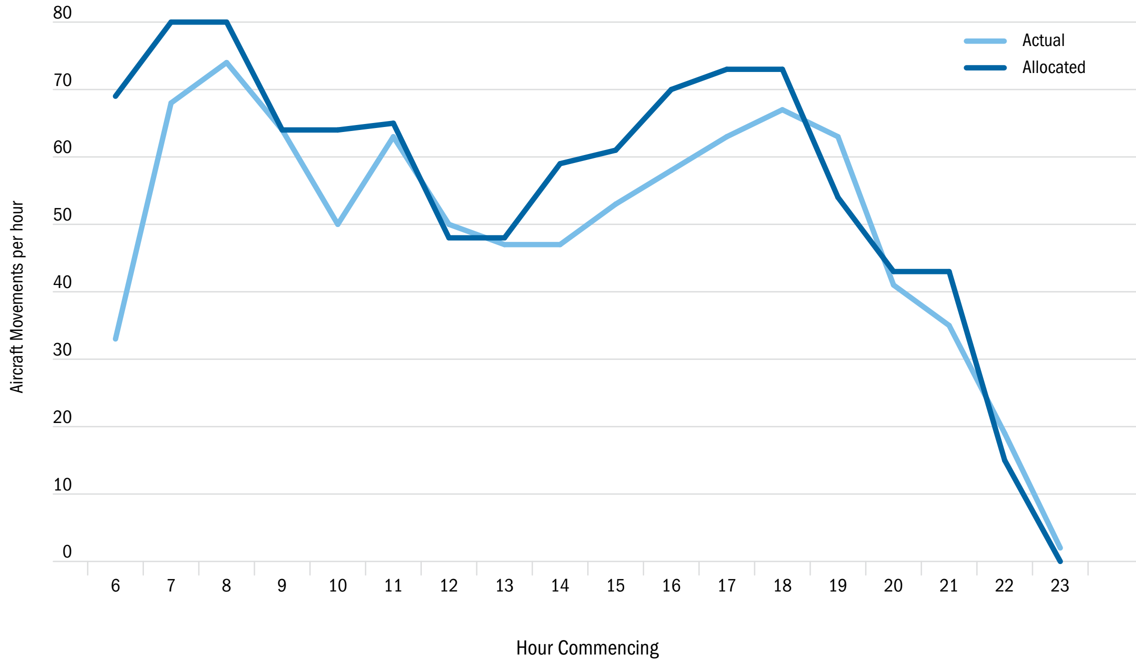
Based on expected demand, it is estimated that by 2027 all slots across the day would have been allocated. Even if operators can adjust schedules to fit available services, it is expected that, based on forecast demand, there will be no slots for new services to access Sydney (Kingsford-Smith) Airport despite approximately 100 aircraft wishing to do so.

Actual movements

In practice, the number of actual movements on a particular day is more commonly lower than the number of allocated slots. To maintain their right to slots, airlines are required to use their allocated slots at least 80 per cent of the time, which takes account of days of disrupted traffic, mechanical failures and a host of other issues which can cause flight cancellations. There is also seasonal variation, such as holiday periods, which can see airlines decrease their operations in certain times of day or on particular routes as the demands of passengers change.

Figure 83 shows a comparison of scheduled and actual movements based on a single representative day.[95] An average of five slots per hour is not used between 7.00am and 11.00pm.[96] However, the cancellations cannot be predicted and there is no practical way to use a slot cancelled at short notice for an alternative service.

Figure 83 **Comparison of allocated slots and actual movements, by hour of day, at Sydney (Kingsford-Smith) Airport, 2010**



Note: Actual movements reflect the planning day, 12 November 2010. Slot allocations were based on the Friday allocations of the corresponding slot allocation season (northern winter, 30 October 2010 to 26 March 2011).

Source: Airport Coordination Australia and Airservices Australia; Booz & Company analysis.

Peak hour utilisation

Demand for movements in some hours will soon exceed the level which can be allocated under the movement cap. As discussed in the preceding sections, slots in two hours of the morning peak are essentially completely allocated.

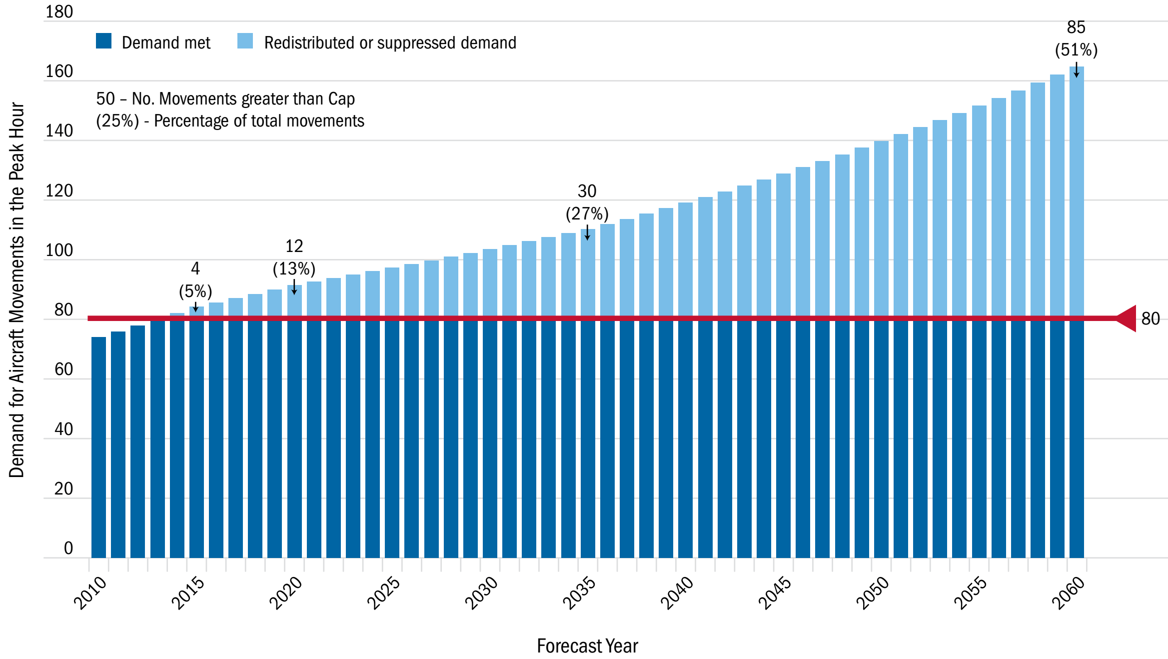
Figure 84 shows the impact of the movement cap on actual movements, against forecast growth rates described in Part Three. Even presuming the gap between allocations and actual movements closes to zero, it is expected that no new services will be able to operate for the peak hour from 2014.[97] By 2015, projected growth in actual movements suggests demand for peak slots will be significantly constrained, increasing progressively over time. These movements will either have to be redistributed to a less preferred time or be suppressed (that is, not operate to Sydney (Kingsford-Smith) Airport at all).

95 Actual movements are based on Airservices Australia data for the planning day (Friday, 12 November 2010). Planned movements are based on allocated slots for a Friday for the corresponding northern hemisphere winter season from Airport Coordination Australia.A planning day is determined usually at around the 30th busiest day to ensure that plans can accommodate the majority of services required without overcatering for peaks such as seasonal holidays.

96 The hour commencing 06:00 was excluded from the average calculation, as the difference between actual and allocated during this hour was 36 movements, which was considered an outlier for the purposes of calculating the average across the operating day.

97 For the planning day used (12 November 2010), this is 8.00am to 9.00am, as shown in Figure 83 (comparison of allocated slots and actual movements).

Figure 84 **Peak hour capacity issues based on expected aircraft movements at Sydney (Kingsford-Smith) Airport, 2010 to 2060**



Note: Figure shows the unconstrained aircraft movement demand in the peak hour, year on year, against the legislated 80 movement per hour cap. Peak hour was identified as occurring between 8.00am and 9.00am, as shown in the hourly movement profile of the planning day, 12 November 2010 (Figure 83 'Actual'). A growth rate was applied consistent with Technical Papers A3 and B3.

Source: Booz & Company analysis.

The lack of available capacity will mean a growing amount of peak demand cannot be met at Sydney (Kingsford-Smith) Airport. Modelling shows that, for the busiest hour (8.00am to 9.00am), an estimated:

- four movements of peak hour demand per day (or five per cent) will not be met by 2015;
- 12 movements of peak hour demand per day (or 13 per cent) will not be met by 2020;
- 30 movements of peak hour demand per day (or 27 per cent) will not be met by 2035; and
- 85 movements of peak hour demand per day (or 51 per cent) will not be met by 2060.

Further, the demand at other hours of the day will be similarly increasing, approaching or exceeding the movement cap.

International airlines proposing new services to Sydney in peak periods will need to consider whether to:

- redistribute a proposed service to non-peak hours, if slots remain available and commercially viable;
- redistribute to other Australian airports;
- go to other airports internationally, representing a loss to the Australian economy (suppressed demand); or
- not offer services at all, again representing a loss to the economy (suppressed demand).

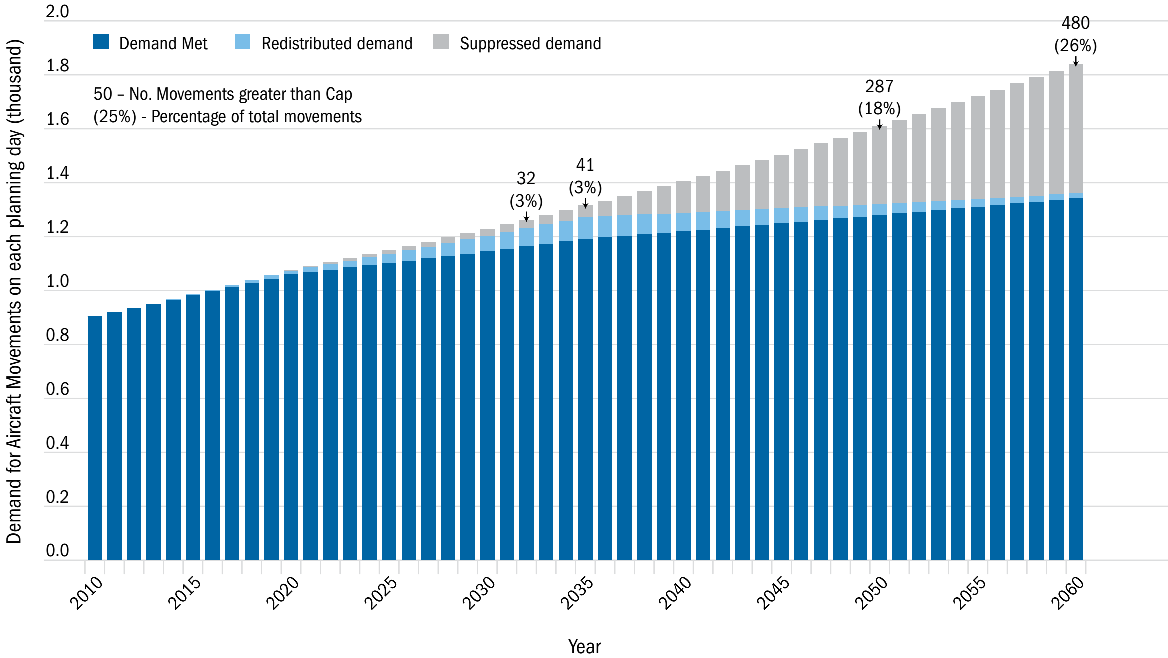
These are commercial options for airlines, but obviously they have an impact on any passenger wishing to fly to Sydney, as they may not be able to do so or, if they do, it is likely to be at a higher cost.

Redistribution and suppression of passenger demand is already starting to take effect as passengers either choose to fly at a different time or not to fly at all, and this will increase in the years ahead as the demand for aircraft movement slots increases. This has a direct link to pricing, with fewer low-cost seats likely to be made available in peak periods.

Existing domestic operators may be able to upgauge aircraft to operate existing slots or reallocate slots within their own holdings across their services to some extent, but they will be unable to introduce additional flights. New domestic operators will not be able to get slots at peak times to inject new competition.

Figure 85 shows the aircraft movements over the entire planning day that will be redistributed and suppressed.[98]

Figure 85 Aircraft movements expected to be redistributed or suppressed on the planning day, 2010 to 2060



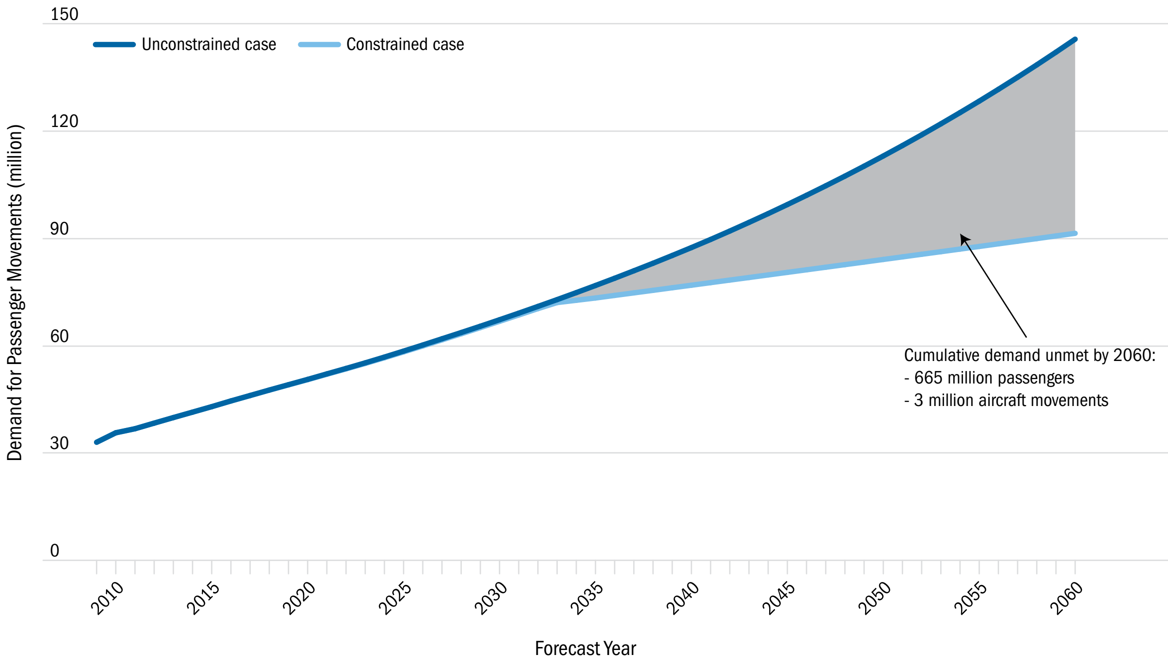
Note: Figure shows the potential redistribution and suppression of services over a planning day as aircraft movements reach the legislated 80 movement per hour cap. A medium level of peak spreading is assumed and a growth rate applied, year on year, consistent with Technical Papers A3 and B3.

Source: Booz & Company analysis.

Assuming airlines opt to operate to Sydney (Kingsford-Smith) Airport, despite the challenges of accessing the airport identified above, the maximum potential redistribution is estimated to occur around the mid-2030s. Figure 86 shows the impact of this.

98 These are aircraft movements that are redistributed or suppressed, not actual passengers.Redistribution and suppression of passenger numbers begin significantly earlier.

Figure 86 **Expected capacity shortfall for passenger and RPT aircraft movements at Sydney (Kingsford-Smith) Airport, 2010 to 2060**



Note: Excludes Military and GA movements. Legislated 80 movement per hour cap applies. Assumes gap between allocated and actual slots (as identified in Figure 83) declines as capacity constraints increase. A 'medium' peak spreading scenario applies, with accelerated aircraft upgauging and load factor changes in the constrained case.

Source: Booz & Company analysis.

By 2035, there is unlikely to be any usable capacity available at Sydney (Kingsford-Smith) Airport. For additional services, passenger growth would be met only by increasing load factors and the upgauging of aircraft (presuming the airport has capacity to meet this).

By 2060 approximately 260,000 RPT aircraft movements per year and 54 million passengers per year will be unable to be accommodated at Sydney (Kingsford-Smith) Airport. This represents a cumulative total of approximately 665 million passengers between 2035 and 2060.

Curfew

There has been a curfew in effect at Sydney (Kingsford-Smith) Airport since 1963. The current curfew was imposed by legislation with bipartisan support in 1995 through the Commonwealth *Sydney Airport Curfew Act 1995*.

The Act and the Sydney Airport Curfew Regulations 1995 regulate movements at Sydney (Kingsford-Smith) Airport between 11.00pm and 6.00am each day. The Act essentially prohibits the operation of large jet aircraft at Sydney (Kingsford-Smith) Airport during this period. There are very limited exceptions.

Flights allowed during the curfew

Small propeller-driven aircraft that meet weight and noise requirements, small low-noise jet aircraft of specific types authorised by the Minister and a limited number of smaller freight aircraft can operate during the curfew.

In addition, a small number of international passenger jet landings are allowed during the 5.00am to 6.00am curfew shoulder provided no more than 24 such movements occur per week (and no more than five on any one day).[99] This is to cover time differences associated with the northern hemisphere summer scheduling season. Additionally, these jet aircraft must meet the strictest international standards on aircraft noise.

During the curfew shoulder period, all aircraft must use the main north–south runway (take off from runway 16R and land on runway 34L) to ensure their operations are over the water.

In exceptional circumstances, the Minister may grant dispensations for aircraft to operate when they would not otherwise be allowed to do so. Historically, dispensations have been very limited in number, in line with guidelines. The guidelines set strict criteria for any exemptions that would include the need for a movement during curfew hours for a reason that was outside the operator's control, that could not be foreseen and where no reasonable alternative was open.

The curfew restrictions do not apply in cases of genuine emergency.

Impact of the curfew on capacity

The curfew was introduced to ensure an appropriate balance between protecting the surrounding communities from aircraft noise and enabling economic development of a key piece of infrastructure. The Australian Government has indicated it has no intention to relax the current legislated curfew arrangements.

In relation to international services, the effects of the curfew at Sydney (Kingsford-Smith) Airport need to be considered with the effects of other curfews at point of origin or destination airports. Where curfews apply at the international destination airports as well, the flexibility of an operation to accept different slot times will be heavily constrained. For example, London's Heathrow Airport, a key destination for Australian international traffic, also has a curfew from midnight to 6.00am. There is only a narrow period where aircraft travelling on this route can depart from one airport, stop off en route and arrive before the curfew commences at the destination. The alternative is for airlines to extend ground time for aircraft at either airport, possibly having to park overnight. This will impact on viability of the service, fleet utilisation and aircraft parking requirements.

The shoulder curfew period (5.00am to 6.00am) is only allocated to international flights. This limited access assists in reducing pressure on the International Terminal in the busy 6.00am to 7.00am period, and is tied to the particular requirements of daylight savings time. It is used for the northern summer scheduling periods (that is, the last Sunday in March to the last Saturday of October every scheduling season).

The Long Term Operating Plan

The LTOP was introduced in 1997 to address concerns raised regarding aircraft noise in the context of the operation of the new parallel runway at Sydney (Kingsford-Smith) Airport. Its aim is to achieve a distribution of flights to share noise rather than to allow a concentration of aircraft noise under one set of flight paths.

The LTOP was developed against the following terms of reference:

- the safety of aviation operations is not to be compromised;
- all three runways at the airport, including the full length of the east-west runway, are to be available for use by jet and propeller aircraft;
- maximum use is to be made of flight paths over water and non-residential areas;

99 Quota set by regulation.

- where it is not possible for flight paths to be over water, the objective is to operate the airport to ensure that the over-flight of residential areas is minimised and noise arising from such flight paths is fairly shared; and
- the capacity of the airport is to be maintained to the maximum practicable extent consistent with noise-sharing objectives, but the programmed movement rate is not to exceed 80 movements per hour.

Usage rates for the LTOP

When the LTOP was introduced, noise-sharing targets were identified for the amount of aircraft movements to the north, south, east and west of the airport. The plan is designed to place as many flights as possible over water (55 per cent to the south over Botany Bay) and for the remaining flights to be shared between the other three directions as equally as operationally feasible (west, 15 per cent; north, 17 per cent; and east, 13 per cent).

ATC nominates the runway in use

ATC is responsible for nominating the runway in use at Sydney (Kingsford-Smith) Airport for all hours of the day. The key requirement is to ensure the safety of operations but also, to the extent practicable, the use of the runway (or combination of runways) that best achieves the noise-sharing objectives.

Under the LTOP, when making runway selections each day, the ATC must ensure, subject to safety and weather conditions:

- as many flights as practical come and go using flight paths over water or non-residential areas where aircraft noise has the least impact on people;
- the rest of the air traffic is spread or shared over surrounding communities as fairly as possible; and
- runway modes change throughout the day, so individual areas have some break (or respite) from aircraft noise on most days.

Runway mode selection

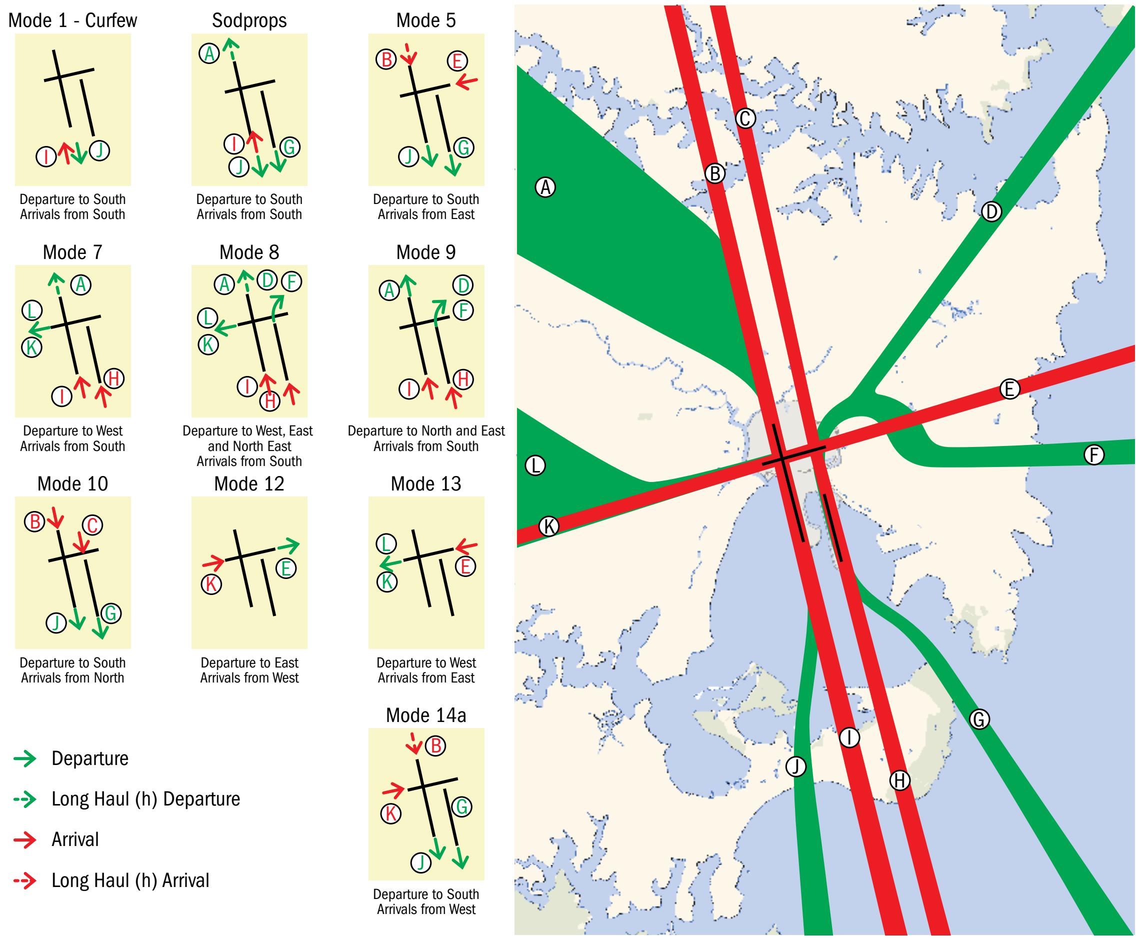
While considering the ability to share noise, the choice of runway mode of operation is affected by the weather conditions and/or the level of traffic demand at any point in time. If the weather and traffic conditions permit then the preferred noise-sharing runway for the particular time of day will be nominated by ATC.

The wind strength and direction are the primary considerations in selecting a safe runway operating mode, but the cloud base and visibility affecting final approach can also be a determining factor. For example, for safety reasons:

- in selecting the runway in use, ATC cannot nominate a runway where the downwind will exceed five knots or the crosswind will exceed 20 knots. Nominating a runway with a higher downwind or crosswind component could compromise safety;
- when the crosswind on the north-south runways exceeds 20 knots, the east-west runway will have to be nominated by ATC and the airport's movement rate will be significantly reduced due to single runway operations;
- ATC is required to nominate runway 16R (assuming wind speed and direction is suitable) for arrivals when the visibility reduces below 1,500 metres due to the requirement for approach lighting facilities (availability of High Intensity Approach Lighting on 16R); and

- LTOP SODPROPS Mode (Simultaneous Opposite Direction Parallel Runway Operations) is unable to be used whenever the cloud base is below 3,000 feet or visibility is less than 10 kilometres.

Figure 87 Sydney (Kingsford-Smith) Airport – runway modes of operation



Source: Airservices Australia.

Traffic demand and the LTOP limitations

There are ten runway modes of operation as shown in Figure 87. The most 'noise preferred' LTOP runway modes are generally the least able to process large volumes of traffic. The parallel runway modes (Modes 9 and 10) are the most efficient traffic modes providing parallel runway capacity and need to be used for significant parts of the day to meet traffic demand. Capacity is reduced under the other modes, which involve either single runway or cross-runway operations.

As traffic demand builds during the course of the day, different noise-sharing runway modes are used to manage demand efficiently – that is, without excessive delay – and to manage aircraft flight paths in an environmentally sensitive manner. The LTOP noise-sharing runway modes are retained in use until an excessive delay trigger point is reached. When arrival traffic demand triggers 20 minutes of airborne holding for an individual aircraft, ATC will switch to a more efficient runway mode of operation to avoid further build-up of cumulative delay to the traffic stream. In effect, this means that the switch from the preferred noise-sharing runway modes to the most efficient parallel runway modes occurs when a movement rate of approximately 55 or more is reached to avoid excessive delay.

Reduced scope to operate the LTOP

Scheduled movement levels are approaching 80 per hour in the peak hours on some days. As overall air traffic demand increases, it is expected peak demand will spread into other parts of the day. Scheduled movements already exceed 55 per hour during peak shoulder periods. Actual movement numbers may also exceed 55 per hour in practice during other periods if a backlog of demand builds up – either from an adverse event such as a storm or from delayed peak traffic.

The opportunity for using the 'noise preferred' LTOP runway modes of operation (single runway operation for either landings or take-offs except for heavy category aircraft) will continue to reduce, requiring longer usage of the parallel runway mode of operation to keep up with demand.

The LTOP performance measure is based on 'runway end usage'. Airservices Australia reports on runway activity for a period aggregated by number of movements, or by time, over the four quadrants – south, north, east and west.

Table 13 below shows, for the period 1998 to 2010, the percentage of average runway usage time for the four directions compared to the LTOP target.

Table 13 Usage of the LTOP runway ends

Direction	Target (per cent)	Actual Usage (per cent)
South	55	51
North	17	28
East	13	14
West	15	7

Source: Airservices Australia.

Assessments undertaken for the Sydney Airport Community Forum (SACF) have found the LTOP targets are unable to be met with the levels of traffic demand now presenting at the airport.

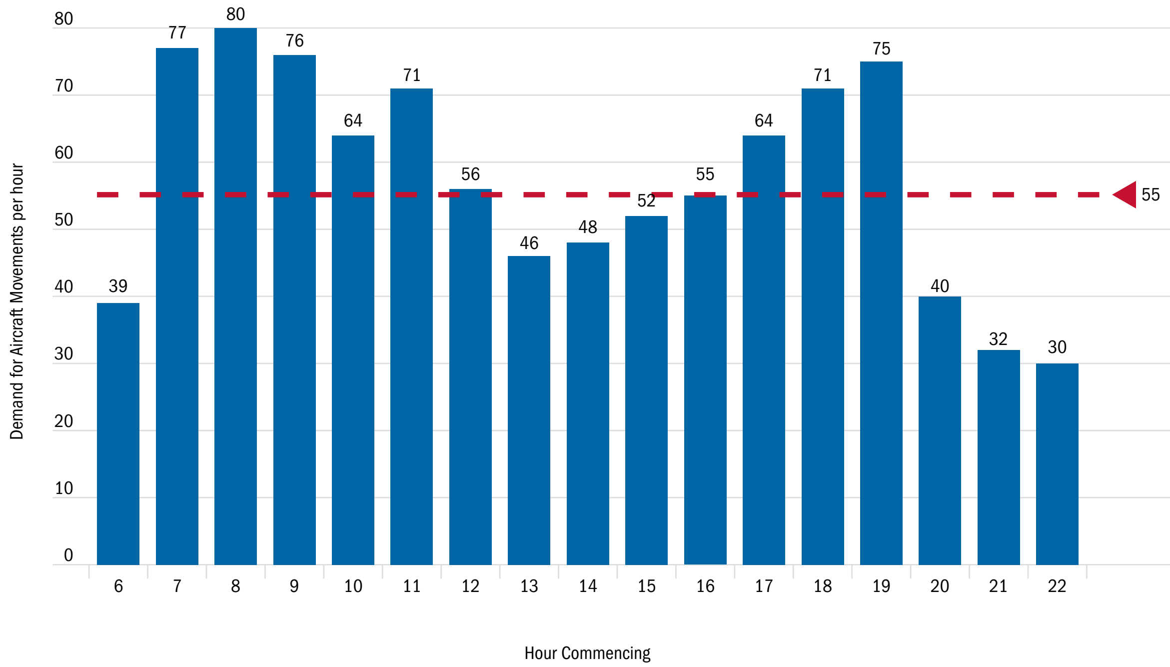
Airservices Australia analysis on the effect of forecast demand on the LTOP suggests:

- there are already some issues with utilising the full range of the LTOP modes (of the 10 modes, four are either currently experiencing limits or will do prior to 2015); and
- utilisation of the LTOP noise-sharing modes will completely reduce over time with demand growth.[100]

It is expected within a few years the ability to share noise will be limited to a few hours of the day. Figure 88 shows that, by 2015, nine hours of the day will have scheduled demand above 55 movements per hour (the point at which the noise-sharing modes cease to be viable in managing air traffic demand) and four hours have scheduled demand at or just below 55 movements per hour. With a small number of flights delayed in the morning peak, this will see these hours also become unviable for noise sharing.

100 Further information can be found in Technical Paper B4.

Figure 88 **Expected forecast aircraft movements at Sydney (Kingsford-Smith) Airport, by hour of the day, 2015**

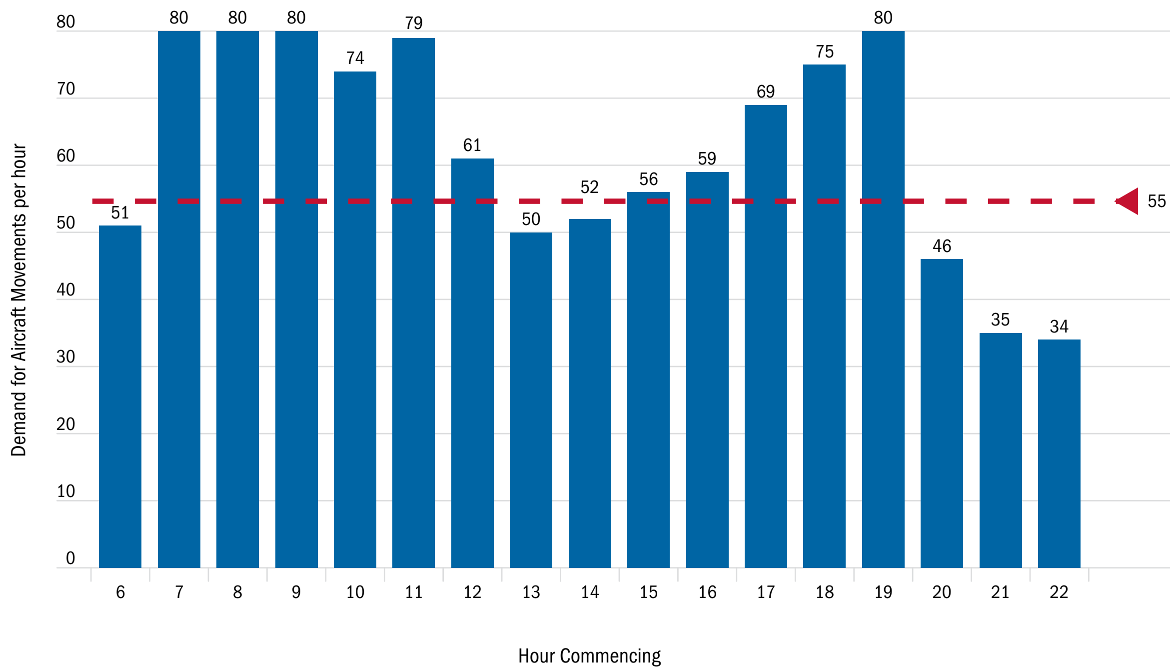


Note: Medium peak spreading assumed.

Source: Constrained planning day forecast developed by Booz & Company; applied to demonstrate LTOP constraints.

As aircraft movements increase at Sydney (Kingsford-Smith) Airport, this will increase peak spreading as more and more aircraft movements, unable to operate in peak periods, start operating in the middle of the day. Figure 89 shows the expected forecast aircraft movements by hour of the day for 2020 against the 55 per hour movement level for the LTOP noise sharing.

Figure 89 **Expected aircraft movements at Sydney (Kingsford-Smith) Airport, by hour of the day, 2020**



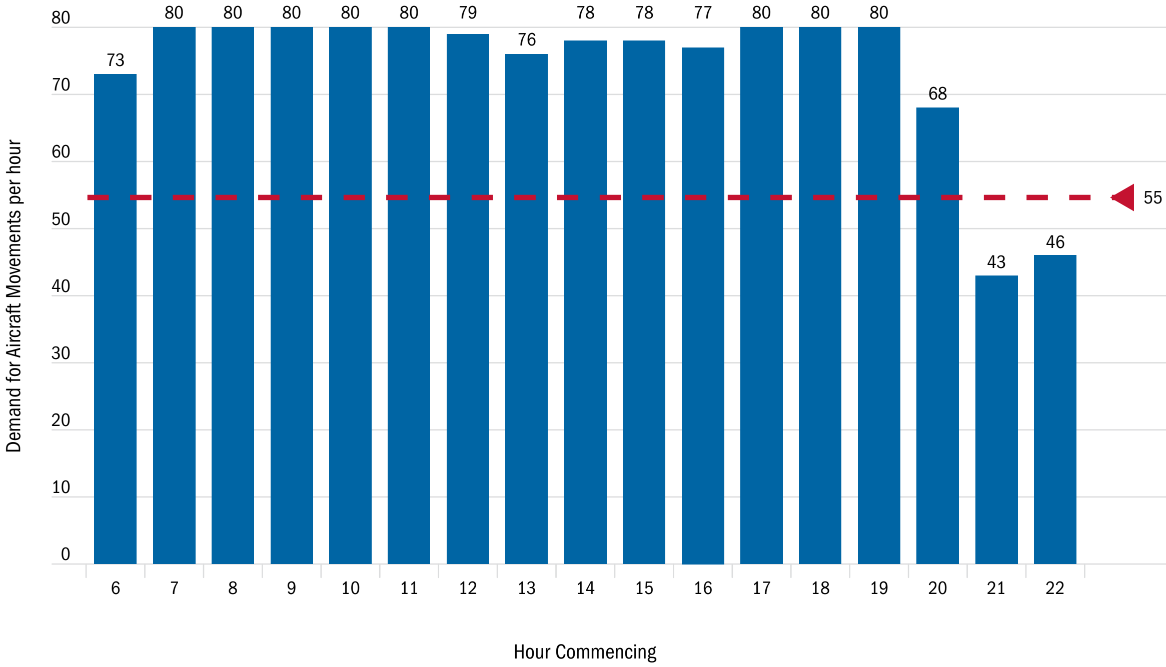
Note: Medium peak spreading assumed.

Source: Constrained planning day forecast developed by Booz & Company; applied to demonstrate LTOP constraints.

By 2020, scheduled movement levels in all the key hours of the day will be above the 55 movements per hour line or approaching it. This means that, effectively, by 2020 the noise-sharing modes will only be able to be operated for a small number of hours after 8.00pm each weekday, and on weekends.

Figure 90 shows the expected planning day profile in 2035. Only two hours in the late evening will operate less than 55 movements.

Figure 90 **Expected forecast aircraft movements at Sydney (Kingsford-Smith) Airport, by hour of the day, 2035**



Source: Constrained planning day forecast developed by Booz & Company; applied to demonstrate LTOP constraints. Medium peak spreading assumed.

Weather

Sydney (Kingsford-Smith) Airport is sometimes affected by the passage of weather fronts and strong winds. These can produce conditions where safety requires greater spacing between aircraft conducting instrument approaches, slowing the rate of arrivals. When winds exceed 20 knots and, particularly, when they are strong westerly winds (affecting the operation on parallel runways), Airservices Australia adjusts the runway operating patterns, resulting in the operation of approximately 55 movements per hour (or less).[101] It is estimated this occurs for some period on approximately 125 days per year. Thunderstorms also curtail the airport's operations for a few hours per month, particularly in the summer months.

Airservices Australia estimates that approximately 50,000 movements per year can be lost to weather conditions. This, in effect, reduces the theoretical maximum capacity of the airport from 496,000 movements per year to a capacity of 446,000 movements (although this will be difficult to achieve, as movements are unlikely to be evenly distributed either throughout the week or across a day on all days).[102]

101 Airservices Australia advises with particularly severe events this can result in a reduction of less than 40 movements per hour for approximately eight days.
102 Further information can be found in Technical Paper B5.

Surface transport

Efficient land transport access is a crucial dimension of the operational capacity at Sydney (Kingsford-Smith) Airport. Road congestion around the airport precinct has the potential to prevent full capacity of aviation assets being realised. The full Transport for NSW study can be found at Technical Paper C2.

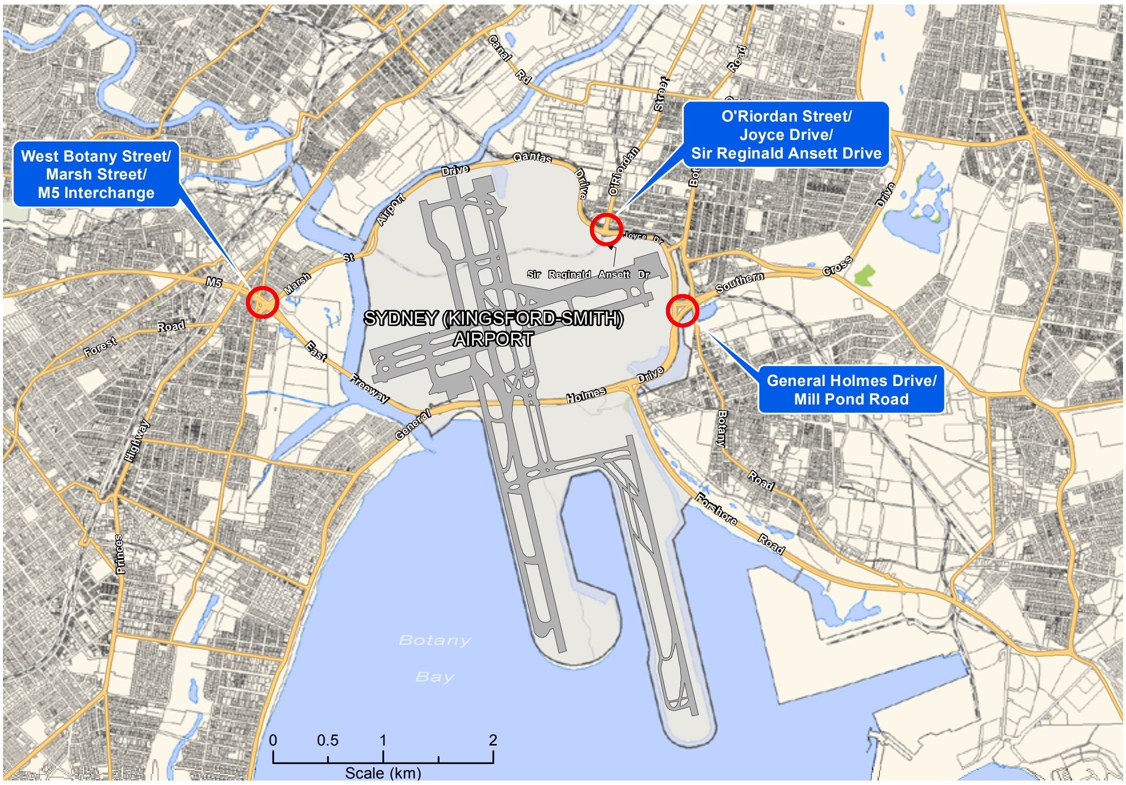
Sydney (Kingsford-Smith) Airport has the advantage of close proximity to Sydney's CBD, making it attractive and accessible for passengers, and especially business travellers. However, it is also at the juncture of a number of key roads and motorways used by commuters accessing the city and forms part of the commercial and freight route between the airport and Port Botany.

Infrastructure Australia and Infrastructure NSW have identified this area of work as a priority project. A coordinated land use and transport approach is essential to the whole triangle between the CBD, Sydney (Kingsford-Smith) Airport and Port Botany.

Surface transport to access Sydney (Kingsford-Smith) Airport

The road and rail network in the immediate airport precinct is presented in Figure 91.

Figure 91 Road and rail network around Sydney (Kingsford-Smith) Airport, 2010



Source: Australian Department of Infrastructure and Transport.

In terms of road access, Sydney (Kingsford-Smith) Airport is served by Southern Cross Drive to the CBD and the M5 East motorway to the west and south-west. The M5 East carries the highest volumes of traffic. The M5 East is at, or near, capacity for large parts of the day and currently carries more than 100,000 vehicles per day. Approximately 10 per cent are heavy vehicles (this level is greater than 10 per cent during some times of the day). The impact of heavy vehicle trips on capacity is high, particularly due to the steeper gradients in the westbound direction (such as for heavier trucks leaving Port Botany).

The Eastern Distributor, Southern Cross Drive and General Holmes Drive provide access to and from the CBD, the north and the east. These roads are also prone to high levels of congestion, particularly in the morning and afternoon peaks.

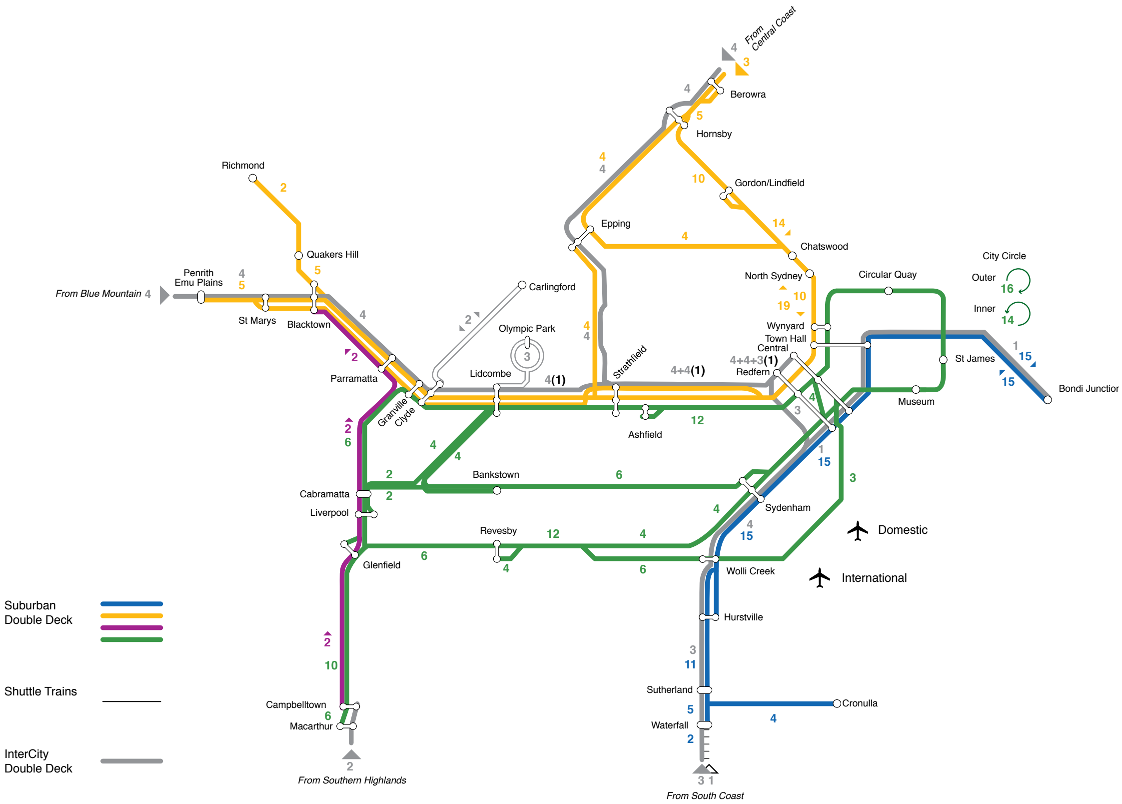
Other significant local roads are Marsh Street, the Princes Highway, Airport Drive (currently part of the airport site leased from the Commonwealth by SACL), Qantas Drive, O'Riordan Street, Botany Road, Joyce Drive, Wentworth Avenue and Millpond Road.

The airport rail corridor connects Macarthur and Revesby with the CBD along the East Hills Line. Currently eight trains per hour run through the airport to the city during peak times. The East Hills Line interchanges with the Eastern Suburbs Line at Wolli Creek, and passes through the airport to the city. Trains then typically (from an operational perspective) continue out of the City Circle down the South Line to Lidcombe.

There are three stations in the vicinity of Sydney (Kingsford-Smith) Airport – International Terminal, Domestic Terminal and Mascot.

Figure 92 shows the simplified train paths on the CityRail network in the morning peak. Only the paths and directions of the CBD-bound trains are shown, except where indicated for the City Circle. The number of trains per hour during the peak is indicated beside each line.

Figure 92 The airport rail line in the CityRail heavy rail network



Note: This diagram represents the 2009 operating plan to be consistent with the modelling and capacity analysis conducted for the Joint Study, and not the most recent timetable.

Source: Transport for NSW.

Trains on the airport rail line operate from Macarthur or Revesby and travel through the City Circle via St James then down the south line to Ashfield and Granville (shown in green). The network has capacity for up to 20 trains per hour through this sector of the rail network, although network enhancements may be required to achieve this on the airport line section. The City

Circle has capacity for 20 trains per hour in each direction and currently the eight airport trains share this capacity with trains from Granville and Bankstown.

Of the current eight trains per hour from the airport to the CBD during the peak, four originate in Macarthur and four originate in Revesby. The airport rail line operates below capacity, on average, throughout much of the day. Trains originating in Macarthur are heavily loaded during the morning peak hour (7.30am to 8.30am). Revesby starters operate with smaller loads during the morning peak and throughout the day. The Revesby starters provide the best opportunities for growth in the morning peak for CBD-bound airport passengers.

However, none of the trains accessing the airport are dedicated airport services. They do not run between approximately 12.00 midnight and 5.00am, impacting on shift workers who may commence or complete work in that period. Nor do they provide facilities such as luggage racks, which meet the needs of air travellers, particularly those with luggage.

Airport user demand for surface transport

Airport accessibility, at both the points of departure and arrival, plays a significant role in a passenger's decision to use an airport. Accessibility takes into account the movement from the airport terminal to the person's destination (a hotel, office, a home of a relative or friend) and, conversely, the movement from the origin of a person's journey to the airport terminal.

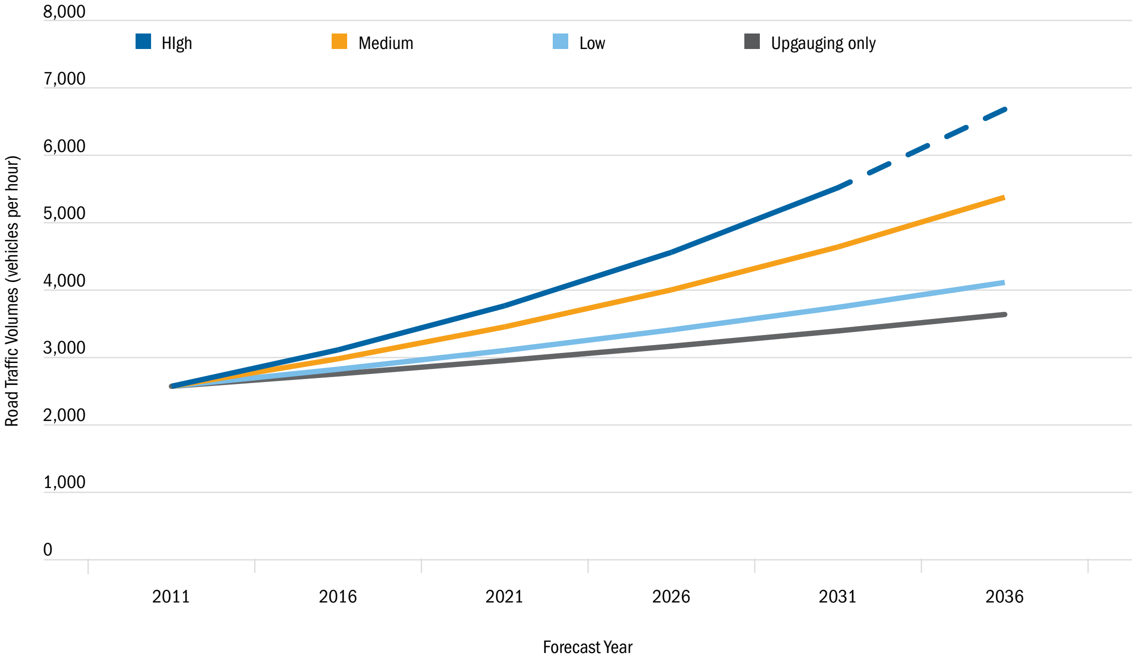
On a typical weekday, there are around 140,000 surface transport trips to and from Sydney (Kingsford-Smith) Airport. This includes an average of 100,000 movements by arriving and departing passengers each day. There is also an estimated 12,000 to 14,000 'meeters and greeters'[103] who either pick up or drop off passengers or travel separately to meet and greet them; and an estimated 16,000 people employed at the airport with between 9,000 and 12,000 employees working on the site on an average day.[104] This suggests an average between 42,000 and 52,000 surface transport trips are undertaken each day by the latter two categories as they travel to and from the airport.

Currently, about 36 million air passengers use Sydney (Kingsford-Smith) Airport each year. In the medium term, the forecasts undertaken for this Report (described in Part Three) estimate unconstrained RPT passenger demand will reach around 76.8 million passenger movements by 2035. This suggests surface transport infrastructure will need to accommodate 200,000 surface transport trips per day. By 2060, constrained demand is estimated to reach 91.4 million passenger trips per year, requiring around 250,000 surface transport trips per day.

Figure 93 shows the total number of vehicles per hour in and out of the airport precinct in the morning peak. This shows the number of surface transport trips will be higher under SACL passenger projections compared with the constrained demand projections of this Report.

103 SACL, *Airport Ground Travel Plan*, 2006.
104 SACL, *Airport Ground Travel Plan*, 2006.

Figure 93 **Expected demand of inbound traffic volumes at the Domestic Terminals under four growth scenarios, 2011 to 2036 (morning peak)**

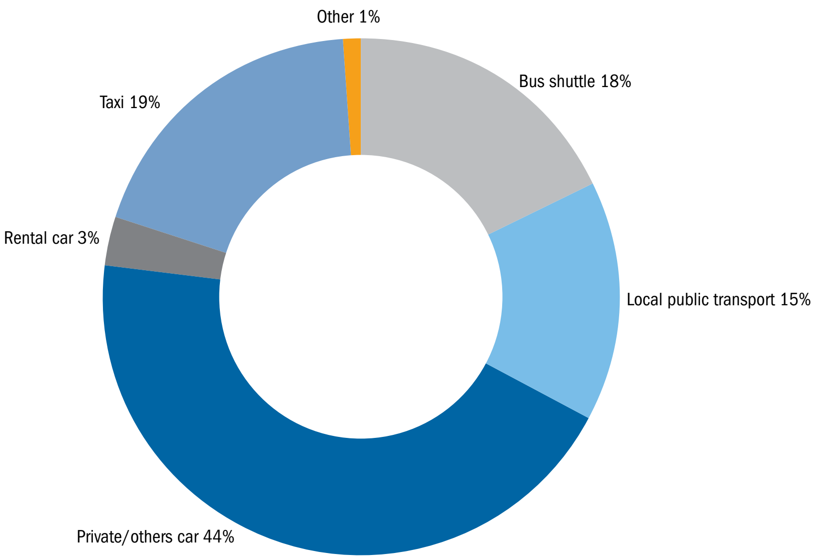


Source: Transport for NSW, based on SACL Sydney Airport Master Plan 2009, Booz & Company annual domestic passenger growth forecasts, and Booz & Company analysis of aircraft movement and average seat capacity 2010–2035 in the 8.00am to 9.00am period.

Passenger mode usage

Figure 94 presents estimates of the surface transport mode split for passenger access to the airport, developed by combining mode share data from various sources and time periods.[105] It indicates 44 per cent of ground access to the airport was by private car; around 19 per cent of passengers took a taxi (or chauffeur-driven hire car); 18 per cent took a shuttle bus (including mini and charter bus); while around 15 per cent used public transport (public bus or rail) and three per cent drove a rental car.

Figure 94 **Surface transport mode share for passenger access to and from Sydney (Kingsford-Smith) Airport, 2005 to 2009**



Source: BITRE analysis of Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data.

105 Further information on aviation users can be found in Technical Paper A2.

Mode split varies across different types of passengers. According to IVS data, 32 per cent of international visitors to Australia use private or company cars to travel from Sydney (Kingsford-Smith) Airport to their first destination (hotel, relative's or friend's residence, or an office). Another 27 per cent used a taxi or were driven in a hire car and three per cent used a rental car. About 21 per cent used chartered or a hotel shuttle bus and another 12 per cent used public transport. In contrast, the majority of Sydney region resident passengers accessed the airport using either their own car or a friend's or relative's car.

For international visitors as well as Sydney region residents, the majority of trips to and from the airport are not by public transport (bus or rail). Analysis undertaken by SACL in collaboration with the NSW Government suggested that, in 2006, 90 per cent of passenger trips to the airport were by road, with 10 per cent by train and two per cent by public bus. This is a similar public transport and rail mode share for all trips (including staff and meeters and greeters), with 2006 estimates showing 89 per cent of total trips to the airport were by road, with 11 per cent by train and four per cent were by public bus. While there are estimates the rail mode share could now be closer to 17 per cent, it remains a relatively low proportion of total surface transport trips.[106]

The Productivity Commission has linked the current low usage of rail to access Sydney (Kingsford-Smith) Airport in part to the high price of tickets.[107] Users of the airport stations must pay a 'station access fee' of $11.80 per adult in addition to the standard one-way, single fare of $3.20 (total one-way fare of $15). It is important to note that the surcharge varies for single-trip, weekly and monthly rail tickets. In particular, the total surcharge paid per weekly ticket (likely to be purchased by airport staff) is significantly lower per trip than that paid for a return or single trip. The station access fee, which is retained by the private station operator (Airport Link Company), was part of the terms and conditions agreed to by the then NSW Government when it commissioned the construction of the line.

Just as important as the fee structure is the capacity, service quality and flexibility of travel offered by the rail access to the airport. The rail service needs to be able to offer peak demand with a quality of service for airport travellers which meets airport user requirements.

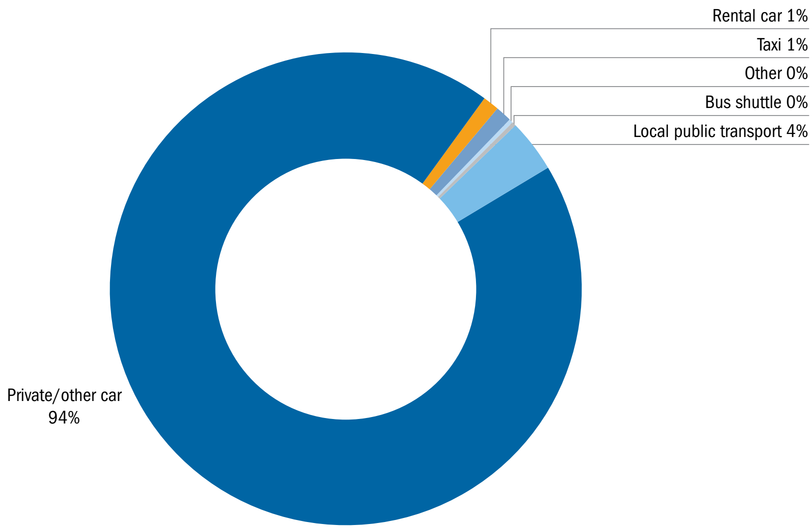
Meeters and greeters mode usage

Figure 95 shows meeters and greeters overwhelmingly use their own car to access the airport (94 per cent). The only other significant transport mode for meeters and greeters was public transport (four per cent).

106 PwC and High Range Analytics analysis based on Sydney Strategic Travel Model (STM) RCZ modelling mode shares adjusted with other travel demand information, 2011.

107 Productivity Commission, Economic Regulation of Airport Services Draft Report, August 2011.

Figure 95 **Surface transport mode share for meeter and greeter access to or from Sydney (Kingsford-Smith) Airport, 2010**



Source: BITRE analysis of independently commissioned survey data.

Airport staff

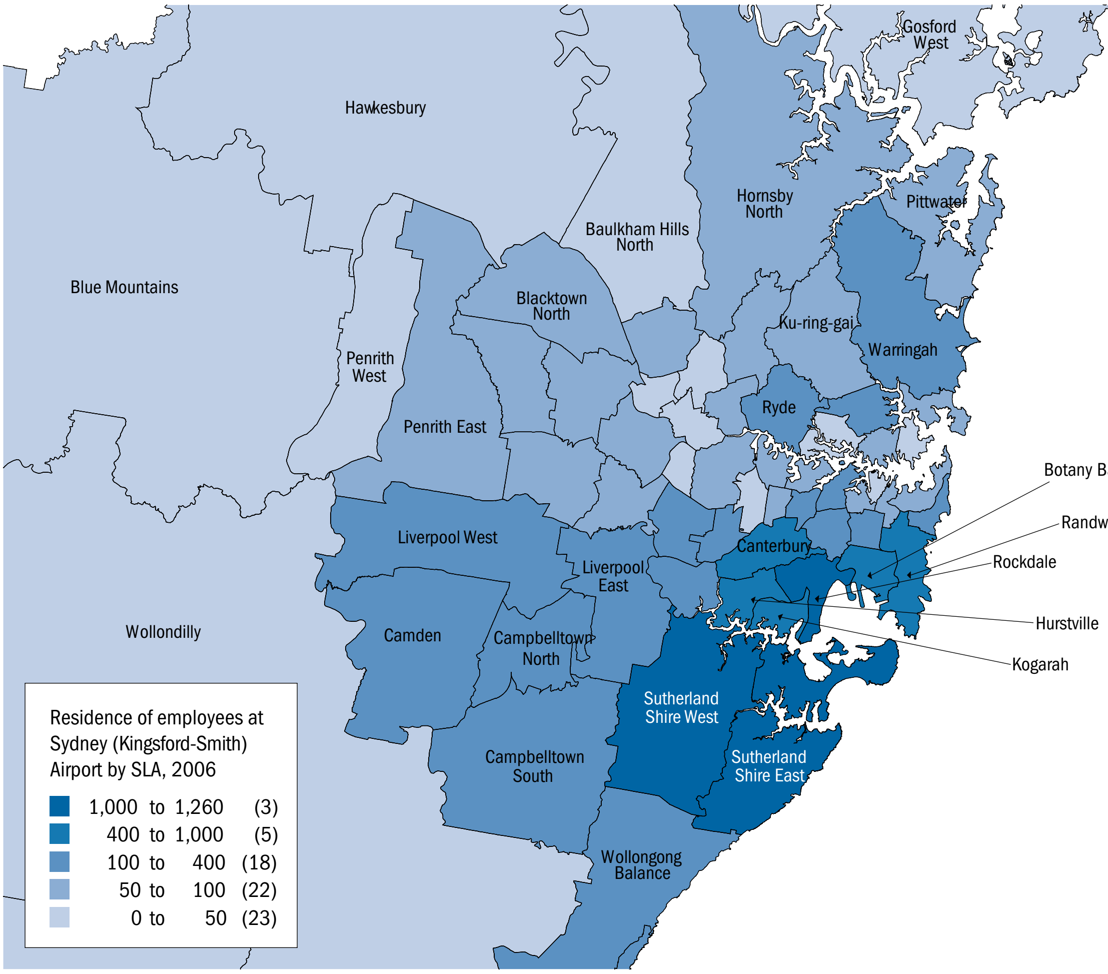
There are 16,000 jobs estimated to be located on site in total, with between 9,000 and 12,000 employees working there on an average day.[108] The ABS 2006 *Census of Population and Housing* indicated airport employment would increase a total of 11 per cent between 2006 and 2011. This suggests the total number of employees has not increased markedly in recent years.

Airport employees operate in shifts, with some commencing as early as 3.00am to meet the demand for aircraft arrivals at 6.00am, and some extending beyond midnight. Meeting the land transport needs of airport employees presents additional challenges to a typical commercial centre due to the extended hours of operation.

The majority of Sydney (Kingsford-Smith) Airport employees (74 per cent) live in four key planning subregions of the Greater Sydney Metropolitan Area – South (which is dominant, contributing 45 per cent of employees), East (which includes the airport and contributes 12 per cent), West Central (nine per cent) and South West (seven per cent). This is illustrated in Figure 96. A substantial proportion of Sydney (Kingsford-Smith) Airport staff is sourced from just three Statistical Local Areas (SLAs) – Rockdale, Sutherland Shire East and Sutherland Shire West – each of which contribute about 10 per cent of Sydney (Kingsford-Smith) Airport employees and belong to the South subregion of Sydney.

108 SACL, *Airport Ground Travel Plan,* 2006.

Figure 96 **Sydney (Kingsford-Smith) Airport employees by Statistical Local Area of residence, Sydney, 2006**



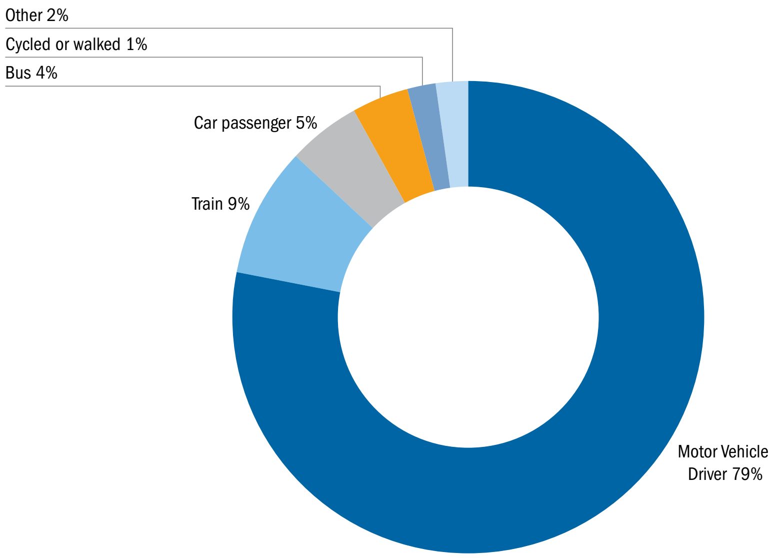
Note: Airport employees are defined as those who had a place of work in travel zones 411, 415, 425 and 581. Excludes those working at Mascot and those living in the Lower Hunter or outside the Sydney Greater Metropolitan Area.

Source: 2006 ABS Census of Population and Housing data, sourced from NSW Bureau of Transport Statistics (BTS).

Information from the ABS *2006 Census of Population and Housing* has been used to build a profile of the transport mode used by Sydney (Kingsford-Smith) Airport employees to journey to work on the day of the Census. As can be seen from Figure 97, the dominant mode of transportation is motor vehicle driving (79 per cent), while a further five per cent journey to work as a car passenger. Only about 13 per cent of Sydney (Kingsford-Smith) Airport employees travel to work by public transport, with nine per cent travelling by train and four per cent by bus. Around 80 per cent of Sydney (Kingsford-Smith) Airport employees work in roles which involve shifts and this work pattern may limit the surface transport choices available to staff.[109]

109 SACL, *Airport Ground Travel Plan*, 2006

Figure 97 **Surface transport mode share for Sydney (Kingsford-Smith) Airport employees, 2006**



Source: BITRE analysis of 2006 ABS Census of Population and Housing data, sourced from NSW BTS.

Results of the Household Travel Survey (the survey undertaken by the NSW Bureau of Transport Statistics) shows that for Sydney as a whole, public transport experienced a two percentage point increase in mode share for the purpose of commuting between 2005–06 and 2008–09. However, private vehicle usage for non-commute trips (education, social, business) has also risen.

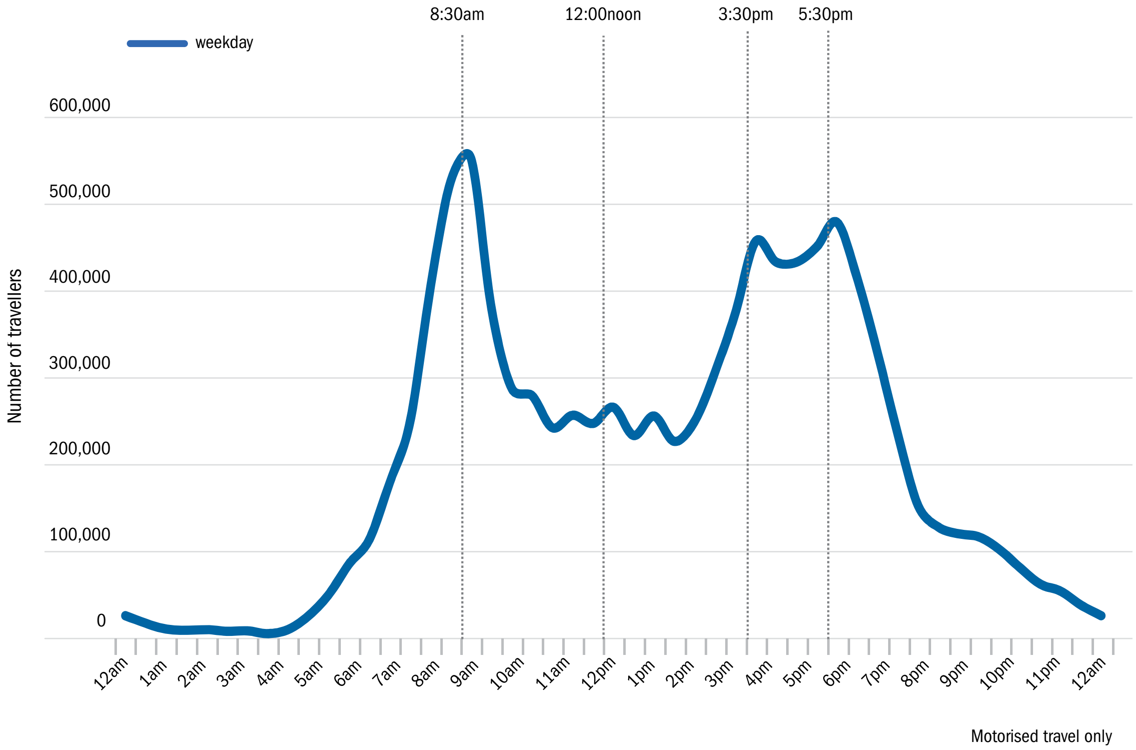
Peak demand

The demand pattern for Sydney (Kingsford-Smith) Airport passenger peak travel follows a generalised travel demand pattern curve. There are four pronounced demand periods: two daily peaks (the morning and afternoon peak), lower demand during the inter-peak period in the middle of the day, and very low activity overnight.

The peak hours for air travel at the airport currently coincide with peak commuter peak hours on the road and rail network. The spreading of the peak in aviation activity will become more apparent for more hours across the middle of the day. Therefore, the aviation peak is expected to continue to coincide with Sydney's road and rail peak in the short to medium term.

Figure 98 illustrates the general demand curve for Sydney's surface transport infrastructure. Aviation activity follows a similar pattern. However, at Sydney (Kingsford-Smith) Airport, the operating curfew restricts travel outside the hours of 6.00am and 11.00pm.

Figure 98 **Demand patterns for land based motorised trips in Sydney statistical division by time of day, average weekday, 2009–10**



Source: Transport for NSW, BTS Household Travel Survey 2009/10, 3-10-1.

Road capacity

Sydney (Kingsford-Smith) Airport is already experiencing capacity pressure on the roads within, and immediately surrounding, the airport precinct. In particular, road traffic congestion in peak periods (broadly 7.00am to 9.00am and 3.00pm to 6.00pm as per Figure 98) around the loop road in the Domestic Terminal precinct is becoming significant.

Over the medium term, congestion and declining service levels are expected on the road network as airport demand increases along with growth in demand for other traffic in the precinct.

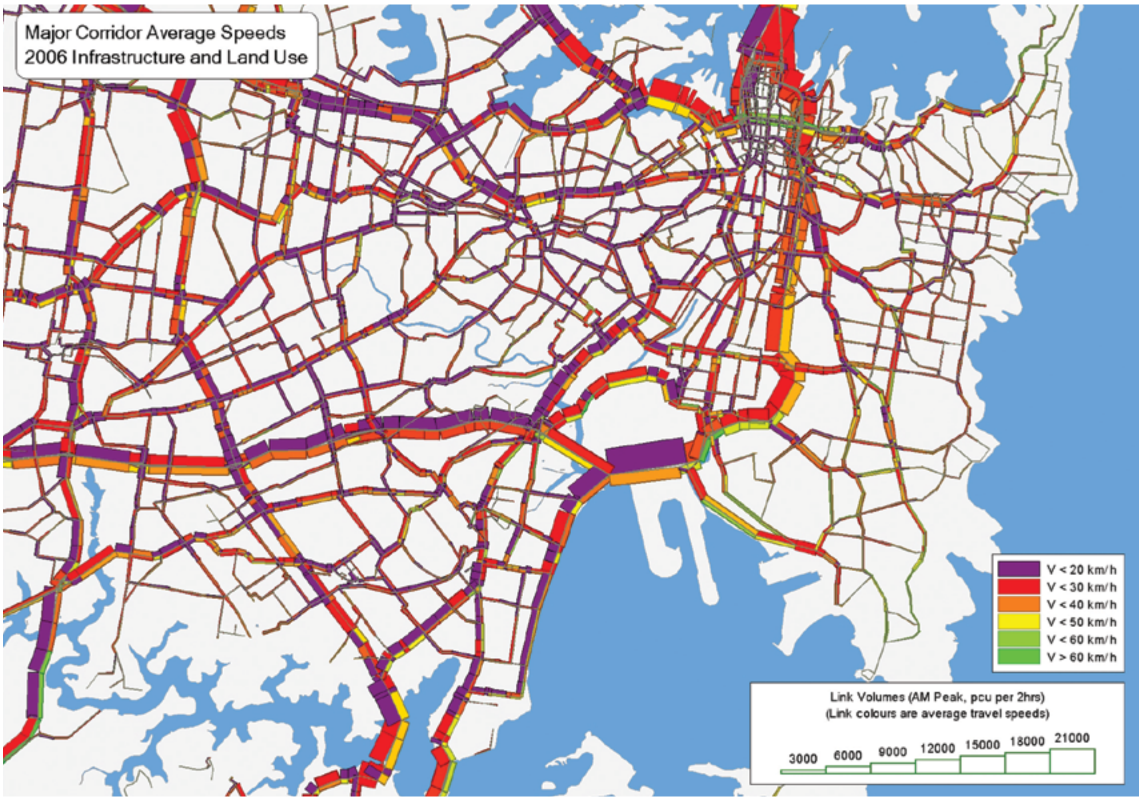
The traffic growth forecast at Sydney (Kingsford-Smith) Airport between 2011 and 2036 will have the following capacity requirements in the am peak:

- **high:** 17,500 vehicles or up to nine lanes of additional motorway capacity to the city;
- **medium:** 13,200 vehicles or up to six lanes of additional motorway capacity; and
- **low:** 5,700 vehicles or up to three lanes or additional motorway capacity.[110]

Figure 99 illustrates the speeds on the roads serving Sydney (Kingsford-Smith) Airport in 2006.

110 Transport for NSW, based on RTA traffic forecasts March 2011, one-hour average of the two-hour peak, 2011–2036.

Figure 99 **Speeds on the roads serving Sydney (Kingsford-Smith) Airport during peak periods, 2006**

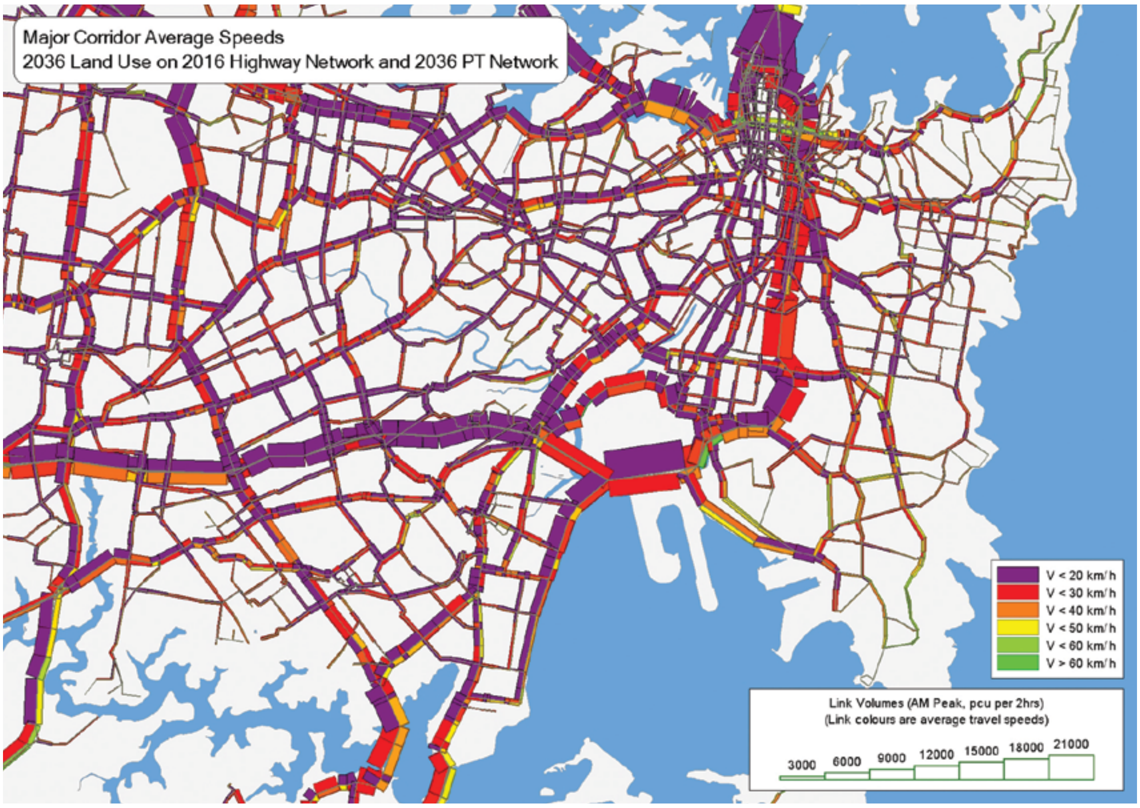


Note: This is Strategic Travel Model output created for the purpose of the Joint Study; it may underestimate the congestion for two reasons: 1) specific junction and link capacities are not finely tuned; and 2) the domestic access road is not included in the calculation. It therefore provides a conservative indication of the quantum of the impact of congestion in the broad vicinity of Sydney (Kingsford-Smith) Airport.

Source: Transport for NSW.

In contrast, Figure 100 shows the speed of roads surrounding the airport in 2036, assuming continuation of the 2006 highway network (such as a 'do minimum' scenario). Many sections of road will experience speeds of less than 20 kilometres per hour in both directions during the two-hour morning peak (the purple sections of road).

Figure 100 **Speeds on the roads serving Sydney (Kingsford-Smith) Airport during peak periods, using 2016 highway network, 2036**



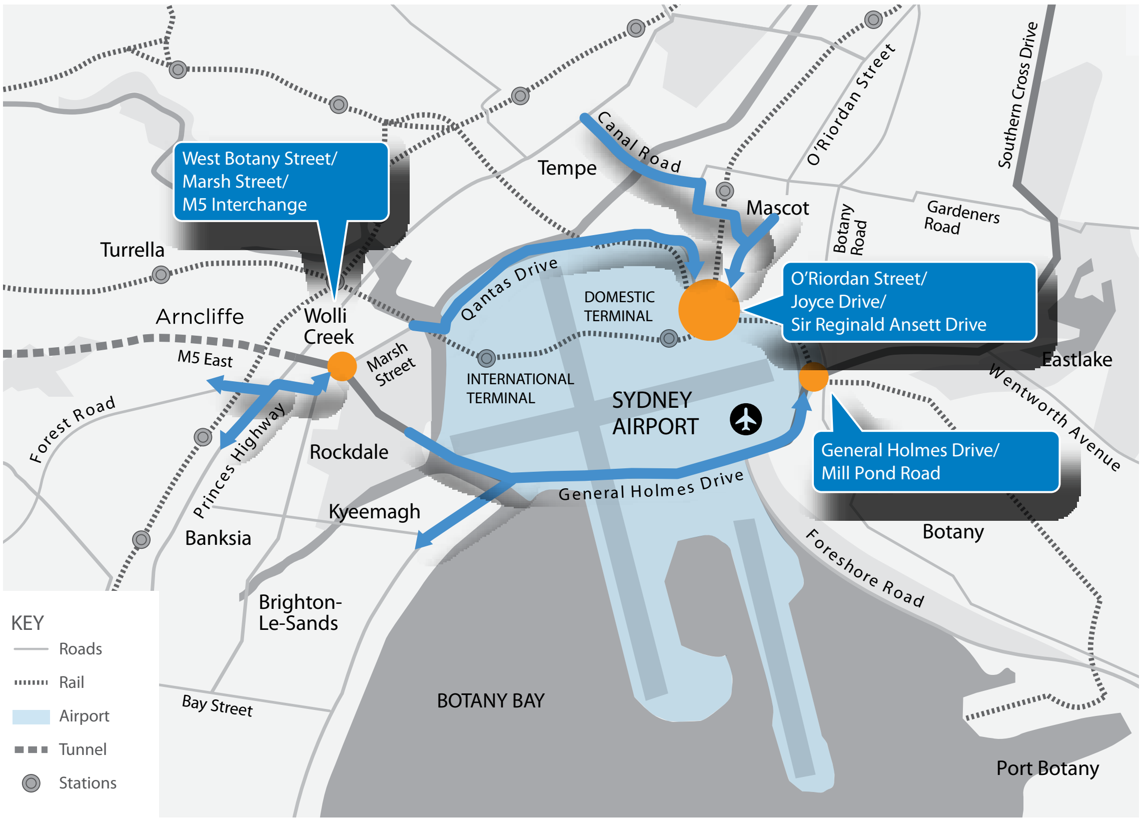
Note: This is Strategic Travel Model output created for the purpose of the Joint Study; it may underestimate the congestion for two reasons: 1) specific junction and link capacities are not finely tuned; and 2) the domestic access road is not included in the calculation. It therefore provides a conservative indication of the quantum of the impact of congestion in the broad vicinity of Sydney (Kingsford-Smith) Airport.

Source: Transport for NSW.

As well as the reduced speed expected in the medium term, under expected patronage growth scenarios at Sydney (Kingsford-Smith) Airport, the airport's three main entrance points to the airport are expected to suffer extensive traffic queue lengths in the morning peak already by 2014, as shown in Figure 101.[111]

111 Modelling by Transport for NSW.Note that the figure is likely to underestimate the extent of queuing, as the lengths were limited by the model area.

Figure 101 Terminal queue lengths, 2014 morning peak inbound



Note: The figure shows where traffic queues occur as a result of problems at specific junctions. The arrows show where the queue is too long to measure; it was based on forecast aviation projections in the SACL Sydney Airport Master Plan 2009 and may be superseded. SACL's decision to plan for a major change in terminal function would probably result in markedly different queuing with the potential for some to remain and others to increase. The Steering Committee notes that the NSW Government's submission to Infrastructure Australia seeks funding to allow more detailed modelling of this kind, with different scenarios for terminal function.

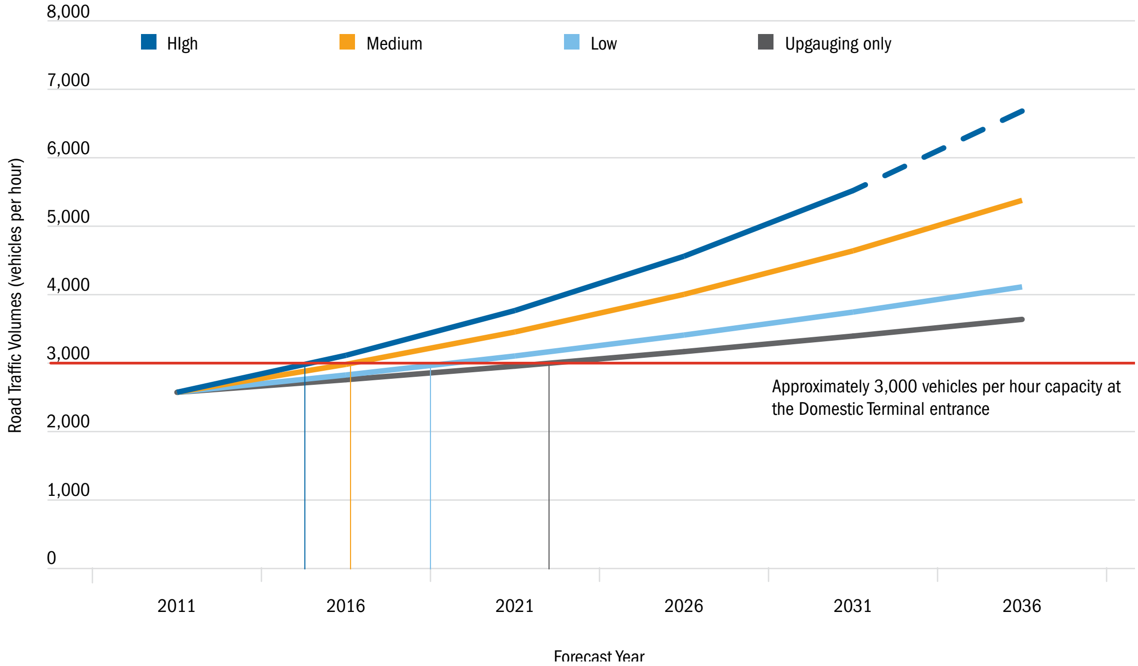
Source: Transport for NSW.

In the morning peak in 2014, the General Holmes Drive queue to the Domestic Terminals will be four kilometres long and the Airport Drive queue to the Domestic Terminals will be over three kilometres long. The queue southbound will stretch the full 2.6 kilometres from the Princes Highway via Canal Road. Other queues extend beyond the illustrated scope of the airport road precinct (as indicated by arrows pointing south to Brighton-Le-Sands.)

The most highly-constrained location in terms of road infrastructure capacity is around the entrance to the Domestic Terminal precinct. The Domestic Terminal loop road has an estimated capacity of 3,000 vehicles per hour. Assuming a medium airport passenger growth scenario, morning peak capacity will be reached in 2017. Modelling of lower and higher growth forecasts indicates it could be as early as 2015 or as late as 2023.

Figure 102 shows forecast traffic to access the Domestic Terminal precinct at Sydney (Kingsford-Smith) Airport and growth in demand for access to the precinct against the capacity of the existing road junctions at the terminal entrance.

Figure 102 **Expected demand of inbound traffic volumes at the Domestic Terminals under four aviation growth scenarios, 2011 to 2036 (morning peak)**



Source: Transport for NSW, based on SACL Sydney Airport Master Plan 2009, Booz & Company annual domestic passenger growth forecasts, and Booz & Company analysis of aircraft movement and average seat capacity 2010–2035 in the 8.00am to 9.00am period.

Nearing this critical point, road users will experience extended delays. Beyond this critical point, the volume of traffic will have exceeded the capacity of the road network, resulting in significant levels of congestion in the morning and afternoon peak periods. The Domestic Terminal road network will reach a level of service quality known as Category F. This category represents the point when road users will experience substantial delays and a near-constant traffic jam, with minimal spacing between vehicles and travel time becoming more unpredictable. This will directly impact on passengers and employees accessing the airport.

NSW Government analysis indicates that morning peak road speeds on key links to the airport already averaged around 30 kilometres per hour in 2006. By 2036 this is estimated to have reduced to below 25 kilometres per hour. Congestion and delays are expected to, in particular, affect northbound links to the CBD, with the average speed in 2036 projected to reduce to 18 kilometres per hour. This means that it could take close to 15 minutes to travel just five kilometres out of the airport precinct. For northbound trips to suburbs such as Surry Hills via O'Riordan Street, it could take up to 40 minutes to travel this same five-kilometre distance out of the airport precinct.[112]

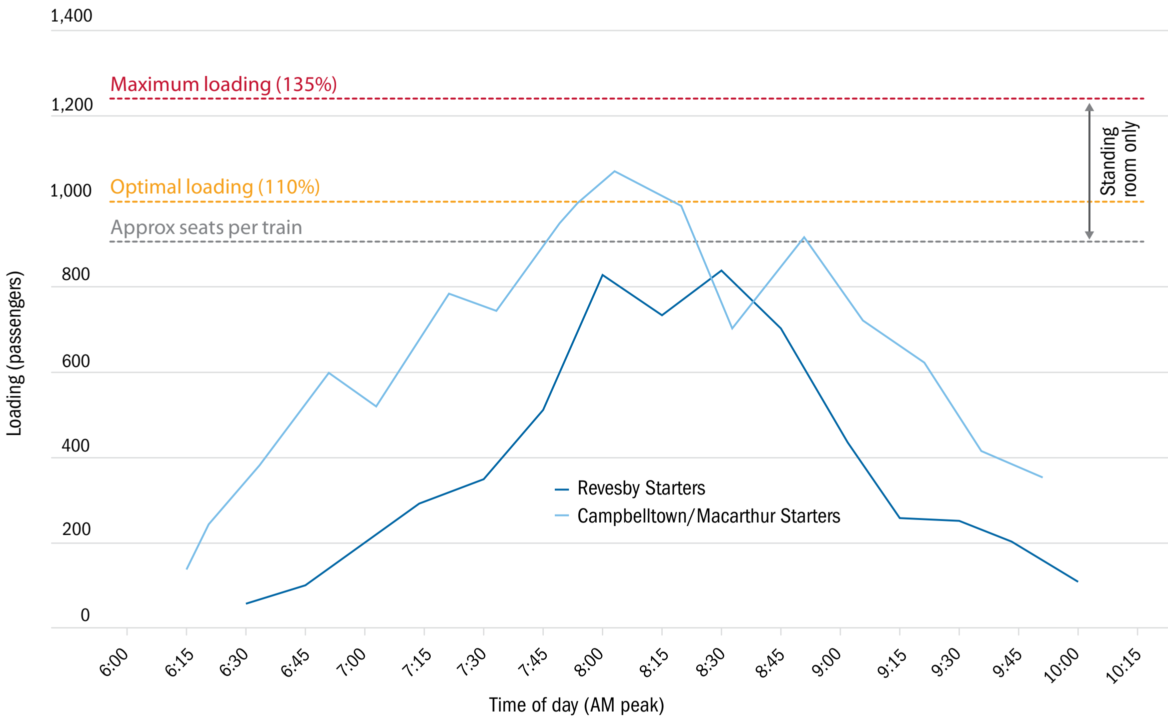
Rail capacity

There is sufficient capacity for growth in the rail corridor under existing arrangements. During the morning peak, the line experiences high passenger demand for through-travel from South West Sydney to the CBD and other employment locations in the Global Economic Corridor. Despite the high peak rail demand, there is still seating and standing room capacity during most hours of the day for services inbound to the CBD, and even in the peak hours there is standing room capacity. The peak for rail travel on this line coincides with the peak for aviation arrivals and departures. However, travel from the CBD to the airport during the morning peak is not affected by crowding from commuters and there is spare capacity in the outbound direction from the CBD.

112 NSW Government analysis, *Average Link Speed (km/hr) AM Peak 7:00-9:00,* based on Bureau of Transport Statistics Strategic Travel Model (derived from BTS 11/029 and 11/119).

Aside from the morning peak CBD-bound trains, the airport train service has ample capacity which could be more utilised to play a role in achieving modal shift to decrease road congestion. In terms of morning peak CBD-bound capacity, eight trains per hour currently run through the airport to the city during peak hours.

Figure 103 Airport rail line loading to Central Station, September 2010



Note: The Campbelltown/Macarthur Starters line – the line achieving the highest passenger loading in the figure – shows observed loads on trains originating in the South West (Campbelltown or Macarthur) and the Revesby Starters line shows the lower-speed, shorter-range Revesby trains. These counts were taken in September 2010, when the observed peak load of 110 per cent occurred between 8.00am and 8.30am.

Source: Transport for NSW.

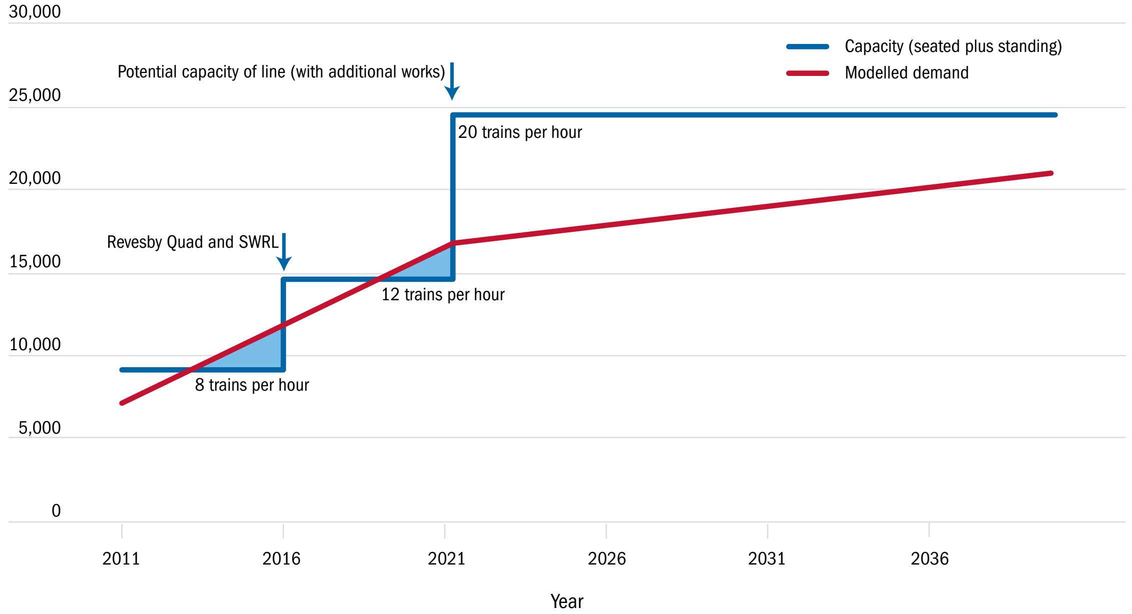
In the short term, modelling of the Airport Link capacity compared to demand indicates the key rail infrastructure capacity issue for Sydney (Kingsford-Smith) Airport is the rail link between Wolli Creek and the International Terminal. Based on modelling of possible rail scenarios in the morning peak (see this first shaded area in Figure 103), CBD-bound trains will be full before they reach the International Terminal by 2013 unless additional rolling stock and train paths can be allocated to the airport rail line. The NSW Government has a sequence of major rail construction works underway which, once completed in around 2016, will provide a temporary increase in capacity of the line to serve growth and accommodate more services over the medium term:

- the South West Rail Link;
- the Kingsgrove to Revesby Quadruplication; and
- construction of the Revesby turnback.

The South West Rail Link includes a major upgrade of Glenfield Station and interchange, and a new twin-track passenger rail line from Glenfield to Leppington via Edmondson Park. The Kingsgrove to Revesby Quadruplication project involves the construction of a second pair of railway tracks between Kingsgrove and Revesby and associated bridge and station works to allow for the physical separation of local and express services on the East Hills Line.

In 2016, after the planned works outlined above, the airport rail line will be served by 12 trains per hour. However, this will require allocation of additional rollingstock to the line. As shown in Figure 104, this will provide morning peak rail capacity until around 2018, when CBD-bound trains will again be full before they reach the International Terminal, unless additional rolling stock (currently unfunded) and train paths can be allocated to the Airport Link.

Figure 104 **Airport rail line capacity against expected demand, 2010 to 2036 (8.00am to 9.00am peak)**



Source: Transport for NSW.

A summary of future capacity shortfalls and related implications is shown in Table 14.

Table 14 **Likely impacts on Sydney (Kingsford-Smith) Airport given capacity constraints**

Capacity Constraint	Potential Impacts	Potential Timing: Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Physical Size	**Land footprint:** unable to extend.	●		
Airside Infrastructure	**Gates, stand and aprons:** shortfall of stands as early as 2015.	●		
	Taxiways: improved, but difficult again in medium term.		●	
	Runways: increased runway imbalance due to upgauging, increased delay and congestion with use of parallels for longer periods of a day, adding to safety and traffic management issues.	●		
Environmental and Social Impacts	**Peak slot availability:** reduced access for internationals, domestic business and new LCCs.	●		
	Slot availability: full by 2027.		●	
	LTOP: noise sharing not possible from as early as 2012 in early peak times and from 2020 only possible during a few hours on weekdays.	●		
Surface Transport	**Road:** increased peak road congestion as early as 2015, expanding to off-peak in medium term.	●		
	Rail: capacity available but constrained during peak, no dedicated airport services.	●		
Delays	**Reduced ability to recover from delays:** there will be rising levels of airborne delays and growth congestion at the airport as 80 scheduled movements is neared. This will be made worse with weather and other events.		●	

Source: PwC and Australian Department of Infrastructure and Transport

4.3 Current capacity at Newcastle Airport to meet demand

Civil aircraft operations at Newcastle Airport are managed through an agreement between the Department of Defence and Port Stephens and Newcastle councils. It provides for the use of a 28 hectare site within RAAF Base Williamtown, with a lease currently held until 2045. Civilian activity is limited under the arrangement to six arrivals per hour (assumed to be equivalent to 12 movements).

RAAF Base Williamtown is RAAF's primary operational fighter base in NSW. Unlike joint user facilities at some other aerodromes, such as Darwin and Townsville, RAAF Base Williamtown is a military facility and civil activity is subject to the operational needs of Defence.

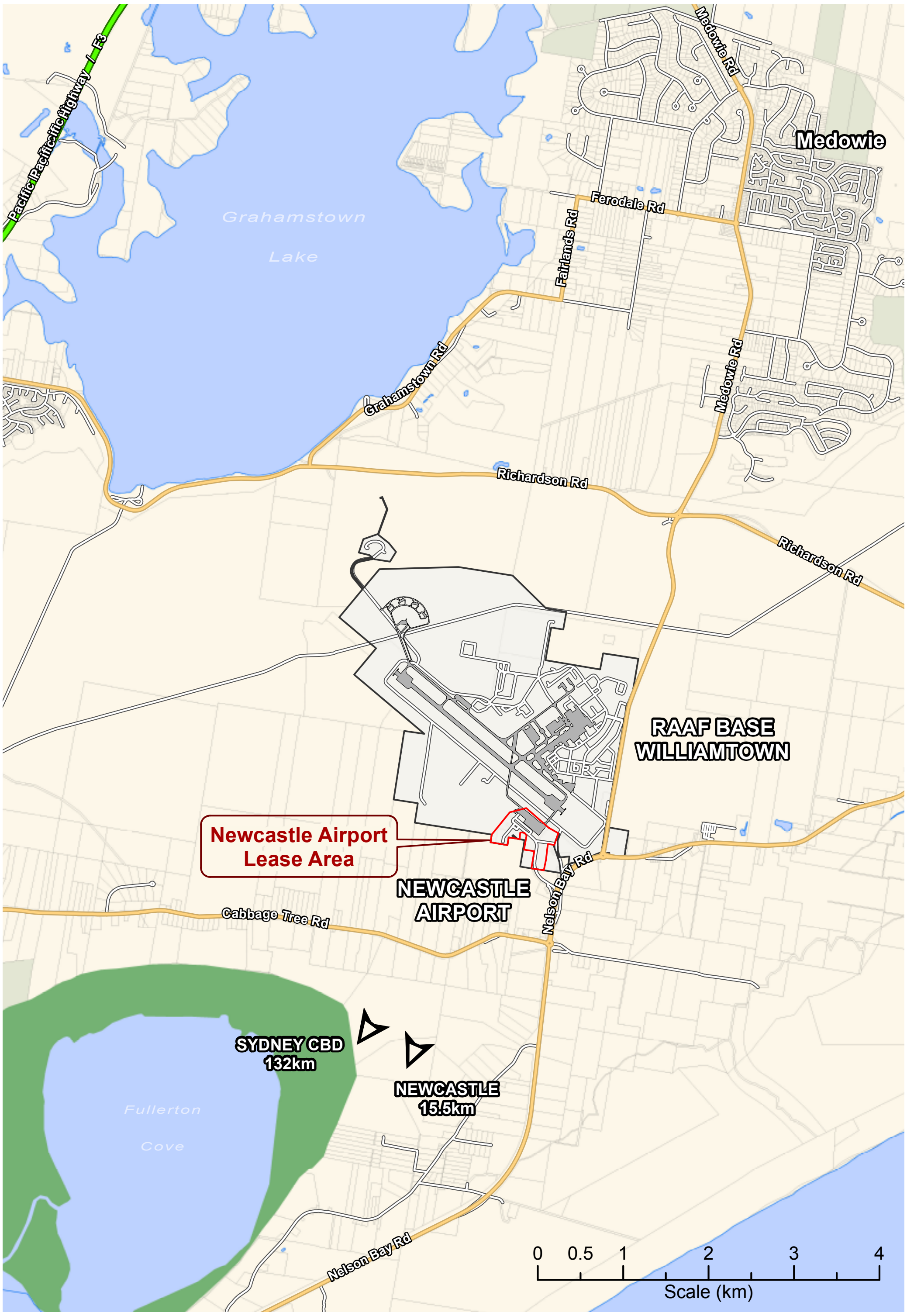
Newcastle Airport's historical growth to date has been significant, with increases in passenger demand of more than 17.8 per cent over the period 2000 to 2010. Given its forecast demand, it is expected Newcastle Airport will likely continue to serve as a civil airport catering for traffic from the growing Newcastle, Port Stephens, Upper and Lower Hunter, Lake Macquarie and Central Coast regions. The Newcastle Airport catchment extends further in the northern and north-western directions towards the Great Lakes and Mid North Coast and New England Regions.

By contrast, parts of the southern end of the Central Coast are broadly midway between Sydney and Newcastle and use both airports, with decisions based on route availability, frequency and airfares. The population of the Central Coast and Lower Hunter Regional Strategy areas, which form the bulk of the Newcastle Airport catchment area, is projected to grow by more than 236,000 from 863,000 in 2011 to approximately 1.1 million by 2036.[113]

In examining the capacity of Newcastle Airport to meet its forecast demand, the only significant capacity concern was the level of aircraft movements currently agreed between Newcastle Airport Limited and the RAAF (six arrivals per hour). At present, the busier hours at Newcastle Airport (such as from 8.00am to 9.00am and 5.00pm to 6.00pm) have two to three civilian arrivals per hour, which means the airport has significant scope, by 2035, to cater for passenger growth from its catchment area.

113 NSW Metropolitan Plan, 2010.

Figure 105 RAAF Base Williamtown (Newcastle Airport) site and surrounds



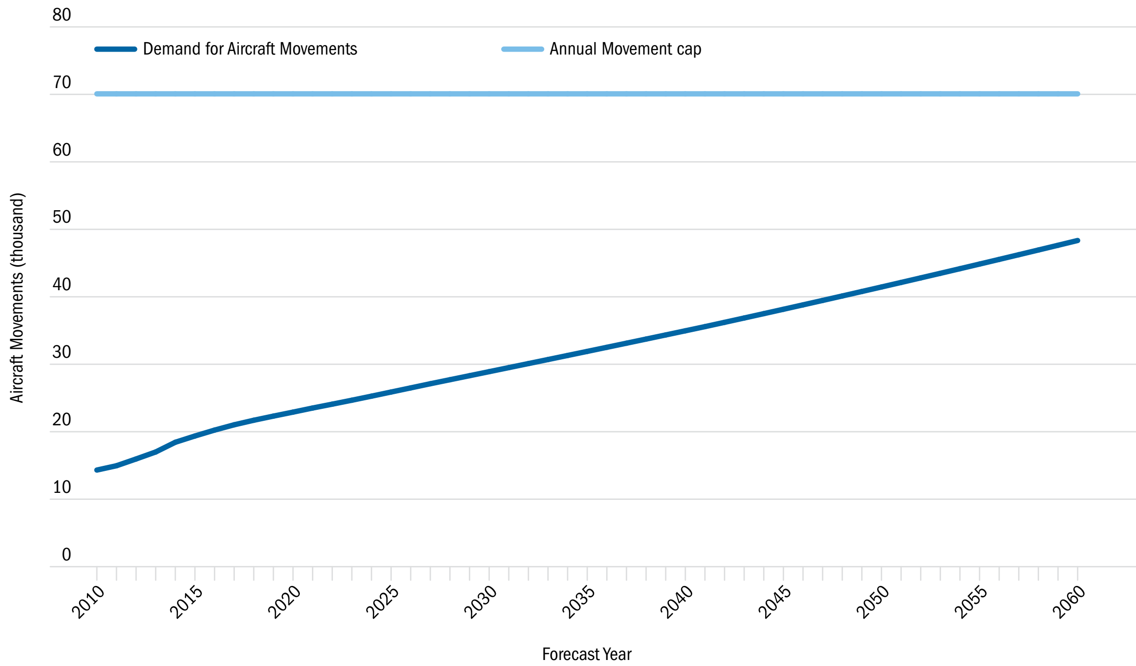
Note: Distances are 'as the crow flies'.

Source: Australian Department of Infrastructure and Transport.

Movement capacity

It is expected the total number of civil movements at Newcastle Airport will continue to climb towards the theoretical capacity limit of approximately 70,000 annual movements, as shown in Figure 106. The theoretical capacity is derived by multiplying the agreed movement cap of 12 movements per hour[114] by the number of hours available in each day, by 365 days per year.[115]

Figure 106 Newcastle Airport expected demand for RPT aircraft movements, 2010 to 2060



Note: 'Annual movement cap' was derived from by multiplying the agreed movement cap of 12 movements per hour (six arrivals and assuming six corresponding departures) by the number of hours available in each day, by 365 days per year.

Source: Booz & Company analysis.

This figure, in itself, does not present any capacity issues, as it shows by 2060 there are still some 20,000 movements before capacity is reached. However this is because at the aggregate (total annual movements) level, it presumes aircraft are able and willing to move to any available hour on any day of the week to meet demand.

The concern is the peak capacity constraint and how this will affect the interaction of RAAF operations with civil movements.

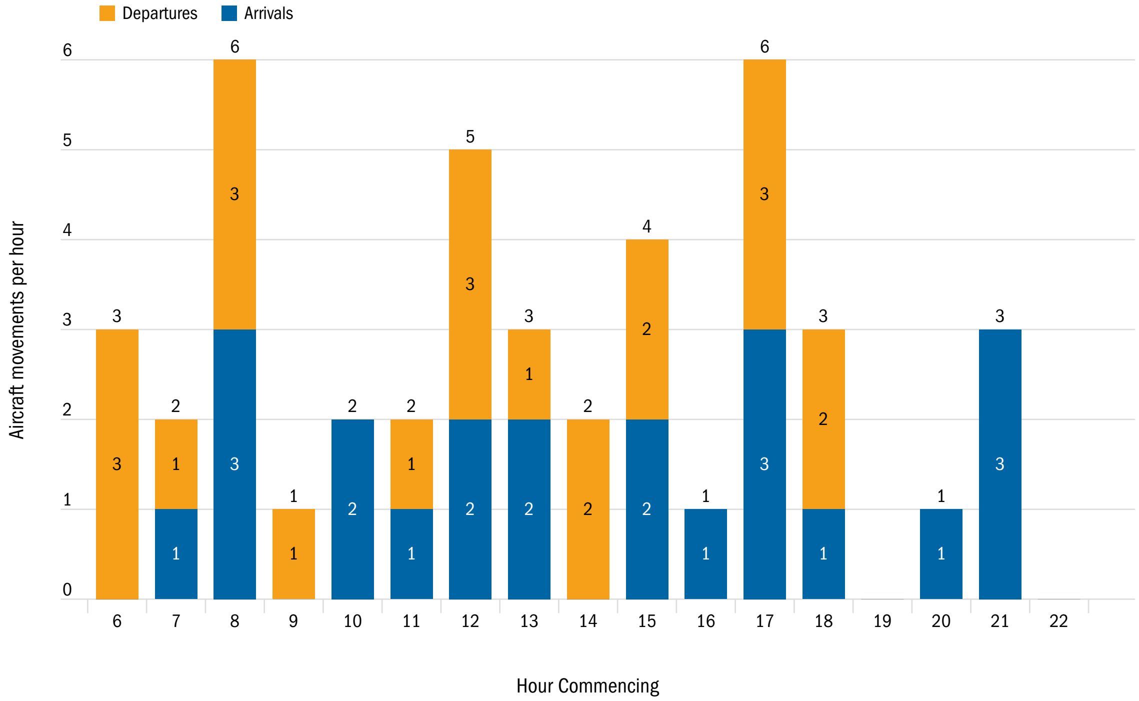
In 2010, an hour-by-hour analysis of activity at Newcastle Airport[116] shows average operations of two to three arrival movements per hour, peaking at six total movements at 8.00am and 5.00pm (as shown in Figure 107).

114 For operational hours, the Department of Defence has agreed with Newcastle Airport Limited to allow a maximum runway movements of six arrivals per hour. For the purposes of analysis, it is assumed each arrival is paired with an associated departure, meaning a cap of 12 civil movements per hour.

115 Newcastle Airport has an agreement with the community which effectively limits any planes after 10.00pm.

116 On the basis of the Newcastle Airport planning day – Wednesday, 13 October 2010. Further information can be found in Technical Paper B6.

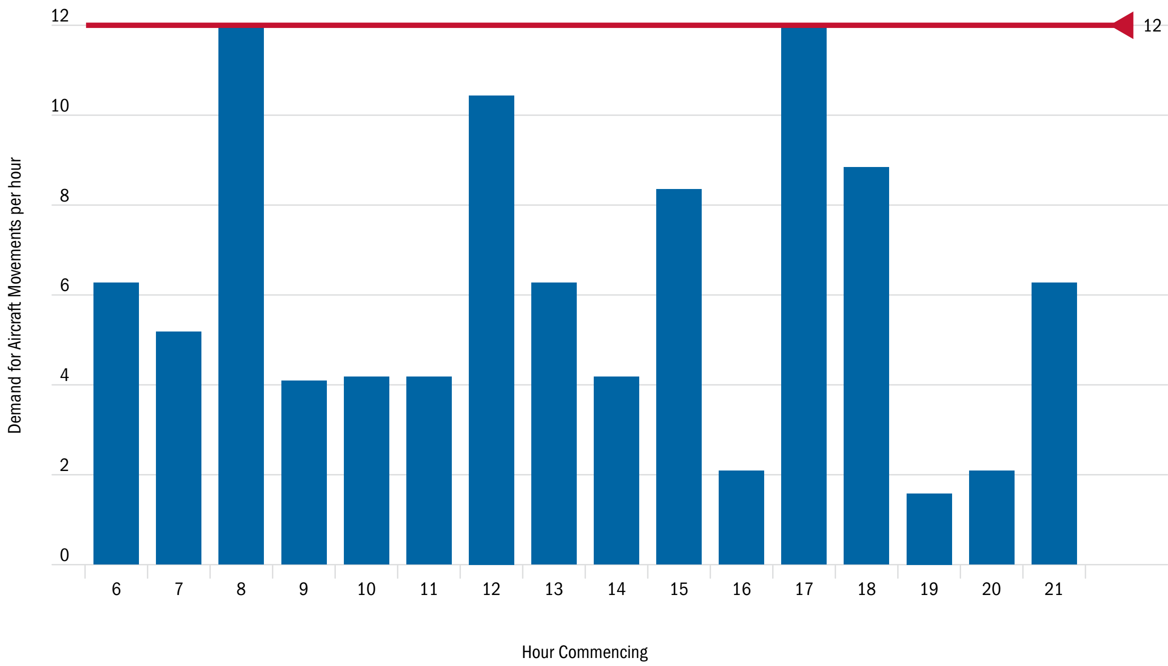
Figure 107 Newcastle Airport aircraft movements by hour of day, 2010



Source: Booz & Company analysis of SRS Analyser data of the Newcastle Planning Day. Further detail is in Technical Paper B6.

Once the arrival cap is reached in the peak, some peak spreading to other hours will be required to meet passenger growth. However, based on forecast growth rates, this is expected to increase and, by 2021, the hourly movement limit will be reached for the 8.00am to 9.00am hour. Figure 108 shows by 2035 both morning and afternoon peaks will reach the movement cap, with the middle of the day also approaching the cap. This will have an impact on the share of usage between RAAF and the civilian operators.

Figure 108 Newcastle Airport expected aircraft movements by hour of day, 2035



Note: Assumes 'annual movement cap' of 12 movements per hour applies. Annual growth rates consistent with those developed in Technical Paper A3 were applied to the planning day profile in Figure 107. A medium peak spreading scenario (including some redistribution and suppression of services) has been applied. Movements are not whole numbers, as forecasts were not rounded after applying growth rates. Further detail is in Technical Paper B6.

Source: Booz & Company analysis.

Interaction with military operations

As stated earlier, RAAF Base Williamtown is Defence's primary fighter aviation facility in NSW. It accommodates most of Australia's military fighter aircraft and is headquarters for the Surveillance and Response Group, Air Combat Group and the Joint Warfare, Doctrine and Training Centre.

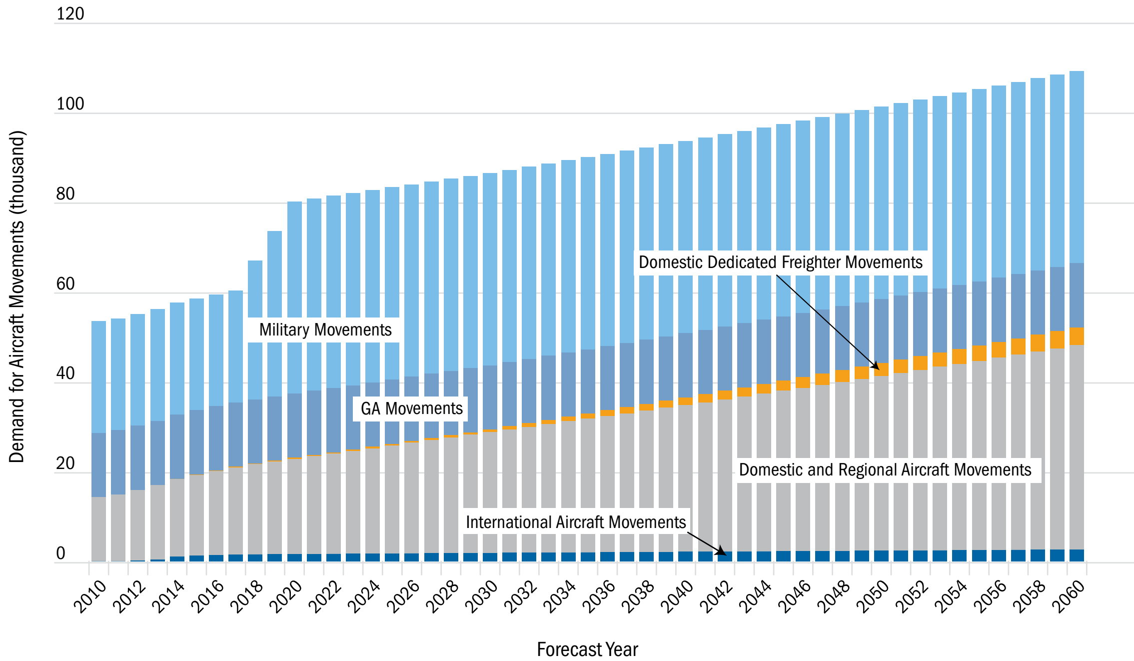
In a recent review of civil access to Air Force airfields, RAAF noted at RAAF Base Williamtown (Newcastle Airport) 'once six to eight civil movements per hour are exceeded regularly, military and civil flying will be affected by both surface manoeuvre area and air space congestion'.[117] Additionally, RAAF is concerned with the use of heavy aircraft, as the increasing separation distances required will disrupt their traffic patterns and cause delays.

This becomes an even higher priority issue with the introduction of the Joint Strike Fighter (JSF) at RAAF Base Williamtown, currently anticipated for around 2017, as it will substantially increase the number of military aircraft movements at the aerodrome. Any extra availability for civil aviation is difficult to predict and provide with any certainty for scheduling purposes.

Planning for future international services will become far more complicated and time critical as a result.

While discussions are ongoing between the parties to consider variations to the movement cap which could provide more flexibility (particularly enabling more civilian movements outside the hours of military operations), these need to be brought forward with a definitive action plan on how to best integrate the civilian needs with RAAF needs, especially given the anticipated growth by 2035.

Figure 109 **RAAF Base Williamtown (Newcastle Airport) expected aircraft movement demand by market type, 2010 to 2060**



Source: Booz & Company analysis.

117 Air Force, *Review into Civil Aviation Access to Air Force Airfields,* 2011.

4.4 Current capacity at Canberra Airport to meet demand

Canberra Airport serves the Canberra market, as well as that of the surrounding region, including centres such as Yass and the Riverina, Goulburn, Queanbeyan, Cooma and the South Coast. It has a runway capable of handling international aircraft to Code F and has made substantial investment in new terminal facilities, which, when completed, will include capacity for international airline services. Its aviation growth has been consistent with growth around Australia.

The Canberra Airport 2009 Master Plan (the Canberra Airport Master Plan)[118] involves investment in terminal infrastructure to accommodate a high scenario estimate of 8.8 million passengers or 157,257 RPT aircraft movements per year in 2029–30. This will involve investment to develop a new terminal building as well as associated aeronautical and roads infrastructure. Canberra Airport has recently increased the value of the investment into this development; parts of this investment have been completed with the remainder expected by the first half of 2013. The Master Plan indicates that the current runway system will meet the passenger forecasts in the planning period to 2029–30.

ACIL Tasman, which prepared the Canberra Airport Master Plan, identified the airport's potential role in the region's aviation in providing:

- increased domestic flights that avoid a change of plane at Sydney (Kingsford-Smith) Airport;
- development as an east coast airline hub as Canberra Airport's flight frequencies and range of destinations increase;
- development of a regional hub at Canberra as many of the services sought by regional residents when travelling to Sydney (such as professional services and entertainment) are also available in Canberra;
- international point-to-point services such as Canberra–Auckland and Canberra–Singapore (for traffic to and from those points and for connections beyond such as to Asia, Europe and North America), Canberra–Bali and other leisure destinations; and
- development of a freight hub.[119]

In examining the airport's ability to meet its future demand, there were no current airfield capacity constraints identified, with the airport readily able to cater for passenger growth in its broader catchment area.

Canberra Airport operates without a curfew. The flight paths for the main runway, to the north and south of the airport, are currently over undeveloped land, largely rural in character. There is a concern that any proposed rezoning for residential development around the airport may curtail the future ability of the airport to grow. This especially includes any proposed housing developments that will fall within the 20 to 25 Australian Noise Exposure Forecast (ANEF) contours, as well as areas outside but in close proximity to the 20 ANEF. Such developments will expose residents to high levels of aircraft noise. The operation of aircraft at night, in particular for the overnight freight hub arrangements proposed in the Canberra Airport Master Plan, would inevitably be a major issue for any such communities, leading to calls for a curfew, further restrictions on the operation of the airport and changes to patterns of operations.

118 Canberra Airport Pty Ltd, *Canberra Airport 2009 Master Plan,* 2009.
119 ACIL Tasman, *Economic impact of Canberra Airport: 2010 to 2030,* prepared for Canberra Airport, 2011.

Figure 110 Canberra Airport site and surrounds

Note: Distances are 'as the crow flies'.

Source: Australian Department of Infrastructure and Transport.

4.5 Ability to meet demand for other aviation activity

Air freight

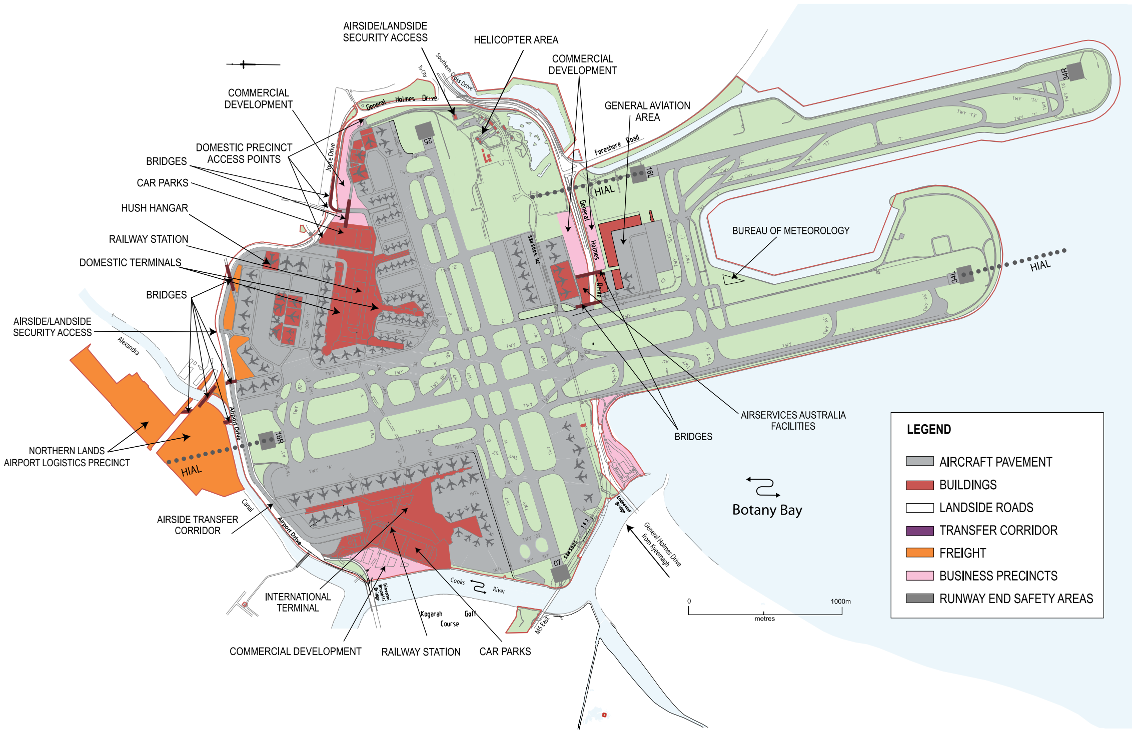
Sydney (Kingsford-Smith) Airport

Currently, there is freight-handling capability to meet the short-term freight tonnage demand at Sydney (Kingsford-Smith) Airport. However, SACL suggested in its Master Plan that international and domestic air freight-handling facilities were already operating near capacity.

In addition, as the International Passenger Terminal is expanded to the north to meet RPT demand, part of the current international freight terminal site will be needed to be relocated.[120] SACL has identified areas to be developed for on-airport freight and freight support facilities within land parcels north of the Alexandra Canal that are owned by SACL. Constrained capacity has already resulted in a number of air freight-handling operators being forced to locate facilities to these off-airport areas. The Master Plan provides for direct landside and airside vehicular access to the proposed logistics areas to enable access. Also, on-airport freight bypass and staging facilities are proposed to be established near the current Qantas Jet Base to support off-airport freight operators.[121]

Figure 111 presents the Master Plan concept with the air freight areas highlighted in orange.

Figure 111 Master Plan layout of Sydney (Kingsford-Smith) Airport, in 2029 – air freight features



Source: SACL Sydney Airport Master Plan 2009.

Besides the increasing pressure on air freight-handling facilities to move off-airport to cater for RPT growth, the ability for dedicated freighters to obtain additional slots in the future will become more limited due to the need to cater for RPT. However, in the short term, there remains scope for operation of dedicated freight services at Sydney (Kingsford-Smith) Airport, particularly as they are not tied to peak period schedules.

120 SACL, *Sydney Airport Master Plan 2009*.
121 SACL, *Sydney Airport Master Plan 2009*.

Canberra Airport

The Canberra Airport Master Plan, currently approved for Canberra, provides for future development and expansion as a 24-hour freight hub. As the only curfew-free airport capable of handling larger freight aircraft within reach of Sydney, Canberra Airport is expected to play an important role in relation to air freight in the future.

The Canberra Airport Master Plan outlines the expected commencement of a domestic overnight express freight hub at the airport in response to the needs of the overnight express freight industry and its development over the planning period. Canberra Airport has been approached by two major domestic overnight air freight operators regarding the opportunity to develop a domestic hub for overnight air freight. While an exact time frame is uncertain, the Master Plan suggests that such a freight hub may commence within five years (that is by 2014).

The Canberra Airport Master Plan outlines the expected commencement of a domestic overnight express freight hub at the airport (in response to the needs of the overnight express freight industry) and its development over the planning period. Canberra Airport has been approached by two major domestic overnight air freight operators regarding the opportunity to develop a domestic hub for overnight air freight. While an exact time frame is uncertain, the Master Plan suggests that such a freight hub may commence within five years (that is by 2014).

The Canberra Airport Master Plan assumes the initial stages of a domestic overnight freight hub will be able to be accommodated at Canberra Airport with little or no additional infrastructure or impact on existing airport users. This includes commencing operations with one to three jets or large turboprop freighter aircraft per night, such as Boeing 737 and ATR-42.

Following the initial establishment of a freight hub, express overnight freight operations at the airport will be expected to continue increasing, growing to five aircraft within two to three years of commencement. Over the 20-year planning period of the Master Plan, it is suggested that additional freight capacity is likely to be achieved through the use of larger aircraft, such as B757F or B767F, on key routes and larger turboprop aircraft, such as on regional freight routes.

Over time, dedicated freight infrastructure is expected to be required to facilitate the growing freight hub – particularly aircraft parking aprons to accommodate the peak overnight period.[122]

The Canberra Airport Master Plan also foreshadows commencement of dedicated international air freight services, suggesting that services could grow gradually, commencing with one airline operating two to three weekly B747-400F (or equivalent) services to and from Canberra Airport in the next five years.

The existing apron at Fairbairn is currently able to accommodate B747-400F and equivalent aircraft and it is expected that this will be sufficient to accommodate aircraft parking requirements in the next five years.

As services grow beyond the five-year time frame, additional apron space will be required. Warehouse and office infrastructure will also be required in the short term to accommodate the commencement of international freight services, especially with respect to Customs and Quarantine requirements. This could initially be accommodated in existing facilities at Fairbairn but may require additional facilities to be constructed in the short to medium term. Some of these facilities may be collocated with facilities supporting the domestic overnight freight hub, although upgraded customs and quarantine facilities and facilities for the international transport of horses and livestock may also be required. The Canberra Airport Master Plan suggests that significant warehouse and office support functions are able to be housed elsewhere on-airport or even on land surrounding the airport.

122 Canberra Airport Pty Ltd, *2009 Master Plan,* 2009.

The ability for Canberra Airport to meet these growth targets will be predicated on its ability to remain curfew free.

General Aviation (GA)

A wide range of GA operators are based at a number of aerodromes in the Sydney region.[123] An assessment of infrastructure in the region has identified sufficient capacity for the future provided the aerodromes currently serving the sector in the Sydney region continue to be available.

Bankstown Airport is by far the largest provider in the region, accounting for more than half the GA movements in the region. It also caters for most of the GA flight training in the region, with over 60 per cent of the airport's activity dedicated to training. Camden Airport is the next busiest airport, with approximately 20 per cent of the market.

123 Canberra Airport Pty Ltd, *2009 Master Plan,* 2009.

PART FIVE
IMPACTS IF DEMAND IS NOT MET

P5

Key points

- If no additional capacity is made available, demand would exceed capacity by 54 million passenger movements and more than 760,000 tonnes of air freight per year in 2060.
  - The cumulative total of unmet demand would be more than 665 million passenger movements and nine million tonnes of air freight between 2035 and 2060.
- By 2060, the economy-wide (direct and flow-on) impacts of the Australian economy could accumulate to a total of $59.5 billion in foregone expenditure and $34.0 billion in foregone gross domestic product (GDP) (in 2010 discounted dollars and considering a medium elasticity scenario).
  - The NSW economy would be the worst affected, with losses across all industries totalling $30.6 billion in foregone expenditure and $17.5 billion in foregone gross state product (GSP) (discounted).
  - In terms of employment impacts, an annual average of 12,700 full time equivalent (FTE) positions in NSW and 17,300 FTE positions nationally could be foregone.
- Any delay in acting would have adverse economic impacts for NSW and Australia.
- By 2035, the economy-wide impacts could accumulate to as much as $2.3 billion in foregone NSW GSP and $6.0 billion in foregone GDP for the Australian economy. In terms of expenditure within the economy, over the period to 2035 foregone expenditure could total $2.6 billion for NSW and $8.9 billion for Australia.
  - Over the period to 2035, 400 FTE jobs per year could be foregone in NSW and 600 FTE jobs per year nationally. This means that employment is expected to be lower than would otherwise be the case if capacity were made available.
- In the short term, other cities could gain a boost to passenger numbers and consequent economic activity from services, passengers and freight operators that cannot access Sydney. However, given a portion of unmet Sydney region demand would be diverted overseas instead of interstate, and some travel will be suppressed, overall, Australia would experience a net economic loss.
- These estimates are considered conservative, given the use of medium scenarios for redistribution and suppression of unmet demand. In addition, a wide range of impacts associated with aviation infrastructure is difficult to monetise due to the role of aviation as a facilitator for trade and economic activity.
- Delay brings the risk that the remaining options to add aviation capacity will disappear, as Sydney's spatial growth and associated land use development encroach on the few potential sites remaining.
  - Delay in action would constrain the ability of governments to provide additional airport capacity in the future.

Options for adding aviation capacity in the Sydney region have been considered on several occasions over many years. In 1986, Badgerys Creek was selected as a site for a second major airport. In 1989, the decision was made to build a third runway at Sydney (Kingsford Smith) Airport as an interim measure, and action on the Badgerys Creek site was suspended. On other occasions, governments have deferred decisions to expand capacity in the region or to protect potential sites for additional capacity. As a result, the number of viable options to add capacity has reduced.

As set out in Part Four of this Report, there is a clear gap between the capacity of existing airports and the forecast demand – a gap that cannot be addressed by action at Sydney (Kingsford-Smith) Airport alone. Unaddressed, this will present not only increasing operational problems but constrain aviation growth and productivity.

The challenge of connecting surface transport to Sydney (Kingsford-Smith) Airport must also be addressed, or congestion will continue to grow, with further impacts on economic and social wellbeing. The problems will only increase over time.

If a decision to expand capacity in the region is again deferred, there will be substantial economic costs. The continuing growth of Sydney will make it harder to add airport capacity in the future.

This Part identifies the problems that will be caused by capacity constraints and their impacts, focusing on both immediate practical implications and the long-term economic costs.

5.1 The timing and nature of impacts

Timing of impacts

As identified in Part Four of this Report, aviation capacity constraints in the Sydney region will begin to impact at different times, with many increasing in severity in the medium to long term.

Impacts are already being felt at Sydney (Kingsford-Smith) Airport. Slot availability is currently limited for all types of services at peak times of the busy weekdays, with two hours each in the morning peak and afternoon peak already at the legislated 80 movements per hour. No protected regional slots are available at peak times, nor are there International Terminal gates available for arrivals on weekdays, during the morning peak between 7.30am and 10.00am.

The opportunities to obtain a suitable series of equivalent slots across the days of the week are also becoming very restricted. As a result, new services will be increasingly turned away as airlines are unable to obtain pairs of arrival and departure slots suitable for their schedules. New routes (particularly on international services) will be foregone and significant opportunities will be lost.

Sydney (Kingsford-Smith) Airport is already experiencing capacity pressure on the roads within, and immediately surrounding, the airport precinct. Between 2015 and 2023, passengers, along with those employed at the airport, will experience significant delays travelling to and from the airport, as road capacity is reached in peak periods, with flow-on congestion in the surrounding road network impacting on other road users.

By 2015, unless the proposed terminal and apron work set out in the *Sydney Airport Master Plan 2009* (the Master Plan) is brought forward, the number of aircraft stands will not meet demand.

By 2020, the scope for noise-sharing arrangements under Long Term Operating Plan (LTOP) will be dramatically reduced, with remaining scope to use noise-sharing modes only in the very late evening and for a small number of weekend hours.

At this level of activity, it will also take much longer for operations at the airport to recover from any periods of disrupted operations. For example, it will take five hours to recover from a two-hour weather event in the morning peak, with substantial impacts on the broader network delays and recovery times continuing to increase.

Growth in services at Sydney (Kingsford-Smith) Airport will start to stagnate from 2027, when all slots are expected to be allocated, and a large number of potential services will be turned away. Increases in passenger capacity will be limited to existing carriers with multiple existing allocated slots which can upgauge the size of aircraft operated on those services. The extent of upgauging to Code E and Code F aircraft will be restricted by the airport site constraints, as well as the constraints at other airports and airport operating requirements.

As outlined in Part Four, conservative forecasting shows that, by 2035, just in the busiest morning hour alone, 30 movements (or 27 per cent of demand) will be unmet. Demand at other hours of the day will similarly be approaching and exceeding the slot allocations.

At that time, all but the last two hours of the non-curfew period will have levels of activity which preclude noise sharing, and communities will experience the effects of almost continuous use of the parallel runway system. It will take approximately 13 hours to recover from a two-hour weather event in the morning peak.

By 2060, the economic and social benefits of some 54 million passenger movements per year and more than 760,000 tonnes of air freight per year will be foregone,[124] with the cumulative impact expected to be as high as 665 million passenger movements between 2035 and 2060.

As access to the city by air becomes constrained, and as delays grow, Sydney's reputation as a global city, the attractiveness of the region for business and as a host for major events will decline.

The nature of impacts

A number of studies[125] have identified a range of impacts which arise when aviation capacity is limited, including:

- direct impacts on aviation-related activity, such as the activity of passengers, freight operators, airlines and airports;
- effects on aviation-facilitated activity, such as tourism and freight expenditure; and
- indirect and catalytic effects that the aviation sector has in facilitating developments in other businesses and improving personal wellbeing in the broader economy.

Impact on aviation-related activity

Aviation-related activities and businesses serving aviation (airport operators, airlines, retail businesses and freight operators) generate significant economic activity for NSW and Australia.

If the industry is limited in its growth, with new activity suppressed or displaced interstate or overseas, a significant level of aviation-related economic activity will be foregone.

124 This assumes a consistent volume of tonnage is carried per passenger aircraft movement, as described in Part 3.
125 Cited by Ernst & Young in Technical Paper B7.

Increasing congestion and delays, and the impact on passenger welfare

If aviation capacity does not keep up with demand, not only will the growth of passenger and freight travel be restricted but increased delays will be experienced. Travellers and freight already face a level of congestion and delay at Sydney (Kingsford-Smith) Airport. Other factors that can result from delays at the airport or in the air include:

- longer queues for passengers;
- increased time taken to load and disembark passengers, baggage and freight;
- extended wait time for aircraft on aprons, taxiways and runways, and potential en route delays or extended holding patterns for aircraft in the air.

Increased queuing, congestion and delay in the aviation sector also have an economic cost associated with the value of time for users. The additional time taken to access and use an airport, including accommodating the risk of delay, adds to the opportunity cost of users in choosing to access the airport. This diverts time and assets which could be better spent elsewhere.

Additionally, when the airport is operating close to full capacity, there will be a higher propensity for further unexpected delays with less ability to catch up. The impact of adverse conditions in the morning peak to a day's schedule was discussed in Part Four of this Report. In a constrained environment it will take longer to clear the backlog and recover.

Service reliability is an important factor for passengers; estimates suggest unexpected wait time is valued by travellers to be three to four times as important as normal wait time.[126]

Delay impacts on connecting services

Sydney (Kingsford-Smith) Airport is strongly interconnected to other major Australian airports. Delays at the airport impact significantly on the performance of the national aviation system and cause delays and associated costs for passengers at other airports.

Delays in the system also contribute to the frequency of missed connections. Table 15 shows the proportions of international passengers from five capital cities who travel via Sydney (Kingsford-Smith) Airport.

Table 15 International passenger traffic travelling to capital city airports via Sydney (Kingsford-Smith) Airport, 2010

	Final Origin or Destination				
	ADL	BNE	CBR	MEL	PER
Proportion of international passengers travelling to and from other Australian destinations who transfer through Sydney (Kingsford-Smith) Airport (per cent)	22	9	65	9	5

Source: Market Information Data Tapes (MIDT) and Booz & Company analysis. MIDT provides passenger ticketing data captured by the Global Distribution Systems, such as indirect passenger bookings.

Large proportions of passengers from other states connect through Sydney (Kingsford-Smith) Airport for travel to the following major markets:

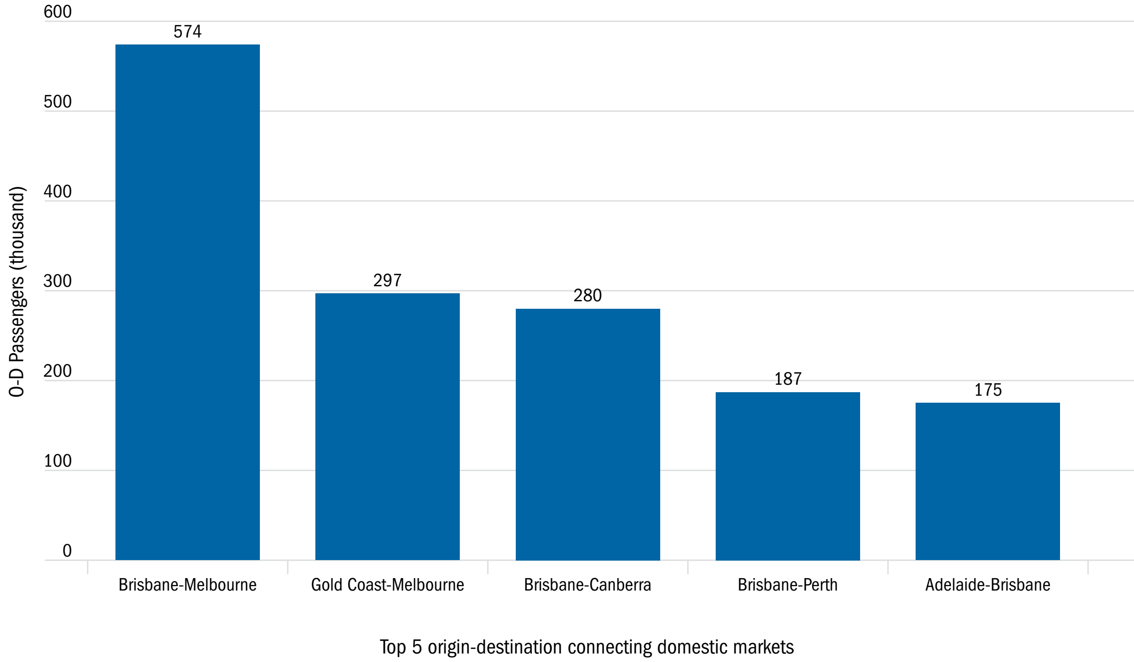
- **Europe, Asia, Middle East and Africa:** Queensland (38 per cent of passengers connecting between these destinations) and Victoria (33 per cent);
- **the Americas:** Victoria (42 per cent); and
- **New Zealand:** Queensland (39 per cent) and Victoria (20 per cent).

126 Australian Transport Council, *National Guidelines for Transport Sydney Management in Australia Volume 4, 2006.*

Delays at Sydney (Kingsford-Smith) Airport therefore have significant impacts for individual states, outside of NSW.

In terms of domestic passengers, there are a number of domestic markets connecting via Sydney (Kingsford-Smith) Airport. In 2010, there were 2.5 million domestic passenger connections through Sydney (Kingsford-Smith) Airport.[127] This is about 10.3 per cent of total domestic and regional passenger movements at Sydney (Kingsford-Smith) Airport. The five domestic markets that comprise the majority (61 per cent) of total domestic connecting traffic over Sydney (Kingsford-Smith) Airport are presented in Figure 112.

Figure 112 **Top five domestic markets connecting through Sydney (Kingsford Smith) Airport, 2010**



Note: O-D represents origin-destination – city pairs where a passenger starts and ends their journey (that is, this does not consider intermediary stops, in this case Sydney (Kingsford-Smith) Airport.)

Source: Booz & Company analysis of MIDT data.

A 24-hour snapshot of these five markets was undertaken to illustrate the potential effect of a missed connection on a passenger. As shown in Table 16, on 12 November 2010, the average effect for a passenger on these routes missing a connection at Sydney (Kingsford-Smith) Airport would have been a delay of 93 minutes. It can be expected that the incidence (and possibly impact) of such delays will only get worse as capacity is further constrained.

Further detail on the impact of aviation service delays is available in Technical Paper B8.

127 Booz & Company analysis of MIDT data for 2010.

Table 16 Delay minutes for passengers missing connections through Sydney (Kingsford-Smith) Airport, 12 November 2010

Origin–Destination Markets	Qantas and Jetstar	Virgin Australia	Tiger Airways	Average
Brisbane–Melbourne	37	58	n/a[1]	48
Melbourne–Brisbane	60	60	160	93
Gold Coast–Melbourne	61	83	130	91
Melbourne–Gold Coast	92	60	n/a[2]	76
Brisbane–Canberra	73	314	n/a[3]	194
Canberra–Brisbane	53	60	n/a[3]	56
Brisbane–Perth	158	190	n/a[3]	174
Perth–Brisbane	69	60	n/a[3]	65
Adelaide–Brisbane	64	60	n/a[3]	62
Brisbane–Adelaide	101	175	n/a[3]	138
Average Weighted by Origin–Destination Passengers	69	100	145	93

Note: This is the weighted average of delay minutes based on an analysis of airlines operating on the top five domestic origin–destination markets connecting through Sydney (Kingsford-Smith) Airport.
N/A (1) Analysis not undertaken for this route as Tiger Airways had no Brisbane-Sydney services on the date of analysis.
N/A (2) Delay minutes not calculated for this sector as the Tiger Airways schedule would require passengers with missed connections to either wait for a flight the next day or switch to another airline.
N/A (3) Tiger Airways did not fly those routes in 2010.

Source: Booz & Company analysis of OAG data (of airline schedules and related data) for 12 November 2010

Aviation delays will be also compounded by delays in surface transport access to Sydney (Kingsford-Smith) Airport. Queues and congestion will be experienced at key access points as a result of slower traffic on roads and fuller trains.

Over time, these delays could deter demand, with some passengers electing not to undertake air travel due to the growing transit times, congestion and the risk of further unexpected delays. While, for some, congestion and delay may result in trips being cancelled, for others it will result in longer trip times and costs in terms of efficiency.

Delay impacts on airlines

Not only will passengers be affected by delay but airline operations will also be affected across the network. Airlines rely more and more on high utilisation of aircraft, setting demanding schedules for the use of each aircraft across different airports during the day. Once an aircraft is delayed at one airport, such as at Sydney (Kingsford-Smith) Airport in the morning peak, it may be difficult to make up time in an already tight schedule. An initial delay in a flight from Sydney is likely to create a flow-on effect as other services are also affected.

Limiting service options

A high degree of connectivity is critical in maintaining the reputation of Australia and Sydney as world-class destinations for business and leisure, particularly given the geographical distance between Sydney and many other cities. In a country of Australia's geographic size, reliable and affordable air transport links are also important for ensuring access to and from other cities and regional/remote communities.

International airlines plan their routes and scheduling carefully to maximise commercial returns. Some airlines, if unable to secure suitable access to Sydney (Kingsford-Smith) Airport, will not operate to Australia at all, opting for alternative destinations.

Australia already faces challenges as a long-haul end point destination and because of its remoteness from key partners in Europe, the United States and Asia.[128] Limiting service options and efficiency of connections is likely to exacerbate this.

A number of airlines that have recently started operations in Australia have decided to base their operations in cities other than Sydney, despite their acknowledgment that Sydney has a sizable and attractive market. Key reasons for this are likely to be the constraints on obtaining movement slots at more viable times of day, the need for suitably paired arrival and departure slots, the impact of the curfew at Sydney (Kingsford-Smith) Airport and the slot constraints of airports at the other end of the desired route.

The current lack of unallocated protected regional slots in peak periods means no new intrastate services can be operated to Sydney in these times. For the communities involved, opportunities for improved access to professional services, business opportunities and connections between communities will be lost.

As movement slots become less available by 2035, airlines are also likely to give preference to higher-yielding routes they can serve with larger aircraft. These routes may not necessarily correlate to the routes of greatest social benefit.

Impact on employment in the aviation industry

As mentioned in Part Two, approximately 60,000 people are currently employed in the air transport sector and many more are engaged in the retail, hospitality and service industries on airport sites.[129]

International evidence shows that airports are significant generators of employment, with about 1,000 jobs being created for every million passengers at an airport.[130] Australian airports generate a similar number of jobs and are associated with employment growth in the immediate vicinity that is substantially higher than their city's overall rate of employment growth.[131] Employing industries include those directly servicing aviation, such as accommodation, hospitality and air services, as well as industries that value proximity to airports, such as electronics and pharmaceuticals. In addition, a new airport expands the industry base of the local economy, increasing local resilience to domestic economic downturns.[132]

If aviation capacity is not increased to meet the growth in demand, it will similarly limit the growth of new jobs in NSW in a range of sectors, including tourism, airlines, airport maintenance and construction, and aircraft maintenance.

Impact on aviation-facilitated activity

The direct impact on business and the economy of constrained aviation activity has been discussed above. In the medium to long term, constraints to aviation growth will have flow-on effects to other industries. Aviation in the Sydney region underpins key components of the economic activity in NSW and the national economy by facilitating:

- tourism by domestic and international visitors who arrive in the region by air; and
- the movement of freight goods that are transported to and from the Sydney region by air.

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128 Flight times from Sydney to Australia's nearest international partners are approximately 3.5 hours (for Auckland, New Zealand) and eight hours (for Jakarta, Indonesia). In contrast, access by European countries to their neighbours is typically one hour to three hours, or less than six hours to northern African states and the Middle East.

129 ABS Cat. 5206.0 *Australian National Accounts: National Income, Expenditure and Product* and ABS Cat. 6291.0.55.003 *Labour Force, Australia, Detailed, Quarterly*.

130 Robertson, J.A.W, Airports and economic regeneration, *Journal of Air Transport Management,* 1995; and York Aviation, *The social and economic impact of airports in Europe,* Report prepared for Airports Council International, 2004.

131 BITRE analysis of ABS, *Census Population and Housing 2006 (also 2001 Census),* 2006.

132 BITRE, *Economic Benefits of Airports,* 2011.

Tourism and business travellers

Constrained aviation capacity in the region will result in unmet demand for tourist travel to NSW and Australia, as new services will be unable to have access to suitable slots. This will be particularly the case for growing international markets such as China. The impact will particularly be felt, as the limited availability of slots will also affect the growth of low cost carriers and other new, innovative airline products which have been driving growth in recent years.

Tourists could travel to other parts of Australia, but many will instead choose other international locations, especially when the Australian dollar is high. Losses to the tourism industry (including business travel) could result in lower expenditure in other visitor-impacted industries, a reduction in potential economic activity and foregone employment growth in a range of sectors.

Freight

Access to efficient air freight services is an important element in many contemporary businesses. While alternatives such as express road freight may be available in some cases, the nature of many freight deliveries (for example, fresh produce and ‘live’ medical supplies) makes the longer times required for road travel impracticable, particularly over significant distances. The curfew at Sydney (Kingsford-Smith) Airport already limits its potential for overnight freight activities.

Businesses which rely on air freight services will choose locations which provide convenient access to those services. Any lack of convenient access to air freight services and facilities for Sydney businesses will result in foregone expenditure, economic activity and employment for the region and the state.

Commercial developments

Another implication of suppressed demand for aviation-facilitated tourism and business is its impact on the associated commercial developments that will otherwise accompany that activity. Airports now often feature business parks and logistics centres and are increasingly more than transport interchanges, creating sizable economic growth centres in their own right. These typically form as businesses identify the efficiency gains of co-locating with complementary service providers and business partners.

In a constrained aviation environment, associated development of business parks and hotels, redistribution centres, freight and logistics handling terminals and other synergistic businesses will also be constrained, though this can also happen when a small airport site has already been extensively developed. This will have downstream impacts on growth and productivity.

The Kenan Institute Centre for Air Commerce has argued that a new urban form is emerging – the Aerotropolis – creating an airport city with clusters of aviation-linked businesses and associated residential development.[133] By locating near each other, firms can benefit from significant economies of scale and network effects.

Sydney (Kingsford-Smith) Airport has already been included in the Global Economic Corridor identified by the NSW Government as a key centre of development in the Sydney region.

A UK analysis of trends in airport cities in Hong Kong, South Korea and Taiwan has demonstrated that, with the growth in passenger flows and related logistical activities, some airports have added intermodal functions, a wider array of organisations and enterprises and have become the focus of a logistics economic zone. In addition, the developments of Seoul, Atlanta and Memphis airports were all cited in the UK analysis as being the catalysts for nearby clusters of

133 *Strategic development trend and key factor analysis of Airport City in Taiwan, 2011,* cited by Ernst & Young.

development, with a $23.6 billion development housing 65,000 residents and 300,000 offices workers being proposed upon reclaimed land near Seoul's Incheon Airport in South Korea.[134]

Additional aviation capacity could provide:

- agglomeration benefits from businesses clustering nearby airports;
- productivity increases from improved transport connections by the provision of aviation services;
- economic attractiveness and connectivity of Sydney, NSW and Australia;
- facilitation of international and interstate trade connectivity; and
- continued attractiveness of Sydney for foreign direct investment in business and events.

Productivity

Provision of efficient aviation capacity has the potential to reduce transport costs, improve transport quality and increase productivity for businesses, freight operators and other airport users.

Boosting productivity growth is a strong focus of the Australian Government and all state and territory governments. In recent years, productivity growth has fallen well below historical levels, in part, due to growing traffic congestion within Australia's larger capital cities.

International trade can increase economic growth. The availability of both air freight and passenger services plays a vital role in facilitating trade and enabling businesses to serve bigger markets. The ability to serve a larger market is likely to have a significant impact on the ability of businesses to innovate and potentially leads to increased sales and profits, more scope to exploit economies of scale and increased competition. Econometric research conducted by Oxford Economic Forecasting across 24 countries in the European Union suggests that, other things being equal, a 10 per cent increase in output of air services will raise productivity and potential output by 0.56 per cent in the long term.[135]

Economic attractiveness and connectivity

Integrated transport networks help businesses to access larger markets. The widespread use of aviation, which in Australia has seen a broad trend of falling air fares over the last two decades, is a key driver in the transformation of the connectivity of both the manufacturing and service sectors globally. As a part of a national and global transport network, airports play an important role in attracting international events, as well as supporting new employment and education opportunities.

Connectivity generates wider economic benefits for businesses through the efficiency of direct linkages and also by providing an environment that benefits businesses, including access to an international labour force, as well as customers, suppliers and knowledge-sharing around the world. Global connectivity is particularly important for those sectors characterised by internationalised, high-value products and services which are dependent on mobile workforces and face-to-face relations. These include high-tech sectors, pharmaceuticals and financial and business services.

In a detailed review undertaken by Oxford Economic Forecasting for the International Air Transport Association, nearly 85 per cent of firms reported air services were important for their sales and more than half of the businesses surveyed believed their ability to compete internationally would be very severely or moderately affected by constraints on the availability

134 Mayor of London, *A new airport for London Part 1, January 2011*, as cited by Ernst & Young.
135 Oxford Economic Forecasting, *The Economic Contribution of the Aviation Industry in the UK,* October 2006, cited by Ernst & Young.

of air transport.[136] In particular, the ability to hold face-to-face meetings with overseas contacts is perceived as crucial to doing business effectively. While it has been argued developments in communication technology (for example, the use of video conference facilities) should diminish the importance of air travel in business, a number of studies have concluded this is not the case due to the importance placed by businesses on building strong personal relationships with their clients.[137]

In addition, it has been argued there is a direct correlation between connectivity through a hub airport and a country's trading performance. For example, in the context of the United Kingdom (UK), analysis has suggested that a lack of direct flights from London Heathrow Airport to emerging markets (including Manila, Guangzhou and Jakarta), may already be costing the economy $1.2 billion each year as trade goes to better-connected competitors.[138] This is despite a recent study conducted for the UK Government which found London had better connections to the key business centres of the world than any other European city (with 1,113 departure flights to the key business destinations in the week studied compared with Paris's 499, Frankfurt's 443 and Amsterdam's 282).[139] While a similar study has not been completed for Sydney, the implications are relevant.

Workforce productivity

The international labour force is particularly significant to Australia's economy in certain skilled sectors. As highlighted by the Productivity Commission,[140] migration contributes to the economy in many ways, including the upskilling of the workforce, economies of scale and the development of new export markets. Indeed, the Productivity Commission concluded increasing skilled migration would make a positive overall contribution to Australia's future per capita income levels. Maintaining strong aviation links will be important to enable the effective flow of international labour both in and out of Australia.

Foreign investment in business and events

Constraints to aviation growth can damage the competitive position of individual companies based in Sydney and reduce the attractiveness of Sydney for foreign direct investment.[141] It can also erode Sydney's national and global competitiveness as the city loses its edge as a gateway to the nation for international travellers. The economic impacts of inaction can lead businesses to relocate to more accessible domestic or international destinations. Businesses considering options for investment or business travel may look elsewhere.

For example, organisers of key business meetings, major events or international conferences may be dissuaded from using Sydney as the venue due to the growing likelihood of travel delays, the larger planning implications required in organising the event (moving large volumes of people through a crowded airport and congested roads) and the overall costs (to pay for services in limited supply).

5.2 Cost of impacts

Many of the impacts associated with aviation infrastructure are difficult to monetise. It is difficult to show a precise link between certain levels of aviation activity and services and the wider economy, due to the inevitable complexity of factors that underpin events such as location or investment decisions by companies.

136 International Air Transport Association, *Airline Network Benefits,* 2007, cited by Ernst & Young.
137 Cited in analysis undertaken for Mayor of London, *A new airport for London Part 1,* January 2011.
138 Frontier Economics, *Connecting for growth: the role of Britain's hub airport in economic recovery,* September 2011, cited by Ernst & Young.
139 AirportWatch, *International Air Connectivity for Business,* 2011, cited by Ernst & Young.
140 Productivity Commission, *Economic Impacts of Migration and Population Growth,* 2006.
141 Ernst & Young, Technical Paper B7.

In other instances, while a dollar cost can be put on time, personal or business expense, it may not fully reflect the value an individual will place on the opportunities air travel makes possible, such as access to professional services (including city-based professionals travelling to regional communities); connecting families; leisure, study or business activities; and economic opportunities. Similarly, it is difficult to fully capture how some people value the time lost when delayed on a plane, at an airport or caught up in traffic elsewhere on the transport network travelling to or from an airport.

For these reasons, any analysis of cost is likely to understate the overall implications of capacity limitations.

Approach to analysis

Ernst & Young, in association with the Centre of Policy Studies (CoPS) at Monash University, undertook an assessment to quantify the economic costs of not proceeding with additional aviation capacity in the Sydney region, using a bottom-up economic computable general equilibrium (CGE) model of the Australian economy.[142] The analysis estimated the potential economic impacts of not acting, with consideration of the cumulative impact in 2020, 2035 and 2060.

Analysis was based on the Booz & Company forecasts for unconstrained aviation demand and the expected capacity shortfall in the Sydney region detailed in Parts Three and Four of this Report. Supplementary information was sourced from the Bureau of Infrastructure, Transport and Regional Economics (BITRE) and other government references, as well as international case studies.

The analysis assessed the direct economic impacts of not acting to meet unconstrained demand in the Sydney region, and then calculated the indirect impacts on economic growth and employment. It was undertaken from both the perspective of the NSW and the Australian economies, as the consequences of limited capacity have both local and national impacts.

The following direct economic impacts were able to be quantified and incorporated in the analysis:

1. **delays and passenger welfare:** the impact of lost value of time on travellers from flight delays, peak demand spreading and, ultimately, the lack of capacity and opportunity to access aviation services;
2. **aviation and airports:** losses to airports and the aviation industry as a result of passengers who will not fly – this includes the impacts on airlines and airport retail outlets;
3. **tourism:** losses to the tourism industry (including business travel) and other industries within which visitors to NSW and Australia undertake expenditure;
4. **freight:** losses to the freight industry in terms of foregone domestic and international freight expenditure;
5. **commercial developments:** losses in traveller expenditure in business industries – for example, revenue and employment; losses to commercial business parks and hotels in the airport vicinity as a result of reduced number of passengers flying in the region.

The estimates of the direct impacts listed above were incorporated into a CGE economic model, which estimated the flow-on effects of those initial impacts on other industries and activities in the economy. This estimation of indirect and total impacts of not proceeding with provision of additional aviation capacity in the Sydney region was captured in terms of:

142 The assessment was undertaken using The Enormous Regional Model (TERM) general equilibrium model developed at the CoPS (the version comprising 144 industry sectors in 57 regions). It is a bottom-up economic CGE model of Australia which treats each region of Australia as a separate economy.

- **expenditure:** impacts on the main components of economic activity from an expenditure perspective (comprising private consumption, investment and international exports and imports);
- **value add:** impacts on GSP and GDP in terms of value add (that is industry profit and wages, a net benefits figure). This is a measure of the value of goods and services minus the value of intermediate consumption at purchase prices; and
- **employment:** the estimated change in employment in terms of FTE employment numbers.

There is a range of possible outcomes for unmet aviation demand in the Sydney region:

- it may enter NSW through different transport modes (road, rail);
- it may enter NSW through airports other than Sydney (Kingsford-Smith) Airport (Canberra Airport or Newcastle Airport);
- it may be redistributed to other airports in Australia;
- it may be redistributed to airports overseas; or
- it may be suppressed, with travellers deciding not to travel.

Any demand that can no longer be accommodated in NSW will represent a loss to the NSW economy. Moreover, the level of unmet demand that is either redistributed overseas or suppressed will represent a loss to not only the NSW economy but to the Australian economy as a whole.

In order to factor this into the assessment of economic impacts, but reflecting the challenges in accurately estimating possible demand outcomes over the long term, low, medium and high scenarios were developed to enable analysis of a range of possible redistribution/suppression outcomes.

This Report presents the medium scenario, unless otherwise stated. The full Ernst & Young analysis can be found at Technical Paper B7.

Direct economic impacts on aviation and related industries

Economic activity

Table 17 presents the flow of expenditure and value add (impact on GSP/GDP) estimated over the 50-year period from 2010 to 2060. The outcomes of the analysis (discounted to 2010 dollars) show:

- foregone direct expenditure of $29.7 billion for NSW and $21.2 billion for Australia; and
- foregone direct value add (GSP/GDP impact) of $8.1 billion for NSW and $5.6 billion for Australia.

Any delay in acting will result in foregone direct economic activity. Over the period to 2035, foregone activity could total $5.1 billion in expenditure for NSW and $4.7 billion for Australia. In terms of value add, GSP impact of $100 million will be foregone in NSW and a GDP impact of $100 million will be foregone in Australia.

Table 17 **Foregone direct expenditure and value add (medium scenario, 2010 dollars, $ billions)**

		2011–2035		2011–2060	
Economic Indicator	Jurisdiction	Undiscounted	Discounted	Undiscounted	Discounted
Expenditure	NSW	16.4	5.1	401.9	29.7
	Australia	14.7	4.7	268.5	21.2
Value Add	NSW	3.9	0.1	113.1	8.1
	Australia	3.5	0.1	73.2	5.6

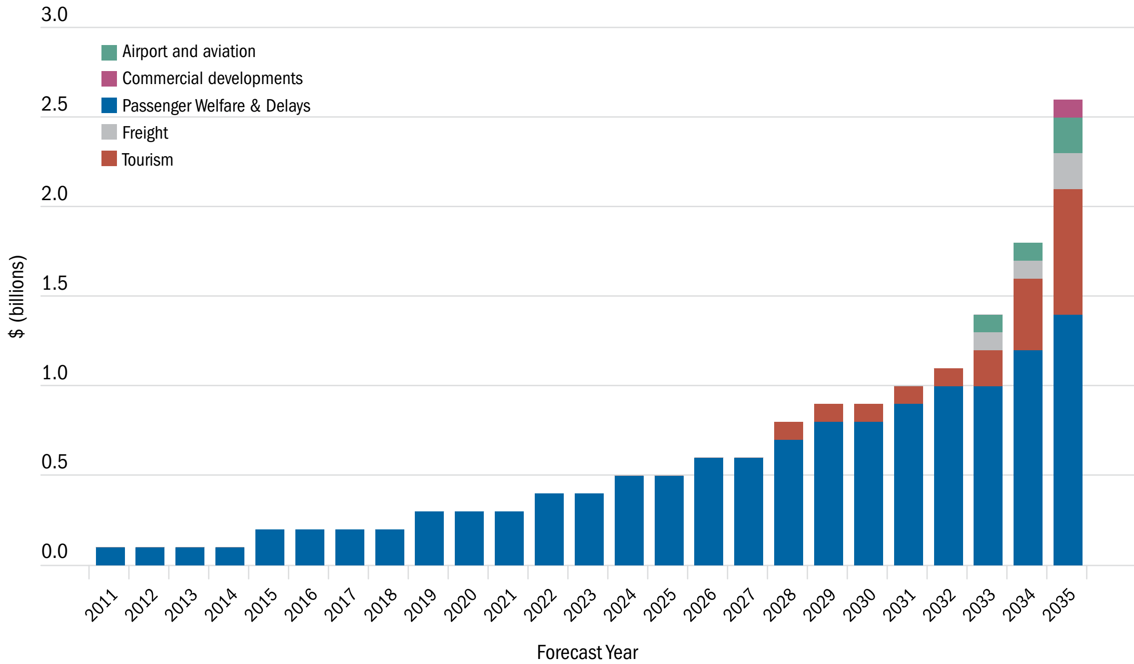
Note: Australia includes NSW.
Source: Ernst & Young, medium scenario.

As can be seen, there is some difference between the level of foregone expenditure and value add for the Australian economy relative to the NSW economy alone. This is because, while some travellers, airlines or freight operators may no longer travel as a result of capacity shortfalls experienced in the Sydney region, some travellers are expected to divert to other Australian cities such as Melbourne, Brisbane or the Gold Coast. The economic impact is therefore transferred from NSW to another state, negatively affecting NSW tourism and the NSW economy but having no overall impact on the Australian economy. Where travel is suppressed and not diverted to an alternative mode of travel or airport, this will result in a loss to both the NSW and Australian economies.

Expenditure

Figure 113 presents the expected annual foregone expenditure in NSW over the short and medium term, based on the five direct impact categories identified above and for a medium elasticity scenario. Over the initial period to approximately 2024, expenditure into the economy expected to be lost due to passenger delay is estimated to amount to less than $500 million per year. However, the impacts on passenger delay and welfare is estimated to increase over time as congestion increases and capacity shortfalls are experienced across more operating hours of the day. The impacts on expenditure foregone become more pronounced by 2035.

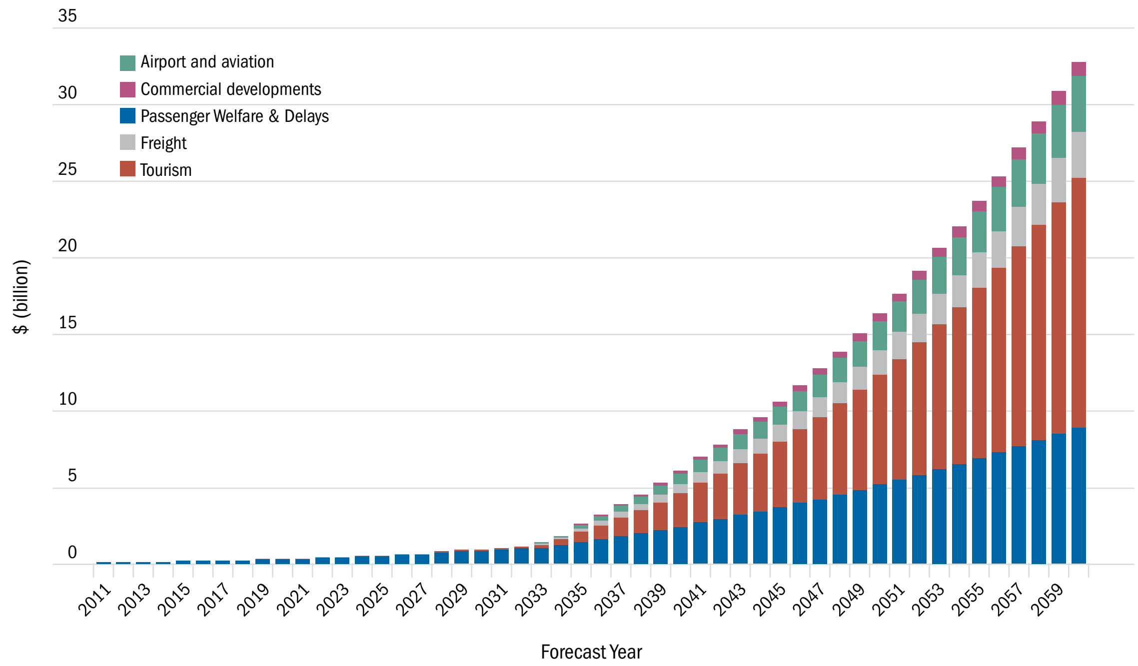
Figure 113 **Foregone NSW direct expenditure, 2011 to 2035 (medium scenario, undiscounted)**



Source: Ernst & Young.

The estimated cumulative loss to the NSW economy is $16.4 billion from 2011 to 2035 (undiscounted) or $5.1 billion (in discounted 2010 dollars). The cumulative foregone expenditure in NSW when viewed to 2060 is substantially higher, at up to $401.9 billion (undiscounted) or $29.7 billion in discounted 2010 dollars. This represents a 480 per cent rise on the discounted cumulative loss to 2035. The way this loss grows over time by component, particularly the sizable losses to the tourism sector after 2035, is illustrated in Figure 114.

Figure 114 Foregone NSW direct expenditure, 2011 to 2060 (medium scenario, undiscounted)



Source: Ernst & Young.

Value add

Over the period to 2060, the level of foregone value add is estimated, on an undiscounted basis, at $113.1 billion for NSW and $73.2 billion for Australia (or $8.1 billion for NSW and $5.6 billion nationally on a discounted basis). If more travel is suppressed or redistributed overseas as assumed in the high scenario, the size of the economic losses is far greater, at 1.5 to 1.8 times higher than the medium scenario.

Employment

The direct employment outcomes are presented in Table 18.

Table 18 Foregone NSW direct employment 2011 to 2060 (medium scenario, annual average)

Economic Indicator	2011–2035	2011–2060
FTE Jobs	1,490	44,700

Source: Ernst & Young.

Over the period to 2060 an annual average of 44,700 direct FTE jobs are estimated to be foregone if aviation capacity is not increased to meet demand in the Sydney region. The high scenario shows this could be as high at 74,300.

Total impacts on the broader economy

Economic activity

Total (direct and indirect) economic impacts

The CGE analysis examined NSW state impacts and the national impacts on economic growth of not adding aviation capacity, derived from the direct impacts outlined above. Specifically, the CGE analysis estimated the impacts on GSP and GDP, which are defined as the total market value of goods and services after deducting costs of goods and services, excluding capital costs for NSW and Australia.

The analysis found any delay in acting would result in foregone total economic activity over the period to 2035 totalling $2.3 billion in GSP for NSW and $6.0 billion in GDP for Australia. The cost of not enhancing aviation capacity is estimated to be a reduction in economic activity from 2011 to 2060 of approximately:

- $17.5 billion of foregone GSP for NSW; and
- $34.0 billion of foregone GDP for Australia (both discounted to 2010 dollars).

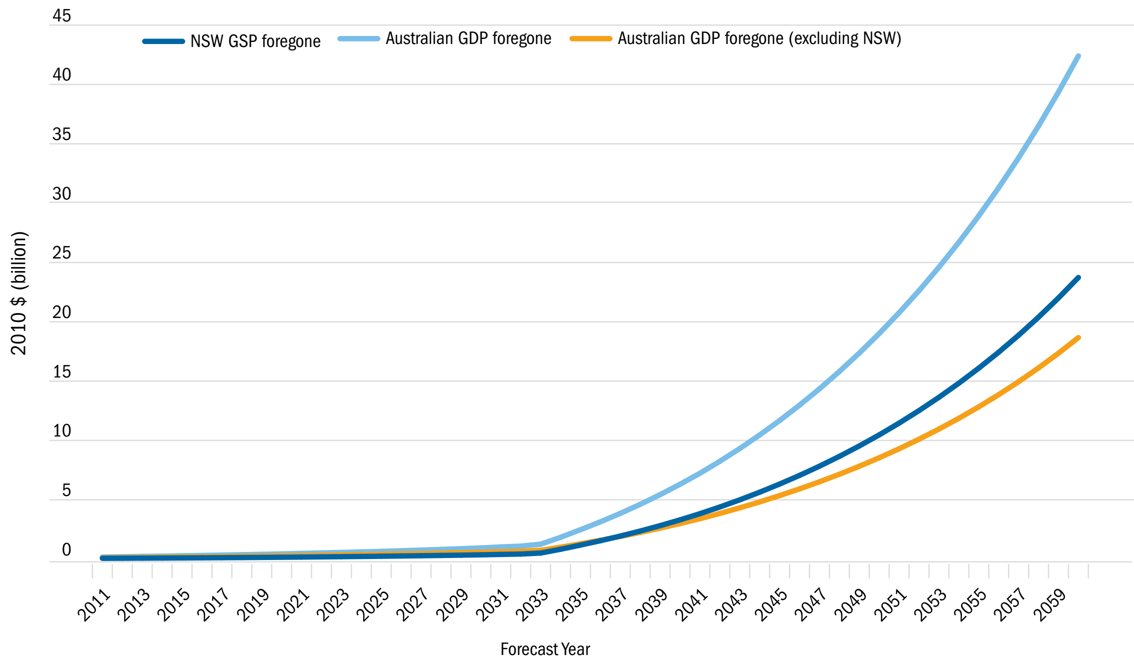
Table 19 Long-term total impacts on GSP and GDP (medium scenario, 2010 dollars, $ billions)

	2011–2035		2011–2060	
Jurisdiction and Economic Indicator	Undiscounted	Discounted	Undiscounted	Discounted
NSW GSP	7.1	2.3	258.8	17.5
Australia GDP	17.7	6.0	747.5	34.0

Note: Australia includes NSW.
Source: Ernst & Young analysis of CoPS and TERM.

The profile of economic activity lost to NSW and Australia over the period to 2060 is presented in Figure 115.

Figure 115 NSW GSP and national GDP (medium scenario, 2010 dollars, $ billions)



Source: Ernst & Young analysis of CoPS and TERM, medium scenario.

The impacts of not adding aviation capacity in the Sydney region on the main components of GSP from the expenditure side are reported in Table 20.

Real expenditure changes estimated are based on changes in private consumption, investment, and impacts on the volume of foreign trade in and out of NSW and Australia. As a whole, the overseas trade position as well as other expenditure is estimated to be lower if aviation capacity within the Sydney region is not expanded.

Any delay in acting will result in foregone total economic activity. Over the period to 2035, foregone activity could total $2.6 billion in real expenditure for NSW and $8.9 billion for Australia (discounted).

Over the period to 2060, analysis found that the cost of not enhancing aviation capacity is estimated to be a reduction in economic activity from 2011 to 2060 of:

- foregone expenditure of $30.6 billion for NSW; and
- foregone expenditure of $59.5 billion for Australia (both discounted to 2010 dollars).

Table 20 **Long-term total impacts on expenditure (medium scenario, 2010 dollars, $ billions)**

	2011–2035		2011–2060	
Jurisdiction	Undiscounted	Discounted	Undiscounted	Discounted
NSW	8.7	2.6	463.7	30.6
Australia	26.9	8.9	838.6	59.5

Note: Australia includes NSW.

Source: Ernst & Young analysis of CoPS and TERM.

NSW total economic impacts

An indication of the annual profile of the foregone expenditure and GSP for NSW is presented in Table 21.

Table 21 **Impact on foregone NSW expenditure and GSP (medium scenario, 2010 dollars, $ millions)**

	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real Expenditure	87	146	249	399	2,065	6,151	11,681	19,094	28,950	42,016
Real GSP	102	160	245	363	1,184	3,310	6,327	10,472	16,096	23,733

Note: Australia includes NSW.

Source: Ernst & Young analysis of CoPS and TERM.

The most significant foregone expenditure and GSP impacts are estimated in the Sydney metropolitan region. However, the CGE assessment indicates there will be adverse impacts in economic performance across most parts of NSW as different areas experience cost increases in aviation movements.

Australia-wide total economic impacts

The difference between the outcomes for NSW and Australia is determined by the impacts on other states and territories – in particular, the extent to which parts of the unmet Sydney aviation demand are shifted to airports in other states.

There were two general influences on real GSP and Australian GDP in the modelling undertaken. The first was positive: resources move from NSW to other parts of Australia when aviation capacity is reached in the Sydney region. In addition, decreased activity in NSW releases labour and capital into other parts of Australia, further increasing activity in those areas relative to NSW. The second is negative: the Sydney aviation constraints are expected to lead to a net decrease in foreign visitor expenditure in Australia as a whole, including outside of NSW.

Later in the analysis period, after the mid-2030s, the impacts on the rest of the Australian economy (i.e. the national economy excluding NSW) as a result of status quo aviation are generally lower than the impact on the NSW economy. This indicates that some of the national resources underlying foregone NSW activity are expected to be drawn to other jurisdictions, causing the economy in the rest of Australia to contract slightly less. In the earlier years, Australian foregone levels of economic activity excluding the impact on NSW are for some years larger than the NSW foregone impacts alone. This suggests that, for those years, the rest of Australia is also negatively impacted from no expansion in aviation capacity in Sydney.

The total impacts for the national economy are shown in Table 22.

Table 22 **Impact on foregone national expenditure and GDP (medium scenario, 2010 dollars, $ millions)**

	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real Expenditure	403	621	938	1,371	4,423	11,635	21,270	34,081	51,039	73,504
Real GDP	281	440	656	944	2,478	6,308	11,681	19,013	28,932	42,405

Note: National figures include NSW.

Source: Ernst & Young analysis of CoPS and TERM, medium scenario.

Employment

The CGE model has also been used to estimate the impact on employment outcomes, which were analysed based on the changes in GSP, GDP and expenditure levels.

The total (direct and indirect) employment outcomes under the medium elasticity scenario are presented in Table 23.

Table 23 **Foregone total employment 2011 to 2060 (medium scenario, annual average)**

Economic Indicator	2011–2035	2011–2060
NSW	400	12,700
Australia	600	17,300

Note: Australia includes NSW.

Source: Ernst & Young analysis of CoPS and TERM, medium scenario.

The number of total jobs that will not be created is estimated to be an annual average of 12,700 FTE positions in NSW over the period between 2011 and 2060, and 17,300 positions in Australia as a whole. The number of foregone jobs is estimated to increase over time as unmet demand increases, such that by 2060, the annual estimate of foregone jobs is approximately 57,000 in NSW and 77,900 nationally. New jobs in NSW will be foregone in a range of sectors, including airlines, tourism, hospitality and aircraft maintenance.

The number of total jobs that will not be created is estimated to grow over time as unmet demand increases. As indicated in Table 24, employment impacts in NSW are modest in the short and medium term but then rise sharply in the long term as peak spreading is fully utilised and the extent of unmet demand rises significantly. Foregone employment impacts are also expected for Australia, though NSW is expected to experience the most significant impacts, given that some NSW employment growth will be transferred to other states. The estimates of total jobs foregone in NSW and Australia. In particular, in 2060 alone, the annual estimate of foregone jobs is approximately 57,000 in NSW and 77,900 nationally.

Table 24 **Foregone NSW and Australian employment, 2015 to 2060 (medium scenario, FTEs)**

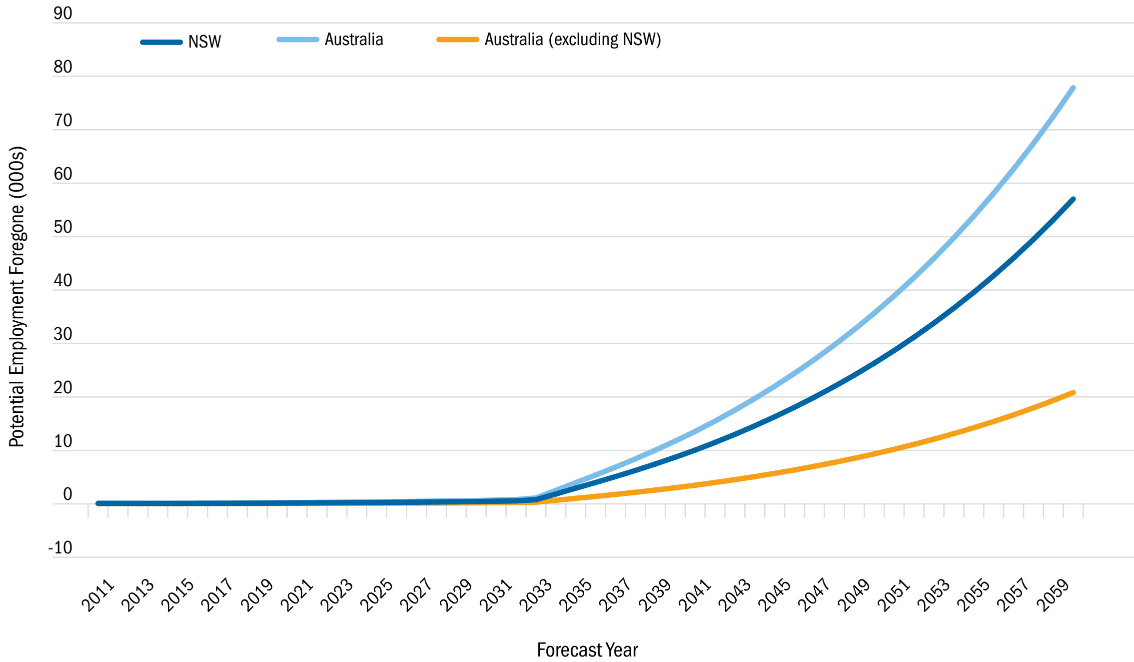
	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
NSW	80	139	257	431	2,938	8,731	16,302	26,329	39,583	57,048
Australia	124	213	382	628	3,975	11,757	22,015	35,681	53,834	77,879

Note: Australia includes NSW.

Source: Ernst & Young analysis of CoPS and TERM, medium scenario.

A graphical comparison of these impacts is provided in Figure 116.

Figure 116 **NSW and Australia employment outcomes (medium scenario)**



Source: Ernst & Young.

The analysis assumes each employee continues to work the same number of hours, and that there is no change in labour productivity over the evaluation period. In reality, some of the increased requirement for labour could be met by increasing working hours of both existing and newly acquired employees or increasing their skill level. Consequently, the analysis is likely to overstate the foregone employment of individuals. However, qualitative impacts – for example, standard of living affected by longer more demanding work conditions – have not been captured.

5.3 Unquantified impacts

Ernst & Young's analysis highlighted a number of other possible impacts which were difficult to quantify. Such impacts should, however, be considered, and include adverse impacts on:

- **regional growth** – while it is difficult to quantify the impact of individual transport investments on overall long-term economic growth and development, Sydney's role and reputation as the 'gateway' to Australia could be at risk if Sydney cannot meet demand for aviation;
- **industry development** – firms may find it more difficult to access emerging markets or connect with key business destinations, which has significant implications for our reputation as a world-class destination for business;
- **tourism** – Sydney's and Australia's international reputation, and the economic and social benefits it generates;
- **social impacts** – contact between residents and friends and families overseas and expanding the choice of products available to consumers. However, quantifying these benefits is challenging, as they are not measured and are highly subjective.

These issues are explored in more detail in Technical Paper B7.

The costs of one further issue – the continuing loss of suitable sites – have not been included in the quantitative analysis but needs to be factored into decision making.

Capacity constraints at Sydney (Kingsford-Smith) Airport have been managed in the past through a variety of infrastructure augmentations. However, as capacity has become more constrained, the improvements have become increasingly incremental. At the same time, the ability to construct and deliver large-scale economic infrastructure within major cities has become more difficult and costly.

As shown in Figure 117, numerous potential sites for alternative airports were identified in studies during the 1970s and 1980s. However, as no decision was made to develop aviation infrastructure at these sites or to protect them for future development, some have progressively been converted to other land uses. A number of these sites have ceased to be viable options. Meanwhile, pressure has continued to grow on existing facilities and resources.

Figure 117 Potential new Sydney aviation sites previously identified

	Benefit/Cost Study of alternative Airport Proposals for Sydney (1971–74)			Major Airport needs of Sydney Study (1977–79)			Second Sydney Airport Site Selection Programme (1983–85)	
	Medium list	Select list	Short list	Zones	Sites/layouts	Short list	Nominated locations	Short list
	Wyong*						Warnervale	
	Somersby						Somersby	
	Richmond**			NW – Londonderry	Londonderry		Londonderry	
	St Marys			Richmond				
North and west of city centre	Blue Gum Ck+	Blue Gum Ck	Blue Gum Ck	Scheyville	Scheyville	Scheyville	Scheyville	
	Marsden Pk	Marsden Pk	Marsden Pk					
	Rouse Hill			N –				
	Galston	Galston		Galston				
	Prospect	Prospect				Sites foregone		
	Duffys Fst							
	Towra Pt	Towra Pt	Towra Pt					
	Wattamolla							
	Long Point++	Long Point	Long Point	S – Holsworthy			Holsworthy	
South and west of city centre	Bringelly	Bringelly	Bringelly	SW – Bringelly	Bringelly		Bringelly	
	Badgerys Ck			Badgerys Ck	Badgerys Ck	Badgerys Ck	Badgerys Ck	Badgerys Ck
							Darkes Forest	
							Wilton	Wilton
	Canberra – Goulburn						Goulburn	

* Later called Warnervale.

** East of the Londonderry site.

\+ Later called Scheyville.

++ Later called Holsworthy.

Source: Department of Aviation Sydney Second Airport Site Selection Programme Draft Environmental Impact Statement prepared by Kinhill Stearns, 1985.

As identified in the Australian Government's *Our Cities, Our Future* National Urban Policy, 'a major impediment to the placement of new infrastructure or the expansion of existing infrastructure is the lack of planning for, and protection of critical infrastructure corridors. A further concern is the adequate protection of sufficient buffers to prevent facilities from being encroached upon by incompatible land uses'.

Continued delay in action to secure an alternative site will increasingly constrain governments' options for future action.

If new capacity is provided, the economic and social benefits could be expected to resume at full natural rates as all passenger demand growth is accommodated. However, the economic and social costs incurred while awaiting extra capacity will never be recaptured.

The choice governments now face is more urgent than in the past, with serious capacity constraints beginning in the near future and serious impacts emerging progressively in the medium term. Given the time required to establish a working airport – as further outlined in Part Seven of this Report – there is a need to commit to action now.

PART SIX

OPTIONS TO BETTER UTILISE SYDNEY (KINGSFORD-SMITH) AIRPORT TO GAIN CAPACITY TO MEET FORECAST DEMAND

P6

Key points

- Sydney Airport Corporation Limited (SACL), Airservices Australia and airline operators are continuing to work on ways to improve efficiencies in operations at the airport. Efficiencies available include airside infrastructure works to add new gates, terminals, taxiway and apron capacity, improved Air Traffic Management procedures, better coordination of arrivals and departures traffic and improved airport ground movements coordination.
  - These are important to help manage congestion and contain delays to some extent but will not address the capacity shortfall in the medium and longer term. This includes the proposed new infrastructure concept outlined by SACL in December 2011.
- There is no real option to increase the capacity of Sydney (Kingsford-Smith) Airport significantly, as:
  - There is no scope to build new runways or to substantially reconfigure or upgrade runways in the existing airport footprint.
  - Options to expand the airport into surrounding suburbs would be prohibitively expensive and would not add any significant new capacity to the airport.
- Options have been raised in the past for an additional runway or new airport at Kurnell, but this would have major environmental impacts and would be prohibitively expensive.
  - Furthermore, airspace interactions with Sydney (Kingsford-Smith) Airport would reduce the level of additional capacity attained.
- Options for changing the legislated operational requirements at Sydney (Kingsford-Smith) Airport could provide some additional capacity but would not meet the medium- to long-term capacity gap, particularly in the peak periods.
- Increasing the movement cap and slot allocations to allow 85 movements per hour in the weekday morning and evening peaks (a one per cent increase in total slots per day) would postpone the impacts of capacity pressures by only one year; however this would be targeted to provide additional capacity at times with the greatest constraint (that is, six per cent increase in total peak slots).
  - Increasing the movement cap to 85 movements per hour for all non-curfew hours would provide a six per cent increase in total slots available to be allocated. This would be expected to result in approximately a three-year postponement of the impacts.
- Increasing the permitted movements during the curfew shoulder periods would have minimal impact on capacity pressures.
  - Allowing movements in the morning shoulder period (5.00am to 6.00am) to the maximum limit permitted under the curfew legislation would only add 0.1 per cent in available slots, although it would assist in clearing the morning international peak arrivals.
  - Allowing movements in the evening shoulder period would have even less impact on the capacity gap, as there are less slots available under the *Sydney Airport Curfew Act 1995* as compared to the morning shoulder.

- Limiting access to Sydney (Kingsford-Smith) Airport by smaller aircraft would potentially open up a small amount of additional capacity for international and domestic services using larger aircraft.
  - A large proportion of regional services are operated with small aircraft. NSW intrastate aircraft movements comprise approximately 20 per cent of all slot allocations and Regular Public Transport (RPT) activity at the airport yet only carry about six per cent of total airport passengers. While the current arrangements support access by regional passengers to Sydney and connecting services, they do not promote efficient economic use of the airport's constrained capacity.
  - Achieving a 30 per cent reduction in the number of movements by aircraft up to 40 seats could free up to two per cent of total airport slots depending on the level of services merged or withdrawn, providing for growth of larger aircraft movements for approximately one year.
- A reduction in the protection of access to Sydney (Kingsford-Smith) Airport by intrastate services would raise broader issues for government consideration, including the impacts on:
  - regional centres which rely on convenient aviation links to the state capital for a range of social and economic activity;
  - viability of regional aviation operators; and
  - regional passengers, a high proportion of whom transfer onto domestic and international flights at Sydney (Kingsford-Smith) Airport.
- There is a need to address the growth of congestion in the road network serving Sydney (Kingsford-Smith) Airport.
  - A key element is to increase the use of public transport – in particular, the train services operating to stations at the Domestic and International Terminals but also bus services.
  - Investment in upgrading roads and intersections around the airport will also be essential.

With continued population growth expected, the Sydney region faces significant RPT capacity shortfalls to meet the forecast demand. On conservative forecasts of just under three per cent per year, RPT traffic growth is expected to double in less than 25 years to nearly 88 million passenger movements and to nearly quadruple to 165 million passenger movements by 2060; with approximately 800,800 RPT aircraft movements forecast in 2060.

As the busiest airport in the region, in terms of passenger movements, the focus will be on Sydney (Kingsford-Smith) Airport to meet that demand.

- Notwithstanding the continued upgauging of aircraft and extension of terminal and gate facilities, demand at Sydney (Kingsford-Smith) Airport will begin to exceed its capacity in the peak and shoulder periods in the near future.
  - It is estimated, by 2015, there will be a shortfall of 25 aircraft stands compared to projected demand based on the infrastructure shown in the *Sydney Airport Master Plan 2009* (the Master Plan). This shortfall could be reduced if terminal and apron work proposed in the Master Plan is brought forward.

- By 2020, there will be an estimated shortfall of 18 stands, even if works proposed in the Master Plan for 2014 to 2019 have been completed.

- In addition, by 2020, all slots on weekday mornings between 6.00am and 12noon and between 4.00pm and 7.00pm will be fully allocated, so growth of passenger capacity at these times will be dependent on aircraft upgauging.
- By 2035, unconstrained forecast demand at Sydney (Kingsford-Smith) Airport will be approximately 77 million RPT passenger movements and approximately 460,000 aircraft movements (including 428,900 RPT aircraft movements) above its current practical capacity.

The Steering Committee has explored a range of policy and infrastructure options to better utilise Sydney (Kingsford-Smith) Airport both on and off airport to cater for the forecast demand.

6.1 Options for better use of Sydney (Kingsford-Smith) Airport

Expansion of physical capacity

Given Sydney (Kingsford-Smith) Airport has little scope to expand within its current land footprint, a range of options has been proposed in the past to expand the airport beyond its boundaries. Possible options included:

- expansion to the area near Kurnell or the adjacent Botany Bay;
- development of an offshore airport; and
- additional or modified infrastructure, such as extending the Sydney (Kingsford-Smith) Airport shorter north-south runway (16L/34R) or constructing a second east-west cross-runway.

The findings and recommendations of previous analyses were considered by the Steering Committee to determine whether the findings remain relevant in today's context. More information can be found in Technical Paper C1.

Expansion to Kurnell / Towra Point area of Botany Bay

There have been a number of proposals considered previously for expansion of Sydney (Kingsford-Smith) Airport into the Towra Point / Kurnell area of Botany Bay area.

In particular, a 1999–2000 proposal by IAC Aviation Technical Services Pty Ltd involved the development of two new parallel runways in Kurnell, south of the airport. This was designed to enable relocation of international and domestic traffic to the new site while retaining Sydney (Kingsford-Smith) Airport for intrastate and General Aviation (GA) traffic. However, the proposal, as suggested, would require closing runway 16L/34R and would effectively displace the existing airport without enabling a significant change in capacity in the region.

Other options included developing:

- a full-service international airport at Kurnell with runways parallel to the existing 16/34 runways at Sydney (Kingsford-Smith) Airport; and
- an RPT airport at Kurnell, near parallel with the existing 07/25 cross-runway at Sydney (Kingsford-Smith) Airport. However, services operated there would be limited to certain aircraft sizes, as the runway length would be limited by Botany Bay National Park to the east and Woolooware Bay to the west.

These options are not considered practical on cost and operational grounds. All present airspace management challenges, as they would impact on the existing operations at Sydney (Kingsford-Smith) Airport. This could potentially limit capacity of the existing runways, reducing the capacity gains and cost-effectiveness of any expansion.

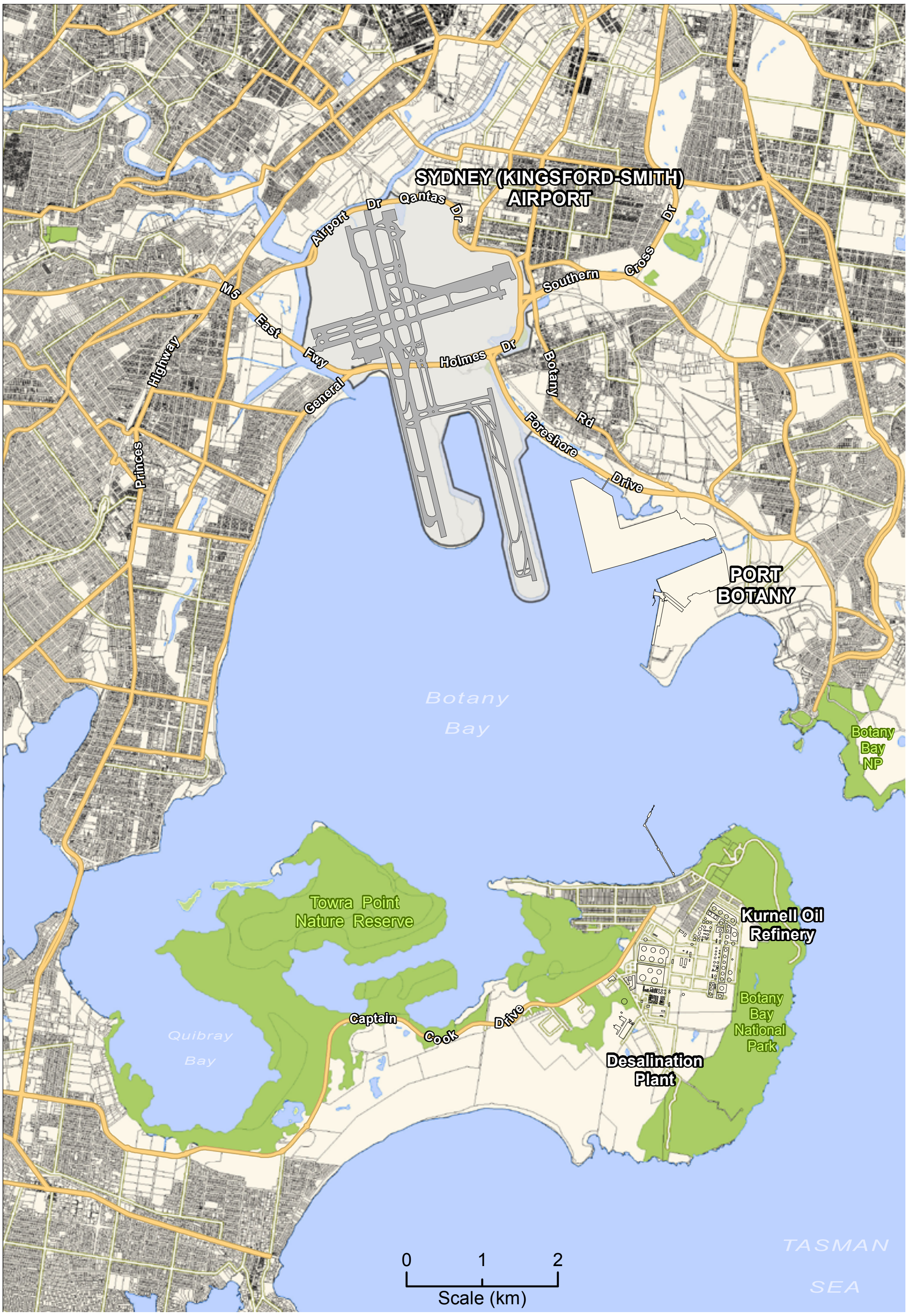
In addition, extensive development in the Kurnell/Port Botany area since such initiatives were initially put forward restricts the land available for development for airport facilities. While an oil refinery has been located at Kurnell since 1952, recent developments in the region include the Sydney Water desalination plant south-west of the refinery and the third container terminal at Port Botany (which itself is capacity constrained by its proximity to the airport).

Given the urban development close to the Kurnell site and the implications for Sydney (Kingsford-Smith) Airport flight paths, an airport development could also increase, not decrease, the number of people exposed to aircraft noise. Given the population density and proximity to the airport, the noise impacts would be greater than possible capacity expansions in other parts of the region. Land acquisition around the airport would be extremely costly and there would be other significant community impacts, such as the number of businesses around the airport, which support airport activity, would find it very difficult to relocate to suitable locations.

Options to develop new runways in the Kurnell area would also have significant environmental impacts on lands and ecosystems. For example, reclamation of land and sand dunes protruding into Botany Bay could have implications for wave energy, beach profiles, water quality and sedimentation, aquatic flora and fauna in the area, and sea level rises. Any option would also affect international commitments entered into by the Commonwealth and efforts by the NSW Government to protect these areas.

The close proximity of the existing airport site to other developments in the region is presented in Figure 118.

Figure 118 **Proximity of Sydney (Kingsford-Smith) Airport to other land use**



Source: Australian Department of Infrastructure and Transport.

Offshore options

A number of offshore areas have been previously examined by the Australian Government. Offshore airports in the vicinity of Sydney (Kingsford-Smith) Airport have been proposed to ensure close proximity to the existing site while limiting noise impacts on surrounding urban areas. Previous analysis has ruled out offshore airport options, as the expense and potential environmental impact would exceed those of the Kurnell options. Passenger access would be expensive to establish and operate, with difficult and costly linkages to the existing networks. Security of infrastructure would now also be a key consideration for such a development.

Modified infrastructure at Sydney (Kingsford-Smith) Airport

A range of potential development options has been proposed relating to additional or modified infrastructure at Sydney (Kingsford-Smith) Airport, such as extending the shorter north-south runway (16L/34R) and constructing a second east-west cross-runway. Such modifications cannot be undertaken within the current airport footprint and would require expansion of the airport boundary further into Botany Bay or into land to the east of the airport.

The extent of further expansion into Botany Bay is limited by the location of Port Botany and the port access needs of container vessels. It may provide for better balancing of the runways and greater efficiency, as larger planes would be able to use it. However, the port capacity would be severely reduced. The lengthening of the shorter runway would also not give any greater capacity than what has previously been estimated by Airservices Australia, as the runway capacity for the parallel configuration would remain the same.

Any extension east of the airport involves significant land acquisition and relocation of roads. Furthermore, while these developments may provide Sydney (Kingsford-Smith) Airport with greater flexibility or options for air traffic management, it is unlikely any of these options would provide the additional capacity required.

For example, an additional cross-runway could allow greater movement levels to be achieved during poor weather conditions, which Airservices Australia states reduces capacity by approximately 10 per cent per year. However, an additional cross-runway would not affect the upper physical parallel runway limit, estimated by Airservices Australia at 85 movements per hour. In addition, such a move would expand the noise footprint over densely-populated areas to the east and west of the airport.

Any new runway infrastructure would also require upgrades to taxiways, aprons and terminal gates, which is unlikely to be able to be undertaken within the limited airport footprint and therefore would require even more land acquisition, again with very little or no improvement to overall capacity.

The size of the land parcel, its location and its surrounds mean that there is little scope to rebuild or extend the site substantially to ensure a more efficient layout to meet the projected long-term demand. In addition, the significant costs and environmental impacts of each of these options are prohibitive to any serious consideration as possible solutions to providing additional capacity at the existing airport.

New SACL concept

In December 2011, SACL announced its intention to work with stakeholders on a new proposal for making use of the airport terminals. At present, the International Terminal precinct (T1) is used by all airlines offering international services, with all major domestic services operating from the Domestic Terminal precinct T2 and T3. Passengers transferring between domestic and international flights need to travel between the two terminal precincts – in some cases, through the Qantas airside transfer bus system; in other cases, by the public road and rail networks. The new concept involves reconfiguring the terminals so that the current Domestic Terminal precinct will accommodate the Qantas Group and its alliance partners for both domestic and international services. The current International Terminal precinct would accommodate Virgin Australia and its partners for both domestic and international services.

The concept also includes the construction of a new Qantas Engineering complex.

The proposal was announced at a concept level and broader consultations are underway to develop the proposal in more detail before any formal decisions can be made to proceed.

SACL's objectives for the proposal are to improve the passenger experience through faster connection times and more efficient airline and airport operations and to minimise operating disruptions, with positive flow-on benefits to the rest of Australia's aviation network. From an airport operations perspective, SACL believes the proposal could reduce aircraft turnaround times and the requirement for crossings of the main runway by aircraft under tow.

The further development of the proposal requires detailed analysis and design, commercial negotiations with a range of parties and a range of regulatory approvals. SACL has announced the intention to finalise the proposal in time for its endorsement in the 2014 Master Plan.

The concept includes the use of common use facilities and swing gates to create flexibility. It is also intended to provide for additional gates and is aimed at delivering eight gates more than anticipated in the Master Plan, with provision for a further 12 gates beyond that.

The two airline terminal concept will not improve runway movement capacity or affect the legislated cap of 80 movements per hour. Nor will it enhance movement capability when under a single runway operation (i.e. Runway 07/25 in adverse wind conditions).

Airservices Australia is working with SACL on the implications of the new proposal, but advises that full consideration has not been given at this stage to operational issues impacting on movement areas and associated air traffic management issues for airborne traffic that may act to inhibit or limit the capacity outcomes being planned.

A range of airside operational and air traffic management concerns may limit the potential of the concept:

- crossing flight paths - for example westbound flights that currently utilise the western parallel runway may shift to the eastern parallel runway causing an airborne cross-over conflict rather than a ground based cross-over. This is a critical safety issue and could limit the realisation of efficiencies;
- new or amended flight paths - the two airline terminal concept may cause a need for amended flight paths or new flight paths to be promulgated which in turn would have environmental implications and the need for associated public consultation;
- relocation of the air traffic tower, VOR, Radar and Aviation Rescue and Firefighting facilities. A major capital project would be required to relocate essential Airservices facilities early on the critical time path for the progression of the concept. Project delivery capacity could oblige Airservices to re-prioritise and defer other capital projects across Australia which currently underpin the five-year pricing and investment agreement; and
- runway balancing issues - a review of runway demand balancing is required particularly with regard to expected upgauging of the fleet. The air traffic management and operational implications of the two airline terminal concept on how the parallel runways are proposed to be used is likely to be a major issue in commercial negotiations with the airlines.

A range of other issues will need to be addressed:

- road works around the airport – notwithstanding the perceived benefits of spreading the peak periods for road traffic at the two terminal precincts, the implications of the new concept for congestion on key roads and intersections on and around the airport will need to be studied, with appropriate strategies developed in consultation with the NSW Government;
- location of hangar and maintenance facilities – the location under consideration for the Virgin maintenance hangar creates an additional issue as aircraft will need to cross the

main runway (if in smaller numbers than is currently required for the Qantas maintenance operations for international aircraft); and

- transitional strategy – a major challenge would be to maintain operational capacity and safety at the airport through the construction and operational changes required.

The Steering Committee welcomes work by SACL with its stakeholders to maximise the efficiency of operations at the airport and to improve the passenger experience. For the purposes of this Joint Study, the Committee notes that, while the proposal may help ensure the airport is operated efficiently and help to make maximum use of the infrastructure, it does not address underlying capacity limitations. In particular, it does not change the maximum capacity of the runway system or address the immediate shortage of gates. Further, it does not provide the additional capacity required to address the growth of demand into the medium and long term.

The Committee is also concerned that essential work on infrastructure upgrades, including additional gates and taxiway enhancements as set out in SACL's *Sydney Airport Master Plan 2009* (the Master Plan), should not be deferred as work proceeds on the new concept.

Air traffic management and other efficiency measures

There are a range of measures and options in development to increase the efficiency of operations at Sydney (Kingsford-Smith) Airport.

New Performance Based Navigation technologies offer advantages over sensor-based navigation, including reduced environmental impact through more efficient use of airspace route placement, fuel efficiency and noise abatement.

The Advanced Surface Movement Guidance and Control System (A-SMGCS) being introduced by Airservices Australia at four of Australia's busiest airports is an air traffic surveillance system enabling aircraft and vehicles on the airport surface to be accurately identified and tracked by air traffic control in all visibility conditions. Commissioned at Sydney (Kingsford-Smith) Airport in 2010, this technology was introduced to improve airport operations, particularly during reduced visibility conditions and at night, and where distances from the control tower make visual contact difficult; and to mitigate congestion experienced, for example, during certain inclement weather conditions.

Airservices Australia is also pursuing the introduction of new collaborative decision-making capabilities to improve air traffic management and realise efficiencies. Three capabilities are being established or improved – namely, Air Traffic Flow Management, Airport Collaborative Decision Making and Integrated Arrival and Departure Management.

While these air traffic management technologies provide a range of benefits in relation to safety, efficiency and managing environmental impacts, they are not expected to provide overall capacity gains to meet forecast demand levels. Instead, they will assist in creating greater efficiency by ensuring the airport can operate as close as practicable to its capacity, with reduced effects from weather and operational impacts, and that, where such impacts do occur, the airport can more quickly recover to full operations.

Review of policy settings

The Steering Committee noted there are three operational policy settings that affect the airport's ability to operate at its full capacity. These are the:

1. demand management system, which imposes a maximum movement limit per regulated hour on the runway and a limit on the slot allocations;
2. curfew, which limits take-offs and landings between 11.00pm and 6.00am; and
3. regional ring fence that protects the number of intrastate NSW movements in and out of the airport.

The demand management system, curfew and regional ring fence provisions were introduced with legislative backing to support specific policy objectives. The movement cap and curfew protect communities from undue impacts of aircraft noise. The regional ring fence ensures appropriate access to Sydney and the CBD for NSW regional communities.

The Steering Committee acknowledges that these provisions have had bipartisan political support for a number of years.

Movement cap and slot allocation

The movement cap and slot allocation system are intrinsically linked. The *Sydney Airport Demand Management Act 1997* sets a cap of 80 movements per hour on the runway and requires that the slot management scheme is consistent with the runway movement cap. In effect, this means that 80 is the maximum for both the runway movements and slot allocation.

As discussed in Part Four of this Report, analysis by Airservices Australia indicates that, in practice, operations of up to 85 movements per hour might be achieved on the parallel runway system in favourable conditions. The Steering Committee has assessed the implications of allowing up to 85 movements per hour, either in peak periods or more generally at the airport.

It should be noted that such a move would involve changes to both the movement cap and the slot allocation arrangements.

- Increasing slot allocations without increasing the movement cap would just add to delays.
- Increasing the movement cap without increasing slot allocation would not change overall capacity but would provide an increase in efficiency by allowing greater ability to recover from delay.

A complete removal of the cap on movements has not been explored. As outlined in Part Four, the physical and operational constraints at the airport will not realistically allow sustained operation over 85 movements per hour for more than short periods.

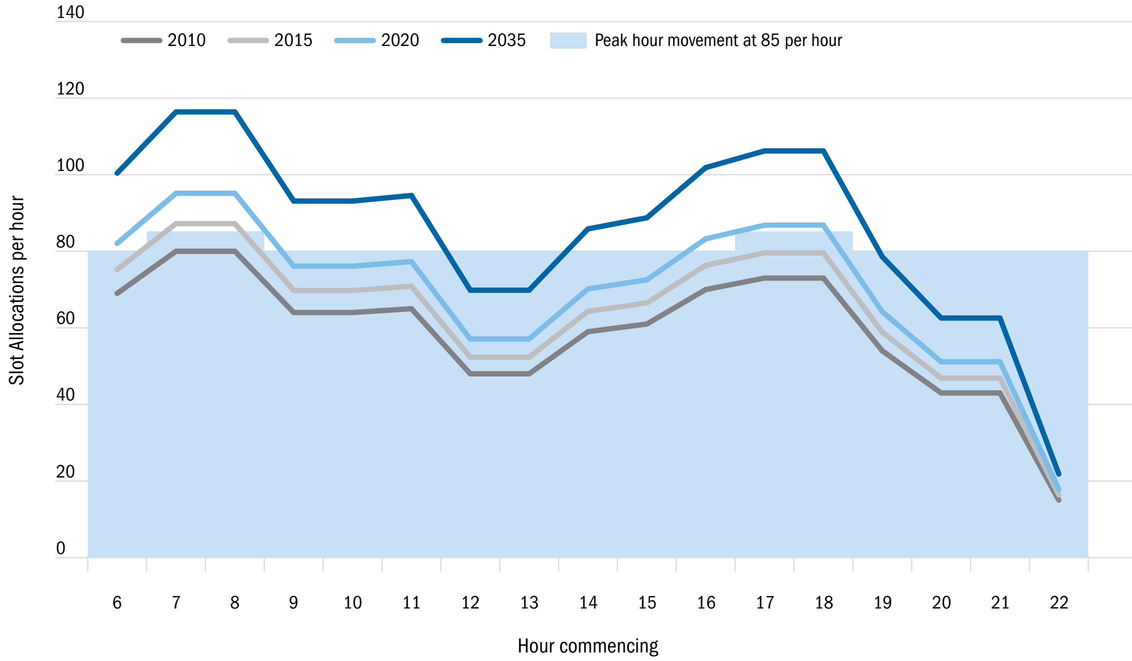
Allowing up to 85 movements per hour in peak hours

Allowing up to 85 movements per hour to be scheduled during peak hours (in the busiest weekday hours of 7.00am to 9.00am and 5.00pm to 7.00pm) would provide for some additional capacity at key times. It would make available 20 additional slots per day or 7,300 additional peak slots per year (six per cent increase in peak slots and one per cent increase in total slots). This could delay the timing of capacity issues for aircraft movements accessing Sydney (Kingsford-Smith) Airport by approximately one year.

While this option would provide peak capacity in the short term, any new release of peak slots would be taken up rapidly.

As shown in Figure 119, the peak hours would very quickly reach the new capacity limit, with forecast slot demand in 2015 already exceeding the 85 slot allocations per hour for most of the morning peak. The unconstrained forecast for 2035 greatly exceeds that made available by the 85 movement per hour peak.

Figure 119 Comparison between unconstrained forecast slot demand and proposed cap of 85 movements per hour at peak times



Source: Forecast slot allocations are based on Booz & Company analysis of Airport Coordination Australia data.

With the additional capacity in peak periods, this will in effect delay peak spreading for a short period. As demand growth continues, peak spreading will resume to levels otherwise experienced earlier under the 80 slot movement per hour arrangements.

Any increase in peak movements would place additional strain on limited airside infrastructure and surface transport linkages. For example:

- There would be a requirement for more gates, as well as greater apron and parking space within the limited airport site. This will require some airside infrastructure restructure and capital expenditure.
- Depending on the aircraft fleet mix attracted to the new peak slots (that is, if there is an increase in larger aircraft), this could increase the use of runway 34L/16R, resulting in greater runway imbalance. The terminal changes proposed by SACL are not expected to substantially mitigate this issue.
- Increased passenger numbers accommodated through the airport in peak periods would also bring forward and exacerbate capacity constraints for surface transport access. Peak hours for air travel at the airport currently coincide with peak commuter peak hours on the road and rail network.
- The system would be even more susceptible to delay and less able to recover from these delays.

An increase in slot allocations in peak hours would not impact on current ring fence arrangements for NSW intrastate services or slots with historical precedence. However, unless there was a change to the slot allocation process, new slots will likely follow the general process for allocation and priority is likely to be allocated initially to new entrants. This could assist in freeing up some capacity for new international services or Low Cost Carrier (LCC) operators during the peak period for at least two seasons. If not taken up by new entrants, the slots will likely be taken up by incumbent operators quickly.

The increase in peak capacity is unlikely to help in the application of the Long Term Operating Plan (LTOP), as the surrounding hours are already above the 55 movements per hour in which LTOP can operate. In addition, noise will increase during the peak periods, as there would be more movements.

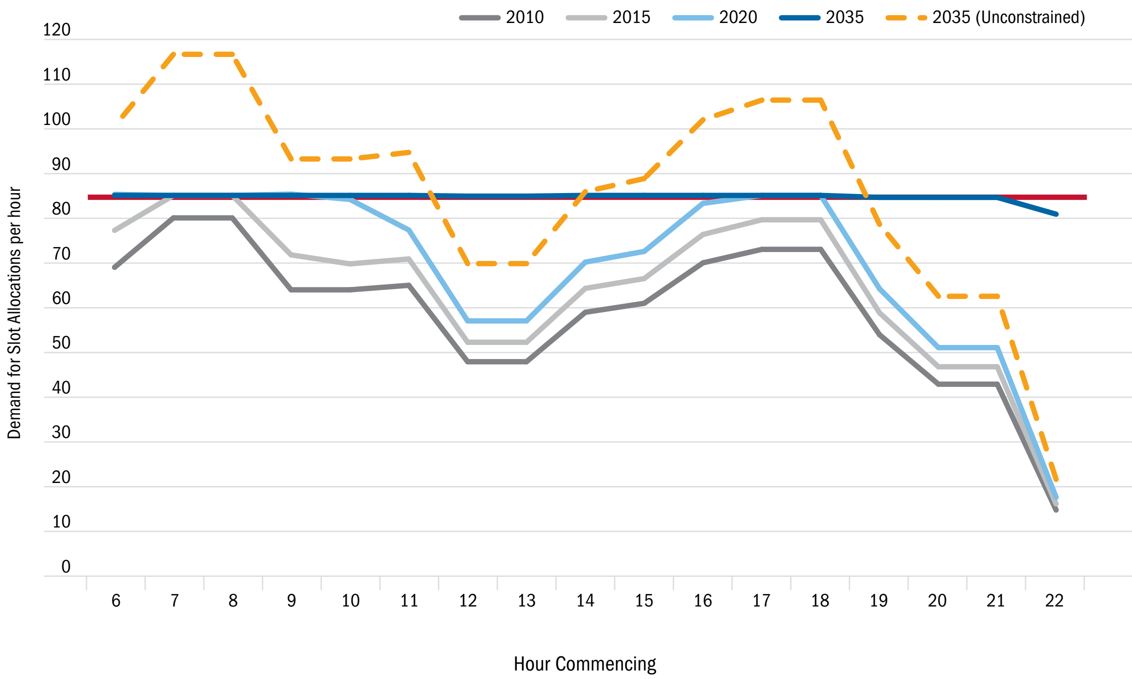
A potential alternative to this option would be to allow a slot increase in peak hours but balance it with a decrease in slots in some non-peak hours so the overall level of slots at the airport remains the same. This would provide for some additional capacity at key times while possibly delaying the loss of noise respite arrangements.

Increasing slot allocations to 85 per hour for all non-curfew hours

This option would allow an increase in slot allocations to 85 per hour across all hours of the Sydney (Kingsford-Smith) Airport non-curfew period (6.00am to 11.00pm) in order to allow greater movements across the airport's operating hours. This would make available an increase of some six per cent in slots available at the airport – an additional 85 slots per day or a total 31,000 per year, of which 20 per day (or 7,300 per year) would be in peak periods.

However, as shown in Figure 120, these allocations would be filled rapidly such that, by the 2035 dark blue line, for a majority of hours in the day (that is, except after 9.00pm) the 85 movement cap per hour will have been exceeded.

Figure 120 Expected hourly profile with 85 slot allocations at Sydney (Kingsford-Smith) Airport, 2010, 2015, 2020 and 2035

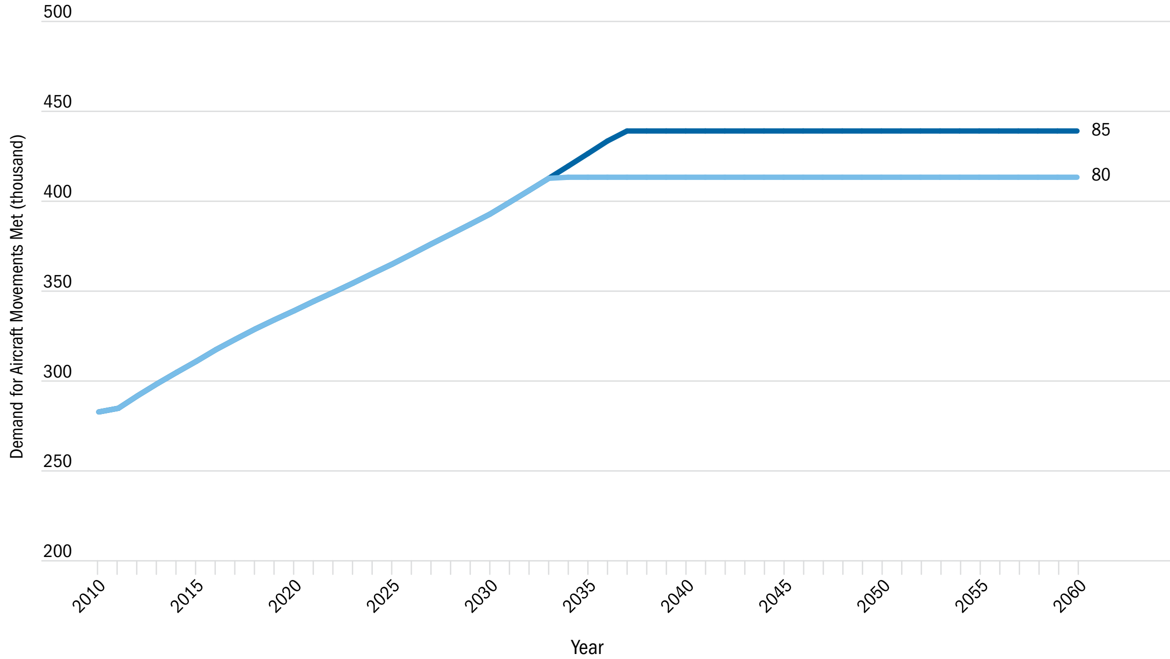


Notes: Excludes Military and GA movements. Red line represents a possible 85 movement per hour cap. The 2035 (unconstrained) case shows forecast growth in slot allocations, based on 2010 allocation in Part Four of this Report. 2010, 2015, 2020 and 2035 constrained cases assume that, when more than 85 slots are demanded in an hour, some will be 'peak spread' and be redistributed to other hours of the day, while others will be suppressed and not allocated. This figure shows a 'medium' peak spreading scenario. Outcomes of other scenarios are identified in Technical Paper B3.

Source: Booz & Company analysis.

On the basis of total annual movements, Booz & Company estimated that increasing the slot allocations and the movement cap from 80 to 85 per hour would delay capacity issues by three years, as depicted in Figure 121.

Figure 121 Sydney (Kingsford-Smith) Airport expected RPT aircraft movements per year under higher slot allocation levels, 2010 to 2060



Note: Excludes Military and GA movements. Assumes 80 or 85 aircraft movements can be achieved in every non-curfew hour of every day for 365 days. Assumes gap between allocated and actual slots (as identified in Part Four of this Report) declines as capacity constraints increase. A 'medium' peak spreading, including aircraft upgauging and load factor changes, applies.

Source: Booz & Company analysis.

The increase in movements could also place strain on airside infrastructure. Surface transport congestion will be exacerbated in the medium term, as there will be more passengers needing access to and from the airport.

Summary of implications from revisions to slot allocations

Table 25 summarises the range of impacts that may occur as a result of the two options presented.

Table 25 Possible revisions to Sydney (Kingsford-Smith) Airport slot allocation: potential range of impacts

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Increasing the slot allocation to 85 per hour in peak hours, retaining the 80 per hour for off-peak hours	**Noise:** increase movements in peak. Limited effect on LTOP as surrounding hours already above 55 movements per hour. **Peak slot availability:** six per cent increase in peak slots. **Slot availability:** one per cent increase in total slots, delaying constraints by at least one year. **Airside infrastructure:** some airside infrastructure restructure and capital expenditure is likely to be required. **Surface transport:** increased peak road congestion. **Delay impacts:** increased delays due to higher peak movements when capacity is reduced.	●		
Increasing the slot allocation to 85 per hour for all non-curfew hours	**Noise:** increase movements initially in peak, then non-peak over medium term. Short-term ability to effectively apply the LTOP improved, but difficult again in medium term. **Peak slot availability:** six per cent increase in peak slots. **Slot availability:** six per cent increase in total slots, delaying constraints by around three years. **Airside infrastructure:** some airside infrastructure restructure and capital expenditure expected, but no more than required for the preceding option. **Surface transport:** increased peak road congestion, expanding to off-peak in medium term. **Delay impacts:** increased delays when capacity is reduced.	●		

Source: PwC and Australian Department of Infrastructure and Transport.

In summary, while the greater capacity increase from the two options would be achieved from a change in the slot allocation to 85 movements per hour for all non-curfew hours, this would not be as well targeted and would reduce delay recovery, compared with an increase only in peak hours. Neither option addresses the real pressure on availability of peak period slots beyond the short term.

Curfew shoulder settings

A curfew has been in place at Sydney (Kingsford-Smith) Airport since 1963 as an essential protection to the communities close to the airport and flight paths. Any substantial reduction in the protection provided by the curfew is likely to be unacceptable to governments and the community and has not been assessed further.

Possible refinements to the curfew shoulder period have, however, been considered below.

Increasing permitted movements in both morning and evening curfew shoulders to the maximum level allowed under the Sydney Airport Curfew Act 1995

As a result of Sydney's geographic position, international demand is currently characterised by early morning arrival peaks from Europe, Asia and the US. International flights cannot be spread evenly throughout the day because of:

- curfews in Asia and Europe;
- connections at hub airports;
- aircraft and crew rotations; and
- the number of sectors per day required to commercially operate trans-Tasman routes.

The *Sydney Airport Curfew Act 1995* allows a small number of movements in the shoulder periods – to a maximum of 35 weekly arrivals between 5.00am and 6.00am and 14 movements between 11.00pm and midnight or to such lower levels as set out in the regulations.

The regulations currently set the limit at no more than 24 movements per week between 5.00am and 6.00am and zero movements between 11.00pm and midnight. In total, this means that the regulated level for curfew shoulder movements is currently 1,248 movements per year, but the absolute maximum curfew shoulder levels allowed under the Act is equivalent to 2,548 movements per year.

If the movement level prescribed in the regulations was increased to the maximum allowed under the Act, this would provide for 1,300 additional curfew shoulder slots per year (or 3.5 slots per day).

The effectiveness of this option to provide capacity would be driven by the level of demand for movements in the curfew shoulder hours. Considering current demand for international landings in the morning peak, it is likely the 5.00am to 6.00am shoulder would attract interest from international airlines. Such a measure would reduce pressure on International Terminal and airport infrastructure in the following 6.00am to 7.00am hour, where the passenger facilitation processing currently experiences peak pressures. However, as current demand for international landings during the 5.00am to 6.00am shoulder period is principally during the northern hemisphere summer scheduling period, any increased slot capacity in the curfew shoulder, if utilised, may only be taken up during those six months.

In the 11.00pm to midnight shoulder period, there is likely to be limited demand for movements (in comparison, there are currently only 15 slot allocated in the final 10.00pm to 11.00pm period). However, a potential benefit of increasing permitted movements in the evening curfew shoulder is that it could reduce pressure on long-haul departure slots between 10.00pm and 11.00pm. At present there is pressure on those slots, as long-haul airlines need to allow for a buffer period in their movements during this period to avoid breaches of the curfew.

This proposed change to the curfew shoulder movements would likely delay capacity issues for aircraft accessing Sydney (Kingsford-Smith) Airport by less than one year.

There are two variations on the above options.

- Increasing the permitted movements only in the morning curfew shoulder period to the maximum level allowed under the Act. This would provide for an additional 11 weekly slots for international landings in the 5.00am to 6.00am curfew shoulder, resulting in an additional 572 slots per year, or an increase of 0.1 per cent in total slots.
- Increasing the permitted movements only in the midnight curfew shoulder period to the maximum level allowed under the Act. This would provide for an additional 14 weekly slots (728 per year or a 0.15 per cent increase in total slots).

Given the curfew shoulder periods are outside of the peak hours for air travel and peak commuter hours on the road and rail network, the potential impact on airside infrastructure and surface transport congestion would be minor.

The Steering Committee is conscious that these options would involve increased movements at very early morning and very late evening periods, when sensitivity to aircraft overflight and noise is greater than at other times of the day.

Summary of implications from revisions to the curfew shoulder settings

Table 26 summarises the range of impacts that may occur as a result of the shoulder curfew options.

Table 26 Possible revisions to Sydney (Kingsford-Smith) Airport curfew shoulder: potential range of impacts

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Increasing permitted movements in the curfew shoulder to the maximum level allowed in the *Sydney Airport Curfew Act 1995*	**Noise sharing:** minimal impact on the LTOP. However, increased aircraft noise during more sensitive times of day. **Peak slot availability:** may free up some peak morning slots if current users can move to more operationally effective time. Otherwise, no impact. **Slot availability:** direct 0.25 per cent increase in total slots, delaying constraints by less than one year. Indirectly, could increase airline take-up of slots between 10.00pm to 11.00pm by providing greater buffer period. **Airside infrastructure:** minor impact, as curfew shoulder would still have less movements than peak periods. **Surface transport:** limited impact, as the curfew shoulder is outside of land transport peak hours. **Delay impacts:** minor impact if shoulder movements are delayed. Greater impact at night, as likely to force recovery next day, though low relative to total movements.	●		
Increasing permitted movements in the 5.00am to 6.00am curfew shoulder to the maximum level allowed under the *Sydney Airport Curfew Act 1995*	**Noise sharing:** minimal impact on the LTOP. However, increased aircraft noise during more sensitive times of day. **Peak slot availability:** may free up some peak morning slots if current users can move to more operationally effective time. Otherwise, no impact. **Slot availability:** 0.1 per cent increase in total slots, delaying constraints by less than one year. Slot take-up may only occur during the northern hemisphere summer. **Airside infrastructure:** minor impact, as curfew shoulder would have less movements than peak periods. Could assist clearing the 6.00am to 7.00am peak demand for international arrivals. Surface transport: limited impact, as the morning curfew shoulder is outside of land transport peak hours. **Delay impacts:** minor impact if shoulder movements are delayed, though low relative to total movements.	●		

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Increasing permitted movements in the 11.00pm to midnight curfew shoulder to the maximum level allowed in the *Sydney Airport Curfew Act 1995*	**Noise sharing:** would result in noise during evening curfew shoulder (compared to now, with no movements allowed). Minimal impact on the LTOP. **Peak slot availability:** no capacity impact. **Slot availability:** direct 0.15 per cent increase in total slots, delaying constraints by less than one year. Indirectly, could increase airline take-up of slots between 10.00pm and 11.00pm by providing a greater buffer period. **Airside infrastructure:** minor impact, as curfew shoulder would still have less movements than peak periods. **Surface transport:** limited impact, as the evening curfew shoulder is outside of land transport peak hours.	●		

Source: PwC and Australian Department of Infrastructure and Transport.

In summary, the shoulder curfew options are likely to have a minor effect on overall capacity at Sydney (Kingsford-Smith) Airport and may not warrant further consideration.

NSW intrastate ring fence and minimum aircraft size

The Slot Management Scheme includes specific provisions to protect slots for intrastate NSW air services and ensure they are not squeezed out by international or major domestic services. The so-called 'regional ring fence' provisions are aimed to preserve equitable access by regional communities in NSW to Sydney (Kingsford-Smith) Airport so as to help with access to the range of services and facilities in Sydney, and to allow convenient connections with domestic and international services.[143]

The regional ring fence provisions limit the scope for the holder of a protected regional slot to swap an intrastate service for an interstate domestic or international service. Further, the provisions limit the right of a new operator to take up a currently unused protected regional slot and use it for ongoing interstate or international services. Without these provisions, the operators of interstate or international services could progressively obtain access to more and more slots, to the gradual exclusion of NSW intrastate services.

For the northern winter 2010 scheduling season (30 October 2010 to 26 March 2011), the total slots allocated to NSW intrastate services represented about 16 per cent of total slots allocated at Sydney (Kingsford-Smith) Airport, and for the northern summer 2011 scheduling season (27 March 2011 to 29 October 2011) about 17.5 per cent, as shown in Table 27.

Table 27 Slots for the northern winter 2010 and northern summer 2011 scheduling seasons, October 2010 to October 2011

	Winter 2010 (30 October 2010 to 26 March 2011)	Summer 2011 (27 March 2011 to 29 October 2011)
Total NSW Intrastate Regional Slots Allocated	24,667	39,650
Allocated Sydney (Kingsford-Smith) Airport Slots	**151,141**	**225,320**

Source: Australian Department of Infrastructure and Transport analysis of Airport Coordination Australia data.

In 2010, there was an average of 30 passengers per movement for regional flights, compared to around 140 passengers per movement for domestic flights and 185 passengers per movement

143 Existing regional services would still be retained.

for international flights. Consequently, notwithstanding the proportion of allocated slots, regional flights accounted for only about six per cent of total Sydney (Kingsford-Smith) Airport passengers.[144]

Table 28 provides an indication of the size of aircraft serving NSW intrastate routes from Sydney (Kingsford-Smith) Airport for the northern summer 2011 scheduling season. As this Table indicates, around 18 of the 26 intrastate routes were catered for by aircraft with fewer than 40 seats between March and October 2011.

Table 28 Seat capacity supported on aircraft types serving NSW intrastate routes from Sydney (Kingsford-Smith) Airport for the period March 2011 to October 2011

Intrastate Location	Current range of aircraft seat capacity
Albury	33–72
Armidale	50
Broken Hill	33
Bathurst	33
Ballina	33–180
Cobar	18
Coffs Harbour	78–106
Dubbo	33–78
Mudgee	19
Griffith	33
Grafton	33
Lord Howe	36
Lismore	33
Merimbula	33
Moree	36
Moruya	33
Narrabri	19
Narrandera	33
Newcastle	19
Orange	33
Cooma	19
Parkes	33
Port Macquarie	72–78
Tamworth	78
Taree	33
Wagga Wagga	33–78

Source: Australian Department of Infrastructure and Transport analysis of Airport Coordination Australia data-.

While the protection of regional access is an important policy objective, a large number of operations by small aircraft does not represent an efficient use of limited airport capacity. This was recognised in amendments to the scheme in 2001, which set a cap for the maximum

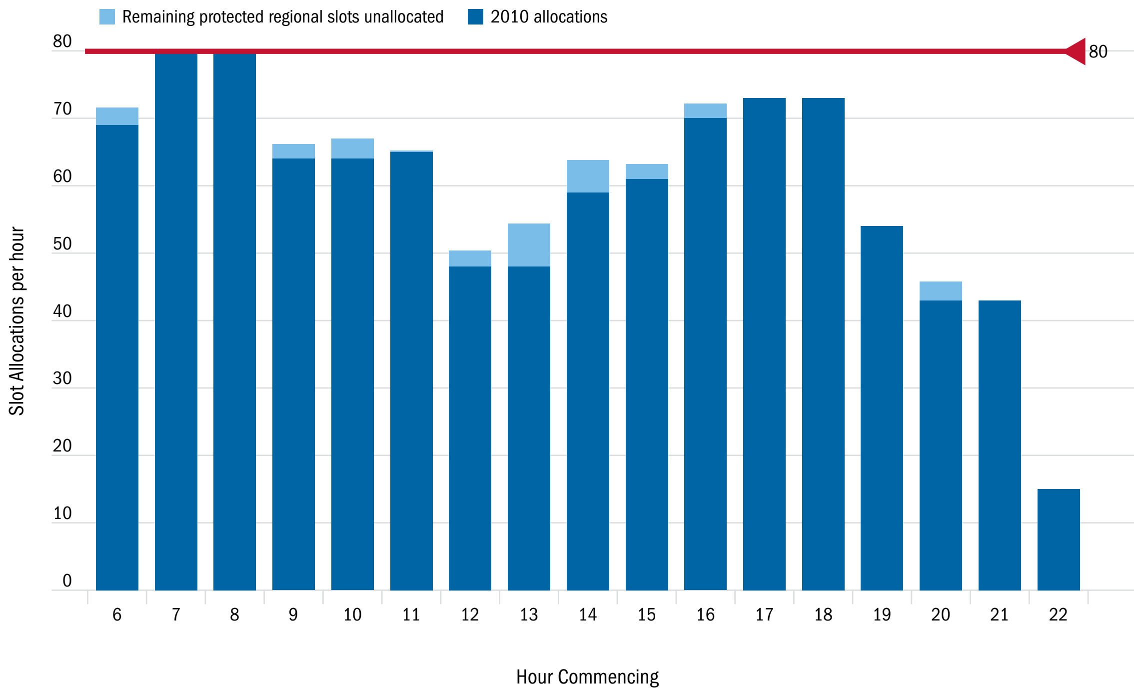
144 Booz & Company.

number of NSW intrastate slots allocated in peak periods (defined for this purpose as from 6.00am to 11.00am and from 3.00pm to 8.00pm on weekdays). The cap was set to reflect the level of intrastate operations scheduled at that time; this in effect reserved the remaining unallocated slots in those periods for international and interstate services.

The Slot Management Scheme also specifies that passenger aircraft seeking a slot series for a new service must have a minimum of 18 seats.

The number of slots set aside for NSW intrastate movements has already been heavily taken up in the morning and afternoon peaks. The cap means that no additional slots can be made available in those periods. As Figure 122 shows, the busy morning and evening hours between 7.00am to 9.00am and 5.00pm to 8.00pm have no remaining protected slots. There are limited numbers of protected slots available in other periods. Taking into account that any new service would require two slots close together – one for arrival and one for departure – it is clear there is limited scope for growth in intrastate movements in the busy periods of the day.

Figure 122 Comparison of all Sydney (Kingsford-Smith) Airport slots allocated relative to remaining NSW intrastate ring fence slots, northern winter, 2010



Note: 2010 allocations are based on slot allocations corresponding to the planning day Friday, 12 November 2010. Protected regional slots reflect an average of the remaining slots per hour during the week.

Source: Australian Department of Infrastructure and Transport analysis of Airport Coordination Australia data.

The protections in the Slot Management Scheme for intrastate NSW services are supported by controls on increases in aeronautical charges at Sydney (Kingsford-Smith) Airport for intrastate airlines. These controls essentially limit potential increases to consumer price index adjustments. SACL's charges for the provision of terminal, check-in, passenger security and bag screening, runways and apron parking services to NSW intrastate air services at Sydney (Kingsford-Smith) Airport have not been increased since May 2001.

Options for reducing the use of small aircraft

The Steering Committee is conscious that the price cap and the regional ring fence protect the continued operation of regional services, including services operated with small aircraft. In the absence of such provisions, commercial pressures would tend to favour interstate or international services using large capacity jet aircraft operations.

The Committee considered whether changes to the regulatory arrangements could create greater incentive for airlines to use larger aircraft, in the interests of more efficient use of the airport's capacity, without prejudicing continued access for regional communities. The options outlined in the following paragraphs were examined.

Removal of regional ring fence

Removing the regional ring fence would allow immediate use of unallocated regional slots to any operators (including domestic and international airlines) seeking to operate new services. Existing regional operators would retain historical precedence for allocated slots they continue to operate. Such options may have implications, however, for the infrastructure requirements at both Sydney (Kingsford-Smith) and the airport at the other end of the route.

Removal of the price cap

Removing the price cap on intrastate services would allow SACL to negotiate with regional airlines on commercial terms, subject to the provisions of the *Australian Competition and Consumer Act 2010*. Notwithstanding those provisions, regional airlines have expressed strong concerns over the years about their ability to negotiate with SACL on an equal basis. An alternative could be to change the price controls to add increased incentive for regional airlines to use larger aircraft. For example, the scheme might allow a minimum charge to be imposed for peak period movements, with the minimum charge set at a level which would discourage use of very small aircraft. The operator at Perth Airport has recently introduced charging for peak times, to ensure efficient use of limited capacity.

Increase the minimum number of seats

The restriction on allocation of a slot series for new services with aircraft with less than 18 seats could be extended to apply to larger aircraft on a staged basis. Estimates indicate that, in 2010, approximately 60 per cent of intrastate aircraft movements at Sydney (Kingsford-Smith) Airport were by aircraft with less than 40 seats.[145] This is equivalent to around 39,000 aircraft movements. If, for example, through the upgauging of aircraft, a 30 per cent reduction could be achieved in the number of movements by aircraft with fewer than 40 seats, this would be equivalent to approximately two per cent of total airport slots. The impacts of capacity pressures at Sydney (Kingsford-Smith) Airport could be therefore delayed by approximately one year. The greater the reduction in aircraft of this size, the more capacity created.

Progressive increases in aircraft size and therefore passengers per movement have been a trend to date and normal market forces are likely to continue driving aircraft upgauging to the extent it is economically viable for airlines. For example, recent trends for the number of passengers per intrastate aircraft movement at Sydney (Kingsford-Smith) Airport have shown an increase from an average of 19 seats per movement to an average of approximately 31 seats over the period 2001 to 2010 – an increase of 4.9 per cent year on year.[146] However, the high pace of upgauging is likely to be more viable in markets where there is sufficient volume of demand to support the larger capacity aircraft.

145 BITRE data.
146 Booz & Company analysis of BITRE data.

If, however, the threshold was increased, to 40 or 50 seats initially, with a view to increasing it to 70 seats in the future, this would assist in providing a more balanced approach to upgauging while still creating capacity. The restriction could initially be limited to peak periods and/or existing services with small aircraft being allowed to continue for a limited period.

Impacts

Any of the above options have some potential to affect the level and pattern of services to centres in regional NSW. To the extent that they create incentives to use larger aircraft for intrastate services, they may encourage a reduction in the number of services if not in seat numbers.

Potential implications may include:

- a need for regional airports to be upgraded to cater for larger aircraft;
- reduction in service frequency, but potentially higher capacity in seat numbers;
- increased hub and spoke activity, with consolidation of smaller flights in regional hubs and larger aircraft operating to Sydney (Kingsford-Smith) Airport;
- operation of smaller aircraft into another airport in the region, such as Bankstown Airport, if available; and
- withdrawal of some services to markets with low demand, where only small aircraft are viable and services through a regional hub are not a realistic option.

A hub and spoke system would result in increased travel times and higher costs for many regional passengers. In addition, for interlining passengers connecting to other flights through Sydney (Kingsford-Smith) Airport, it would involve multiple flights and airport transfers. Given the analysis of capacity pressures at Sydney (Kingsford-Smith) Airport and their impacts, the Committee considers it important that a strategy is put in place to support a progressive upgauging of small aircraft operations in the medium term, drawing on these options. This would need to be combined with an approach to infrastructure investment to ensure gates and aprons will be adequate to support the move to larger aircraft.

Summary of implications from removing the regional ring fence, the price cap and increasing the minimum aircraft size

Table 29 summarises the range of impacts that the option of removing the regional ring fence, the price cap or introducing a requirement for the minimum aircraft size.

Table 29 Possible revisions to Sydney (Kingsford-Smith) Airport intrastate pricing and aircraft size: potential range of impacts

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Removal of regional ring fence	**Noise sharing:** minimal impact on noise and the LTOP due to low and likely gradual affect on slot and movement availability. **Peak slot availability:** minimal increase of peak slot availability. **Slot availability:** if 20 per cent of the affected intrastate movements were upgauged or rationalised (one per cent of total airport slots), capacity issues could be delayed by less than one year. **Airside infrastructure:** minor impact due to low potential change in total movements, though may require upgrades/investment to accommodate larger average aircraft size over time. **Surface transport:** limited impact due to low potential change in total movements. **Delay impacts:** minor impact due to low potential change in total movements.	●		
Removal of the price cap	**Noise sharing:** minimal impact on the LTOP. **Peak slot availability:** minor increase in peak slot availability. **Slot availability:** if 30 per cent of affected intrastate movements were upgauged or rationalised (two per cent of total airport slots) then capacity issues could be delayed by approximately one year. **Airside infrastructure:** airside infrastructure at Sydney (Kingsford-Smith) Airport would require capital expenditure to accommodate larger aircraft. Airports at other end of the route may also require investment. **Surface transport:** limited impact due to low potential change in total movements. **Delay impacts:** minor impact due to low potential change in total movements.	●		
Increasing the minimum size of aircraft for RPT aircraft accessing Sydney (Kingsford-Smith) Airport to at least 40 seats per movement	**Noise sharing:** minimal impact on the LTOP. **Peak slot availability:** possible minor increase in peak slot availability. **Slot availability:** if 30 per cent of affected intrastate movements were upgauged or rationalised (two per cent of total airport slots) then capacity issues could be delayed by approximately one year. **Airside infrastructure:** airside infrastructure at Sydney (Kingsford-Smith) Airport would require capital expenditure to accommodate larger aircraft. Airports at other end of the route may also require investment. **Surface transport:** limited impact due to low potential change in total movements. **Delay impacts:** minor impact due to low potential change in total movements.	●		

Source: PwC and Australian Department of Infrastructure and Transport.

6.2 Options to improve Sydney (Kingsford-Smith) Airport surface transport access

The road and rail networks connecting Sydney with Sydney (Kingsford-Smith) Airport are already experiencing capacity pressures. There are currently around 130,000 land transport trips to and from the airport each weekday, which is a rise of over 40 per cent from 90,000 per weekday in 2006. These trips will continue to increase with airport passenger growth, contributing to congestion problems for airport users and others.

A range of options exist to improve Sydney (Kingsford-Smith) Airport land transport connections to create capacity and enable more reliable and less congested journeys.

A preliminary assessment was conducted of more than 20 options (including cycle ways, park ‘n’ ride facilities, bus enhancement and rail upgrades. Transport for NSW and PwC then selected a set of options to principally serve Sydney (Kingsford-Smith) Airport users, and one set that has the potential to improve land transport performance for airport and other transport network users more broadly. More detail can be found in Technical Paper C2.

Surface transport options principally benefiting airport users

Airports are complex surface transport trip generators, where access planning is more complicated than simply dealing with peak commuter demand. Given the complex nature of surface transport needs for airport users, a set of surface transport options principally improving connections for airport users to Sydney (Kingsford-Smith) Airport were identified for consideration.

The options that were assessed are presented below.

Rail

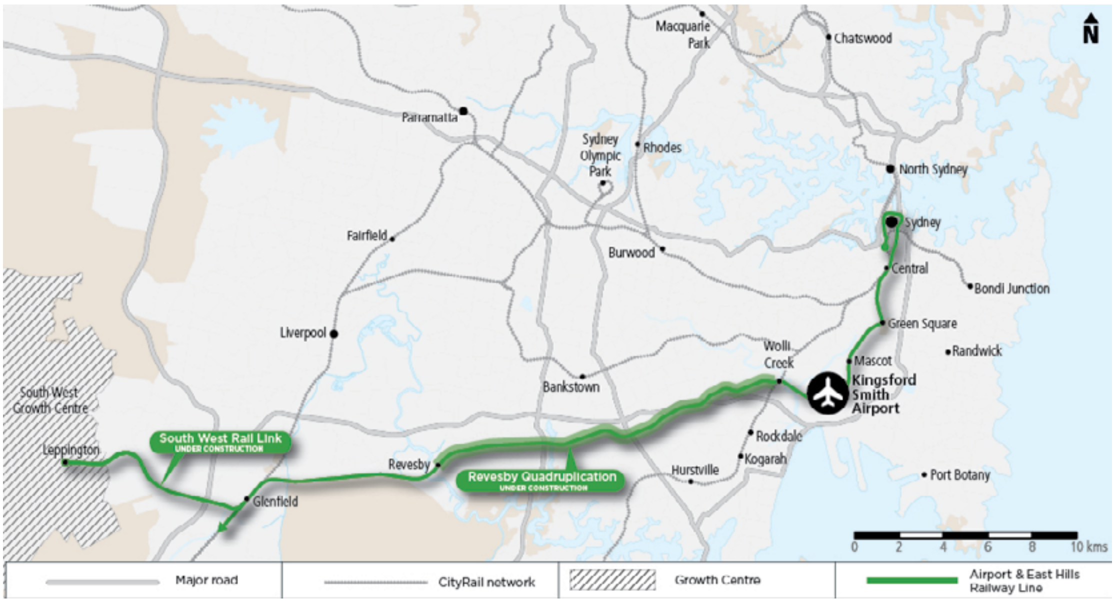
Upgrades to airport train services and possible long-term rail scenarios

The airport rail line operates within the broader CityRail network and cannot be considered in isolation. Sydney’s future rail challenges are likely to require provision of additional capacity for the broader rail network to meet demand growth for rail and public transport. As such, any significant development of capacity on the airport rail link is likely to involve extensive capital works across the network.

Currently the airport rail line has eight trains per hour and this is increasing to potentially 12 per hour in 2016 (post opening of the South West Rail Line, the Kingsgrove to Revesby Quadruplication and the Revesby turnback; and if additional rollingstock is allocated to the line). To achieve 20 trains per hour or to meet demand growth for rail on the rail lines serving the airport would, however, require an expansion of capacity.

Figure 123 shows the rail capacity on the airport rail line and works under construction.

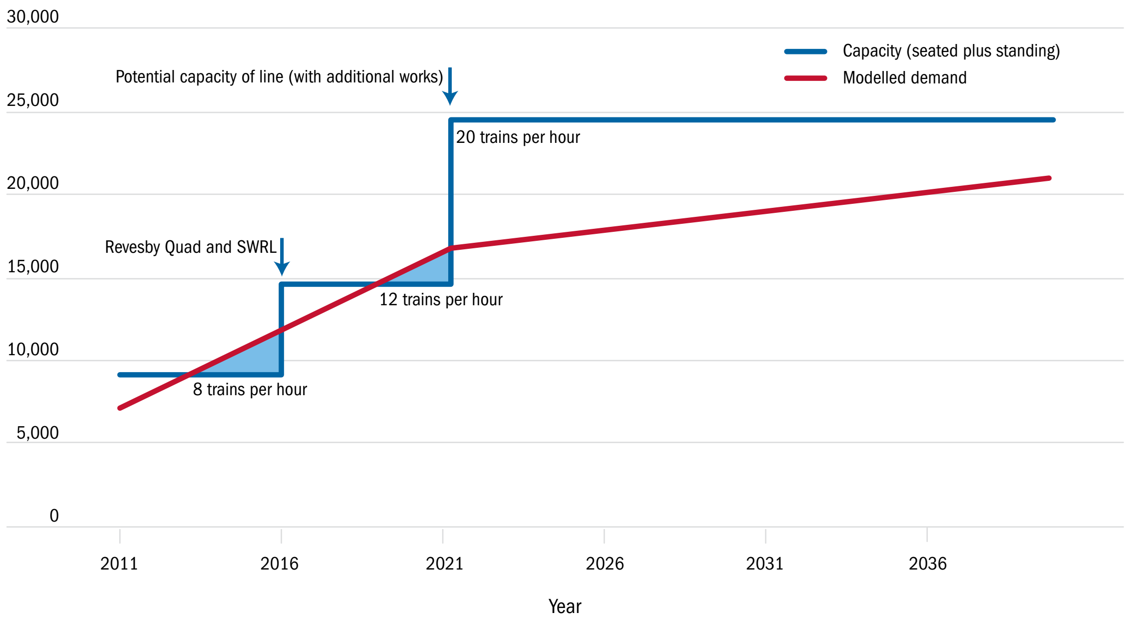
Figure 123 Rail capacity and works under construction



Source: Transport for NSW.

Figure 124 illustrates the timing of the increases in rail frequency compared to forecast demand growth in the morning peak for city-bound services. Assuming implementation of additional network capacity, the airport rail line has the potential to provide important medium- and long-term capacity on the airport station line. However, additional works would be needed to achieve the maximum of 20 services per hour under current operating conditions.

Figure 124 Expected capacity of the airport rail line to accommodate demand growth (with long-term rail network capacity increases), 2010 to 2036



Source: Transport for NSW.

However, if additional rolling stock and train paths are not allocated to the Airport Link, or long-term rail investments do not facilitate a higher number of trains per hour, there will be significant ongoing issues, especially city-bound during peak hour.

At other times of day for CBD-bound services, adequate spare capacity exists as well as across the whole day for services to the south-west (for example, Wolli Creek and Campbelltown).

Potential options to assist in creating more mode shift and greater capacity include:

- converting Wolli Creek to an express stop for Illawarra and South Coast trains (for all services or to coincide with work shifts);
- improved interchange facilities, lifts and signage at Central Station for passengers with luggage;
- extending night ride services into the airport to assist airport workers (if trains are not viable for night use then a night ride bus could be investigated).

A number of options for improving rail mode share access to Sydney (Kingsford-Smith) Airport were examined.

Removal of the station access fee at the International and Domestic Terminals railway stations

In 2006, an assessment by SACL suggested rail had an estimated 11 per cent mode share of all surface transport trips to and from Sydney (Kingsford-Smith).[147] There are estimates this could now be closer to 17 per cent.[148]

Travellers are currently charged a station access fee to access the International and Domestic airport rail stations. The high cost relative to other rail ticket prices in the network may be deterring some users from accessing Sydney (Kingsford-Smith) Airport by rail, putting more pressure on the congested road network.

This option assumes removal of the station access fee from the Domestic and International Terminal railway stations for all commuters, with the price paid for all tickets aligned to CityRail system-wide fares.

Funding the station access fee could deliver a range of benefits in order to assist with performance of surface transport in the short term. Transport for NSW estimated that, combined with a public transport information campaign, removal of the station access fee could delay capacity issues on the roads serving the airport (in particular, the problematic Domestic Terminals entrance) by between one and four years.

Removal of the fee is expected to encourage a mode shift to rail among all market segments due to the demand response caused by the relative price reduction of rail. A rapid cost benefit analysis (CBA) undertaken by PwC suggests that this will result in a positive benefit cost ratio (BCR), principally due to travel time benefits for users switching to a more time-efficient mode of transport, as well as the decongestion benefits generated for road users. The significant reduction in the cost of rail travel for airport users will not only provide existing rail users with cost savings but also attract new rail travel.

Average fares are estimated to fall from over $11 to $3 per trip, which could result in more than 3,500 new users per weekday diverting from road to rail in the first year of operation alone (equivalent increase of 26 per cent of existing airport rail users). In the long term, this could increase the diversion of almost 8,400 users from car to rail (equivalent to 34 per cent of existing airport rail users). The Productivity Commission's August 2011 draft report Economic Regulation of Airport Services supports these results and suggests that the patronage increase

147 SACL, *Airport Ground Travel Plan,* 2006.
148 BITRE analysis of *Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data*; PwC and High Range Analytics analysis based on Sydney Strategic Travel Model (STM) RCZ modelling mode shares adjusted with other travel demand information, 2011.

may be even greater than expected in light of the effect seen when the station access fee was removed at Green Square and Mascot stations in March 2011.

Reduced road congestion as a result of the mode shift will be a further benefit. Diversion of trips from road to rail will result in reduced travel times for remaining road users to and around Sydney (Kingsford-Smith) Airport. This will in turn reduce vehicle operating costs for car drivers, as fuel, tyre and vehicle maintenance can be reduced and greater average speeds can be achieved, with less stops and starts in congested traffic.

There will be some environmental benefits for third parties as a result of the station access fee removal. The Australian Transport Council externality values suggest that rail has lower environmental impact than road travel in relation to costs including air pollution, greenhouse/climate change, noise, water, nature and landscape, and urban separation.[149]

Public transport information campaign to promote rail access to or from Sydney (Kingsford-Smith) Airport

The implementation of a NSW Government customer information campaign for public transport serving the airport could provide greater information on rail services in order to encourage an increase in rail mode share to assist relieving road congestion. The main focus of the campaign could be customer information about Airport Link services to the airport, with the possibility to extend information about public bus services and private minibus services in later years.

Measures include:

- signage and street prompts to direct people to St James Station from Martin Place to reduce congestion from taxi trips;
- communicating the airport rail line operating pattern to give passengers the choice to stay on through the City Circle line rather than interchange at Central Station when this option is available; and
- improved signage for the Airport Link at the International Terminal.

An information campaign would increase awareness among all market segments of the availability and operation of public transport services to and from the airport, and act primarily to create a mode shift towards rail. While the possible mode shift is not estimated to be as significant as removing the station access fee, an information campaign would require relatively low investment and cost outlay in order to encourage behaviour change and mode shift from road to rail when accessing Sydney (Kingsford-Smith) Airport. It is also low risk given the low level of investment required and also considering that if, after implementation, it does not result in the level of benefits predicted, resources could be readily directed elsewhere.

As opposed to the station access fee removal, which reduces generalised trip costs for existing and new rail users, this public information campaign would principally benefit new users who are encouraged to use rail and are able to experience savings in the trip cost. A public transport information campaign could also be viewed as a facilitator that could be combined with the station access fee removal option. The packaging of these two options was estimated in rapid cost benefit analysis to offer synergies and increase overall economic benefits. A pedestrian link from Martin Place to St James of up to 300 metres could also facilitate easier access to airport link train services from across the CBD.

149 Australian Transport Council, *National Guidelines for Transport System Management in Australia,* 2006.

Road

Upgrades to Sydney (Kingsford-Smith) Airport arterial roads

Potential upgrades to Sydney (Kingsford-Smith) Airport arterial roads were considered as an option to reduce road congestion in the airport precinct. These upgrades were not assessed in the rapid CBA, as the specifics of the projects would be highly dependent upon other projects. In particular, in the event that the M5 East Expansion and/or M4 Extension proceed, some of these projects will be required to ensure that the motorways connect smoothly with the airport precinct, while others may no longer be required.

There are a range of arterial road upgrades and projects that could assist to ease congestion in the short to medium term. The following projects are defined in SACL's Master Plan:

- widening of Joyce Drive and General Holmes Drive between Mill Pond Road and O'Riordan Street by one lane in each direction;[150]
- widening of Airport Drive / Qantas Drive by one lane in each direction;
- improving capacity at the Mill Pond Road right turn into General Holmes Drive;
- improvements proposed for the International Terminal precinct's road access, egress and internal road networks; and
- domestic precinct road system upgrade by development of multiple entry/exit points with segregation of the main traffic flows including taxis, passenger drop-off and pick-up and parking.[151]

The NSW Government has also identified additional upgrades for consideration:

- realignment of Wickham Street to connect Forest Road to Marsh Street to address traffic queueus extending through and beyond the intersections of Wickham, Marsh and West Botany Streets;
- widening of O'Riordan Street to three lanes in each direction from Botany rail bridge to north of Bourke Road; and
- widening Marsh Street to three lanes each direction to provde continuity for traffic flow from Airport Drive.

The majority of these projects are likely to be relatively expensive to construct due to the requirement to amend current infrastructure in relatively constrained areas of land. While many are defined as "minor works" they still have an estimated cost of between $700 million and $1 billion. Furthermore, with the current levels of forecast demand growth around the airport, these projects will be unlikely to provide enough additional capacity in the future to solve forecast capacity issues. They would, however, play an important role in helping to manage existing congestion problems.

Public buses running from selected locations to and from Sydney (Kingsford-Smith) Airport

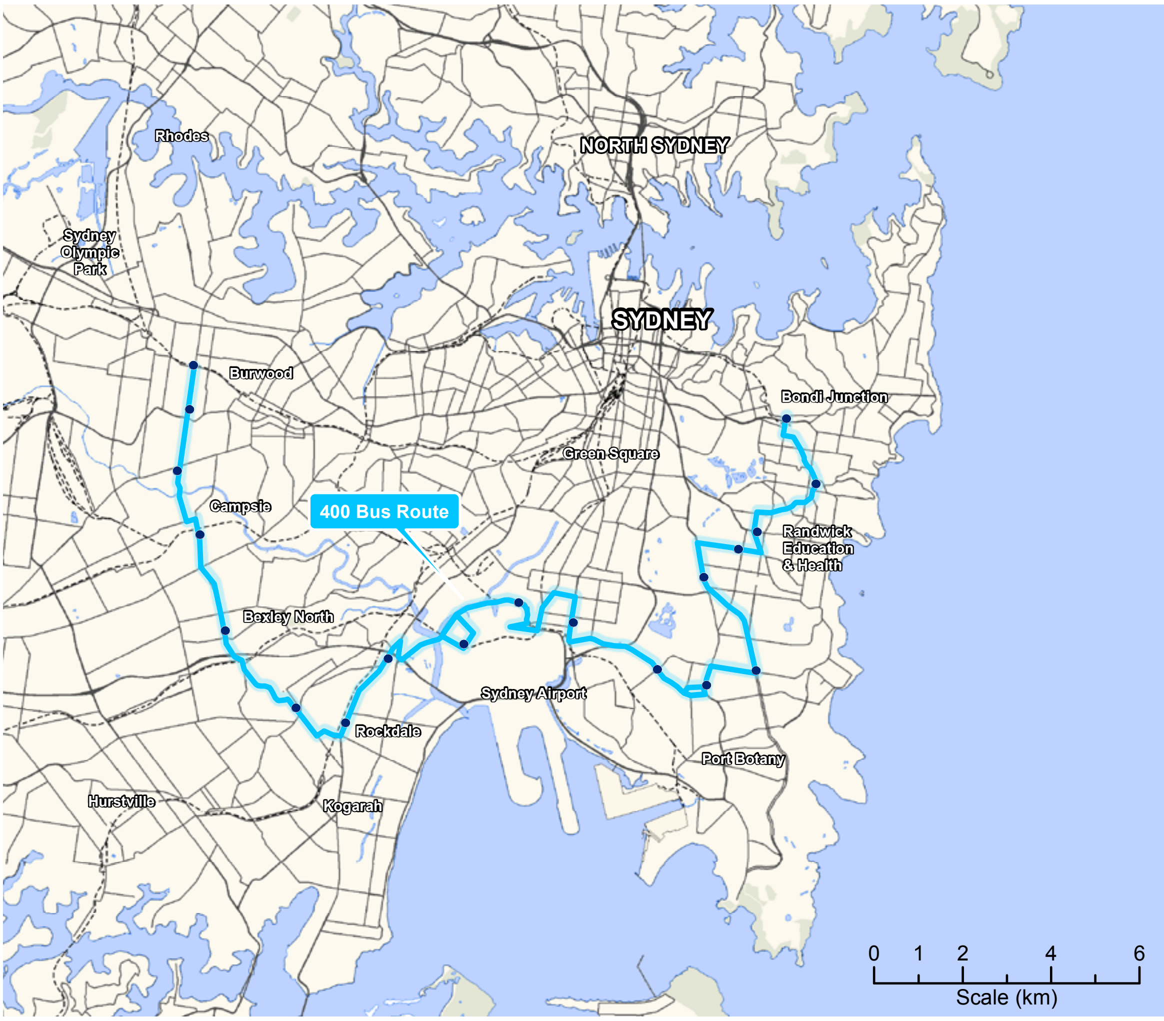
Currently, there are two public buses that directly service Sydney (Kingsford-Smith) Airport; only the 400 Burwood to Bondi bus route (as shown in Figure 125) operates to the airport terminals.

As a comparison, North Sydney, which has 50,000 people employed in the area, is served by 62 bus routes (the airport averages 130,000 users per day).[152]

150 The introduction of high occupancy vehicle lanes in the airport precinct could be considered within the bounds of this project.
151 SACL, *Landside Access – Master Plan Concept,* 2009.
152 Productivity Commission, *Economic Regulation of Airport Services, Draft Report,* August 2011.

The 400 bus is a medium- to high-frequency trunk daily cross-regional service and calls at both the International and Domestic Terminals. There may be potential to implement new bus services to target two potential pools of bus patronage where there are clusters of commuters and airport passengers. As discussed in Part Four of this Report, a significant portion of airport users are from Sydney's Lower North, with a concentration of commuter/staff trips to Sydney (Kingsford-Smith) Airport from the Sutherland Shire – both areas which are not currently well served by public transport to the airport.

Figure 125 **400 bus route passing Sydney (Kingsford-Smith) Airport**



Source: Transport for NSW.

The introduction of the following two bus services to and from Sydney (Kingsford-Smith) Airport could assist to encourage these two demand segments to access the airport by bus to reduce road congestion:

- **St George/Sutherland bus service:** this service would connect airport staff in South West Sydney with Sydney (Kingsford-Smith) Airport. An extension of a current route could be possible so that the airport employees in the St George / Sutherland area are connected to the International Terminal, Airport Drive bus stops and the Domestic Terminals. Such a service could also potentially connect some largely residential land to the rail system at Miranda, Rockdale and the airport.
- **Lower North Shore bus service:** This service could serve airport users from the Lower North Shore. While the pool of commuter patronage from the Lower North Shore is relatively small to warrant a direct service, a metrobus service could provide a direct bus link from the Lower North Shore to the airport, also connecting other areas in between.

The introduction of these services would provide new options for road users to divert from car to bus. For users attracted to shift to the bus, benefits may include reduced travel time as well as reduced costs associated with parking at Sydney (Kingsford-Smith) Airport. As a result of increased bus use, road congestion would improve, resulting in faster travel times for other remaining road users to and around Sydney (Kingsford-Smith) Airport. This would in turn result in reduced car operating costs as well as a reduction in environmental externalities, as one bus trip can replace a number of car trips.

The option also has relatively low up-front costs and, along with the public transport information campaign, represents a relatively low-risk solution. If, after implementation, the buses do not provide the level of benefits predicted, the additional buses operated to and from the airport could be redirected to other services in the metropolitan area.

Taxis, minibuses and hire cars

Taxis, minibuses and hire car services play major roles in providing almost 40 per cent of movements to and from the airport.[153] They consequently also account for a major component of road congestion around this precinct.

Taxi trips in particular have a high impact on the local road network due to additional circulation brought about by the queuing system, restrictions on where passengers can be picked up, unbalanced unloading and backloading and low passenger loads per vehicle. As congestion around the airport has increased and with queues for taxis in peak periods approaching 30 minutes on occasions, there has been a shift from taxi trips to the train service. Given the congestion around the airport, there are limited opportunities to grow taxi usage compared to other public transport modes. Taxi pick-up and drop-off points are highly controlled at Sydney (Kingsford-Smith) Airport to ensure pedestrian safety is not compromised by the very high movement of taxi movements.

Additionally, the collection of a taxi entry fee at pick-up points and the complex system of taxi vehicle queuing at the airport can also contribute to congestion and reduce the customer experience for passengers. SACL is continuing to focus on facilitating the efficient movement and backfilling of taxis with longer ranks and more intensive supervision of the taxi loading area. However, unless there is a mode shift to rail or bus (including minibus), any congestion at and around the airport will only continue to grow.

Minibuses are becoming increasingly popular and account for more than 10 per cent of all trips to Sydney (Kingsford-Smith) Airport.[154] They are more popular for suburbs of Sydney more distant from the airport which are not on the rail line, such as those in Northern Beaches. Over 100 minibus companies provide a door-to-door airport service at a lower price than a taxi, albeit with a longer transit time due to multiple pick-ups or set-downs. There is scope for improving the marketing and accessibility of the minibus services and, because loads per vehicle are better than taxis, this could achieve a reduction in congestion.

The NSW Government is considering reforms to better support the minibus market (particularly where they complement the rail market) and improve customer experience (such as mobile phone apps). There may also be merit in locating minibuses, together with other higher occupancy vehicles such as buses and taxis, in a better centralised space or a transit mall to improve vehicle flows out the front of Domestic and International Terminals.

153 BITRE analysis of Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data.
154 BITRE analysis of Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data.

For airport users who do not access trains to travel from the airport to their final destination, a transit mall could provide capacity for higher-occupancy vehicles to reduce traffic congestion at the airport. This space could be combined with improvements in passenger information about travel options, costs and approximate travel times – for example:

- real-time information boards for customers on departure time, destinations served and price;
- applications for smart phones to provide on-demand shuttle bus services; and
- customer service booths to assist passengers with various forms of transport.

There also appears to be merit in developing new minibus services catering specifically to airport shift workers (who commence in the early hours of the morning prior to public transport services starting) with potentially some industry funding to reduce fares for workers.

Hire car (or limousine) services make up a small proportion of trips, but they have a much higher congestion impact on the local airport road network, as many of them have long dwell times close to the exit points to the Domestic Terminals. Hire cars are often double-parked as they meet their customers, which slows road circulation and reduces parking availability as these drivers wait for their customers. There is limited opportunity for this market to grow unless alternative new waiting arrangements are developed (such as a dedicated valet-style facility within the car park).

Broader network options for surface transport

Given the interconnected nature of surface transport and the challenge of isolating one part of the network that does not have an impact on other parts of the network, the Steering Committee has examined broader network-wide options to provide surface transport capacity in the medium term. These all provide benefits to the surface transport access of Sydney (Kingsford-Smith) Airport as well as provide benefits more broadly in Sydney.

M5 East expansion

The M5 motorway is part of Sydney's Orbital Road Network and is a key link to Sydney (Kingsford-Smith) Airport and Port Botany. It is the main road freight, commercial and passenger route between Sydney (Kingsford-Smith) Airport and South West Sydney and comprises two sections:

- the M5 South West motorway from Prestons to Beverley Hills; and
- the M5 East Freeway, which is the focus of this option.

The NSW Government's proposed M5 East Expansion aims to:

- duplicate the capacity of the existing M5 East Freeway (including tunnels) to a total of eight lanes between Beverly Hills and Kyeemagh; and
- provide enhancements to the road network and improve access to the airport and commercial and industrial areas north of the airport.

Improved travel times

The M5 East Expansion has been estimated by the NSW Government to be economically viable in terms of its BCR. This is primarily driven by travel time savings given that the increased capacity on the motorway will improve traffic flows.[155] This will in turn result in reduced road vehicle operating costs and will also result in reduced environmental externalities.

155 RTA (2009) *M5 Expansion – Preliminary Economic Evaluation*, cited by Transport for NSW (Technical Paper C2)

Analysis of travel time changes with and without the M5 East Expansion was undertaken in order to gauge the impact of the project on airport users. The motorway project was found to reduce travel times to the airport from a selection of town centres in comparison to a 2036 base case. The travel time savings resulting from the project will be captured by airport users living along the motorway corridors. Those living in less proximate locations will derive improved accessibility as a result of the expansion, although to a lesser extent.

M4 Extension

The M4 Extension project arose out of a NSW Government commitment to examine the needs of the wider network between the eastern end of the M4 at North Strathfield, the CBD, and the Sydney (Kingsford-Smith) Airport / Port Botany precinct. This was intended to improve connectivity between the western part of Sydney, Parramatta and the Sydney CBD and airport / Port Botany area and reduce traffic intrusion into local residential areas in Sydney's Inner West.

The proposal for the M4 connection to the airport has not yet been finalised and detailed designs have yet to be developed. Broad route options have been examined which could include components such as:

1. widening/upgrading of the M4 motorway from west of Church Street (near Pitt Street at Merrylands) to Concord Road at North Strathfield;
2. a tunnel from North Strathfield to just south of Campbell Road at St Peters with ramp connections to the City West Link at Lilyfield/Rozelle and Parramatta Road / Broadway at Glebe/Chippendale. A bus-only connection at Parramatta Road, Haberfield, is also possible;
3. a surface motorway link from just south of Campbell Road to the road network around Sydney (Kingsford-Smith) Airport, most likely connecting to Canal Road and Qantas Drive (the latter subject to M5 East Expansion planning and SACL agreement), with a potential link to the M5 at Arncliffe; and
4. northern motorway tunnel connecting Victoria Road near Gladesville Bridge to the main tunnel in the Leichhardt area.

The M4 Extension is estimated by the NSW Government to deliver substantial economic benefits to metropolitan Sydney by addressing key areas of network congestion and future travel demands from the port and airport. The toll on the existing M4 was also covered by cashback, but this toll was totally removed when the concession period ended in 2010.

The principal benefit of the M4 Extension is travel time savings, given that the increased capacity will improve traffic flows.[156] The M4 Extension project would provide a more direct link to the airport than existing arterial roads. This would be captured by airport users living along the motorway corridors. Those living in less proximate locations would derive improved accessibility if these projects are built, although to a lesser extent.

Freight

This Joint Study has also considered the impact of rapidly growing freight movements from Port Botany on land transport capacity, and the need to pursue measures to separate the freight task from the land transport needs of Sydney (Kingsford-Smith) Airport within the Global Economic Corridor. Although the air freight task at Sydney (Kingsford-Smith) Airport is relatively small compared to the container freight task for Port Botany, the colocation within one precinct creates land transport capacity issues. As discussed in Part Two of this Report, Port Botany is Australia's second-largest container terminal, handling two million containers in 2010–11 (one-third of national volume), with this trade worth more than $40 billion per year. Freight activity has been growing by seven per cent per year. Strong growth (albeit at slightly lower levels) is expected

156 RTA (2008) *M4 Extension – Preliminary Economic Evaluation,* cited by Transport for NSW (Technical Paper C2)

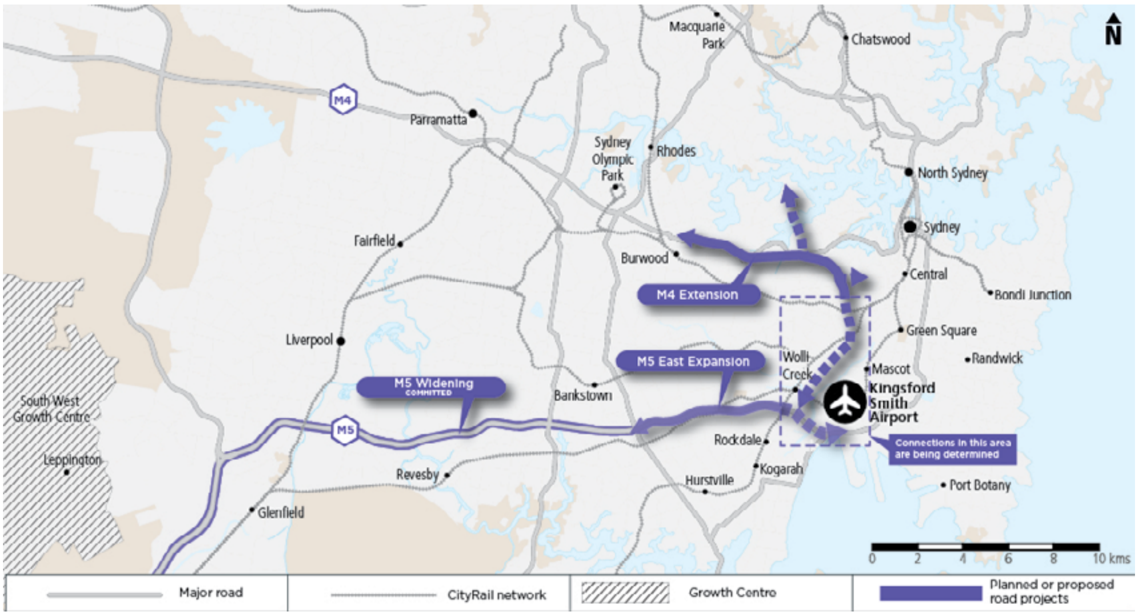
to continue, with container volumes rising to reach the 3.2 million per year container volume planning limit (set by the NSW Government) by 2018.

Port Botany operates 24-hours a day, seven days a week. This means that often a significant proportion of truck trips to the precinct are scheduled to avoid the commuter peaks on the road network. Nevertheless, truck movements to and from Port Botany total 3,900 to 4,400 per day, or one million to 1.5 million movements per year.[157] The NSW Government's Container Freight Strategy aims to reduce the impact of freight truck trips on the road network by increasing the rail network's mode share of containers to and from the Port.

The NSW State Plan has set a target for reducing the impact of truck trips and doubling the mode share of rail from 16 per cent to 32 per cent by 2020. The upgrades to the Southern Sydney Freight Line, which are underway, as well as extra intermodal capacity at sites such as Enfield and Moorebank, are key to achieving this target. However, there is a requirement to consider some of the surface transport linkages between the port and airport together to ensure a whole-of-precinct response. Transport for NSW is currently developing a proposal for Port/ Airport Transport Improvement Plan, designed to alleviate congestion and increase productivity.

The routes for the proposed M5 East Expansion and the M4 Extension are illustrated in Figure 126.

Figure 126 Proposed improved motorway connections to Sydney (Kingsford-Smith) Airport



Source: Transport for NSW.

Summary of implications for options to improve surface transport for airport users and broader network

Table 30 summarises the range of impacts that may occur as a result of the surface transport options to access Sydney (Kingsford-Smith) Airport.

157 Sydney Ports Corporation, *Port Freight Logistics Plan: A framework to improve road and rail performance at Port Botany,* 2008.

Table 30 **Implications of surface transport options to access Sydney (Kingsford-Smith) Airport**

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Long-term rail network capacity increases	**Generalised trip cost:** savings in travel costs for users across the CityRail network due to improvements to the rail system. Road decongestion: as a result of mode shift from road to rail, road decongestion will be experienced across the region, with lower travel time and reduced vehicle operating costs. Environmental externalities: improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.		●	●
Removal of the station access fee at the International and Domestic Terminals railway stations	**Generalised trip cost:** relatively high savings in travel costs for airport users accessing the airport by rail due to lower rail fares. **Road decongestion:** as a result of mode shift from road to rail (potential increase of 26 per cent of existing users in first year), resulting in reduced road congestion to access the airport, with lower travel time and reduced vehicle operating costs. **Environmental externalities:** improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.	●		
Public transport information campaign to promote rail access to Sydney (Kingsford-Smith) Airport	**Generalised trip cost:** increased awareness of rail could result in some new users switching from car to rail and benefiting from lower travel costs. **Road decongestion:** slight increase in rail mode share will lead to less road congestion. **Environmental externalities:** slight increase in the number of users travelling on rail as opposed to road will result in a reduction in environmental externalities.	●		
M5 East Expansion	**Generalised trip cost:** significant travel time savings for motorway users, primarily benefiting airport users travelling to and from destinations along the motorway corridor. Considering the current trip distribution of airport users, the M5 East Expansion is likely to benefit a higher number of airport users than the M4 Extension, given the volume of trips to and from the west and north-west of the airport relative to the south and south-west. **Road decongestion:** improved traffic flows affecting a number of users in the network will reduce road congestion and result in reduced vehicle operating costs. **Environmental externalities:** significant improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.	●	●	

continued...

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
M4 Extension	**Generalised trip cost:** significant travel time savings for motorway users, primarily benefiting airport users travelling to and from destinations along the motorway corridor. **Road decongestion:** improved traffic flows affecting a number of users in the network will reduce road congestion and result in reduced vehicle operating costs. **Environmental externalities:** significant improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.	●	●	
Public buses running from selected locations to or from Sydney (Kingsford-Smith) Airport	**Generalised trip cost:** will provide new public transport options for staff in the St George / Sutherland area and passengers from the Lower North Shore to divert from car to bus if their travel cost is less. They will avoid the inconvenience and financial costs of parking at the airport. **Road decongestion:** with increased number of bus users, road congestion will decrease and provide reduced travel times for road users to and around Sydney (Kingsford-Smith) Airport, which will result in reduced vehicle operating costs. **Environmental externalities:** improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.	●		
Minor improvements to taxis, hire cars and minibuses	A range of minor improvements to improve the short-term parking, loading, unloading and terminal road circulation arrangements.	●		

Source: PwC and Australian Department of Infrastructure and Transport.

Summary of economic analysis of land transport capacity options

PwC completed a preliminary economic CBA of key options, which were compared to a reference or base case. This was defined as the road, rail and bus plans currently planned by the NSW Government to 2016. The key options were:

- removal of the station access fee at airport stations, with a complementary public transport information campaign to promote rail including improved affordability;
- establishment of a transit mall at each terminal to coordinate and promote high occupancy vehicles, such as mini buses;
- provision of additional public bus routes serving the airport from St George/Sutherland and the lower North Shore;
- M5 East motorway expansion; and
- M4 motorway extension.[158]

158 Potential upgrades to Sydney (Kingsford-Smith) Airport arterial roads were also considered as an option to reduce road congestion in the airport precinct but were not evaluated in a CBA separately due to them being highly dependent upon the final airport connections determined for the large-scale motorway projects.

Table 31 provides a summary of the economic results for these key land transport improvement options and illustrates the substantial diversity in capital cost between the options. All projects show BCRs above one, indicating they each deliver positive net economic benefits, with M4 Extension and removal of the station access fee having the highest BCR. The NPV result provides a quantification of the size of the net benefit stream..

Table 31 Summary of economic results for key land transport options

Option	Remove Station Access Fee, with a Public Transport Information Campaign	New Public Buses (North Shore and St George / Sutherland) along with a Transit Mall	M5 East (untolled)	M4 Extension
BCR	1.5	1.2	1.5	3.3
NPV ($m)	268	17	2,000	17,700

Note: BCR represents benefit cost ratio; NPV represents net present value.

Source: PwC and Australian Department of Infrastructure and Transport.

6.3 Summary of existing infrastructure options

Table 32 summarises those policy and infrastructure options considered to have some impact on providing greater capacity at Sydney (Kingsford-Smith) Airport. As can be seen, the policy options will assist more with short-term capacity shortfalls, and the land transport infrastructure options will assist with medium- and long-term capacity issues. There are no aviation infrastructure options for the airport that are viable or will provide significant increased capacity; and no option meets the expected gap in demand forecasts.

Table 32 **Possible existing infrastructure options: potential range of impacts**

	Option	Potential Delay in Capacity Shortfall (years)	Potential Timing: Short Term (0–10 years)	Potential Timing: Medium Term (10–25 years)	Potential Timing: Long Term (25–50+ years)
Options for Better Use of Sydney (Kingsford-Smith) Airport	Increasing the movement cap to 85 movements per hour in peak hours	Around one year	●		
	Increasing the movement cap to 85 movements per hour for all non curfew hours	Around two years	●		
	Increasing permitted movements in the curfew shoulder to the maximum level allowed in the Act (both 5.00am to 6.00am and 11.00pm to midnight)	Less than one year	●		
	Increasing permitted movements in the 5.00am to 6.00am curfew shoulder only	Less than one year	●		
	Increasing permitted movements in the 11.00pm to midnight curfew shoulder only	Less than one year	●		
	Redefining the NSW intrastate services affected by price regulation	Less than one year	●		
	Increasing the minimum size of aircraft for RPT aircraft accessing Sydney (Kingsford-Smith) Airport to 40 seats per movement	Around one year	●		
Options to improve Sydney (Kingsford-Smith) Airport surface transport access	Improved rail connections to the airport	Medium- and long-term solution		●	●
	Removal of the station access fee at the International and Domestic Terminal railway stations	One to four years	●		
	Public transport information campaign to promote rail access to Sydney (Kingsford-Smith) Airport	Short-term solution	●		
	M5 East Expansion	Medium-term solution	●	●	
	M4 Extension	Medium-term solution	●	●	
	Public buses running from selected locations to or from Sydney (Kingsford-Smith) Airport	Short-term solution	●		
	Minor improvements to taxis, hire cars and minibuses	Short-term solution	●		

Source: PwC and Australian Department of Infrastructure and Transport.

PART SEVEN

OPTIONS TO BETTER UTILISE OTHER EXISTING INFRASTRUCTURE TO GAIN CAPACITY TO MEET FORECAST DEMAND

P7

Key points

- Bankstown Airport could be upgraded and made available to accommodate a limited level of operations by turboprop Regular Public Transport (RPT) aircraft.
  - A proposal by the airport operator for a 220 metre extension of the main runway would enable up to Code 3C aircraft to operate at the airport.
  - Airservices Australia advises that the operation of RPT jet aircraft at Bankstown would conflict with operations at Sydney (Kingsford-Smith) Airport in some conditions.
- Bankstown is Sydney's major General Aviation (GA) airport, with a large volume of Visual Flight Rules (VFR) flights, including a high proportion of training flights. The operation of Instrument Flight Rules aircraft at levels of more than 10 to 12 per hour would create significant disruption and risks to VFR activity.
  - If a significant level of RPT services – above about 10 per hour – were to commence at Bankstown, provision would need to be made to relocate GA activity to other airports.
- The commencement of any significant level of RPT activity at Bankstown and any extension of the runway would require regulatory approvals, with public consultation and assessment of the environmental impacts.
  - Given the location of Bankstown Airport in a heavily urbanised area, aircraft noise and impacts on road congestion are likely to be significant issues of local concern.
- Utilisation of Bankstown Airport for RPT services would require upgrades of airport and road access infrastructure to the airport. Any upgrades should also consider linkages with Sydney (Kingsford-Smith) Airport and be consistent with NSW Government transport plans.
- RAAF Base Richmond is presently capable of accommodating jet RPT services but would require a significant upgrade of airport infrastructure to accommodate civil traffic.
  - The RAAF supports opening up the Richmond base to civil access, as it is compatible with its plans for a reduced presence and would extend the life of the RAAF Base at the location.
- Based on preliminary cost estimates, an initial investment of around $150 million would provide a functional joint civil/RAAF facility able to handle around one million passengers per year.
  - An investment of $500 million would extend the capacity to an estimated five million passengers per year.
- RAAF Base Richmond has significant operational limitations, including:
  - the prevalence of fog at certain times of the year and the proximity to the Blue Mountains;
  - operations on the east-west runway would have some impact on flight paths to Sydney (Kingsford-Smith) Airport.
- In addition, the communities of Richmond and Windsor, which are located close to the ends of the current east-west runway, would experience a level of additional aircraft noise from civil operations.

- Better noise outcomes and additional capacity could be achieved if additional land was acquired and a new runway was constructed on a north-south alignment. This would provide a major airport able to service all market segments. However, it could cost around $4.0 billion for a single 2,600 metre runway with a terminal suitable for up to 20 million passengers per year, or around $10.0 billion for a single 4,000 metre runway and terminal facilities suitable for 30 million passengers per year.
- RAAF Base Richmond will remain a constrained site and it would be challenging to develop it into a parallel runway airport. However, providing civilian access to the site based on use of the existing runway would serve the growth of North West Sydney and Western Sydney.
- Canberra and Newcastle (Williamtown) airports are important airports serving RPT markets to the south and north of Sydney. Neither is located close enough to the population of Sydney to take the role of Sydney's second RPT airport, but both will provide additional options for a small proportion of passengers who are prepared to travel the extra distance.
- Canberra Airport is the only curfew-free airport within reach of Sydney and provides the potential for night-time services which cannot be accommodated at Sydney (Kingsford-Smith) Airport, including overnight freight services, and possibly some international Low Cost Carrier (LCC) services . It is important that Canberra's 24-hour unrestricted curfew-free status be protected.
- Newcastle Airport serves the growing population in the Hunter Valley region and parts of the Central Coast. The civil operations are conducted under an agreement with the RAAF. However, because of RAAF requirements, the scope for continued growth of civil services is unclear.
- Other aerodromes in the region may also want to attract some RPT (such as Illawarra Regional Airport). However, even if a combination of the options considered for maximising the use of existing airports is implemented, they do not provide sufficient additional capacity to meet the long-term demand for aviation services in the Sydney region.

7.1 Options for better use or expansion of other existing aerodromes

It is anticipated that Sydney (Kingsford-Smith) Airport will be able to undertake a range of actions to improve efficiencies across the airport to better handle increased throughput, to manage delays and improve the passenger experience. However, the aviation infrastructure options do little to manage the expected long-term forecast demand.

As a result, the Steering Committee also examined options to better use or expand other existing aerodromes to help cater for the demand that cannot be met by Sydney (Kingsford-Smith) Airport.

Potential to expand the RPT role of existing aerodromes

There is a range of other existing aerodromes in the Sydney region that currently fulfil a role serving particular demand segments.

However, Bankstown and Richmond are the two aerodromes close to the Sydney market base able to undertake an expanded role to service a proportion of RPT.

RAAF Base Williamtown (Newcastle Airport) has the physical capacity to accommodate existing demand levels and can accommodate some growth in its current RPT services. However, its distance from Sydney means that the airport principally serves the Hunter and Central Coast regions.

Canberra Airport is expected to continue to grow and potentially to introduce some international services, but it will largely serve its own market to the south of the Sydney region. It is the only RPT airport in the region that is currently cap-free and curfew-free. This gives Canberra Airport an opportunity to target both late night international flights, especially from LCCs (though demand for this would be long term), as well as overnight freight. Overnight air freight carried to and from Canberra currently includes overnight express freight envelopes; critical medical items such as blood, plasma and radioactive isotopes for cancer treatment; cash for the banking system; diplomatic parcels; and newspapers. In the *Canberra Airport 2009 Master Plan*, Canberra Airport's lessees have published their objectives to establish a wider overnight freight hub, with night-time connections in and out to major Australian cities and potentially New Zealand.

> As Sydney (Kingsford-Smith) Airport operations are expected to remain constrained by the curfew, there will be a need for an alternative airport to meet the growing demand for overnight services. Canberra Airport, provided it remains curfew-free, is expected to play an important role in providing these services.

While further work is continuing on the potential business case for High Speed Rail (HSR), there is as yet no developed analysis of the scope for Canberra or Newcastle airports to serve a substantial share of the Sydney aviation market if connected to a future HSR link. As these airports are too far away from most of the Sydney market, they are unlikely to make a major contribution to meeting the Sydney aviation market demand.

A range of other GA airports or military aerodromes in the region have also been assessed, with a focus on their ability to make a significant contribution.

Illawarra Regional Airport at Dapto near Wollongong has for short periods provided RPT services to Melbourne. Expansion in the level of possible RPT operations could be constrained by a range of environmental issues. Additionally, there could also be significant future noise issues for major residential development occurring close to the airport, particularly in two new housing estates planned for Calderwood and West Dapto.

A range of other airports were considered but were found to also face constraints in being able to serve RPT demand.[159] Table 33 provides a snapshot of aerodromes assessed and their capacity to assist with future demand levels.

Table 33 Other aerodromes' ability to assist with future demand levels

Aerodrome	Longest Runway Length	Current Operational Function	Type of RPT That Could Be Provided from Existing /Upgraded Infrastructure				
			Long Haul International	Short Haul International	Domestic	East Coast Domestic	Regional Domestic
RAAF Base Richmond	2,134m	RAAF military logistics facility and supply chain into Sydney basin	✗	✓	✓	✓	✓
Canberra Airport	3,283m	Major RPT airport with some military and VIP aircraft operations	✓	✓	✓	✓	✓
Bankstown Airport	1,416m	Primary GA airport for the Sydney basin	✗	✗	✗	✓	✓[1]
RAAF Base Williamtown	2,438m	RAAF's primary operational air base in NSW; RPT for Newcastle market	✗ ✓[2]	✓	✓	✓	✓
Illawarra Regional Airport	1,819m	Provides GA services	✗	✗	✗	✓	✓
Camden Airport	1,464m	Provides GA services	✗	✗	✗	✗	✓[3]

Note 1: Turboprops only.
Note 2: If agreed by Defence.
Note 3: Turboprops and only with significant upgrades to pavement strength.

Source: WorleyParsons/AMPC.

Based on the assessment, Bankstown Airport and RAAF Base Richmond are considered to be the only existing aerodromes able to serve a significant proportion of the Sydney region's RPT demand. These facilities are considered further in the section below.

This does not limit other aerodromes in the region from expanding RPT services as part of their own planning processes.

159 Further information can be found in Technical Paper A1.

7.2 Potential expanded role of Bankstown Airport

Bankstown Airport is located about 4 kilometres west of Bankstown city centre, 37.5 kilometres from Sydney and 14 kilometres from Parramatta by road, in a heavily urbanised part of Western Sydney. It functions as the primary GA aerodrome for the Sydney region and NSW, and it has the second highest number of aircraft movements in Australia.

The annual operational capacity of Bankstown Airport's runway system has been estimated at 480,000 to 500,000 GA aircraft movements per year, with Bankstown Airport recording more than 484,000 aircraft movements in 1989–90 during the pilot's strike.[160] Assuming continued GA growth of 0.5 per cent to 1.0 per cent per year, this level of movement could be reached between 2060 and 2090.

Some capacity at Sydney (Kingsford-Smith) Airport could be released by inducing or requiring by regulation some passenger services (for example, turboprop services) to relocate to Bankstown Airport. This would allow larger aircraft to take up the slots vacated at Sydney (Kingsford-Smith) Airport.

The airport lessee, Bankstown Airport Limited (BAL), has long expressed an interest in establishing point-to-point passenger services targeting Melbourne, Brisbane and Canberra, as well as regional NSW. The approved *Bankstown Airport Master Plan 2004/05* (the 2005 Bankstown Master Plan) foreshadows up to 12 RPT movements per day. In the draft Master Plan submitted in 2010 BAL sought to extend the provision to 32 RPT movements per day. However, as the draft Master Plan was not accepted by the Australian Government, this change has not as yet been realised.

While there are no RPT services currently, the airport is technically capable of accommodating up to Code 3C aircraft such as the BAe-146 (albeit with possible pavement and/or payload limitations). The airport is currently not capable of serving domestic jet aircraft operations. While some extension of the runway is possible, the airport site is relatively small and constrained. Further its location in a heavily urbanised region means that a public consultation process and government approval would be required for any runway upgrade.

Considering the potential physical capacity of Bankstown Airport, options have been considered for the airport to expand its role to provide RPT capacity in the region.

160 Bankstown Airport Limited, Aviation Development Concept – Proposed Requirements, Bankstown Airport Master Plan, 2004/05.

Figure 127 **Bankstown Airport site and surrounds**

Note: Distances are 'as the crow flies'.

Source: Australian Department of Infrastructure and Transport.

Provide incentives to relocate or otherwise induce all NSW intrastate turboprop aircraft movements to Bankstown Airport

Current airline schedules indicate that approximately 240 RPT turboprop movements occur at Sydney (Kingsford-Smith) Airport per weekday, principally on intrastate services.[161] In 2010, approximately 90 per cent of all intrastate aircraft movements at the airport were by turboprop aircraft.[162]

Airspace management and air traffic control

Airservices Australia advises that a level of turboprop operations could be accommodated within the current airspace configuration; however, the proximity of Bankstown Airport to Sydney (Kingsford-Smith) Airport precludes the segregated operation of larger RPT jet traffic from both airports.

Airservices Australia also suggests current airspace classification and control zone dimensions for Bankstown Airport do not support a combination of high-density GA traffic and significant RPT turboprop movements. As a result, a level of RPT movements above about 10 to 12 per hour[163] would require the relocation of most GA Visual Flight Rules traffic, including flying training, to another airport.[164]

Considering the current and forecast movement levels at Bankstown Airport, it would be difficult for other GA aerodromes in the region to collectively accommodate the demand, as some are located significant distances from Sydney. More remote locations may not be viable for some of the businesses operating at GA airports. Bankstown Airport is home to a significant number of GA-related businesses and privately-owned infrastructure. The relocation of GA movements to alternative aerodromes in the region would also require the relocation of these businesses. This is likely to be costly.

Potential capacity

There may be potential to put in place relocation incentives to induce all NSW intrastate turboprop movements from Sydney (Kingsford-Smith) Airport to Bankstown Airport. This would enable a proportion of slots used by the 64,000 intrastate[165] movements to become available for other movements at Sydney (Kingsford-Smith) Airport.

There would be a requirement for incentives or regulatory intervention to drive take-up and demand for this option if it is to achieve slot capacity increases at Sydney (Kingsford-Smith) Airport. As capacity pressures build at Sydney (Kingsford-Smith) Airport, some RPT airline views on the use of Bankstown Airport may change by normal market forces. However, over recent years, airlines, including those operating intrastate, have had the option of relocating operations to Bankstown Airport but have not done so. This has been despite potential savings in aeronautical charges as well as avoiding peak capacity challenges at Sydney (Kingsford-Smith) Airport. Operations to Bankstown Airport would not meet the needs of passengers transferring to major domestic or international services. Airlines are also likely to be reluctant to split their operations between Sydney (Kingsford-Smith) Airport and Bankstown Airport.

161 Airservices Australia. Other turboprops operate from Sydney to Canberra but are not considered 'intrastate'.
162 BITRE data.
163 It is anticipated by Airservices Australia that the 10–12 movements per hour would be the maximum.Depending on the number of GA operating in that hour it may be significantly less.Such operations would need the approval of the Civil Aviation Safety Authority.
164 Further information can be found in Technical Papers C3 and C4.
165 Other turboprops operate from Sydney to Canberra but are not considered 'intrastate'.

If all turboprop movements were relocated, this could delay capacity issues for aircraft movements accessing Sydney (Kingsford-Smith) Airport by up to six years.

Infrastructure improvements

To allow full use by Code 3C aircraft at Bankstown Airport, it is likely that a 220 metre extension of the centre runway from 1,416 to 1,635 metres would be required. This would allow Code 3C aircraft to operate at Maximum Take Off Weight (MTOW) without undue payload or flight distance restrictions. This runway extension would not make Bankstown Airport capable of accommodating Code 4C aircraft such as B737-800 and A320-200.

While the runway has a strength rating of 20,000 kilograms and accommodates occasional use by aircraft up to 50,000 kilograms, some strengthening may be required to handle regular use by turboprop aircraft with a MTOW over 20,000 kilograms, such as the Q400. Similarly, some strengthening may also be required on a parallel taxiway and associated parking aprons.

The existing passenger terminal will need to be redeveloped or expanded if passenger demand exceeds the current processing capacity of 170 departing passengers and 150 arriving passengers at International Air Transport Association Level of Standard 'Category C'. The scale and rate of redevelopment would largely depend on the scheduled distribution of aircraft throughout the day and the extent to which the schedule generates peaks in terminal use.

At Sydney (Kingsford-Smith) Airport, the change in aircraft mix arising from any substantial diversion of turboprop operations to Bankstown Airport would likely require some restructuring of airside infrastructure and capital expenditure to accommodate a fleet of generally larger aircraft.

Surface transport connections

One of the reasons that Bankstown Airport is often cited to assist with aviation capacity in the Sydney region is its proximity to Sydney CBD and the region's population relative to other existing aerodromes. Bankstown Airport is located 37.5 kilometres and a travel time of 41 minutes (as of 2011, assuming relatively free-flow traffic) from the CBD by road. In contrast, Sydney (Kingsford-Smith) Airport is located 11.7 kilometres and a travel time of approximately 15 minutes from the entry to the Domestic Terminals via the Eastern Distributor to the CBD and 16.9 kilometres and a travel time of 17 minutes from the International Terminal. This suggests at least an additional 25 minutes travel time each way for passengers to Bankstown Airport seeking to access the city centre. However, Bankstown Airport is comparatively closer to the Parramatta CBD than to Sydney in terms of both distance and travel time (14 kilometres or 32 minutes from Bankstown Airport by road), suggesting that for some travellers this option may result in an improvement in overall journey time.

As any significant level of RPT services would also involve a significant increase in the number of users accessing the airport, road congestion around Bankstown Airport at peak times would be a significant challenge, with increased Bankstown traffic joining high peak time traffic volumes on the M5 motorway, Henry Lawson Drive and Milperra Road.

Increased local traffic would also be an issue for local residents.

While there is a Bankstown Station on the CityRail network 4.7 kilometres away, connections between the airport and the rail line are only currently served by charter bus services to and from Bankstown Airport. To connect this level of patronage in the CityRail network would either require increased bus services or an underground branch rail line.

The distance from Bankstown Airport to Sydney (Kingsford-Smith) Airport would present challenges for those passengers connecting to interstate or international services. For these passengers connecting with other services, this would require at least an additional 30 minutes to travel between the two airports to connect to another flight and at additional cost.

Managing the impact of RPT on surface transport connections around Bankstown Airport will therefore require appropriate integration with current transport and land use planning strategies.

Aircraft noise

Aircraft noise associated with the introduction of RPT services is likely to be a significant issue. Bankstown Airport is located in a heavily urbanised area, with residential area in close proximity to the site. While the airport is currently used by turboprop and small jet aircraft, the predominant operations are by smaller piston engine aircraft. Current aircraft operations generate some noise complaints, but the airport is able to operate without a curfew.

Regular RPT services using larger turboprop aircraft will generate different noise patterns in the vicinity of the airport. Even though these aircraft may be relatively quiet compared to passenger jet aircraft, the changed noise patterns are still likely to raise concerns with potentially affected residents. There will likely be a need for a full environmental assessment of the proposed introduction of RPT services.

Bankstown Airport to accommodate up to 32 RPT turboprop movements per day

In the 2005 Bankstown Master Plan, Bankstown Airport Limited published its plans for RPT movements commencing with four movements per day, six days per week (1,248 aircraft movements per year), increasing to 12 movements per day, six days per week (3,744 aircraft movements per year).[166] In its *Bankstown Airport Preliminary Draft Master Plan 2010*, Bankstown Airport Limited was seeking to increase movements to up to 32 movements a day in 2011–12.[167]

This number of movements per day is equivalent to around 11,700 RPT movements per year. If this level of RPT is relocated from Sydney (Kingsford-Smith) Airport[168] to Bankstown Airport, this is equivalent to a saving of two per cent of total slots. Provision for the higher level of 32 RPT movements per day relative to the 12 per day currently in the 2005 Bankstown Master Plan may increase the attractiveness for airlines, allowing the chance of take-up by natural market forces – in particular, as capacity pressures increase at Sydney (Kingsford-Smith) Airport. Although, this is significantly lower than the option of 10–12 movements per hour.

At a level of 32 RPT movements per day, GA could still be accommodated at Bankstown Airport but may require the displacement of some GA IFR operations if there are periods of peak demand for IFR operations (RPT and other) and the maximum hourly rate of IFR movements (10–12) is reached.

Other GA operations may also be displaced or interrupted by RPT movements because of separation requirements, but the extent of this displacement has not been analysed. This level of movements would require Civil Aviation Safety Authority (CASA) approval given the potential safety implications for an arrangement where both GA and RPT services are operating at Bankstown Airport in what is currently Class D airspace.

Table 34 below summarises the range of impacts that may occur as a result of the Bankstown Airport RPT options.

166 Bankstown Airport Limited, *Master Plan Bankstown Airport 2004/05, Aviation Development Concept – Traffic Forecast, 2005.*
167 Bankstown Airport Limited, *Bankstown Airport: Preliminary Draft Master Plan 2010,* 2010. Note that this Master Plan was not approved by the Minister for a variety of reasons and a new preliminary draft is currently being developed.
168 Note not all of the activity is likely to relocate.Some of it will be induced demand.

Table 34 Possible Bankstown RPT options

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Provide relocation incentives or otherwise induce regional movements to Bankstown Airport. If level of RPT conflicts with GA operations, commence relocation of GA (such as training traffic) out of Bankstown Airport.[1]	**Noise:** less noise initially at Sydney (Kingsford-Smith) Airport, but not as demand takes up capacity created. **Noise implications at Bankstown Airport:** greater noise per aircraft, but if GA relocated 80 per cent reduction in total movements. Noise implications at GA aerodromes accommodating Bankstown Airport's current GA. **Peak slot availability:** greater peak slot availability at Sydney (Kingsford-Smith) Airport. **Slot availability:** potential 12 per cent increase in total Sydney (Kingsford-Smith) Airport slots, delaying constraints by around six years. Timing would depend on intrastate service take-up of the relocation incentives. Capacity issues created for GA movements in the region. **Airside infrastructure:** investment and capital expenditure required at Sydney (Kingsford-Smith) Airport, Bankstown Airport and GA airports accommodating approximately 330,000 GA movements. GA operator and intrastate airline operator investment to relocate. **Surface transport:** congestion on roads to access Sydney (Kingsford-Smith) Airport could be reduced; however, surface transport to Bankstown Airport and other GA aerodromes accommodating the GA demand could become more congested and may require investment. **Delay impacts:** less flow-on delays at Sydney (Kingsford-Smith) Airport in the short term, but impacts would resume as demand takes up capacity. **Passenger impacts:** more expensive and longer transits for those passengers interlining with domestic or international services. Closer proximity to Western Sydney, including Parramatta. **Relocation of services:** Shortfall in GA capacity, with current GA airports in the vicinity unable to accommodate the relocated services. **Airspace implications:** This level of activity will need to be assessed by CASA.	●	●	
Bankstown Airport serves up to 32 Code 3C propeller and jet aircraft RPT movements per day.	**Noise sharing:** minor impact at Sydney (Kingsford-Smith) Airport due to scale of movements, though Bankstown Airport would be affected by noise from both GA and RPT operations. **Peak slot availability:** minimal impact due to the scale of movements relative to overall Sydney (Kingsford-Smith) Airport movements. **Slot availability:** potential two per cent increase in total Sydney (Kingsford-Smith) Airport slots (around one year delay of constraints). Timing would depend on intrastate service take-up of the relocation incentives. Capacity issues created for GA movements in the region. **Airside infrastructure:** given the scale of movements, minimal if any airside infrastructure restructure and capital expenditure is expected. **Surface transport:** minimal impact for Sydney (Kingsford-Smith) Airport due to the scale of movements; however, surface transport to Bankstown Airport may require investment. **Delay impacts:** minimal impact due to the scale of movements relative to overall Sydney (Kingsford-Smith) Airport movements.	●		

Note: 1. *This option may be undertaken without relocating GA if movements are kept to below 10–12 per hour or as assessed by CASA.*

Source: PwC and Australian Department of Infrastructure and Transport.

In summary, relocation of all RPT turboprops to Bankstown Airport would create a significant amount of slot capacity at Sydney (Kingsford-Smith) Airport and could provide an additional six years in capacity. However, this capacity expansion needs to be balanced against other factors such as relocation of GA traffic to another airport or other airports.

Limiting RPT operations to 32 turboprop movements per day at Bankstown Airport would still enable GA operations at the airport; however, it provides limited additional capacity for Sydney (Kingsford-Smith) Airport.

The commencement of any substantial level of RPT operations at Bankstown would raise significant issues for the local community, including around aircraft noise and increased road congestion.

7.3 Potential expanded role of RAAF Base Richmond

RAAF Base Richmond is located between the towns of Windsor and Richmond, which lie to the immediate east and west of the aerodrome respectively. The base is within proximity of the North West Growth Centre.

Its location within the Sydney region (65 kilometres from the CBD by road) provides it with reasonable transit times, particularly for large parts of Northern and Western Sydney. A range of investments in passenger facilities would be required to accommodate significant RPT.

Two potential options have been explored for RAAF Base Richmond investment to accommodate RPT movements, one involving use of the existing east-west runway for a level of RPT services and the other involving construction of a north-south runway to provide an expanded capacity for RPT services. Both presume the continuance of Defence operations at the base.

Ability to accommodate RPT on existing east-west runway

RAAF Base Richmond has a similar runway capability to RAAF Base Williamtown (albeit the main runway is 300 metres shorter, at 2,134 metres) and is able to presently accommodate aircraft types such as B737, A320 and EMB 190.[169] It currently has no RPT usage and has relatively less RAAF usage than Williamtown.

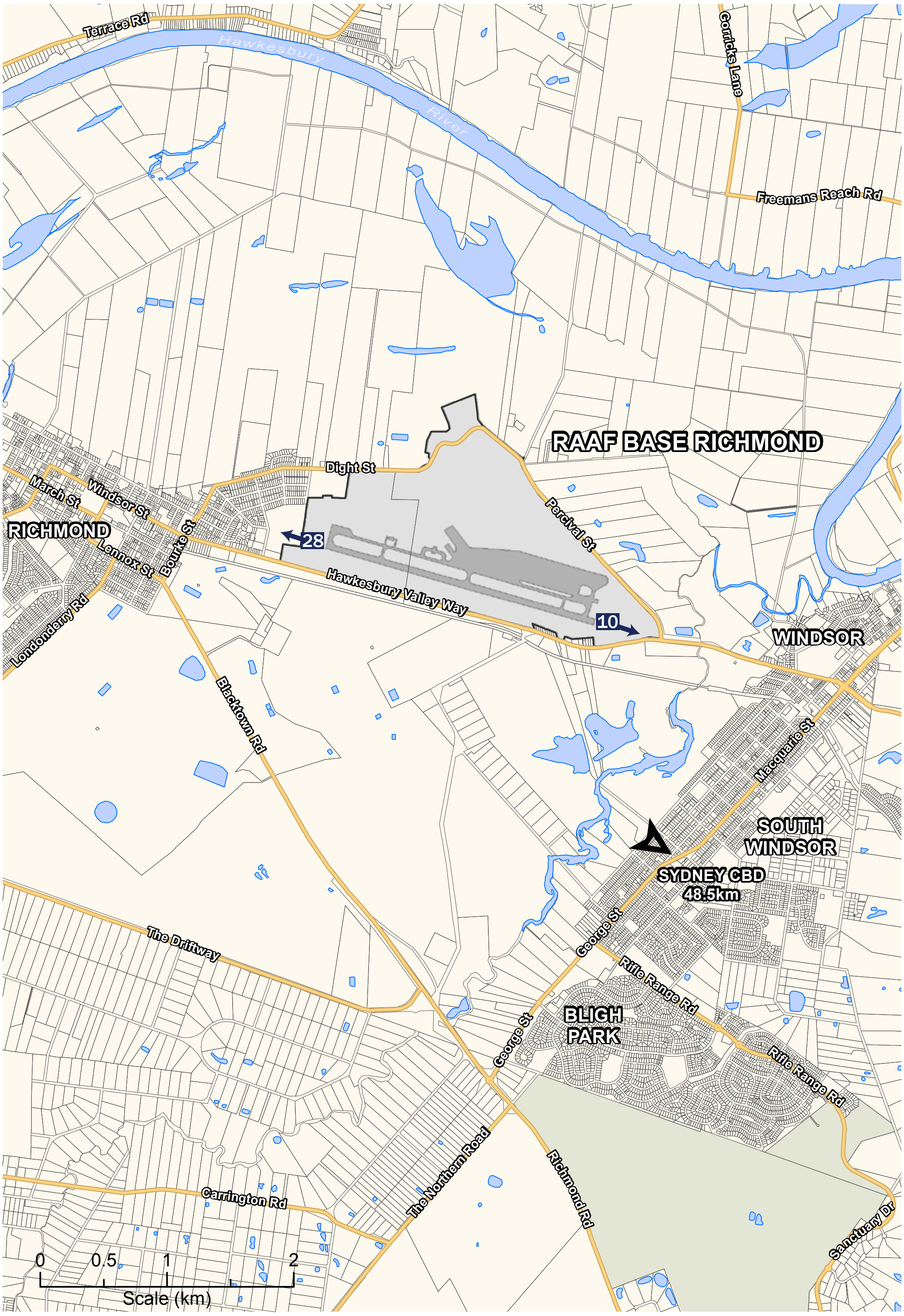
The addition of civilian movements would likely extend the duration of RAAF use of the site, as it would also facilitate a number of necessary infrastructure upgrades. However, arrangements for interactions between civil and military movements would need to be considered.

Development scenarios

Figure 128 presents the current layout of RAAF Base Richmond. The RAAF Base and facilities are concentrated to the north-east of the existing runway. Loading areas for explosive ordnance are currently located in the north-west area. Richmond Road and the CityRail Western Line connecting Richmond and Chatswood are located to the south of the existing runway, with Hawkesbury Racecourse, Hawkesbury Showground, Clarendon Station and heritage buildings located to the south-east.

169 Depending on the level of RPT activity and type of aircraft, adjustments may be required for other infrastructure such as taxiways.

Figure 128 RAAF Base Richmond site and surrounds



Note: Distances are 'as the crow flies'.

Source: Australian Department of Infrastructure and Transport

WorleyParsons/AMPC considered what changes would be needed at the Richmond site to cater for civilian activity.[170] Key issues included the appropriate location of parking and terminal facilities for civil aircraft and the need for relocation of any existing RAAF facilities. A particular requirement of RAAF operations at Richmond is a suitable area for storing and loading ammunition and other explosive ordnance. Irrespective of the options below, the storing and loading of ordnance is complex when integrated with civilian aircraft operations. This would need to be discussed further with Defence to ensure optimum use of the facility.

Three development scenarios for accommodating civil operations were considered.

1. **Scenario A – RPT operations developed to the north-west of the existing runway:** Scenario A assumed it is possible to relocate the ordnance loading area to special uses land and develop an area in the north-west quadrant of the base for RPT civil aviation operations.
2. **Scenario B – RPT operations developed to the south-west of the existing runway:** Scenario B assumed that the existing ordnance loading area is shifted to the north to create an adequate distance from potential RPT civil operations to be developed in the south-west quadrant.
3. **Scenario C – RPT operations developed to the north and south-west of the existing runway:** Scenario C assumed Defence no longer operates an RAAF Base at Richmond and the existing RAAF precinct is adapted for RPT civilian operation.

The area to the south-east of the existing runway was found to be relatively more constrained by the road, railway, rail station, racecourse, showground and heritage buildings. It was not considered possible to develop this area for RPT civil operations without considerable costs being incurred.

Consultation undertaken with the Department of Defence identified that the approach that would align best with military needs would be Scenario B, with civil activity occurring on the south and opposite side of the runway from military operations. While such an approach may allow a greater separation of civil and military operations, in order to achieve this it requires deviation to existing railway and road infrastructure on the southern boundary, involving additional capital expenditure. Scenario B may also reduce the overall movement rates possible on the runway due to the requirement for taxiing civil aircraft to cross the active runway. Both Scenarios A and B would be likely to extend the duration of RAAF use of Richmond, providing RAAF with opportunities to share costs to develop and maintain the facilities and increase investment in the site's infrastructure.

Potential capacity

When considering the capacity of RAAF Base Richmond to accommodate RPT on the existing east-west runway, there are a range of issues that need to be examined. These include the physical capacity of airside infrastructure such as the runway and taxiways; scope to accommodate passenger facilities such as a terminal; and existing airspace arrangements.

RAAF Base Richmond's capability to meet demand will also be dependent on its attractiveness or its ability to attract the demand from civil operators.

In the short term, RAAF Base Richmond has the potential to attract services (up to Code 4C, such as B737/A320) that cannot access Sydney (Kingsford-Smith) Airport due to capacity constraints. In the medium to long term, services at RAAF Base Richmond may attract some demand from Sydney (Kingsford-Smith) Airport and may help build a new market in Western Sydney.

170 Further information can be found in Technical Paper C5.

As for Bankstown Airport, commercial issues will also impact the airlines' decisions about whether to operate at RAAF Base Richmond. For those already established at Sydney (Kingsford-Smith) Airport, issues include the splitting of operations and catering for interlining passengers. Accordingly, the airport is likely to be best suited to LCC operations targeting the North West and Western Sydney markets, with limited-frequency operations.

Airspace management and air traffic control

Airservices Australia undertook analysis of the effect on Sydney (Kingsford-Smith) Airport operations of using RAAF Base Richmond as an additional civilian airport. As part of this, estimates of the unconstrained, potential RPT capacity at RAAF Base Richmond were developed for the existing runway, assuming LCC type operations are attracted to the site.

This analysis was limited to consideration of airspace and air traffic management, and assumed that the aerodrome would not be operating as a joint user facility.

Airservices Australia suggests a theoretical maximum hourly capacity of 40 movements, assuming use of Runway 28 under visual meteorological conditions when there is sufficient visibility to maintain visual separation from terrain and other aircraft. Potential interaction with some traffic patterns at Sydney (Kingsford-Smith) Airport may result in lower movement rates.

In practical terms, capacity is likely to be lower due to a number of issues, including:

- weather;
- airspace conflicts;
- physical size of the aerodrome; and
- the intention of the RAAF to retain the site as an operating base and continue to use it for its existing support activities.

Weather

Under instrument meteorological conditions, however, when weather requires pilots to fly primarily by reference to instruments, the theoretical capacity of RAAF Base Richmond is estimated to be reduced to 30 movements per hour on Runway 28 (approximately 186,000 aircraft movements based on similar key demand periods of day as Sydney (Kingsford-Smith) Airport).

Fog events at RAAF Base Richmond could affect the physical capacity at the aerodrome. Anecdotal evidence indicates the aerodrome is affected by fog for longer periods and more often than Sydney (Kingsford-Smith) Airport, with a longer time to 'burn off'. These fog events are exacerbated by the surrounding river, creek and flood plain topography. Richmond fog data from 1995 to 1999 indicates there are six days, on average, per month of recorded fog events. RAAF Base Richmond is also affected by severe weather (thunderstorm) events, either directly at the aerodrome, in the Sydney basin, or in the surrounding en route airspace. WorleyParsons/AMPC suggests that provision of a CAT II instrument landing system for Runway 28 could reduce the likelihood of diversions in poor weather (primarily fog).

Table 35 Nominal traffic handling capacity at RAAF Base Richmond, hourly rate

Weather	Mode	Runway 28		Runway 10	
		Day	Night	Day	Night
Visual Meteorological Conditions	Arrivals	20	20	20	15
	Departures	20	20	20	10
Instrument Meteorological Conditions	Arrivals	15	15	5-6	5-6
	Departures	15	15	Nil	

Note: Departure capacity may increase with a reduction in arrival rates.
Note: In this table it is assumed that a satellite-based navigation solution (for example, RNP or GLS) would deliver Runway 28 VMC rates to both runways in all conditions.

Source: Airservices Australia.

Airspace

Airspace conflicts with Sydney (Kingsford-Smith) Airport and Bankstown Airport may also restrict capacity at the aerodrome.

The airspace above RAAF Base Richmond currently facilitates north-western departures from Sydney (Kingsford-Smith) Airport, which accounted for 12.1 per cent of all jet departures (approximately 16,500), and 4.0 per cent of all non-jet departures (approximately 5,600) in 2007. Any increased use of Precision Runway Monitors (PRM) at Sydney (Kingsford-Smith) Airport would impact on Richmond. In particular, departures from Runway 10 and arrivals to Runway 28 would be in immediate conflict with aircraft conducting PRM circuits to Runway 16R at Sydney (Kingsford-Smith) Airport.

This airspace is also utilised by IFR aircraft departing and arriving from Bankstown aerodrome from the north. Enabling RPT jet aircraft operations to RAAF Base Richmond would significantly change the current traffic patterns in the Sydney basin airspace. Table 36 presents an indication of tracks that will have additional traffic confliction areas as a result of RPT operations on the RAAF Base Richmond east-west runway.[171]

171 Further information can be found in Technical Papers C6 and C7.

Table 36 Tracks with potential traffic confliction due to RAAF Base Richmond east-west RPT operations

Tracks	Possible Traffic Confliction
Sydney (Kingsford-Smith) departures	Runway 34L jet departures via Richmond, Katoomba and Wollongong. Runway 34L turboprop departures via Richmond, Katoomba and north-west NSW destinations. Runway 25 jet departures via Richmond, Katoomba and northern destinations. Runway 25 turboprop departures via Richmond, Katoomba and north-west NSW destinations. Runway 16R jet departures via Richmond and Katoomba. Runway 16R turboprop departures via Richmond, Katoomba and north-west NSW destinations.
Sydney (Kingsford-Smith) arrivals	Runway 07 arrival tracks from the north (BOREE and CALGA STARs). Runway 16R arrival tracks from the southwest (RIVET and ODALE STARs). Runway 34L arrival track from the north (BOREE STAR).
Richmond departures	From both Runway 28 and Runway 10, all departure tracks will conflict with one or more of the above Sydney tracks. Departures from Runway 10 will be in immediate conflict with aircraft conducting PRM circuits to Runway 16R at Sydney.
Richmond arrivals	To both Runway 28 and Runway 10, all arrival tracks will conflict with one or more of the above Sydney tracks. Arrivals to Runway 28 will conflict with aircraft conducting PRM circuits to Runway 16R at Sydney.

Source: Airservices Australia.

Physical size of the airport

The size of the existing site at RAAF Base Richmond will impact on the scale of RPT operations possible. It has a relatively small site area of approximately 277.5 hectares, comprising the main base area of 202 hectares and leased land of 77.2 hectares. The Londonderry Drop Zone is an additional property of 63 hectares located about 10 kilometres from the Base.

WorleyParsons/AMPC advises that a limited-service airport accommodating all RPT segments and satisfying civil Code 4C requirements (with the potential to accommodate passenger aircraft types such as the B737 series) could at a minimum be located on a land area of around 330ha. In contrast, a minimum service airport type serving GA and limited RPT (principally turboprop) could at a minimum be located on a 170 hectares site.

This compares to Avalon Airport, which is estimated to occupy a site size of 1,776 hectares; Gold Coast Airport, 385 hectares; and Canberra Airport, 437 hectares.

An example of an international secondary RPT airport of a similar land area is London Luton, with a land area of 235 hectares. London Luton serves nine million passengers and some 95,000 aircraft movements per year, with principally LCC airlines operating services to Europe and Africa. Its facilities include a 2,160 metre long Category 3 Instrument Landing System (CAT 3 ILS)[172] runway, 38 commercial aircraft stands, a 68,000 square metre passenger terminal and two fixed-base operators, a cargo terminal and a number of hangars for private and business aviation.[173]

172 CAT 3 ILS means aircraft will be able to make an approach and landing in the worst of weather conditions.
173 abertis airports website, *London Luton Airport,* 2011.

Potential demand

While RAAF Base Richmond is located further from the Sydney CBD than Sydney (Kingsford-Smith) Airport, its location relative to some major population centres in the Sydney region suggests it is accessible for a substantial number of residents and users (depending on increasing congestion). Some examples of current road travel times and distances (as of 2011, assuming relatively free-flow traffic) are:

- **distance to Sydney CBD:** 65 kilometres and travel time of approximately one hour, five minutes;
- **distance to Penrith:** 27 kilometres and travel time of approximately 39 minutes;
- **distance to Blacktown:** 27 kilometres and travel time of approximately 44 minutes; and
- **distance to Parramatta:** 44 kilometres and travel time of approximately 52 minutes.

Clarendon Station is located 800 metres from RAAF Base Richmond. The journey from Clarendon Station to Central Station is approximately 58 kilometres and has a current travel time of one hour and 20 minutes. Current service frequency is approximately every half hour and the cost of a rail trip is $6.00 one way.

The relative attractiveness of RAAF Base Richmond for passenger demand is expected to increase over time in line with NSW Government projections that population growth will occur in Sydney's west and north-west regions. By 2036, half of Sydney's population will live in Western Sydney, suggesting a gradual westward trend for the centre of Sydney's population.

In addition, some new LCC operators may be interested in using RAAF Base Richmond as a Sydney base, and some existing airlines may be attracted to commence a level of operation at RAAF Base Richmond due to limited availability of domestic movement slots at Sydney (Kingsford-Smith) Airport at the more popular times of day.

Despite the westward trend for Sydney's population, RAAF Base Richmond would be competing with Sydney (Kingsford-Smith) Airport for Sydney air traveller demand. The decision whether to use RAAF Base Richmond will be based on considerations such as cost, availability of services at preferred times and convenience of access. For users travelling to the Sydney CBD, arriving at RAAF Base Richmond would mean 50 minutes more travel time than if they arrived at Sydney (Kingsford-Smith) Airport. However, it would only be 12 minutes more travel time than Sydney (Kingsford-Smith) Airport for users travelling to Parramatta on current travel times, and as outlined elsewhere in this report travel time from Sydney (Kingsford-Smith) Airport are expected to rise.

Considering factors such as generalised trip cost for different market segments, as well as potential airline service offerings, Booz & Company assessed potential demand levels at RAAF Base Richmond for Sydney air travellers. This analysis assumed that demand growth for RPT services at RAAF Base Richmond will increase when unmet demand for Sydney (Kingsford-Smith) Airport is equal to the demand estimated to be captured by the new services and, where the generalised cost of travel utilising the new site is cheaper than the alternative airport. As a result, a portion of passengers was estimated to shift from one airport to the other.[174]

174 Further details can be found in Technical Report C9.

The analysis considered when unmet demand at Sydney (Kingsford-Smith) Airport is of the level and type that will warrant the following volume of airline services:[175]

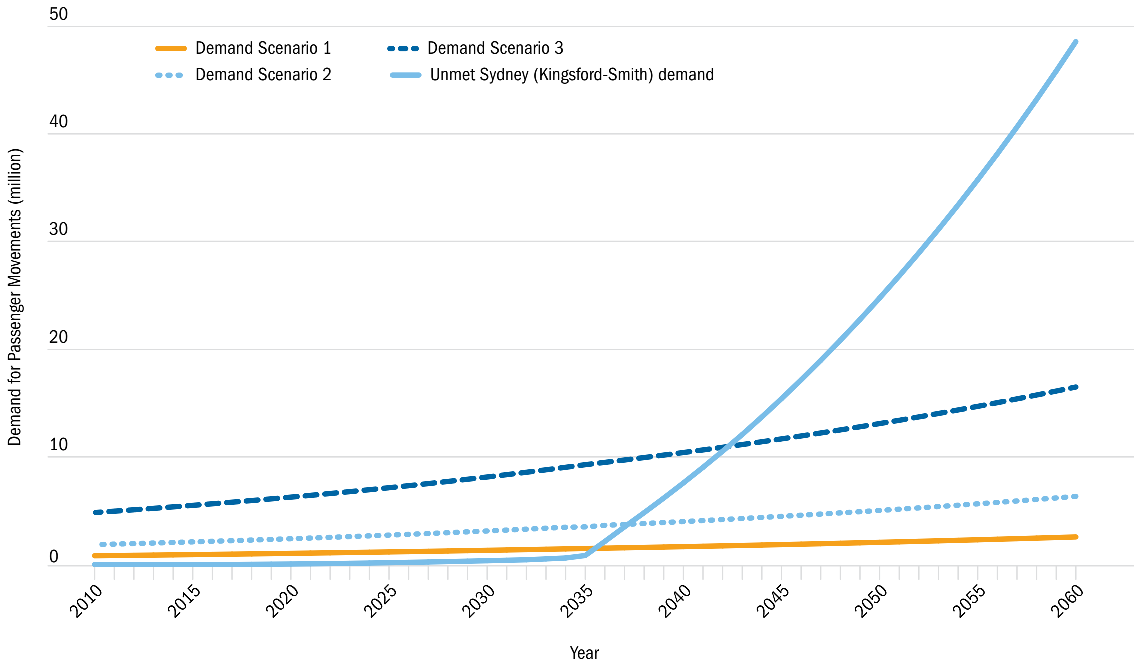
- **Demand Scenario 1 – airline services supporting around two million passengers per year serving predominantly short-haul domestic services:** such as Gold Coast, Brisbane, Melbourne, Canberra and Adelaide. This is a similar service offering as that currently at Avalon Airport, which serves domestic LCC demand.
- **Demand Scenario 2 – airline services supporting around five million passengers per year serving up to medium-haul domestic and some trans-Tasman and international services:** Booz & Company analysis of such a service offering for a new location in the Sydney region assumed that it would involve a significantly broader range of domestic services than the two million passengers per year offering above (for example, North Queensland and Central Australia services) and also include some trans-Tasman services. This is a similar service offering as that currently at Gold Coast Airport.
- **Demand Scenario 3 – airline services supporting around 20 million passengers per year serving some medium-haul international services:** such as South-East Asia, China and India. This volume would be adequate to support two major airlines and a range of additional airlines.

Figure 129 shows the potential growth profiles of the scenarios identified, compared with the forecast unmet demand as described in Part Four. Booz & Company's analysis suggests that the level of unmet passenger demand at Sydney (Kingsford-Smith) Airport could support a progressive increase in airline services in all three options.

In particular, the modelling suggested that there would be some passenger demand to access RPT services at RAAF Base Richmond if it was operational today. For example, if an airline operation the size of Demand Scenario 1 was in place, the modelling suggested that around 800,000 Sydney region passengers would have been attracted to RAAF Base Richmond in 2010. An implication, however, of any RPT operations commencing at RAAF Base Richmond prior to Sydney (Kingsford-Smith) Airport reaching constraints in its movements is that it would involve competitive impacts in the region and this would vary the result.

175 The level of capital investment required at RAAF Base Richmond is considered separately by Worley Parsons/AMPC.

Figure 129 **Indicative timing when particular services at RAAF Base Richmond have the potential to accommodate Sydney region passenger demand, 2010 to 2060**



Note: Unmet demand was derived from analysis of the unconstrained demand discussed in Part Three, and assumptions about factors including aircraft upgauging, peak spreading, load factors and traveller share under a constrained scenario, as discussed in Part Four. Possible demand scenarios assume a competitive model relative to Sydney (Kingsford-Smith) Airport. A level of induced demand may be created from the provision of aviation capacity.

Source: Booz & Company analysis.

Similarly, if an airport operation the size of Demand Scenario 3 was able to be located at RAAF Base Richmond, Booz & Company estimates that the aerodrome could serve demand of 16.5 million passengers by 2060. There would still be a significant level of unmet demand, however – in particular, long-haul international passenger demand that could not be accommodated given the east-west runway length.

This analysis assumes a portion of induced demand in the catchment area around Richmond would be created by the development of a new RPT facility (this is not included in the unmet demand for Sydney). However, the majority is estimated to be passengers who would otherwise use Sydney (Kingsford-Smith) Airport.

Summary of potential capacity created in the Sydney region

In summary, Airservices Australia estimates suggested that RAAF Base Richmond may have an unconstrained, theoretical RPT aircraft capacity of between 186,000 and 250,000 movements. This would provide an additional 35 per cent to 50 per cent of RPT capacity compared to current Sydney (Kingsford-Smith) Airport slots. Theoretically, if the 200,000 aircraft were B737/A320s and carried 120 passengers per movement, the airport could cater for up to approximately 24 million passengers per annum.

However, the practical capacity is likely to be lower than this due to air space conflicts with departures from Sydney (Kingsford-Smith) Airport and aircraft departing from and arriving at Bankstown aerodrome from the north. In addition, the type of forecast demand that needs to be catered for will not be able to be serviced by just B737/A320 aircraft. It would also require activity to be consistent across all hours of the day, which is unlikely given peak demand and operational requirements.

Practical capacity would also be affected by the size of the site. RAAF Base Richmond's current land footprint is smaller than a number of medium-sized RPT Australian airports.

However, this should not deter consideration of RAAF Base Richmond to provide RPT capacity in the Sydney region. London Luton, which operates on a smaller land area, serves nine million passengers and around 95,000 aircraft movements per year. The east-west runway could easily serve a patronage of up to five million passengers.

Development cost estimates

WorleyParsons/AMPC prepared capital cost estimates to provide an indication of the cost of developing an RPT operation at RAAF Base Richmond. Compared to other costs developed for this Joint Study, these have been developed to a greater level of detail, reflecting they are based on an existing site and are inclusive of a 70 per cent allowance for contingencies and risks, project management and uncosted items.

Scenario A was examined and indicative costs were estimated for the start-up and medium-term demand levels. This scenario does not involve major relocation of civil infrastructure in and around the airport, with minimal works required to increase apron and terminal size. To accommodate one million passengers per year, capital costs of around $150 million were estimated. To accommodate demand levels of five million passengers per year, capital costs of around $500 million were estimated. Both of these estimates exclude land acquisition and off-airport costs but include a 70 per cent allowance of total costs to consider factors such as risk, contingency, management costs and uncosted items.

Scenario B would have a cost estimate comparable to Scenario A, but would involve additional cost for land acquisition from the University of Western Sydney, the relocation of railway and construction of a new airport station, a pedestrian footbridge, and associated additional parking and road access.

Scenario C could have further additional costs associated with the off-site relocation of RAAF infrastructure.

Table 37 summarises relative capital costs for each of the potential development scenarios and also the scale and level of operations.

Table 37 Indicative capital costs for RAAF Base Richmond east-west runway development scenarios, 2011 dollars

Development Scenario	Level of Operations Assumed	Preliminary Cost Estimate
Minimal Scenario A	1 million passengers per year	$144 million
Scenario A	5 million passengers per year	$504 million
Scenario B	5 million passengers per year	Scenario A + additional land acquisition cost + road and railway and some other relocation costs
Scenario C	5 million passengers per year	Scenario A, with no on-site RAAF relocation costs (potential off-site relocation has not been considered or costed)

Note: Includes costs for runway, taxiways, aprons, terminal, car parking, roads and services on site, other airport infrastructure, RAAF facilities, project management fees, 70 per cent allowance of total costs to consider factors such as risk, contingency, management costs and uncosted items (estimated to a P50 level). Excludes land acquisition, government fees, charges and levies, and off-airport works.

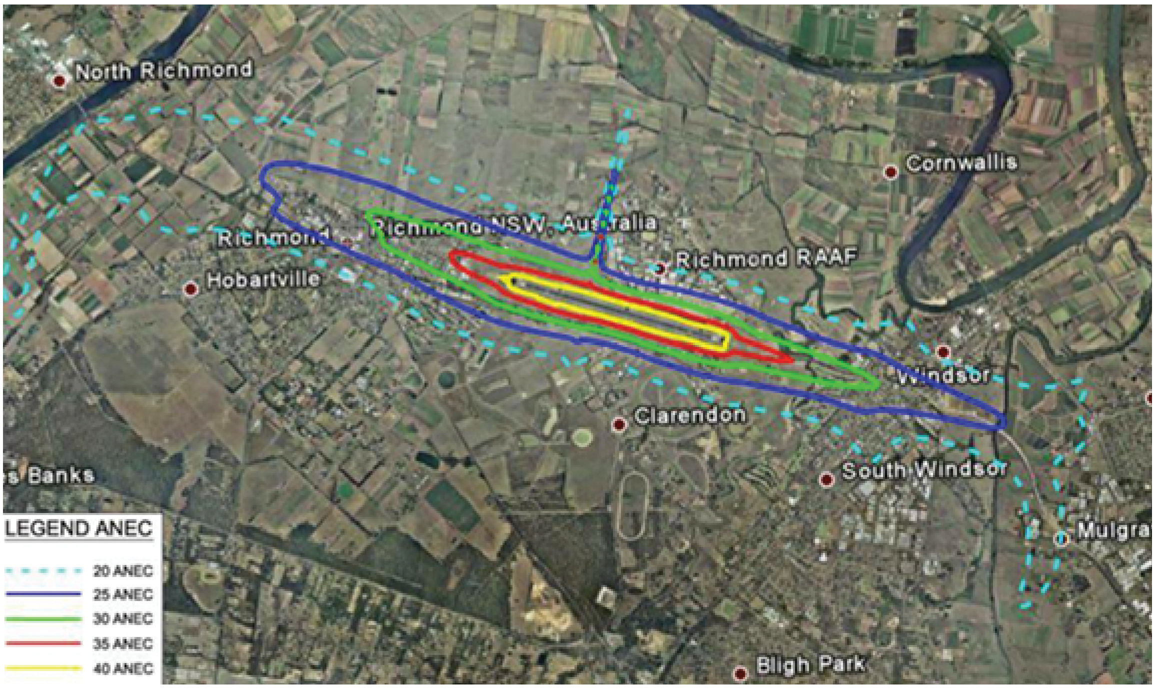
Source: WorleyParsons/AMPC.

Noise implications

The impact of civil jet aircraft noise on residents in the Richmond region needs to be considered. As the runway is aligned roughly east-west, and has the townships of Richmond and Windsor at either end, potential noise is a key issue for local residents.

Figure 130 shows the locations of centres around RAAF Base Richmond and the ANEC[176] contours for an airport catering for one million passengers.

Figure 130 **ANEC contours expected for a Richmond east-west layout supporting one million passengers**

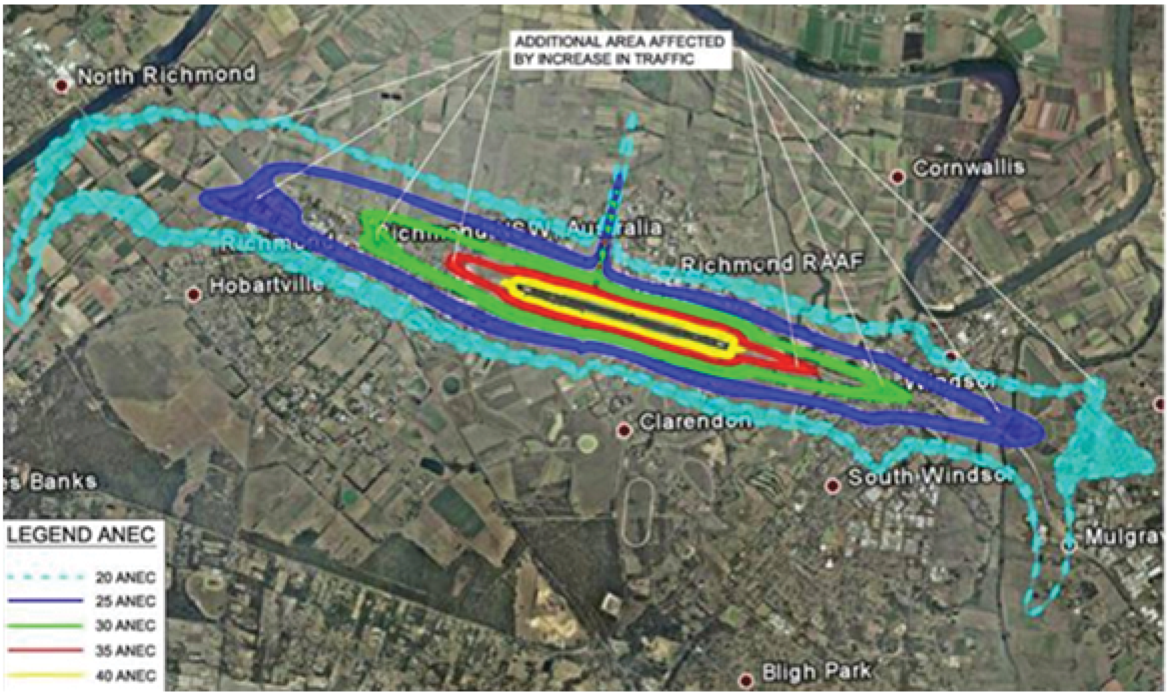


Source: WorleyParsons /AMPC.

176 ANEC reports the noise impacts of aircraft noise under Australian Standard AS2021, based on the Australian Noise Exposure Forecast (ANEF) system.It takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location.

Figure 131 shows the locations of centres around RAAF Base Richmond and the ANEC contours for an airport catering for five million passengers.

Figure 131 ANEC contours expected for a Richmond east-west layout supporting five million passengers



Source: WorleyParsons/AMPC.

For the purposes of assessing potential noise impacts, WorleyParsons/AMPC considered three levels of demand for RPT services on the east-west runway at RAAF Base Richmond at representative points from start-up to the medium and long term. Assuming a 180-seat aircraft configuration and an 85 per cent load factor, the following demand levels considered:

- one million passengers per year, resulting in 6,536 annual aircraft movements (18 average daily movements);
- three million passengers per year, resulting in 19,608 annual aircraft movements (54 average daily movements); and
- five million passengers per year, resulting in 32,680 annual aircraft movements (90 average daily movements).

Considering the impact of a range of operating levels of between 6,000 and 30,000 annual civilian aircraft movements, assuming RAAF aircraft movements remain constant at approximately 16,500 aircraft movements per year, WorleyParsons/AMPC suggest that there would only be a small increase in the size of the ANEC relative to projections for military-only operations. With these civilian operating levels, the contours would extend marginally to the west over Richmond urban areas and to the east to a larger extent over Windsor urban areas.

However, there would be a noticeable increase in the overall flight activities at RAAF Base Richmond. Analysis of potential N70 contours[177] show a larger area of impact with increasing levels of civilian traffic extending to the western side of the Nepean River and to the east, extending about 4 kilometres east of the Windsor urban area. The N70 contours suggest that residents will experience more overflights than under a military-only scenario.

177 N70 contours indicate the number of aircraft noise events that exceed 70 dB (A) (the external noise level threshold for an average residence with doors and windows closed).This is supplementary to the ANEC developed to describe aircraft noise in terms that are more readily understood by the public.

The Airservices Australia analysis of the effect on Sydney (Kingsford-Smith) Airport operations from the use of RAAF Base Richmond as an additional civilian airport indicates there will be implications for the LTOP flight paths, and any significant increase in aviation activity at RAAF Base Richmond will necessitate a redesign of the LTOP.

Airservices Australia also suggests that any development of RAAF Base Richmond as an additional civilian airport with traffic levels and mix similar to RAAF Base Williamtown will impact Sydney (Kingsford-Smith) Airport operations, requiring airspace redesign and development of an integrated airspace operating plan.

As indicated above, investment in airside infrastructure and passenger facilities is required to accommodate civil aircraft and passengers at RAAF Base Richmond. This may require relocation of RAAF operational facilities and more detailed planning on the management of the explosive ordnance operations to accommodate civil functions.

Surface transport links to RAAF Base Richmond would also need consideration and are likely to require some investment – for example, to provide upgraded road connections in and around the airport and more frequent train services. Depending on the development scenario, land acquisition and relocation of existing road and rail infrastructure may also be required.

Develop a north-south runway to accommodate RPT

The Committee also examined the option of building a larger airport at RAAF Base Richmond based on an alternative north-south runway alignment on a larger site.

- A north-south alignment would assist to minimise some of the possible airspace conflicts with Sydney (Kingsford-Smith) Airport that would arise from RPT services operating on the east-west runway. A north-south alignment could also reduce significantly noise impacts on residents, as air traffic would avoid the townships of Richmond and Windsor. There is also the potential to construct the north-south runway to a greater length than the east-west runway so that it could cater for up to long-haul internationals.

Development scenarios

WorleyParsons/AMPC considered five development scenarios for a north-south runway using rural lands currently undeveloped but owned and used by the University of Western Sydney.[178] In order to minimise impact on existing military operations, it was assumed that any RPT civilian airport would operate as a single runway (with civilian use of the existing east-west runway confined to periods of high crosswinds[179]). This would allow RAAF operations to continue at RAAF Base Richmond on the northern side of the existing runway. Joint operations would provide the RAAF with opportunities to share costs of developing and maintaining the facilities and to increase investment in the site's infrastructure, extending the duration of RAAF use of Richmond.

The preferred option for development of a new runway at RAAF Base Richmond was on an orientation of runway 01/19. This reflects constraints of existing development on the RAAF Base, the approach and departure paths and existing urbanised areas. This alignment is also likely to be more compatible with operations of the parallel runways at Sydney (Kingsford-Smith) Airport, as it is close to parallel in orientation.

The scenarios considered for the runway and related development required consideration of possible constraints from the need to maintain flood evacuation routes, existing public and private recreation areas, and other existing infrastructure (such as the Richmond Sewage Treatment Plant). In addition, relocations and adjustments to existing road and rail systems

178 Further information can be found in Technical Paper C9.

179 Although the runway configuration could operate similar to that of Melbourne or Brisbane, increasing capacity it would also increase the noise footprint.

would be required, with the form and scale depending upon decisions such as whether a close connection between the airport terminal and the rail system is required.

The five development scenarios for the concept of a north-south runway address different runway lengths and locations as follows (grouped by potential types of air service):

Domestic capacity similar to the three east-west runway operating scenarios discussed above – for example, services operated by a Code 4C aircraft such as B737/A320 for interstate LCC operations (typical routes being Gold Coast and Melbourne):

- **Option A1 –** a 2,600 metre long runway (partly on RAAF Base Richmond);
- **Option A2 –** a 2,600 metre long runway (fully off RAAF Base Richmond); and
- **Option B –** a 2,800 metre long runway (partly on RAAF Base Richmond).[180]

Limited international, domestic and intrastate traffic operated by aircraft up to Code E, such as the A330 and B787, for international; the full range of medium, narrow body jet aircraft such as the B737 and A320 series, predominantly for domestic; and the Code D DHC8-400, predominantly for intrastate; and with typical international routes including South-East Asian ports such as Singapore, Hong Kong:

- **Option C –** a 3,000 metre long runway (partly on RAAF Base Richmond).

Full international, domestic and intrastate traffic – for example, services operated by aircraft up to and including the Code F A380 for long-haul international operations to ports such as Los Angeles:

- **Option D –** a 4,000 metre long runway (partly on RAAF Base Richmond).

Runway capacity

Airservices Australia suggests that the theoretical physical capacity of a single runway is estimated to be approximately 40–50 movements per hour for an assumed aircraft mix. This is between 250,000 and 260,000 aircraft movements per year. Therefore, if used as a single runway configuration, the east-west and north-south runways technically could provide for the same number of movements (albeit noting Airservices Australia's advice on airspace interactions with Sydney (Kingsford-Smith) Airport on the east-west).

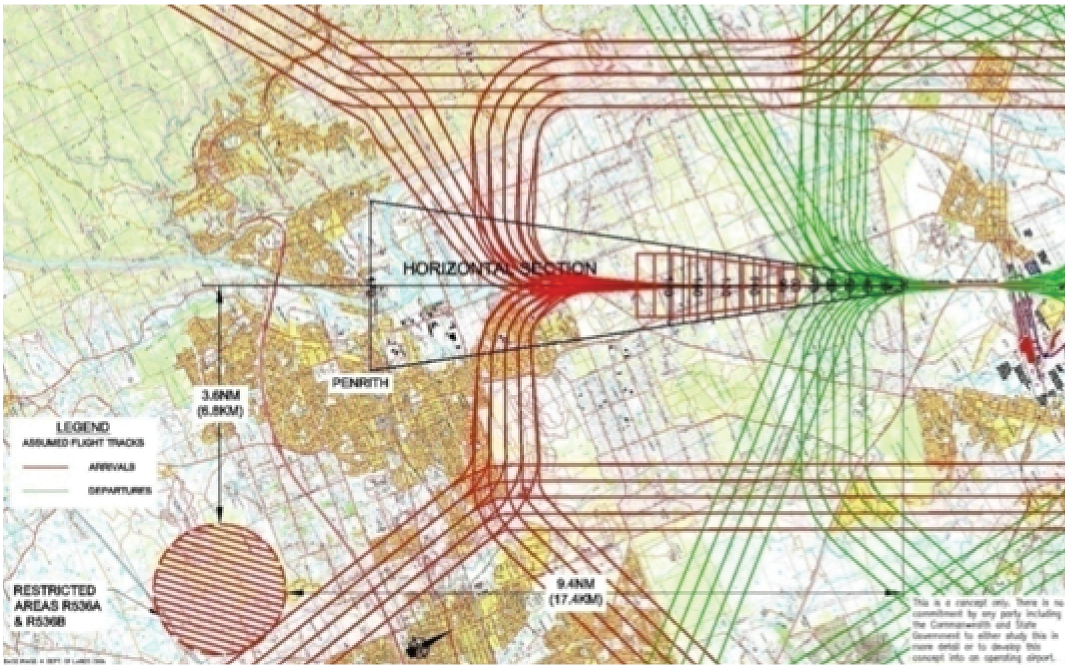
If the east-west and north-south runways were used in a similar configuration to Melbourne or Brisbane, it is estimated that up to 65 movements per hour could be accommodated.

Airspace management and air traffic control

There would be complex airspace arrangements within the Sydney basin from operation of a north-south runway with significant RPT movements at RAAF Base Richmond. Figure 132 provides an indication of the possible flight tracks from Option D.

180 The operational differences between a 2,600m and 2,800m long runway are not of such significance as would suggest notionally different traffic types.

Figure 132 **RAAF Base Richmond 4,000m north-south runway 01/19 southern OLS and flight tracks**



Source: WorleyParsons/AMPC.

Weather

As noted above, fog events at RAAF Base Richmond could affect capacity at the aerodrome. Fog data from 1995 to 1999 indicates that on average there are six days per month of recorded fog events.

Physical size of the airport

For a north-south runway, acquisition of additional land is required. It is also expected that major relocations and adjustments to existing road and rail systems would be required.

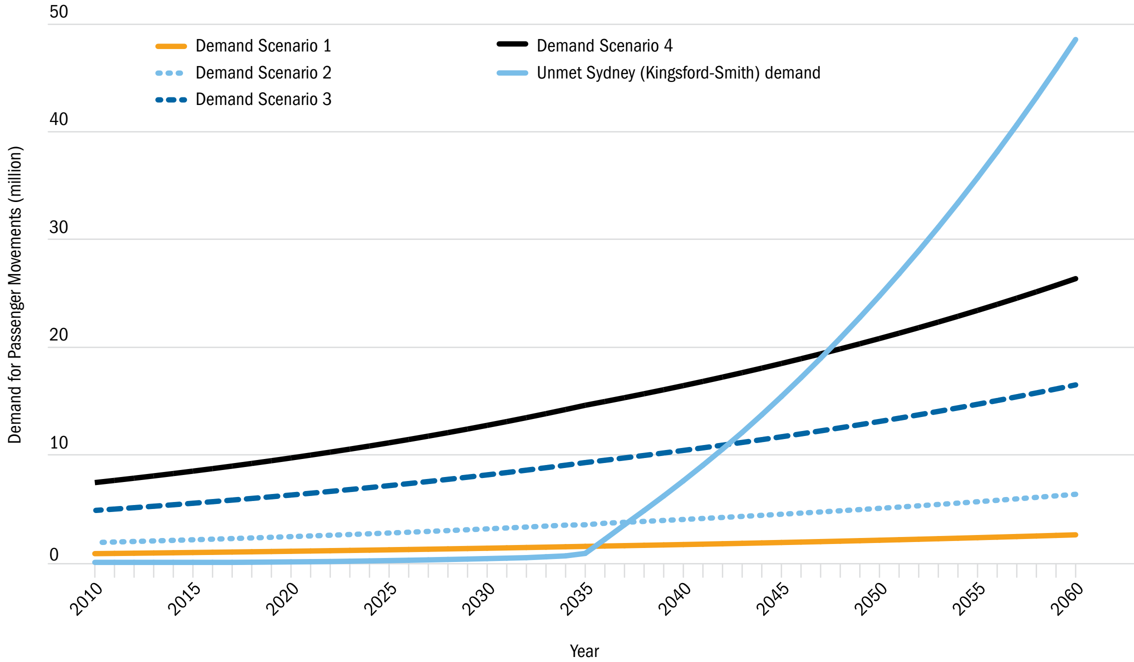
For the development scenarios explored in this Joint Study, WorleyParsons/AMPC suggests that the new civil RPT apron, parallel and link taxiways, International and Domestic Terminals and car park could be located to the south of the existing base on lands currently owed by the University of Western Sydney. This would affect the current alignments of Hawkesbury Way and the Richmond rail line.

Potential demand

The demand that would be met will be determined by the type of aircraft and services offered. For the purposes of providing information on the type of demand that could be catered for, the analysis considered when unmet demand at Sydney (Kingsford-Smith) Airport is of the level and type that will warrant use of the existing RAAF Base Richmond runway, as well as the potential for providing short-haul and long-haul international services on a north-south runway. Specifically, Booz & Company tested a fourth scenario based on operations up to 30 million passengers per year with the capability to support domestic as well as short- and medium-haul international services.

Booz & Company's modelling of the relative generalised trip cost for Sydney region airport users to access Sydney (Kingsford-Smith) Airport or RAAF Base Richmond suggested such services could meet demand for 26 million passengers by 2060. It suggested there would be some passenger demand to access RPT services at RAAF Base Richmond if it was operational today.

Figure 133 Indicative timing when particular airline services at RAAF Base Richmond with a north-south runway have the potential to accommodate Sydney region passenger demand, 2010 to 2060



Note: Unmet demand was derived from analysis of the unconstrained demand discussed in Part Three, and assumptions about factors including aircraft upgauging, peak spreading, load factors and traveller share under a constrained scenario, as discussed in Part Four. Possible demand scenarios assume a competitive model relative to Sydney (Kingsford-Smith) Airport. A level of induced demand may be created from the creation of aviation capacity.

Source: Booz & Company analysis.

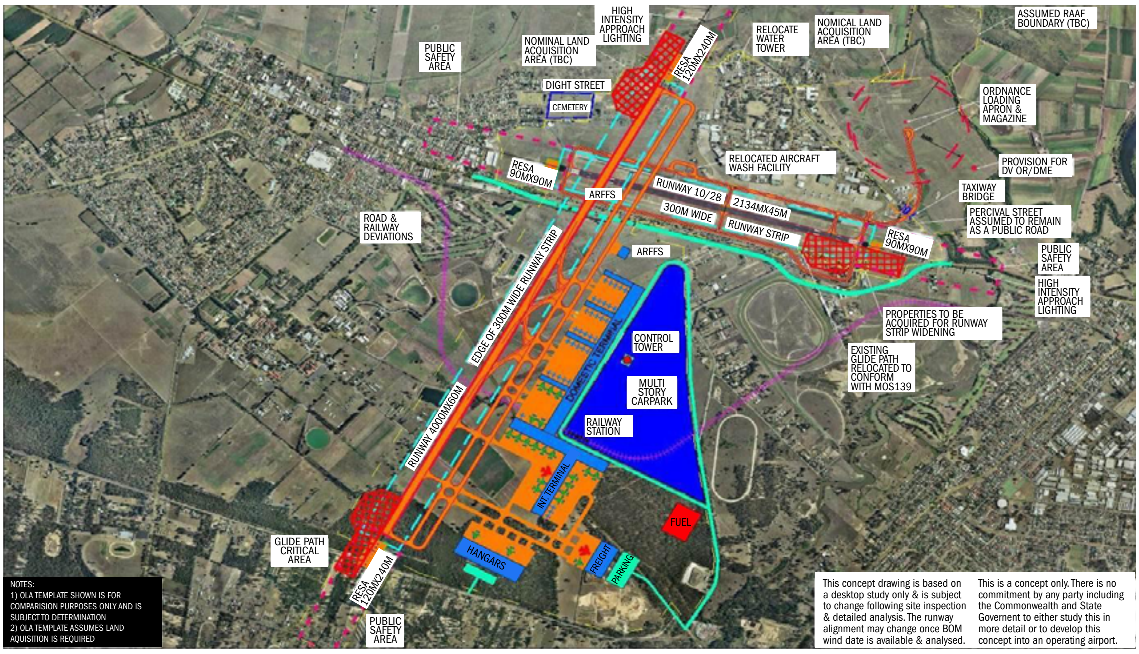
Noise implications

Development of a north-south runway at RAAF Base Richmond will reduce noise impacts on local residents compared to scenarios assuming RPT solely using the existing east-west runway. It is likely that, even after development of a north-south runway, the existing east-west runway would be used in periods of high crosswinds.

For the purposes of developing indicative cost estimates and assessing potential noise impacts, WorleyParsons/AMPC assumed the following forecast RPT passenger movements for each of the north-south runway development scenarios:

- **Options A1, A2 and B:** 20 million passengers per year or approximately 130,700 annual aircraft movements (358 average daily movements) accommodating aircraft types up to Code 4C (B737, A320);
- **Option C:** 25 million passengers per year or approximately 183,300 annual aircraft movements (502 average daily movements), Code 4E (A330, B787); and
- **Option D:** 30 million passengers per year or approximately 178,700 annual aircraft movements (490 average daily movements), Code 4F (A380).

Figure 134 RAAF Base Richmond Option D 4000m layout



Source: WorleyParsons/AMPC.

WorleyParsons/AMPC analysis indicates that the 20 and 25 ANEC contours for civil operations on a north-south runway are clear of the urban areas of Richmond and Windsor, to the east of Freeman's Reach and clear of Wilberforce. To the south the 20 to 25 ANEC is close to an urban area at Londonderry.

N70 contours show a larger area of impact though to areas relatively less densely populated, most noticeably along the extended runway centreline, east and west of the southern end of the runway, and to the west at the northern end of the runway.

Development cost estimates

WorleyParsons/AMPC developed cost estimates for the range of north-south runway options identified. These estimates are based on the concepts of runway length described above and assume full development of the concept (that is, no staged development).

As with the costs developed for the RAAF Base Richmond east-west runway scenarios, these costs have been developed to a greater level of detail than those in Part Eight of this Report as they are based on an existing site as opposed to a indicative site. The costs are also inclusive of a 70 per cent allowance for contingencies and risks, project management and uncosted items.

Table 38 Indicative capital costs for RAAF Base Richmond north-south runway development scenarios, 2011 dollars

Runway Length	Level of Operations Assumed	Indicative Cost Estimate
Minimal start up Option A1 (2,600m runway and minimal terminal)	Up to 20 million passengers per year	$3.9 billion
2,600m runway (Option A1)	20 million passengers per year	$5.4 billion
3,000m runway (Option C)	25 million passengers per year	$8.5 billion
4,000m runway (Option D)	30 million passengers per year	$10.8 billion

Note: estimated to a P50 level.

Source: WorleyParsons/AMPC.

Cost estimates range from around $4.0 billion for a 2,600 metre runway with a minimal terminal suitable for up to 20 million passengers per year to over $10 billion for a 4,000 metre runway and terminal facilities suitable for 30 million passengers per year.

The cost estimates include:

- general construction costs;
- airside north-south runway and airside runway 10/28 works;
- landside works, including widening of access roads, purchase of additional rolling stock, major utilities, aviation fuel pipeline and telecommunications; and
- 70 per cent allowance of total costs to consider factors such as risk, contingency, management costs and uncosted items.

Excluding allowances for project management, design, contingencies and risks, the cost estimates range from $2.0 billion to $6.5 billion. The costs also exclude land acquisition, government fees, charges and levies.

A north-south runway able to support RPT operations would require relocation of the existing rail link near RAAF Base Richmond (which is also currently being upgraded) and would require the railway to be lowered into a cut and cover tunnel below the proposed runway in order to ensure the availability of rail access to the new civilian airport, with construction costs of more than $200 million.

Economic appraisal of the development of RAAF Base Richmond for RPT

Ernst & Young undertook a cost–benefit analysis (CBA)[181] of options to accommodate RPT at RAAF Base Richmond – on both the existing east-west runway and the development of a north-south runway.

This showed that the Scenario A east-west runway option (handling around five million passengers per year) is viable, though marginally, with a benefit cost ratio (BCR) ranging between 0.9 and 1.1 depending of demand forecasts. Assessment of the minimal start-up scenario for Scenario A (able to handle around one million passengers per year) indicates it is less economically viable with a BCR ranging between 0.0 and 0.3. This reflects the lower benefits of the minimal development option due to its ability to handle fewer passengers.

The north-south option with a 4,000 metre runway has been assessed by Ernst & Young to result in more significant net economic benefits with a BCR ranging between 1.6 and 2.0.[182]

However, without extremely expensive and extensive land acquisition and surface transport re-alignment, the north-south option could never be extended to a parallel runway. This means, it will never by itself meet the unmet demand projected for the Sydney region.

181 A cost–benefit analysis (CBA) is an analytical tool used to assess the benefits and costs to society of a project or other action. Costs and benefits are examined from the perspective of the community as a whole to help choose the best means to satisfy specified objectives, and to rank competing proposals when resources are limited.

182 These economic results represent the Ernst & Young scenario involving no land acquisition in order to reflect it is a development on an existing site. Further information can be found in Technical Paper C13.

Summary of implications from development of RAAF Base Richmond for RPT

Table 39 summarises the range of impacts that may occur as a result of the RAAF Base Richmond RPT options presented above.

Table 39 RAAF Base Richmond RPT options

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Operation of RPT services from RAAF Base Richmond east-west runway	**Noise sharing:** minimal impact on noise at Sydney (Kingsford-Smith) Airport, demand takes up capacity created. Redesign of the LTOP may be required due to airspace conflicts. Noise implications at RAAF Base Richmond principally affecting Richmond urban areas to the west, and to a larger extent, east over Windsor. **Peak slot availability:** would create new peak slots in the Sydney region. **Slot availability:** 35 per cent to 50 per cent increase in RPT movement capacity in the Sydney region. Would depend on demand levels, airline service offering and level of infrastructure provided; with scenarios for this suggesting capacity issues could be delayed by 10 years. **Airside infrastructure:** minimal impact on airside infrastructure at Sydney (Kingsford-Smith) Airport, though may require investment if it is largely LCCs attracted away to RAAF Base Richmond. RAAF Base Richmond would require investment in airside infrastructure and passenger facilities to accommodate civil aircraft and passengers. **Surface transport:** minimal impact to reduce road congestion to Sydney (Kingsford-Smith) Airport; however, surface transport to RAAF Base Richmond would be affected and would require investments. **Airspace:** there would be considerable interaction with Sydney (Kingsford-Smith) Airport and Bankstown Airport operations which would need to be investigated further. **Delay impacts:** fog events at RAAF Base Richmond could create delays for operations.			
Development of a new north-south runway at RAAF Base Richmond to facilitate RPT	**Noise sharing:** minimal impact on noise at Sydney (Kingsford-Smith) Airport, given suppressed demand likely to take up capacity created. Noise impacts at RAAF Base Richmond are clear of the urban areas of Richmond and Windsor, to the east of Freeman's Reach and clear of Wilberforce. To the south, the 20 to 25 ANEC is close to an urban area at Londonderry. **Peak slot availability:** given the time period required to develop and construct the new runway, peak slots may be close to exhausted at Sydney (Kingsford-Smith). Would create new peak slots in the Sydney region. **Slot availability:** 50 per cent to 60 per cent increase in RPT movement capacity in the Sydney region. Would depend on timing of construction, demand levels, airline service offering, runway length and level of infrastructure provided. **Airside infrastructure:** minimal impact on airside infrastructure at Sydney (Kingsford-Smith) Airport given time required to develop and construct. RAAF Base Richmond would require investment in airside infrastructure and passenger facilities to accommodate civil aircraft and passengers. **Surface transport:** minimal impact to reduce road congestion to Sydney (Kingsford-Smith) Airport; however, surface transport to RAAF Base Richmond would be affected and would require investments. **Airspace:** improved alignment and interaction with Sydney (Kingsford-Smith) Airport and Bankstown Airport. **Delay impacts:** fog events at RAAF Base Richmond could create delays for operations.		●	●

Source: PwC and Australian Department of Infrastructure and Transport.

In summary, use of the existing east-west runway or construction of a new north-south runway at RAAF Base Richmond would provide a significant level of RPT capacity for the Sydney region. Use of the existing east-west runway for RPT demand is a relatively cost-effective approach to providing capacity and has the potential to be developed more quickly than construction of a new runway.

However, it is likely to have a larger noise impact because of the townships of Richmond and Windsor at either end and could create significant airspace conflicts with Sydney (Kingsford-Smith) Airport.

Construction of a new north-south runway at RAAF Base Richmond would assist to minimise some of the airspace issues and could also minimise noise impacts on residents. There is also greater potential to construct a longer north-south runway, creating more opportunity to meet international demand, which is the fastest-growing RPT segment.

Whichever alignment is concluded, the site also has a number of operational limitations, including the impact of fog and terrain on operations, which will need to be considered.

PART EIGHT
OPTIONS TO DEVELOP NEW INFRASTRUCTURE TO GAIN CAPACITY TO MEET FORECAST DEMAND

P8

Key points

- Initially, all parts of the Sydney region were considered to find a site suitable for either:
  - a ‘Type 1’ airport – a full service airport serving all market segments capable of handling a future parallel runway layout; or
  - a ‘Type 3’ airport – a single runway airport serving all market segments.
- Eighteen localities were identified for further assessment, from which five were shortlisted. A small number of specific sites were identified within these five localities as offering the best potential for a new airport.
- Key issues in the shortlisting and site assessment included proximity to demand (within 90 minutes travel time of Sydney’s population centre); site suitability; aviation development capacity; airspace conflicts with existing airports and flight paths; environment impacts; and proximity to growth centres.
- The sites listed below are assessed as the more suitable sites in each locality.

Table 40 Sites identified as more suitable (on technical analysis), by locality

	Localities				
	Central Coast	Hawkesbury	Nepean	Burragorang	Cordeaux-Cataract
More suitable Type 3 Airport(s) sites	Wallarah	Wilberforce	Badgerys Creek Luddenham Bringelly Greendale	Silverdale Mowbray Park	Wilton Wallandoola
More suitable Type 1 Airport(s) sites	Wallarah	Wilberforce	Badgerys Creek Luddenham Bringelly Greendale	Mowbray Park	Wilton

Source: *Australian Department of Infrastructure and Transport.*

- A quantitative assessment was made against the criteria that could be monetised, to arrive at Relative Cost Benefit Ratios for these sites. An additional qualitative analysis was made of the sites against the criteria that cannot be monetised.
- The sites in the Nepean locality were assessed as clearly superior against most criteria compared with the sites in any other locality. The key advantage of these sites is their relative proximity to the sources of potential demand and the associated benefits that would accrue to airport users. Site development costs were also estimated to be relatively lower than for compared with most of the sites in other localities.
- The next best ranking site in the quantitative assessment was Wilberforce in the Hawkesbury locality. Its main advantage was also proximity to potential demand including nearby commercial growth opportunities. Its main disadvantages were noise impacts on communities and sensitive uses as well as the potential social impacts of land acquisition. Furthermore, a Type 3 site located at Wilberforce would require its runway alignment to be parallel or near parallel to RAAF Base Richmond with coordinated control between the two airports in order to operate both facilities. A Type 1 airport located at Wilberforce is likely to require closure of RAAF Base Richmond or relocation of RAAF activities to the Wilberforce site.
- Following the four Nepean sites and Wilberforce, the next best ranking site in the quantitative analysis was Somersby in the Central Coast, which had relatively high development costs but also reasonable levels of economic benefits. It also received a

relatively mid-range ranking against the qualitative criteria. However, Somersby would be constrained in operational capacity terms due to airspace interaction with Sydney (Kingsford-Smith) Airport.

- Wilton in the Cordeaux-Cataract locality rates just behind the Nepean and Hawkesbury sites and level with Somersby on BCR (although with a slightly lower NPV) in the quantitative assessment for a Type 1 airport. It has the best ranking in terms of noise impacts on existing communities. Its capacity would not be constrained through airspace interaction with Sydney (Kingsford-Smith) Airport.
  - Wilton is located further from the potential market under existing planning instruments but would be well located if Sydney's longer-term growth is to the south-west.
- Mowbray Park in the Burragorang locality rated mid-range in the quantitative analysis and had mixed ratings on the qualitative analysis. It has a relatively lower noise impact on local communities compared to most other sites but is not well located in terms of potential demand.
- The Relative Cost Benefit Ratios were higher for Type 1 airport developments than for Type 3 developments, reflecting the high economic value that a major airport would provide in the long term.
- Sites that enable initial development as a Type 3 airport with the capacity to be extended to a full Type 1 airport in the future would best allow for the medium- and long-term growth in the Sydney market.
- Given the analysis of capacity pressures on Sydney (Kingsford-Smith) Airport, the supplementary airport would need to be available for initial use between 2025 and 2030.
- To finalise a decision on the best location for a supplementary airport, additional work will be required on detailed site studies and environmental assessment.
- Indicative costs of land acquisition for the shortlisted sites range from $40,000 to $70,000 per hectare for sites in the Central Coast, Nepean and Cordeaux-Cataract localities; to $140,000 to $215,000 per hectare for sites in the Hawkesbury and Burragorang localities. Including an allowance for risk and contingency suggests costs per site between $30 million and $600 million, dependent on airport type and location.
- Based on high-level, strategic cost estimates, indicative generic construction costs of airport infrastructure would be in the order of $1.7 billion for a limited service Type 3 airport and $5.3 billion for a maximum Type 1 airport with parallel runways.
- A large additional cost in most locations would be the earthworks costs to prepare sites for airport infrastructure owing to the undulating nature of the land. For example, land preparation costs for the development at a location such as Wilton could range from $350 million for a Type 3 airport development to $810 million for the ultimate Type 1 airport site preparation. For the range of shortlisted localities and airport types, and factoring in an allowance for risk and contingency, indicative earthworks costs are between $140 million and $1.2 billion.
- Supporting infrastructure such as road, rail and utilities costs would be additional to the above high-level costs. These could comprise significant cost elements of up to $950 million for a Type 3 airport and up to $3.6 billion for a Type 1 airport (assuming inclusion of a rail connection and incorporating an allowance for risk and contingency) in a suitable site.
- Totalling these key cost elements, the capital investment to develop an airport and supporting infrastructure could total between $7 billion and $11 billion for a Type 1 airport and between $2 billion and $4 billion for a Type 3 airport.

The options considered in Parts Six and Seven of this Report for making best use of existing airports, provide enough additional capacity for only the short or medium term. The cost, community impacts or aviation impacts associated with a number of these options may make them unsuitable, either individually or in combination, in the judgement of governments. It is important to look for new options that will provide additional capacity for the long term.

Numerous cities around the world are served by multiple Regular Public Transport (RPT) airports, providing a range of aviation services and serving broad economic areas. This is the case especially as Low Cost Carriers (LCCs) have emerged with the deregulation of aviation in Europe and North America. The Steering Committee has therefore also considered options for additional greenfield airport sites which could be appropriately developed for the forecast levels and types of traffic.

An alternative which has not been considered, is planning for a replacement airport to Sydney (Kingsford-Smith) Airport. This is in recognition of the economic and access benefits Sydney (Kingsford-Smith) Airport provides to Sydney, NSW and Australia as a whole, given its location next to the Sydney CBD, and its proximity to the market catchment for business, freight and leisure travel. Taking into account the existing sunk and programmed investment in infrastructure, it is expected the airport will continue to be the focus of demand particularly for peak business and high value air freight.

8.1 Factors affecting decisions to use a new airport

The extent to which new options will meet the unmet demand will depend on whether they can attract airlines, passengers and other users.

The evolution of airline structures, coupled with the growth in LCCs and alliances, are influencing the patterns of airline activity, the airports they use and whether primary or non-primary airports are preferred.

The categories of airlines could be considered to include:

- full service (predominantly long established or legacy) carriers;
- LCCs;
- ‘hybrid’ LCCs (with some full service/legacy characteristics); and
- freight airlines.

The line between these airline types has become increasingly blurred and new models are emerging. These developments reflect the drive by airlines to lower operating costs, increase revenue and become more competitive.

The role and diversity of airports is changing as a consequence of this restructuring and, with it, the distinction between usages of a primary or non-primary airport is becoming less clearly defined. LCCs and legacy airlines alike now often operate out of either airport type depending on the market requirements.

Airlines choose to operate to airports based on a wide range of criteria. The criteria vary but decisions are largely based on strategic, commercial and operational objectives.

Table 41 presents key criteria for each airline model in considering non-primary airport relative to primary airport usage.[183]

183 Further information can be found in Technical Paper C10.

Table 41 Key criteria for airlines considering non-primary airport usage

Criteria	New entrant to a market				Established operator			
	Legacy	LCC	Hybrid LCC	Freight	Legacy	LCC	Hybrid LCC	Freight
Network connectivity	H	L	M	H	H	H	M	H
Alliance requirements	H	L	M	M	L	L	M	L
Access (24-hour, turnaround/ utilisation opportunities)	L	H	M	H	H	H	H	H
Operational constraints/ congestion at primary airport	L	H	H	M	H	H	H	H
Proximity to market	H	H	M	H	H	H	M	H
Size/viability of catchment (including passenger mix, yield)	H	H	H	L	H	M	H	L
Good transport linkages (road/rail)	H	M	M	H	H	M	H	H
Airport owner/government incentives	L	H	M	L	L	M	M	L
Competitive advantage	M	H	M	L	H	H	H	L
Strategic and market development opportunities	M	M	M	L	H	H	H	M

Note: Ratings of High, Medium and Low have been applied to the above criteria to indicate the level of importance for each (High=Most important; Medium=Reasonably Important; and Low=Less important).

Source: CAPA Consulting.

While this assessment is high-level and is therefore unlikely to capture the nuances of commercial decisions, it highlights that, across all airline types, proximity to market and the size of the market are important, while legacy airlines in particular will also be highly sensitive to network connectivity, alliance linkages and the availability of land transport in choosing an airport. The assessment also shows variations in relative priorities between an airline already established in a market and a new market entrant. Congestion at the primary airport, or strategic and/or competitive issues, may influence an established airline to move from a primary to non-primary airport or to co-locate operations.

Overall, considering the range of airline models, short-haul LCC airlines typically gravitate to secondary airports while legacy airlines generally remain at primary airports. Hybrid LCCs are more likely to use primary airports which perform as business hubs. Freight operators tend to remain at primary airports, as the duplication of freight handling and surface transport facilities may be excessive to operate at separate locations, but they can also operate out of secondary airports where there is adequate freight demand.

Network connectivity and alliance requirements

Legacy / full service carrier airlines tend to be hub airlines, operating a model that allows them to fill aircraft with both local and connecting passengers, thus increasing load factors and reducing the cost per seat. This can occur in terms of funnelling domestic traffic onto international services (examples include Sydney (Kingsford-Smith) Airport and Chicago (O Hare) in the United States) or alternatively through consolidating different international traffic at the one airport to feed into services for multiple onward destinations (for example in the case of Singapore, Kuala Lumpur, Dubai or Abu Dhabi airports). Concentration of traffic at a hub airport also allows airlines to increase frequencies, particularly on high-yielding business routes, where passengers tend to be time-sensitive and value schedule flexibility. An airline’s own connectivity requirements will extend to the group operations where, for example, a parent airline has a subsidiary offering regional services, as is the case for Qantas and its QantasLink subsidiary.

Further considerations are the alliance and code-sharing arrangements entered into by an airline, which require not only connectivity but also similar standards and product offerings, such as lounges, across the airlines. Members of the global alliances such as Star Alliance, oneworld and SkyTeam usually gravitate to the same airport to provide for seamless connections, group branding and a sharing of check-in areas and marketing and sales facilities. Alliances often aggregate around hubs in a particular market, enabling passenger and freight transfers between member airlines, coordinated scheduling and expanded service coverage. Recent announcement by Qantas and Virgin Australia have seen renewed emphasis on alliances to ensure more competitive services at a lower cost.

By contrast, point-to-point services optimise operational efficiency through:

- no passenger hubbing processes or structures;
- aircraft, pilots and cabin crew generally returning to home base each day; and
- avoiding interlining and code-shares as they add cost and complexity to operations.

Point-to-point services are generally offered by LCCs where connectivity is less of an issue, as they advertise the fact that they do not provide any services relating to flight connections such as baggage transfer. However, this may change with the increase in alliances and offshore ventures among LCC airlines as well.

Regional airlines are less likely to use non-primary airports for connectivity reasons. They generally provide links between smaller population areas and major cities or between regional towns and cities. In Australia, regional airlines focus on capital city airports and maintain alliance or interline relationships with interstate and international operators (such as Regional Express / Virgin Australia and SkyWest / Qantas).

Interlining and alliances will put greater pressure on appropriate transport links between airports. While the cost incurred through using primary airports is higher (in some cases much higher) than at non-primary airports, this is outweighed by the need for convenient transfers and the revenue benefits generated in accessing connecting traffic.

Competitive advantage / strategic and market development opportunities

Non-primary airports are a more likely option for new entrants (especially LCCs) than market incumbents, and their attractiveness is derived from their relative accessibility and pricing, compared with the primary airport.

Non-primary airports have an important role to play in delivering a market advantage over a competitor operating from a primary airport with its more convenient location and connectivity advantages. A non-primary airport offering a strong incentive regime and short turnaround times can reduce airline unit costs. Price is usually the main tool available to an LCC and it becomes a strong advantage when combined with easy airport access and on-time performance.

The opportunity to be the first operator at a new non-primary airport also potentially provides a strategic opportunity for an airline to develop a hub in the long term. Other airlines seeking to enter the market may face barriers to entry under this scenario.

Freight operators have particular requirements which may be met at either a primary or a non-primary airport. Express freight, for example, has characteristics which may support the development of dedicated distribution hubs separate to mainstream airports. These could operate in isolation to a scheduled gateway.

These factors can operate together: for example, Frankfurt-Hahn Airport in Germany developed initially as a specialist freight gateway, and has now seen the entry of LCCs Ryanair and Wizz Air.

Cost and duplication issues

Airlines face high establishment costs at each airport. As such, there are a number of benefits for an airline to concentrate operations at one airport. Use of multiple airports within a catchment is likely to lead to a duplication of assets and supporting resources.

The major cost duplication relates to infrastructure finance, upkeep and upgrade. However, there may also be operating costs that either are duplicated or have a higher unit cost at a non-primary airport. Airlines may not be able to achieve the economies of scale or cost efficiencies available when operating from one location.

For full service airlines, the priority is likely to be on primary airports where possible. Full service airlines also rely on the availability of flexible schedules with high frequencies and connectivity to provide a competitive advantage in the important business travel market. Duplication costs are likely to act as disincentives to the use of non-primary airports.

However, once these airlines reach a critical mass and it becomes difficult to further expand services, the option of relocating some services to a less congested access point to accommodate market growth becomes more attractive.

CAPA Consulting's analysis suggests that the scale of investment by Qantas Group and the Virgin Group at Sydney (Kingsford-Smith) Airport, and the competitive and cost advantages and revenue generation as a result of their major role at the airport make it highly unlikely the groups, as a whole, would relocate to a secondary facility. However, this would not preclude the deployment of some services at such an airport. For example, the Qantas Group's strategy for the Melbourne region suggests a similar structure could be adopted for the Sydney region if a second airport facility were available. In Melbourne, Jetstar was established at Avalon Airport as a means of strengthening the group's position in the market in tandem with the presence of the mainline brand and its LCC subsidiary at Melbourne Tullamarine Airport.

As a result of this, CAPA Consulting advised the Steering Committee that the prospect of LCC usage for a secondary facility in Sydney is feasible, especially in relation to Tiger Airways and Jetstar. However, it considers Virgin Australia may prefer to maintain services at Sydney (Kingsford-Smith) Airport, subject to the availability of appropriate capacity to meet growth requirements.

Proximity to market and size/viability of catchment

Airlines require proximity to markets with development potential to absorb the capacity introduced by commencing or expanding operations.

- **Outbound routes:** if an airline's route(s) from a non-primary airport are outbound then there needs to be a sizeable population base in close proximity to the airport and GDP growth forecasts need to be at least promising. This is because the propensity to travel broadly tracks GDP growth and, if the market is outbound, then the success of the route would be determined by the population in the airport's catchment area.
- **Inbound routes:** if the market is inbound then there should be one or more key reasons passengers have to travel to the airport, including: tourism, easy access to a major city, materially lower relative real estate prices than their origin market, or greater employment opportunities than in their origin market. This requirement was emphasised by the impact of the downturn in incoming tourism from Japan on operations at Cairns Airport.

- **Balanced markets:** balanced markets require elements of both to be successful. While other criteria are important, however, their importance quickly declines if there is no market development potential, either inherently or based purely on stimulation of demand through low fares.

Even with significant incentives, airlines generally will not commence operations from a non-primary airport unless they can penetrate a greater share of their target market.

In the case of LCCs, there needs to be a sufficient potential market of price-sensitive outbound travellers in the airport's catchment. GDP growth forecasts also need to be at least promising or no amount of price stimulation will create a market.

Airlines apply different benchmarks to what they may consider to be a 'viable' market size. Table 42 presents an indication of the number of passengers required to achieve 80 per cent loads at varying weekly frequencies by aircraft type and by basic LCCs, hybrid LCCs and full service airlines.

Table 42 Indicative passenger market requirements for various service frequencies and airline and aircraft types (annual passengers)

				Number of return flights			
Airline	Service	Aircraft type	Seats	1/week	3/week	5/week	Daily
Basic LCC	Domestic/International	A320	180	14,980	44,930	74,880	104,830
Hybrid LCC	Domestic	B737NG	180	14,980	44,930	74,880	104,830
	International	B777-300ER	363	30,200	90,600	151,010	211,410
Full service airlines	Domestic	B737NG	168	13,980	41,935	69,890	97,845
	International	A380	450	37,440	112,320	187,200	262,080

Note: Assumes 80 per cent passenger loads for each aircraft type.

Source: CAPA Consulting.

On this basis, a traditional LCC or a hybrid LCC could potentially require 104,000 passengers per year for a daily domestic service with an A320 or B737NG, while a market of 211,000 passengers could be needed for a daily B777-300ER. The requirement to operate a daily A380 service at an 80 per cent load would be 262,000 passengers per year.

As discussed in Parts Two and Four, the Sydney region is home to approximately six million people and more than 4.2 million live in the Sydney Metropolitan Area. Forecasts show Sydney's population is expected to reach 6.2 million by 2036, with estimates reaching between seven and 7.5 million by 2056 (with over half living in Western Sydney). It is projected that by 2060 approximately 260,000 aircraft movements per year and 54 million passengers per year will be unable to be accommodated at Sydney (Kingsford-Smith) Airport.

The analysis by CAPA Consulting is based in part on overseas experience. It can only provide broad indications of the likely use of any new greenfield airport in the Sydney region, as outcomes will be affected by the particular circumstances of the local market. However, the analysis does suggest that, with continued growth in gross domestic product (GDP) and increasing constraints at Sydney (Kingsford-Smith) Airport, the Sydney region will provide an attractive and large market for both new entrants and legacy airlines. While LCCs and new entrants are likely to be the first to operate at a new airport, with increasing constraints at Sydney (Kingsford-Smith) Airport, the new airport is likely to become attractive to existing operators for growth services and potentially a transfer of some services from the airport.

8.2 Identifying viable options

Over recent decades, a range of alternative and innovative greenfield options has been proposed to provide aviation capacity in the region.

A strategic assessment of a broad spectrum of these options was undertaken for the Steering Committee, which included consideration of some of the options previously raised by stakeholders or considered in past government studies.

The assessment considered past proposals to develop new sites outside the Sydney region. However, all such options were such a distance from Sydney that they would not provide significant relief to capacity constraints, given that the location would still either require flights to connect to Sydney or may not attract Sydney region users due to the significant land transport travel time required.

Other options, such as offshore airports along the NSW coast, raised engineering and access issues and would incur significant expenditure. Significant capital outlay would be required not only to develop the offshore platform but also to provide appropriate land transport linkages for passengers and freight. Passenger access would be expensive to establish and operate, with difficult and costly linkages to the existing networks. Offshore airports would also create a range of environmental impacts and security of infrastructure is now also a key consideration for such a development.

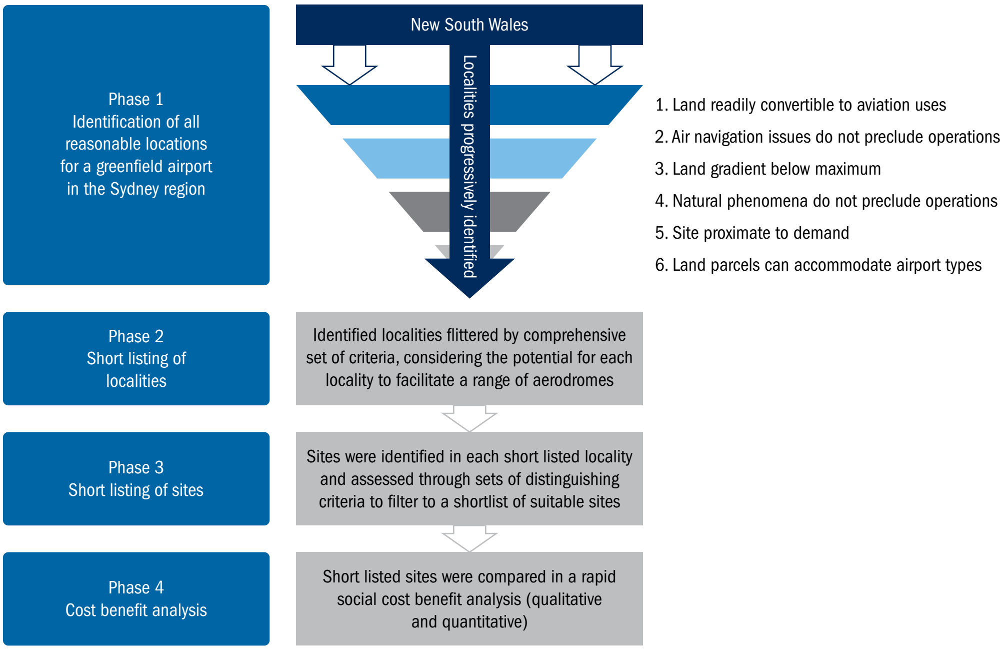
As a result of this assessment, analysis was refined to focus on land in the Sydney region capable of accommodating development of a new airport. Detailed information can be found in Appendix F and Technical Papers C11, C12 and C13.

8.3 Methodology to identify and assess greenfield airport sites

Four-phase methodology

In order to identify a comprehensive range of potential greenfield airport sites, a four-phase process was applied, commencing with all land in the broader Sydney region. Filters were then applied to locations that were identified as being conceivably able to accommodate a greenfield airport to progressively identify the sites which might best accommodate an additional airport. An outline of the process is shown in Figure 135.

Figure 135 Methodology for greenfield airport identification and assessment



It includes:

- **Phase 1 – Identification of all potential locations:** involved the identification of all possible areas in the region that could conceivably accommodate large-scale domestic and international operations on a minimum land parcel size, as well as a limited service airport on a reduced land parcel size.[184]
- **Phase 2 – Shortlisting of localities:** these geographic areas ('localities') were compared against a comprehensive set of criteria, considering the potential for each locality to support a range of airports, from a small-scale airport serving mainly General Aviation (GA) and limited RPT to a large-scale international airport serving all market segments. Criteria that more clearly distinguished each locality's suitability for an airport were used, along with a preliminary rapid cost benefit analysis (CBA), to filter the number of localities.
- **Phase 3 – Identification of sites:** in each shortlisted locality, sites that were suitable to accommodate either a full-sized international airport serving all market segments or a limited service airport aimed primarily at the LCC and regional markets were identified.
- **Phase 4 – Assessment of sites:** the identified sites were assessed further in order to select the sites considered most suitable in each locality. This involved assessment against a set of technical criteria, and evaluation through a rapid CBA.

Distinguishing criteria

A complex range of factors were identified and applied in the four-phase identification and assessment process as criteria to filter and prioritise options. These were developed by PwC and WorleyParsons/AMPC from sources spanning four decades including Australian and international aviation studies and reports documenting previous aviation upgrades and international standards. Specifically for the greenfield identification and assessment process, a comprehensive set of 30 criteria were developed to allow analysis across a range of factors.

184 It should be noted that, for the purpose of describing the greenfield site assessment process, four airport types have been developed and have been used throughout the Report. More information on the process and findings can be found in Technical Papers C11 and C13.

8.4 Phase 1: Identification of potential locations

The aviation sector accommodates a range of demand types regular public transport (RPT, including international, domestic and regional), GA, military and freight. A new greenfield site could be developed to serve just one or multiple segments of aviation demand. The parameters that directly influence the ability of a site to support aviation activities will vary considerably dependent on the segment of demand (for example, the length of runway required).

To guide the identification and assessment of greenfield airport sites, consideration was given to four possible airport types that could respond to a range of potential aviation demand segments:

- **Type 1:** full service airport with runway length up to 4,000 metres, serving all RPT segments, capable of accommodating a future parallel runway layout;
- **Type 2:** land constrained full-service airport serving all RPT segments, capable of accommodating one runway;
- **Type 3:** limited service airport serving all RPT segments, accommodating a single shorter runway of up to 2,600 metres; and
- **Type 4:** minimum service airport serving GA and limited RPT.

Before assessing the relative merits of any particular site, it was necessary to identify the areas where a new airport could realistically be located.

WorleyParsons/AMPC undertook this work by applying a set of six criteria across the broader Sydney region to exclude areas that could not conceivably accommodate a greenfield airport. The criteria enabled identification of a number of areas where it will not realistically be feasible to locate a new airport.

Localities within the Sydney region that did not satisfy the criteria below were not assessed further.

- **Land at the location must be readily convertible to aviation uses and not already urbanised:** noting almost any land parcel is likely to have some pre-existing use (such as residential, employment, recreational or agricultural use). Dense residential and business areas of NSW, such as existing suburbs, were excluded from further assessment.
- **Air navigation issues should not preclude major civilian aviation operations at the location:** while any potential greenfield airport sites in the Sydney region may involve changes to accommodate existing use of airspace, some airspace use is more readily adapted. Areas with existing airspace classifications and aircraft operations were identified as being more challenging to adapt. Areas were excluded if the operation of any new airport located there would present a danger to existing aviation activity.
- **The site should be proximate to demand:** one of the key success factors for a new airport is its proximity to sources of demand. This criterion sets a generous initial threshold of two hours along each major existing road system out of Sydney, from the centre of the Sydney region's population (Ermington),[185] to reflect a travel time beyond which an airport is likely to be unattractive to use for the largely Sydney-based population whose needs it is aiming to meet. Current travel times were used given the uncertainty projecting all factors that could affect future travel times over the Joint Study period, including certainty of future road and rail improvements being implemented, and the level of population and employment growth relative to targets and projections.
- **The locality should not be subject to natural phenomena (for example, wind shear) which would preclude major civilian aviation operations at the location:** throughout the world airports operate within a range of climatic conditions and experience natural phenomena

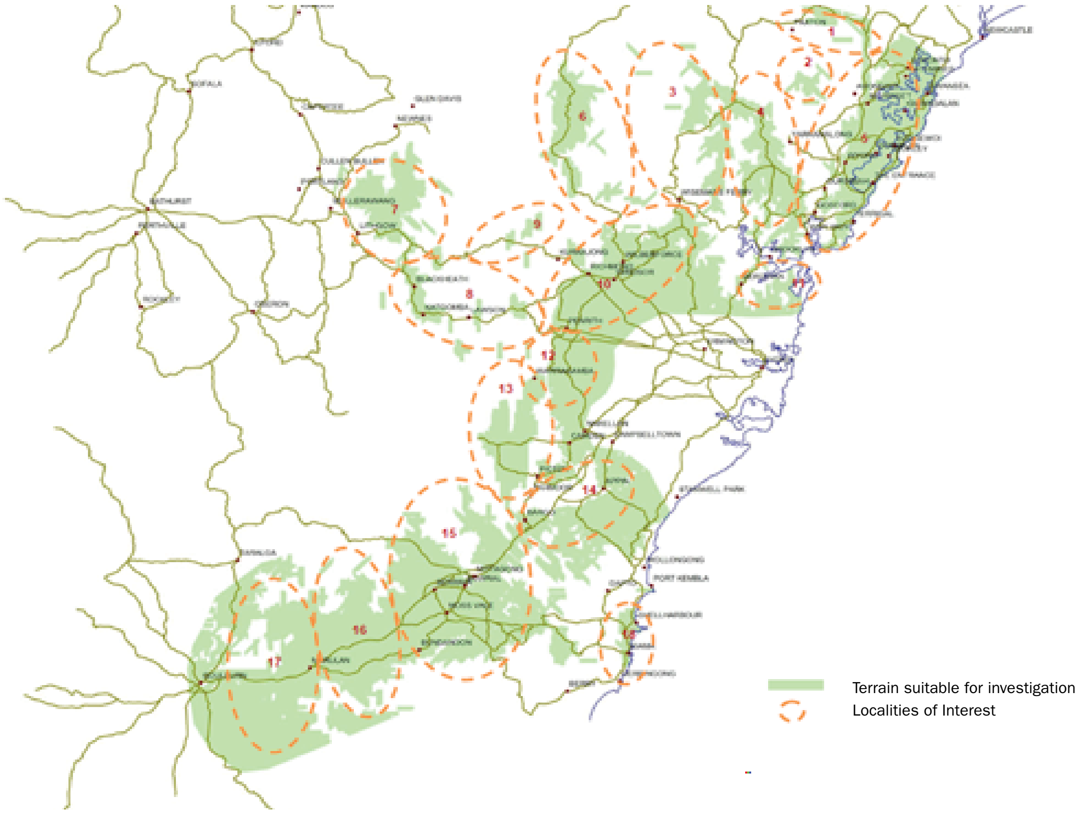
185 ABS, 3218.0 *Regional Population Growth, Australia, 2009–10,* centre of population of the Sydney Statistical Division, 2010.

that can be accommodated by means such as instrument landing systems. Consequently, factors such as fog, wind and hail were not considered to exclude land areas. However, areas not considered suitable for aviation purposes due to potential wind shear were excluded, as this phenomenon has significant safety implications.

- **Land at the location is (or can reasonably be adapted to be) within the minimum acceptable land gradient for aircraft operations:** for safety reasons there are International Civil Aviation Organisation (ICAO) standards and Civil Aviation Safety Authority (CASA) regulations setting out maximum longitudinal slopes and specifications for obstacle limitation surfaces (OLS) for airport runways. While any site is likely to require some cut and fill earthworks to suitably level or grade the land for use as an airport, this criterion excluded areas where the terrain and surrounding landscape may either limit earthworks or make them prohibitively costly to accommodate safety requirements.
- **The land parcels must be able to accommodate a set number of runways, minimum runway lengths, minimum separation of runways and minimum airside and landside requirements:** earlier criteria may identify a range of land parcels of differing sizes, but some may be shaped such that it is not feasible to locate an airport on a given parcel. This criterion sought to ensure the land areas identified could feasibly site one or more runways. A broad range of potential airport localities were sought by considering the land parcel size and a potential runway length required to accommodate a Type 4 airport.

By applying the six criteria above, Phase 1 identified a range of possible areas that could reasonably locate a greenfield airport. These areas were grouped into 18 localities, where areas of land were reasonably contiguous, as shown in Figure 136.

Figure 136 Indicative greenfield airport localities



Note: Green areas within the ellipses represent the land areas identified. The ellipses shown are indicative only and generally enclose the green shaded areas intended for further investigation.

Source: WorleyParsons.

Table 43 summarises the region and principal Local Government Areas (LGAs) of each locality and also provides a descriptor of each geographic location. A mix of localities within the Sydney basin and beyond was identified.

Table 43 Greenfield airport localities identified in Phase 1

Region	Locality number	Locality	Principal LGAs
Northern localities	1	Ellalong	Cessnock
	2	Watagan Mountains	Cessnock, Lake Macquarie, Wyong
	3	Yengo National Park and Macpherson State Forest	Cessnock, Gosford, Hawkesbury
	4	Central Mangrove-Kulnura	Gosford, Wyong
	5	Central Coast	Lake Macquarie, Wyong
Western and north-west localities	6	Putty Road	Hawkesbury, Lithgow, Singleton
	7	Newnes State Forest and Plateau	Blue Mountains, Lithgow
	8	Great Western Highway	Blue Mountains, Lithgow
	9	Bell's Line of Road, Bilpin	Blue Mountains, Hawkesbury
Sydney basin localities	10	Hawkesbury[1]	Baulkham Hills, Blacktown, Hawkesbury, Hornsby, Penrith
	11	Ku-ring-gai National Park and surrounds	Hornsby, Gosford, Pittwater, Warringah
	12	Nepean[2]	Blue Mountains, Liverpool, Penrith, Wollondilly
South-west localities	13	Burragorang[3]	Camden, Wollondilly
	14	Cordeaux-Cataract[4]	Campbelltown, Wingecarribee, Wollondilly, Wollongong
	15	Southern Highlands[5]	Wingecarribee
	16	Goulburn to Marulan[6]	Goulburn-Mulwaree, Upper Lachlan, Wingecarribee
	17	Marulan to Illawarra Highway junction[7]	Goulburn-Mulwaree, Upper Lachlan
Southern localities	18	West of Kiama Bypass	Shellharbour

Notes: 1. Northern Hawkesbury River valley and slopes.
2. Nepean River valley and slopes.
3. The Oaks and surrounds.
4. Wilton-Appin and surrounds.
5. Mittagong, Moss Vale, Berrima and surrounds.
6. North and south of the F5 between Goulburn and Marulan.
7. North and south of the F5 between Marulan and Illawarra Highway junction.

Source: WorleyParsons/AMPC analysis.

8.5 Phase 2: Shortlisting of localities

In Phase 2, information was gathered on the 18 identified localities and compared against a comprehensive set of criteria to allow assessment of the relative merits of each to facilitate aerodromes ranging in scale from a Type 1 full land-sized international airport, serving all market segments, to a Type 4 minimum service GA airport. [186]

186 Further information can be found in Appendix F (Matrix 1).

The following 10 primary criteria were applied to assess and compare localities:

- capacity created and/or unlocked in the network;
- accessibility to the Sydney land transport network;
- scope for commercial opportunities near or on the airport site;
- proximity to the landside origins and destinations of likely users;
- restrictions due to nature of sites, considering air traffic management arrangements and potential OLS restrictions;
- noise impacts on residents (with impacts on other noise-sensitive land uses considered in the next phase);
- impact on national/state parks;
- flora and fauna impacts;
- impact on state significant sites; and
- unexploded ordnance risks.

Extensive data was collected for each locality against each of the primary criteria. In addition, key performance indicators were developed to measure each criterion. These were applied to facilitate further differentiation between localities.

Some localities encompassed large areas and gathering detailed information on the entire area would have been time and cost-prohibitive. Therefore, to assist in the comparison of the 18 localities, representative airport sites were identified in each of the localities. These representative sites were identified principally to enable further testing of each locality and were not chosen as an indication of the optimal airport site or sites in each locality. The same set of criteria already developed was used to identify the most representative site.

To compare the representative sites in each locality, a comprehensive set of 30 criteria were applied to allow analysis across a range of factors. These encompassed the initial 10 primary criteria, supplemented with criteria including factors such as frequency of meteorological conditions, the number of properties and population located within the site, occurrence of heritage items, flood risk and bushfire risk.

The results of this analysis were incorporated into a comprehensive matrix documenting the performance of each locality. The full matrix of information, collated for Phase 2 providing details for each locality against all the criteria, is set out in Appendix E.

The collated data for each locality in the matrix provided an overview of the locality's potential to provide additional aviation capacity for the Sydney region, as well as the implications of developing and operating an airport in that locality.

While all of the factors developed had relevance, there were some criteria that more clearly distinguished each locality's suitability to provide a site for an airport, and these were used to filter the number of localities. These distinguishing criteria are discussed below.

Proximity to demand

As identified earlier in this Part, proximity to market and the size of that market will be key considerations for airlines when considering whether to operate to a non-primary airport.

A number of localities identified in Phase 1 were situated close to the two-hour travel time from Sydney's population centre threshold applied in the locality identification process. On a number of measures, a locality (or site) situated closer to demand will be more suitable, as, in addition to the attraction for airlines, it is likely to be more attractive to airport users on time and cost grounds and involve lower costs to provide transport links from key demand areas.

The supplementary information collected in Phase 2 showed that these more distant localities were not consistently stronger on other criteria than localities closer to Sydney. This held true regardless whether localities were located north, south-west or south of Sydney.

For example, the Ellalong, Watagan Mountains and Yengo National Park/Macpherson State Forest localities all lie to the north of Sydney and between an estimated 111 and 116 minutes travel time from Sydney. Furthermore, none of these localities were considered able to support the development of a full service Type 1 international airport. In contrast, the Central Mangrove–Kulnura and Central Coast localities also lie to the north of Sydney but at an estimated 64 to 76 minutes travel time to Sydney. These two sites were considered capable of supporting the development of any of the four airport types considered in the Joint Study. Therefore, there was no advantage in retaining the Ellalong, Watagan Mountains and Yengo National Park / Macpherson State Forest localities relative to the more proximate Central Mangrove–Kulnura and Central Coast localities.

As a result of this finding across a number of the more distant localities, the travel time threshold was revised to 1.5 hours.

Seven of the 18 identified localities were located beyond the 1.5 hour travel time threshold and were not taken forward for further assessment. These seven localities were:

- Ellalong;
- Watagan Mountains;
- Yengo National Park and Macpherson State Forest;
- Newnes State Forest and Plateau;
- Goulburn to Marulan;
- Marulan to Illawarra Highway junction; and
- west of Kiama Bypass.

Potential impact on protected areas

In Phase 1, dense urban residential and business areas were not considered suitable for development of a greenfield airport given the level of existing activity that would be impacted or need to be relocated. However, land occupied by national parks and other preserved land was considered to be technically feasible to convert to an airport. In Phase 2 it was identified that such areas were not consistently stronger on other criteria relative to other localities, and clearly were less desirable sites on environmental grounds.

For example, the Great Western Highway and the Bell’s Line of Road, Bilpin localities fall within the Greater Blue Mountains world heritage area. Furthermore, these localities are only suitable for the development of single runway airports given the dissected mountain plateau nature of the terrain. There was, therefore, no advantage in retaining these localities in comparison to other localities closer to Sydney with more potential to provide greater aviation capacity for the Sydney region.

As a result of this broad comparative assessment, areas within, or partially within, a national park or a state conservation area were not taken forward for further assessment.

Of the 11 localities or partial localities remaining after the 1.5 hour travel time threshold was applied, four had no viable airport site outside of a national park or state conservation area and were not taken forward for further assessment. The four localities were:

- Putty Road;
- Great Western Highway;
- Bell's Line of Road, Bilpin; and
- Ku-ring-gai National Park and surrounds.

This resulted in seven localities being prioritised for further assessment:

- Central Mangrove–Kulnura;
- Central Coast;
- Hawkesbury;
- Nepean;
- Burragorang;
- Cordeaux-Cataract; and
- Southern Highlands.

Preliminary economic appraisal

In order to further compare these seven localities, a preliminary rapid CBA was undertaken by Ernst & Young.[187] This incorporated key monetised as well as non-monetised impacts, and viewed benefits from a national perspective.

The locality specific factors that were monetised and included in the analysis were:

- airport capital and operating costs;
- supporting infrastructure capital and operating costs;
- land acquisition costs and earthworks platform costs;
- value of aviation movements, including:
  - consumer surplus realised by Australian residents who will be able to fly if new capacity is added but whose demand will be suppressed in the base case;
  - tourism spend of non-Australian residents who would otherwise not visit Australia; and
  - value of freight that is able to be transported to and from Sydney that will have otherwise not been transported;
- reduction in aviation movement costs:
  - reduction in delay of passengers that would have flown in the base case;
  - reduction in delays to aircraft operators; and
  - reduction in the percentage of passengers that have to alter their preferred flight times due to supply constraints; and

187 Further information can be found in Technical Papaer C13.

- increased externality costs on the wider community and society:
  - additional landside transport costs (including congestion/delays on the land transport network, realised by additional passenger vehicle movements and additional freight vehicle movements that can now be accommodated);
  - environmental impact of additional flights; and
  - cost to mitigate noise impacts on local areas.

The results of the rapid CBA of the monetised impacts are shown in Table 44, with the five highest economic results for each of the airport types shaded.[188]

Table 44 Rapid CBA results (relative benefit cost ratios) – monetised impacts

Airport type	Central Mangrove–Kulnura	Central Coast	Hawkesbury	Nepean	Burragorang	Cordeaux-Cataract	Southern Highlands
1	1.37	2.25	1.67	2.82	1.80	2.00	0.81
2	1.23	1.64	1.30	1.92	1.28	1.33	0.35
3	0.68	0.95	0.74	1.22	0.72	0.76	0.02
4	-0.09	0.05	0.23	0.38	0.00	0.18	-0.50

Note: Shaded areas represent the five localities that return a higher ratio of benefits to costs. Results presented are comparative benefit cost ratios based on discounted costs and benefits (seven per cent discount rate). Some of the variation between airport type results is due to the assumption of when each airport type will commence operation (assumed to be 2035 for Types 1 and 2, and 2025 for Types 3 and 4 considering potential development and construction time required).

Source: Ernst & Young.

These Relative Benefit Cost Ratios (RBCRs) were developed by Ernst & Young to provide a relative comparison between localities. Given the rapid nature of the economic appraisal, a RBCR of less than 1.0 was not considered to definitively suggest a locality would be unviable; likewise, a high RBCR was not considered to definitively suggest economic viability.

The RBCRs suggested two of the localities would deliver significantly lower RBCRs than the other five. These two localities were:

- Central Mangrove–Kulnura; and
- Southern Highlands.

The lower economic results were principally attributed to the higher travel time to airport user origins and destinations due to the lack of connectivity (Southern Highlands), and a combination of higher travel times and relative site development costs (Central Mangrove Kulnura).

The quantitative analysis suggested that Type 1 airports are more economically viable than other airport types. However, the Steering Committee considered that there was merit in continuing to assess Type 3 airport sites, as such sites could reasonably represent the first stage of development for a greenfield airport.

188 While cost benefit ratios of 1.5 or greater would normally be the preferred choice from a CBA, in a rapid CBA, a ratio greater than 1.0 is considered reasonable for shortlisting purposes. As the results are presented as relative benefit cost ratios due to the rapid nature of the appraisal, however, a CBR of less than 1.0 was not considered to definitively suggest a locality/site would be unviable.

To highlight any further significant differences between the localities, a qualitative analysis was also undertaken based on the following eight criteria:

- proximity of aviation capacity to NSW commercial growth centres;
- commercial opportunities near or on-site;
- potential impact on existing residents and other land users as a result of land acquisition;
- Indigenous cultural heritage items;
- national and state parks;
- flora/fauna species within the representative site;
- noise impacts on residents; and
- noise impacts on sensitive areas.

There was a wide variation in the results of the qualitative analysis. The best performing localities are outlined below.

- Strategic growth alignment: Nepean and Hawkesbury are located relatively close to existing growth centres.
- Social and cultural: Cordeaux-Cataract has the fewest number of people living in the airport footprint and the most compatible current land use.
- Environmental: Southern Highlands has the lowest impact on national and state parks and/or flora and fauna species.
- Noise: Cordeaux-Cataract and Nepean have the lowest number of residents or ‘sensitive’ users exposed to noise impacts.

As a result of this process, the five localities identified in Figure 137, being those with the highest RBCRs, were taken forward for further analysis.

Figure 137 Greenfield airport localities to be assessed in Phase 3

Note: Green areas within the ellipses represent the land areas identified. The ellipses shown are indicative only and generally enclose the green shaded areas intended for further investigation.

Source: WorleyParsons/AMPC.

Table 45 summarises the shortlisted localities and identifies the regions and the LGAs where the localities are situated.

Table 45 Greenfield airport localities to be assessed in Phase 3

Region	Locality number	Locality	Principal LGAs
Northern localities	5	Central Coast	Lake Macquarie, Wyong
Sydney basin localities	10	Hawkesbury	Baulkham Hills, Blacktown, Hawkesbury, Hornsby, Penrith
	12	Nepean	Blue Mountains, Liverpool, Penrith, Wollondilly
South-west localities	13	Burragorang	Camden, Wollondilly
	14	Cordeaux-Cataract	Campbelltown, Wingecarribee, Wollondilly, Wollongong

Source: WorleyParsons, AMPC and Ernst & Young analysis.

8.6 Phase 3: Identification of sites

The assessment process through Phase 1 and 2 focused on identifying and assessing broader, geographic localities. While a broad area was considered appropriate in the initial identification and analysis phases, the sheer scale of some localities required that specific sites were identified to further progress the process. In this phase, analysis was undertaken to identify the more suitable site/s within each locality. This involved application of a set of filters to identify and assess sites within each of the five localities.[189]

A focus was placed on identifying Type 1 and Type 3 airport sites in this phase.

Reflecting the findings in Part Four of this Report that in the short to medium term, key capacity issues at Sydney (Kingsford-Smith) Airport arise principally for new international and LCC operator demand, Type 4 airport sites were no longer considered as they are not able to accommodate these demand segments. While a Type 2 airport can accommodate these segments, it represents a land-constrained alternative to a Type 1, which was considered less relevant for long-term planning at this stage.

Identify broadly suitable lands

The first filter involved screening each locality in order to exclude land considered unsuitable for airport development and identify broadly suitable lands. It focused on factors that could make areas in a locality particularly challenging to adapt, or could make operations relatively unsafe. These factors are listed below.

- **Site terrain:** airports require large areas of land, which, while not necessarily needing to be completely level, must be able to accommodate linear infrastructure to closely defined geometrical standards and tolerances, including runways, taxiways and OLS requirements. Land that is near level, or able to be modified to the required shape at the lowest cost, is preferred for airport development. While it will always be preferable to choose a site which is as level as possible, the scale of earthworks required to transform a non-level site into an airport can be significantly reduced by fitting the airport's geometry as closely as possible to the terrain. This refinement would typically occur during the detailed design stage.

  However, for the purposes of this phase of site analysis, terrain requiring earthworks of more than 150,000 cubic metres of cut plus fill per hectare (derived from international and Australian benchmark data) was considered to preclude airport development due to the significant cost. In past studies, 10,000 to 25,000 cubic metres per hectare was the level considered in previous Badgerys Creek and Wilton assessments, while 100,000 to 150,000 cubic metres per hectare, while difficult in terms of earthworks volumes, would be characteristic of one of the previously considered Holsworthy options (OptionB).[190]
- **Air navigation:** several aspects of air navigation requirements for safe airport operation, when applied to an area under investigation for new airport development, effectively act as absolute excluding criteria for airport operations. These include airspace management, OLS, and approach surfaces for an instrument runway approach.
- **Wind shear:** wind shear is a well-known causal factor in a proportion of aircraft accidents. It is also the only weather-related factor that can be readily incorporated into an airport site suitability assessment because of its specific association with particular terrain formations, especially large-scale escarpments.
- **Protected ecosystems:** protected ecosystems were mapped and excluded from further investigation for airport sites; these included National Parks, State Conservation Areas, State Forests and Ramsar wetlands.

189 Further information can be found in Appendix F (Matrix 2) and Technical Paper C11.
190 Airport Planning Pty Ltd, *Second Sydney Airport (SSA) Planning and Design Summary Report,* 1997.

- **Urban areas and rural settlements:** existing urban areas and more populous rural settlements were considered absolute excluding areas because of the potential high cost of wide-scale acquisition of property. It is also preferable to locate airports away from urban areas to avoid adverse levels of aircraft noise impact.

Findings: broadly suitable land

After applying these criteria to the five localities, each locality still had land remaining after exclusion of land considered unsuitable for airport purposes. These lands were essentially similar in their location and shape for either a Type 1 full service international airport or a Type 3 limited service RPT airport.

In general terms, larger areas of broadly suitable land were identified in the Nepean and Hawkesbury localities, with smaller areas identified in the Cordeaux-Cataract, Burragorang and Central Coast localities, as listed below.

- **Central Coast:** three main areas were identified – in the vicinity of Wallarah, Somersby and Peats Ridge. These areas are discrete and discontinuous with each other.
- **Hawkesbury:** a large overall area was identified comprising some substantial and continuous parcels of land lying between the Western Motorway and Windsor Road, with other smaller discrete parcels to the north of Windsor Road and along the Old Northern Road.
- **Nepean:** the largest continuous area of any locality was identified lying mostly between the Western Motorway and Camden Valley Way and to the west of the M7 motorway and east of the Nepean River.
- **Burragorang:** a series of smaller, discrete parcels of land were identified lying west of the Nepean River, south of the Warragamba River and along the generally north-south alignment of Silverdale and Montpellier Roads, in the vicinity of the Oaks township.
- **Cordeaux-Cataract:** a set of six discrete, discontinuous areas of land were identified in the vicinity of Appin, Wilton and the Cordeaux-Cataract water catchment areas and lying to the east of the M5 South Western motorway and to the west of the F6 Southern freeway and the Illawarra escarpment.

These areas of land in each of the five localities formed the input to the next stage of the assessment process.

Identify the most suitable land

The second filter involved assessment of the broadly suitable land within each locality to identify areas most suitable for aviation uses. This involved relative, scaled assessments of the broadly suitable land based on the following criteria:

- **Earthwork volumes:** earthwork volumes to create a level site were assessed in terms of a range of bands; for example, zero cubic metres to 10,000 cubic metres per hectare, 10,000 cubic metres to 25,000 cubic metres per hectare and so on, up to 125,000 cubic metres to 150,000 cubic metres per hectare. These bands were mapped for the broadly suitable land in the five localities so that areas which required greater or lesser volumes of earthworks for a notionally level site could be identified.
- **Population density:** the total population within the 20 ANEC contour was determined for a range of possible runway orientations. The smallest total population that was produced by the different orientations was recorded and mapped to the following scale: 101 to 500 persons, 501 to 1,000 persons and so on, up to a category of 20,001+ persons inside the contour. Land having the lowest count of population within the associated

20 ANEC contour was considered to represent the more suitable land in relation to this criterion.

- **Mine subsidence:** designated mine subsidence districts were mapped to identify those areas which could be potentially affected by mine subsidence and long-wall mining activity. Such areas were not considered suitable for airport development.
- **Distance to land transport network:** transport accessibility was assessed in terms of the direct distance to the Sydney land transport network, and specifically to the designated freeway and motorway system. The distance from existing freeways and motorways was mapped based on the following bands: less than 2 kilometres, 2 to 5 kilometres, 5 to 10 kilometres and so on.

Findings: most suitable land

In terms of earthwork volumes, the greatest continuous extent of easy and moderate terrain for creating a platform for a Type 1 airport lies within the Hawkesbury and Nepean localities. There are smaller parcels of such land in other localities, which are generally characterised by terrain which is more difficult, in terms of the extent of earthworks, to create a level site suitable for airport development.

The Hawkesbury and Nepean localities were found to contain continuous areas of terrain where earthworks below 75,000 cubic metres per hectare, and even below 25,000 cubic metres per hectare, would be required to prepare an airport site platform to meet prescribed standards. By comparison, the Burragorang and Central Coast localities were found to largely comprise terrain requiring earthworks of 75,000 to 125,000 cubic metres per hectare, with some areas in the localities between 125,000 to 150,000 cubic metres per hectare.

As would be expected, lands with the lowest populations in the 20 ANEC contour are those more distant from existing urban areas. Additionally, some lands, though relatively proximate to urban areas, may enable a runway to be oriented such that aircraft noise would not occur over more heavily populated areas. All localities contain some lands which are at the lowest levels of population exposure to aircraft noise, with the Cordeaux-Cataract locality having the greatest extent of potential sites with options to minimise population within the ANEC noise contours.

Known mine subsidence areas are exclusively concentrated in two localities – Central Coast, to the north of Wyong, and Cordeaux-Cataract, mostly around Appin. No other localities are known to be affected by designated mine subsidence districts.

With the exception of the Burragorang locality, all other localities have significant extents of land less than five kilometres from the major transport network, which is generally the road network, and the majority of the locality within 10 kilometres. In several cases, there are tracts of land adjoining or less than two kilometres from the road network.

The results of this process identified land considered suitable within each locality and enabled the search for suitable sites to be focused on a smaller footprint of land.

Identify suitable sites within the suitable land

In the land areas identified as being most suitable to locate a Type 1 or 3 airport within each locality, a third filter was applied in order to identify potentially suitable sites. This was undertaken using airport site and airport planning principles, and involved a manual review of specific runway alignments in the suitable land areas, with application of airport planning principles.

The four criteria from the previous phase, as well as the following seven additional criteria, were applied:

- Avoiding flight paths over urban areas;
- Orienting runway for greatest compatibility with Sydney (Kingsford-Smith) Airport's runways;
- Minimising site- and runway-specific OLS issues;
- Avoiding adverse effects on major infrastructure where possible;
- Ensuring airspace management compatibility;
- Assessing suitability of local topography for airport facilities; and
- Determining ability to incorporate a cross-runway.

In order to identify suitable airport sites, an 8 x 8 kilometre square grid, as shown in Figure 138 and Figure 139, was superimposed on a map covering all five localities. For the most suitable lands identified earlier, each grid cell was reviewed against the 11 criteria described above. The desired outcome of the filter, and for the phase overall, was the definition of one or more suitable sites for each airport type, within each of the five localities.

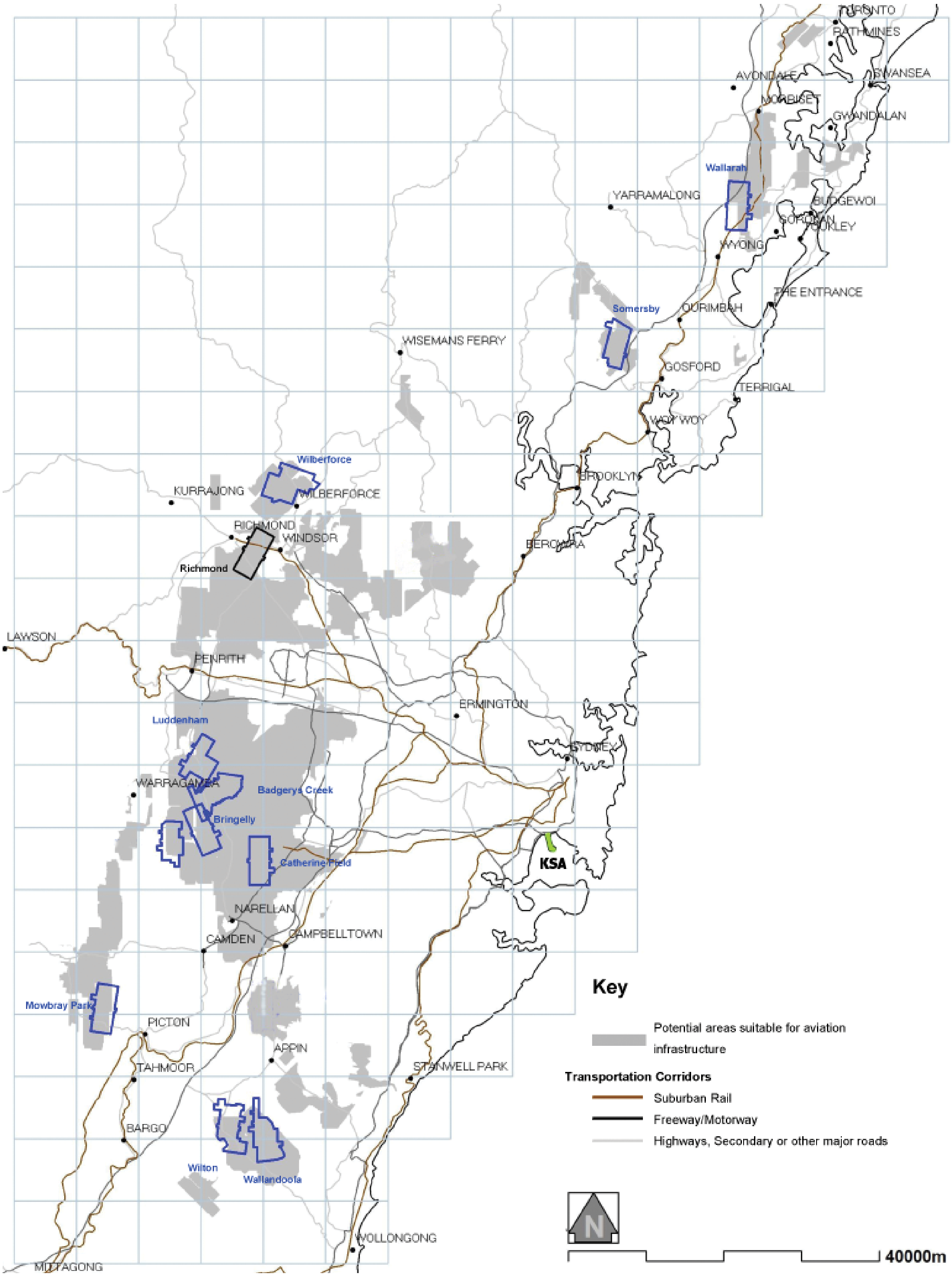
Table 46 presents the 13 sites identified as suitable to accommodate a large Type 1 full service international airport at each of the localities, and Figure 140 presents the sites graphically.

Table 46 Suitable Type 1 airport sites by locality

Region	Locality number	Locality	Shortlisted sites
Northern localities	5	Central Coast	Wallarah
			Somersby
Hawkesbury	10	Hawkesbury	Wilberforce
			Glenorie
Sydney basin localities	12	Nepean	Luddenham
			Badgerys Creek
			Bringelly
			Greendale
			Catherine Field
South-west localities	13	Burragorang	Mowbray Park
	14	Cordeaux-Cataract	North Appin
			Wilton
			Wallandoola

Source: WorleyParsons/AMPC analysis.

Figure 138 Suitable Type 1 airport sites identified



Note: The Richmond site in the figure represents the RAAF Base Richmond north-south runway option discussed in Part Six of this Report. It has been included in this figure to illustrate its general location relative to the greenfield suitable sites.

Source: WorleyParsons/AMPC.

Table 47 presents the sites identified as suitable for a limited service Type 3 RPT airport at each of the localities. Given that this type of airport requires significantly less land than a Type 1 airport, there were more opportunities to locate suitable sites for these airports. In this case, 21 sites were identified as suitable for possible airport development.

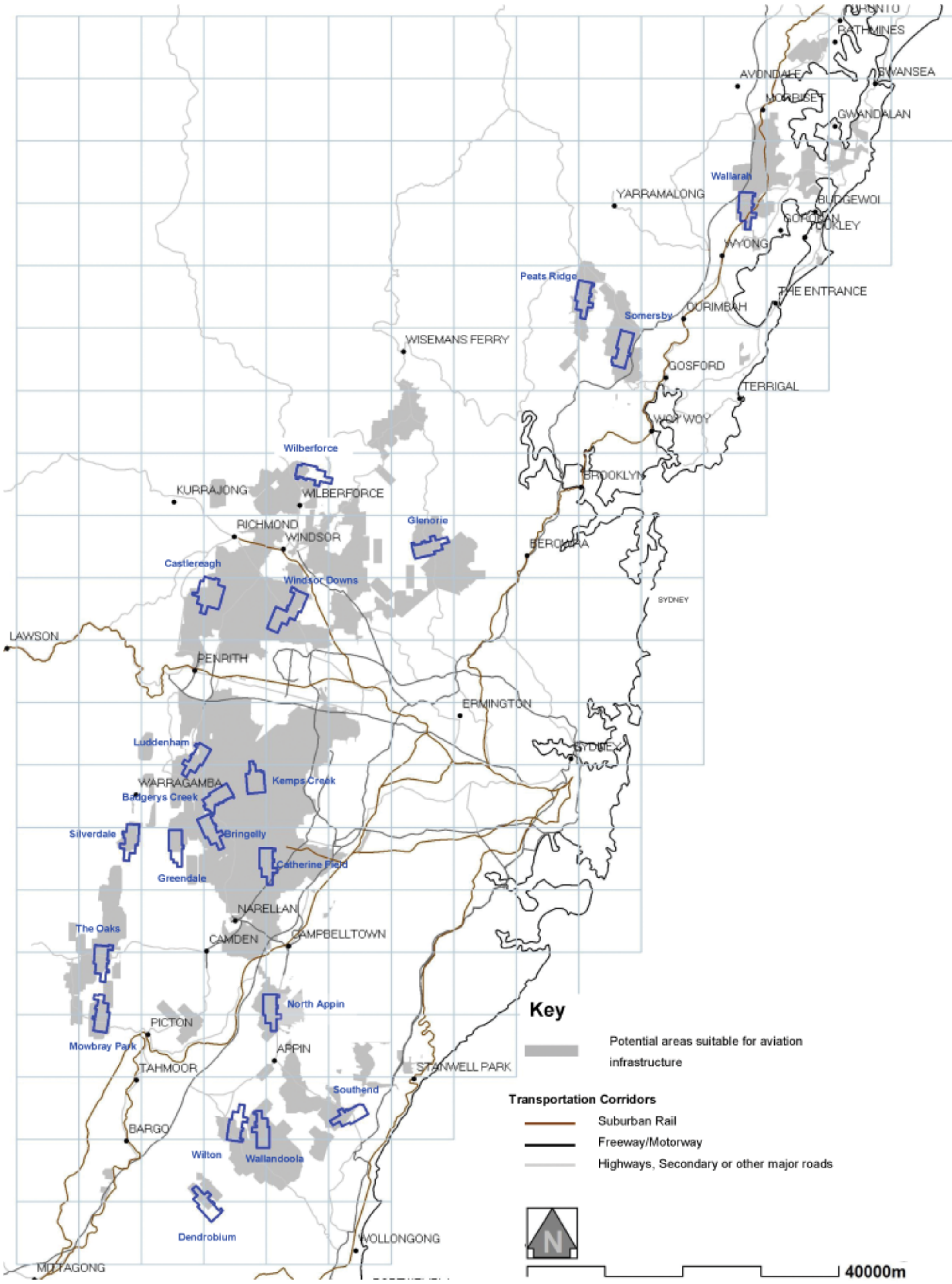
Table 47 Suitable Type 3 airport sites by locality

Region	Locality number	Locality	Shortlisted sites
Northern localities	5	Central Coast	Wallarah
			Peats Ridge
			Somersby
Hawkesbury	10	Hawkesbury	Wilberforce
			Castlereagh
			Windsor Downs
			Glenorie
Sydney basin localities	12	Nepean	Luddenham
			Kemps Creek
			Badgerys Creek
			Bringelly
			Greendale
			Catherine Field
South-west localities	13	Burragorang	Silverdale
			The Oaks
			Mowbray Park
	14	Cordeaux-Cataract	North Appin
			Southend
			Wilton
			Wallandoola
			Dendrobium

Source: WorleyParsons/AMPC analysis.

Figure 139 presents the more suitable Type 3 airport sites graphically.

Figure 139 Suitable Type 3 airport sites identified



Source: WorleyParsons/AMPC.

Specific limitations for some sites

Prior to proceeding to the Phase 4 assessment of more suitable sites, the implications of three factors were considered:

1. **Safety implications of mine subsidence:** when undertaking the process of identifying suitable lands, areas which could be potentially affected by mine subsidence and long-wall mining activity were still considered suitable for location of a greenfield airport. This was principally on the basis that despite high cost implications this may be overcome if the site had other

advantages. As the North Appin site was located within a designated mine subsidence district underlain by old mine workings, it was excluded at this point in the analysis for safety reasons.

2. **Future land use and growth centre plans:** in the greenfield identification and analysis undertaken to this point, criteria applied to identify suitable lands had principally considered current land use in determining lands not suitable for conversion to an airport. Given the recent actions by the NSW Government to accelerate development of precincts in the South West Growth Centre and the North West Growth Centre, it was considered that planned development in these areas would significantly change the suitability of such sites against assessment criteria such as the presence of urban areas and the scale of population likely to be impacted by noise. Therefore, prior to proceeding to the Phase 4 assessment of more suitable sites, the Catherine Field and Windsor Downs sites were excluded on the basis that their footprints were entirely located within these planned growth centres.

3. **Airspace management:** In addition, Airservices Australia further considered airspace in relation to the identified suitable sites. From this assessment, Airservices Australia advised sites generally became less constrained by airspace and route structures from north to south across the Sydney region. Furthermore, it was broadly inferred that Glenorie, in the Hawkesbury locality, was unviable operationally for both Type 1 and Type 3 airports. Therefore, it was not considered further for the purposes of identifying suitable sites. All other suitable sites were considered able to be operated.

8.7 Phase 4: Assessment of sites

The outcome of Phase 3 was a list of suitable sites in each of the shortlisted localities. In Phase 4, assessment was undertaken to identify the sites considered more suitable in each geographic area.

The following assessment was undertaken:

- a set of technical criteria were applied in order to identify the sites considered most suitable within each locality; and
- a rapid CBA featuring both a quantitative and qualitative assessment was undertaken to assist comparing the RBCRs of each site.[191]

Technical assessment of suitable sites

Firstly, a set of technical criteria was applied to the suitable sites in order to identify the sites considered more suitable in each geographic area. The information gathered in this step also formed one of a number of data inputs for the rapid CBA undertaken on the suitable sites. This analysis, together with the rapid CBA, enabled assessment of the more suitable Type 3 and maximum Type 1 airport sites from the range of suitable sites within each locality.

The criteria applied were those best able to be measured and costed, and which would best distinguish the relative merits of identified sites. The criteria were:

- general site attributes (encompassing factors such as site zoning, estimated population within and immediately surrounding the site, potential site footprint, and terrain);
- accessibility of the Sydney land transport network (rail and state roads);
- proximity to urban growth centres and commercial opportunities;
- comparative earthworks estimates;

191 Further information can be found in Appendix F (Matrix 3), and Technical Papers C11, C12 and C13.

- noise impacts on residents – measured by estimating the Person-Events Index (PEI) over an average day based on an estimate of the number of instances where an individual may be exposed to noise levels;[192]
- designated mine subsidence zone partially present within or adjacent to the site;
- number of lots which would require acquisition;
- airspace interaction;
- capacity for future expansion to a maximum Type 1 Airport;
- topographic constraints and risks at the site such as being flood prone; and
- potential infrastructure dislocations, relocations and other items likely to involve cost outlays.

For the Burragorang locality, there was only one suitable maximum Type 1 identified as part of Phase 3 (Mowbray Park) and, as such, that site was determined to be the more suitable site in this locality. However, Phase 3 had identified more than one suitable site in all other localities for either a maximum Type 1 or Type 3 airport.

A further qualitative process was applied to these localities in order to identify sites considered more suitable. The rating scale shown in Table 48 was adopted as an indicator of the general and relative suitability of the sites based on distinguishing differences between them.

Table 48 Rating scale for comparison of sites

More suitable	Suitable	Less suitable
✓✓	✓✗	✗✗
Adverse issues are those considered capable of being readily remedied through normal planning and design processes and/or some additional capital cost.	Adverse issues should be capable of being remedied through normal planning and design but with possible additional capital cost.	Adverse issues would be difficult to remedy through normal planning and design and/or expensive to remedy with likely additional capital cost implications.

Source: WorleyParsons/AMPC.

In the application of these ratings, no attempt was made to rank the criterion. However, the approach adopted did enable major differentiators to be identified. This enabled assessment to focus on what was different between the sites rather than what was reasonably the same.

Central Coast locality

Table 49 provides a summary comparison and qualitative assessment of the Central Coast locality suitable sites.

192 The PEI allows the total noise load generated by an airport to be computed by calculating the potentially exposed population and the total number of instances where an individual is exposed to an aircraft noise event above a specified noise level over a given time period.For the purposes of this assessment, WorleyParsons/AMPC has used an average daytime period and a specified noise level of 70 dB(A). A-weighted decibels, or dB(a), are an expression of the relative loudness of sounds in air as perceived by the human ear.70 dB(A) is considered the external noise level threshold for an average residence with doors and windows closed.

Table 49 Central Coast locality suitable sites

Criterion	Type 3 Airport Sites			Maximum Type 1 Airport Sites	
	Peats Ridge	Somersby	Wallarah	Somersby	Wallarah
1 –Comparative transport upgrade costs ($ millions)[1]	✓✗ $260	✓✓ $80	✓✓ $70	✓✗ $80 (road) $2,190 (rail)	✓✓ $110 (road) $740 (rail)
2 – Proximity to growth centres	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✗ $410	✓✗ $430	✓✓ $180	✓✗ $530	✓✓ $280
4 – Noise impacts (PEI: N70, person-events)	✓✓ 45,500	✓✗ 236,600	✗✗ 1,048,700	✓✗ 670,600	✗✗ 2,534,200
5 – Mine subsidence areas (MSAs)	✓✓ n/a	✓✓ n/a	✓✓ n/a	✓✓ n/a	✓✗ Surrounded by MSAs
6 – Property acquisition (number of lots)	✓✗ 110	✓✗ 140	✓✗ 200	✓✗ 190	✓✗ 500
7 – Airspace interaction capacity (movements per hour)	✗✗[2]	✗✗[3]	✓✗	✗✗[4]	✓✗
8 – Potential to expand to a maximum Type 1 airport	✗✗ No	✓✓ Yes	✓✓ Yes	✓✓ n/a	✓✓ n/a
9 – Major flood risk	Non Major	Non Major	Non Major	Non Major	Non Major
10 – Other major costs	No major items	No major items Closure of Somersby Airfield	Freeway, rail and major power realignment Closure of Somersby, Mangrove Mountain Airfields	No major items	Freeway, rail and major power realignment Closure of Somersby, Mangrove Mountain Airfields

Notes: 1. For Type 3 – road upgrade cost only.
2. Must be integrated with Sydney (Kingsford-Smith) Airport airspace management and may be unable to operate for periods of time due to close connection with Sydney (Kingsford-Smith) Airport, such as during major wind shifts, which requires change of runway at Sydney (Kingsford-Smith) Airport.It may also be further constrained by military airspace associated with RAAF Base Richmond and RAAF Base Williamtown.
3. As per comment above.
4. As per comment above.

Source: WorleyParsons/AMPC and Airservices Australia.

It can be observed that two of the three Type 3 airport sites are capable of expansion to a maximum Type 1 airport (Somersby and Wallarah) while the Peats Ridge site does not have that potential. The Type 3 airport sites are distinguished principally by the criteria listed below.

- **Noise impacts on surrounding community:** with Peats Ridge having a significantly lower impact than either Somersby or Wallarah.
- **Number of properties to be acquired:** with Peats Ridge having the lowest number.
- **Construction issues:** with Wallarah having lower costs to construct an airport platform and to connect to both road and rail transport systems.
- **Additional capital costs:** with Wallarah having much greater possible additional costs to relocate or make alignment adjustments to major infrastructure.

The key factor overall which distinguishes between Central Coast Type 3 suitable sites is airspace management. Both the Peats Ridge and Somersby sites are considered to be operationally connected to Sydney (Kingsford-Smith) Airport and, as a result, their actual day-to-day capacity in terms of aircraft movements is likely to be seriously affected by the necessary interaction with Sydney (Kingsford-Smith) Airport.

This capacity may be worsened in specific circumstances. For example, a southerly front passing through Sydney which causes a change of runway from, for instance, Runway 34 to Runway 16 at Sydney (Kingsford-Smith) Airport may take more than an hour to reach Peats Ridge or Somersby. An airport at either the Peats Ridge or Somersby site could be still operating under a wind direction from the north (for example, in the opposite direction to Sydney (Kingsford-Smith) Airport). During this time, until the southerly passed through these sites, these airports would have to be restricted in capacity or even closed because the identified runway orientation would not allow aircraft movements. While this condition applies, these sites would be severely operationally compromised. On this basis alone, neither site can be considered to be more suitable than Wallarah within the Central Coast locality.

Wallarah, while not subject to such a limitation in regard to Sydney (Kingsford-Smith) Airport, is operationally affected by other airspace issues such as RAAF Base Williamtown and would still require detailed consideration of a number of airspace management issues in order for it to be able to operate at 100 per cent of theoretical runway capacity. This may entail reorientation of the runway(s) and this may have adverse consequences for effects on infrastructure and for aircraft noise on residents. It may also be difficult to achieve while continuing to keep the airport site's footprint outside lands designated as mine subsidence areas.

Although Wallarah has some major shortcomings which would need to be addressed, of the Central Coast sites, it is considered to be more suitable for both a Type 3 and a maximum Type 1 airport. As noted, this assessment would only change if the Somersby and Peats Ridge sites could be operationally decoupled from airspace arrangements for Sydney (Kingsford-Smith) Airport, which on current advice from Airservices Australia appears unlikely.

Hawkesbury locality

The key issue in respect of any site in this locality is the presence of RAAF Base Richmond and the interaction that any new airport would have with that operation. For RAAF to continue operations in the area, runway orientations have to be compatible with ongoing operation at RAAF Base Richmond, or provision would need to be made for a RAAF precinct on any new airfield. Table 50 provides a summary comparison and qualitative assessment of the Hawkesbury locality suitable sites.

Table 50 Hawkesbury locality suitable sites

Criterion	Type 3 airport sites		Maximum Type 1 airport sites
	Castlereagh (including RAAF)	Wilberforce (09/27 Runway)	Wilberforce with RAAF precinct on new airfield (01/19 Runway(s))
1 – Comparative transport upgrade costs ($ millions)[1]	✓✗ $210 (road)	✓✗ $260 (road)	✓✗ $260 (road) $1,320 (rail)
2 – Proximity to growth centres	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✓ $130	✓✓ $200	✓✓ $340
4 – Noise impacts (PEI: N70, person-events)	✗✗ 1,085,400	✓✗ 172,800	✗✗ 2,020,800[2]
5 – Mine subsidence areas (MSAs)	✓✓ n/a	✓✓ n/a	✓✓ n/a
6 – Property acquisition (number of lots)	✓✗ 180	✓✗ 100	✓✗ 380
7 – Airspace interaction capacity (movements per hour)	✓✗	✗✗	✓✗
8 – Potential to expand to a maximum Type 1 airport	✗✗ No	✓✓ Yes	✓✓ n/a
9 – Major flood risk	✓✗ Partial 1:100 and Probable Maximum Flood (PMF) events	✓✗ Partial 1:100 and PMF events	✓✗ Partial 1:100 and PMF events
10 – Other major costs	✗✗ Relocation of RAAF Base Richmond Possible relocation of Orchard Hills Bankstown flying areas may close Severe impacts on aircraft lane entry	✓✓ No major items	✗✗ Relocation of RAAF Base Richmond

Notes: 1. For Type 3 – road upgrade cost only.
2. Note the runway orientation changes from Wilberforce Type 3 to Wilberforce Maximum which is more north-south.

Source: WorleyParsons/AMPC and Airservices Australia.

Two Type 3 airports and one maximum Type 1 airport site were identified for the Hawkesbury locality. However, it should be noted that while not specifically analysed as a separate option for a Type 3 airport at Wilberforce, possible first stages to develop from a Type 3 to a Maximum airport could be a Type 3 Wilberforce runway with a 10/28 alignment (to be later used as a cross-runway). This alignment would have greater compatibility with RAAF Base Richmond, while the preferred 01/19 orientation would have greater compatibility with Sydney (Kingsford-Smith) Airport.

The major factors which provide differentiation between the Wilberforce and Castlereagh sites are:

- noise effects with a Type 3 at Wilberforce 09/27 predicted to generate only 172,800 N70 person-events while a Type 3 at Castlereagh would generate more than five times that amount at 1.085 million person-events;
- the ability to expand Wilberforce into a Type 1 airport, should this be required in the future (as discussed 09/27 could form a cross-runway; or alternatively the Type 3 Wilberforce could be developed with a 01/19 orientation); and
- the relatively easier connection of a Castlereagh Type 3 airport to the major road system by virtue of its position east of the Hawkesbury River.

While Wilberforce would generally be a more suitable site than Castlereagh for a Type 3 airport, advice from Airservices Australia is that, due to interaction with Sydney (Kingsford-Smith) Airport's approaches and circuits, capacity is likely to be constrained below the theoretical runway capacity. If, on closer examination, this makes the Wilberforce 09/27 (or 10/28) Type 3 site effectively unviable then, to develop the other sites, there would be a need to relocate RAAF Base Richmond – either to the Castlereagh site or a Wilberforce 01/19 site. In this case, Castlereagh would merit further consideration, as its primary orientation is more compatible with overall aircraft movements in the Sydney Control Zone[193], though not without adverse interactions with current Sydney (Kingsford-Smith) Airport airspace management.

Only one site in the Hawkesbury locality – Wilberforce 01/19 – was identified as capable of accommodating a maximum Type 1 airport and, accordingly, it is nominated as a more suitable site in the Hawkesbury locality. As has been noted, this situation would force the closure of RAAF Base Richmond, necessitating the inclusion of a precinct on this site for RAAF's activities and operations. Another key issue for a maximum Type 1 airport at Wilberforce would be the relatively high effects on people, with more than two million N70 person-events being predicted, as well some 380 property lots having to be acquired.

193 The Sydney Control Zone is controlled airspace approximately 10 nautical miles radius around Sydney (Kingsford-Smith) Airport.

Nepean locality

Table 51 provides a summary comparison and qualitative assessment of the Nepean locality suitable sites for a Type 3 airport.

Table 51 Nepean locality suitable sites – Type 3 airport

	Type 3 Airport Sites				
Criterion	Luddenham	Kemps Creek	Badgerys Creek	Bringelly	Greendale
1 –Comparative transport upgrade costs ($ millions)[1]	✓✗ $350 (road)	✓✓ $130 (road)	✓✗ $190 (road)	✓✗ $270 (road)	✓✗ $370 (road)
2 – Proximity to growth centres	✓✓ Not affected	✗✗ Partial direct footprint	✓✗ Partially acoustic footprint	✗✗ Partially acoustic footprint	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✓ $130	✓✓ $100	✓✓ $160	✓✓ $310	✓✓ $230
4 – Noise impacts (PEI: N70, person-events)	✓✗ 206,300	✓✗ 330,300	✓✗ 200,700	✓✗ 179,200	✓✗ 104,800
5 – Mine subsidence areas (MSAs)	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
6 – Property acquisition (number of lots)	✓✓ 80	✓✗ 200	✓✓ 10	✓✗ 150	✓✓ 40
7 – Airspace interaction capacity (movements per hour)	✓✓	✓✓	✓✓	✓✓	✓✓
8 – Potential to expand to a maximum Type 1 airport	✓✓ Yes	✗✗ No	✓✓ Yes	✓✓ Yes	✓✓ Yes
9 – Major flood risk	✓✓ Non Major	✓✗ Flood prone	✓✓ Non Major	✓✓ Non Major	✓✗ Partial, 1:20, 1:100 and PMF events
10 – Other major costs	✗✗ RAAF Orchard Hills closure Major power lines Sydney water supply Camden and Bankstown flying training areas and Wilton Parachute Centre may close	✗✗ RAAF Orchard Hills closure Flying training areas and Wilton Parachute Centre closures Operations at Holsworthy, Camden and Bankstown affected: new GA airport may be needed Severe impacts on aircraft lane of entry Major power lines	✓✗ Camden Airport closure Flying training areas and Wilton Parachute Centre may close Major power lines	✓✗ Camden Airport closure RAAF Orchard Hills and Wilton Parachute Centre closure Operations at Holsworthy and Bankstown severely affected Major power lines	✓✗ RAAF Orchard Hills may require a buffer zone Operations at Bankstown affected Camden and The Oaks airport, Wilton Parachute Centre closure Major power lines

Note: 1. For Type 3 – road upgrade cost only.

Source: WorleyParsons/AMPC and Airservices Australia.

Kemps Creek is one of the easier sites on which to create a platform in terms of earthworks. It also has the lowest cost for upgrading road access. On the other hand, a Kemps Creek site would result in a greater effect on people, with the highest number of N70 person-events, the highest number of property lots needing to be acquired and a partial footprint on the land designated for the South West Growth Centre. Finally, Kemps Creek is considered only capable of providing a site for a Type 3 airport which could not be expanded to a maximum Type 1 airport.

All of the remaining sites are considered capable of expansion to a maximum Type 1 airport. All sites are also reasonably equivalent[194] in terms of operational capability as Type 3 airports, though this is not necessarily the case if they were to be expanded to maximum Type 1 airports.

In terms of effect on people, Greendale generates the lowest impact with N70 person-events at 104,800 while the other three sites are predicted to generate N70s between 179,000 to 210,000 based on the current distribution of population. Proximity to the land designated for the South West Growth Centre would result in an overlap of the acoustic footprint of airports at Kemps Creek, Bringelly, and a site at Badgerys Creek. This may not be an issue depending on the land use proposed for that overlap. However, the Greendale and Luddenham sites would not have such an overlap. A site at Badgerys Creek obviously has the least amount of property needed to be acquired with the majority, if not all, of the site already owned by the Commonwealth Government. If expansion capability is not required at the site, there is potential, subject to runway orientation, for a Type 3 airport to be located wholly on the existing Commonwealth Government land. Kemps Creek would require the highest number of lots estimated at 200 lots.

All sites would require adjustment to some forms of major infrastructure, notably power transmission lines and existing airports, but the Luddenham site would require the closure of the RAAF Orchard Hills facility and possibly a relocation of the Warragamba water supply pipelines. Greendale, on the other hand, is more liable to major flooding by its position lower in the Nepean River valley.

While there are variations in terms of all criteria between the all of the Type 3 sites, those at Luddenham, Badgerys Creek, Bringelly and Greendale are sufficiently similar to be retained as sites considered more suitable in the Nepean locality, notwithstanding that changes to the concepts shown may be required to suit airspace operations. By being virtually contiguous sites, this retains the possibility of a yet better site being identified in the future, which could incorporate some or all of these sites.

Kemps Creek should only be considered further if there is no requirement for the site to ever be expanded to a maximum Type 1 airport and, even then, the interaction with the South West Growth Centre lands would need to be resolved to enable even a Type 3 airport at that site to operate efficiently.

Table 52 provides a summary comparison and qualitative assessment of the Nepean locality suitable sites for a Type 1 airport.

194 All sites interact with existing airspace constraints that influence capacity in some way or another as outlined in Technical Papers C11 and C12.

Table 52 **Nepean locality suitable sites – Type 1 airport**

	Maximum type 1 airport sites			
Criterion	Luddenham	Badgerys Creek	Bringelly	Greendale
1 –Comparative transport upgrade costs ($ millions)[1]	✓✗ $350 (road) $1,130 (rail)	✓✗ $190 (road) $1,130 (rail)	✓✗ $270 (road) $1,130 (rail)	✓✗ $370 (road) $1,130 (rail)
2 – Proximity to growth centres	✓✓ Not affected	✓✗ Partially acoustic footprint	✗✗ Partially acoustic footprint	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✓ $280	✓✓ $360	✓✗ $410	✓✓ $300
4 – Noise impacts (PEI: N70, person-events)	✗✗ 1,545,200	✗✗ 1,668,800	✗✗ 1,284,600	✓✗ 499,200
5 – Mine subsidence areas (MSAs)	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
6 – Property acquisition (number of lots)	✓✗ 140	✓✓ 40	✓✗ 180	✓✓ 70
7 – Airspace interaction capacity (movements per hour)	✓✓	✓✗	✓✗	✓✓
8 – Potential to expand to a maximum Type 1 airport	✓✓ n/a	✓✓ n/a	✓✓ n/a	✓✓ n/a
9 – Major flood risk	✓✓ Non major	✓✓ Non major	✓✓ Non major	✓✗ Partial, 1:20, 1:100 and PMF events
10 – Other major costs	✗✗ RAAF Orchard Hills closure May close Camden/ Bankstown flying training areas Wilton Parachute Centre closure Major power lines Sydney water supply	✓✗ Camden and Wilton Parachute Centre closure may severely impact Camden/ Bankstown flying training areas Major power lines	✓✗ Camden Airport closure Severe impacts on Bankstown Closure of RAAF Orchard Hills Limitations on operations at Holsworthy Possible need to relocate some facilities/activities Wilton Parachute Centre closure Major power lines	✓✗ Impacts on Bankstown Airport Closure of Camden and The Oaks Airports and Wilton Parachute Centre Buffer to RAAF Orchard Hills Major power lines

Note: 1. For Type 3 – road upgrade cost only.

Source: WorleyParsons/AMPC and Airservices Australia.

The key distinguishing factors for maximum Type 1 airport sites are, firstly, the possible effects on people with the Greendale site assessed to generate an N70 of 499,200 person-events based on current population distributions, which are about three times less than predicted for the sites at Luddenham, Bringelly and a site at Badgerys Creek. Greendale and Luddenham would not cause either direct, partial or indirect effects on the South West Growth Centre lands whereas both Badgerys Creek and Bringelly, if configured as currently shown, would have acoustic footprints which do overlap with the designated Growth Centre lands. However, while the land uses in this area are in the planning stage, the eventual end land use in such areas of overlap is not yet known and may or may not require changes either to growth centre land uses or to airport runway orientation in order to increase compatibility between the airport and the Growth Centres. As with the Type 3 airports, the Badgerys Creek site can be distinguished from sites which would require between 70 and 180 lots to be acquired to achieve a similar aggregated land area to that at Badgerys Creek. While an airport could be constructed on the current Commonwealth-owned site at Badgerys Creek, the acquisition of 40 additional properties would better accommodate a cross-runway and items such as a public safety area, glide path and runway end safety area.

The second key distinguishing factor is in terms of airspace and operational compatibility with Sydney (Kingsford-Smith) Airport, which, based on currently proposed runway allocations and orientations, the Luddenham and Greendale sites would yield greater movement capacity at, or about, the theoretical maximum capacity of the airport. However, more intensive airspace modelling and realignment of runways may achieve better results at all of these sites.

Like the Type 3 sites, all the maximum Type 1 airport sites would require adjustment of some forms of major infrastructure, notably power transmission lines. The Luddenham site would require the closure of the RAAF Orchard Hills facility and possibly a relocation of the Warragamba Dam water supply pipelines. Greendale on the other hand is more liable to major flooding because of its position at a lower level in the Nepean River valley.

Burragorang locality

Table 53 provides a summary comparison and qualitative assessment of the Burragorang locality suitable sites.

Table 53 Burragorang locality suitable sites

	Type 3 airport sites			Maximum Type 1 airport sites
Criterion	Silverdale	The Oaks	Mowbray Park	Mowbray Park
1 –Comparative transport upgrade costs ($ millions)[1]	✓✗ $430 (road)	✓✗ $320 (road)	✓✗ $400(road)	✓✗ $400 (road) $930 (rail)
2 – Proximity to growth centres	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✗ $460	✓✗ $490	✓✓ $370	✓✗ $680
4 – Noise impacts (PEI: N70, person-events)	✓✓ 42,100	✓✗ 194,600	✓✗ 159,600	✓✗ 799,400
5 – Mine subsidence areas (MSAs)	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
6 – Property acquisition (number of lots)	✓✓ 40	✓✓ 70	✓✓ 40	✓✓ 100
7 – Airspace interaction capacity (movements per hour)	✓✓	✓✓	✓✓	✓✓[2]
8 – Potential to expand to a maximum Type 1 airport	✗✗ No	✗✗ No	✓✓ Yes	✓✓ Yes
9 – Major flood risk	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
10 – Other major costs	✓✗ RAAF Orchard Hills, The Oaks Airfield, Camden Airport, Wilton Parachute Centre closures Operations at Bankstown affected Major power lines	✓✗ The Oaks Airfield, Camden Airport, Wilton Parachute Centre closures	✓✗ The Oaks Airfield, Wilton Parachute Centre closures Camden Airport operations affected Major power lines	✓✗ The Oaks Airfield, Wilton Parachute Centre closures Camden Airport operations affected Major power lines

Notes: 1. For Type 3 – road upgrade cost only.
2. Based on advice provided by Airservices Australia, assuming Mowbray Park is similar to Greendale.

Source: WorleyParsons/AMPC and Airservices Australia.

Three Type 3 sites have been identified in the Burragorang locality. On most criteria, while there are some differences, these are not great and do not distinguish between sites. The areas where there is some degree of differentiation are that:

- the Silverdale site is predicted to have a much lower effect on the current distribution of population, with an N70 of 42,500 person-events, compared to 195,000 person-events at the Oaks site and 160,000 person-events for the Mowbray Park site;

- the comparative cost of creating an airport platform has been assessed to be lower at the Mowbray Park site than the other sites;
- only the Mowbray Park site has been assessed as being capable of expansion to a maximum Type 1 airport;
- construction of an upgraded access road to The Oaks site has been assessed as being lower in cost than to either of the other two sites; and
- the Mowbray Park site would require closure of The Oaks Airfield while the sites at Silverdale and the Oaks would require closure of not just the Oaks Airfield but Camden Airport.

On the basis of these differentiations, Mowbray Park is deemed to be the more suitable of these sites, most notably because of its ability to be upgraded to a maximum Type 1 airport. However, if only a Type 3 airport is sought then, given its much lower effect on people, Silverdale may be regarded as a more suitable suite. However, the site would still have issues to be addressed in terms of links to the existing road network and impacts on various forms of existing infrastructure.

Only one maximum Type 1 airport site could be found in the Burragorang locality – at Mowbray Park – and therefore becomes the more suitable site in this category in this locality. This site is not capacity constrained in relation to Sydney (Kingsford-Smith) Airport and could operate at or near its theoretical capacity. The site's relatively more remote location would require greater investment in transport infrastructure. The site is in relatively more difficult terrain so airport platform costs would be higher. However, while relatively remote, it would still result in a level of N70 events at about 800,000 person-events if it was to be a large Type 1 airport.

Cordeaux-Cataract Locality

Table 54 provides a summary comparison and qualitative assessment of the Cordeaux-Cataract suitable sites.

Table 54 Cordeaux-Cataract locality suitable sites – Type 3 airport

Criterion	Type 3 airport sites			
	Southend	Wilton	Wallandoola	Dendrobium
1 –Comparative transport upgrade costs ($ millions)[1]	✓✗ $450 (road)	✓✗ $460 (road)	✓✗ $460 (road)	✗✗ $370 (road)
2 – Proximity to growth centres	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✓ $500	✓✗ $350	✓✓ $350	✓✓ $250
4 – Noise impacts (PEI: N70, person-events)	✓✓ 27,200	✓✓ 19,800	✓✓ 29,400	✓✓ 26,100
5 – Mine subsidence areas (MSAs)	✓✗ Not directly affected	✗✗ Partially affected	✓✗ Not directly affected	✓✗ Not directly affected
6 – Property acquisition (number of lots)	✓✓ 10	✓✓ 10	✓✓ 5	✓✓ 5
7 – Airspace interaction capacity (movements per hour)	✓✓	✓✓	✓✓	✓✓
8 – Potential to expand to a maximum Type 1 airport	✗✗ No	✓✓ Yes	✓✓ Yes	✗✗ No
9 – Major flood risk	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected	✓✓ Not affected
10 – Other major costs	✓✗ Wilton Parachute Centre to close Holsworthy, Camden operations affected Water catchment areas Major power lines	✗✗ Wilton Parachute Centre to close Holsworthy, Camden and Bankstown operations and Wedderburn Airfields affected Water catchment areas Major power lines	✓✗ Wilton Parachute Centre to close Holsworthy, Camden operations and Wedderburn Airfields affected Water catchment areas	✓✗ Wilton Parachute Centre to close Camden operations affected Illawarra Regional Airport affected Water catchment areas Major power lines

Note: 1. For Type 3 – road upgrade cost only.

Source: WorleyParsons/AMPC and Airservices Australia.

Airservices Australia has indicated a Type 3 airport at Southend would likely be constrained by interaction with operations at Sydney (Kingsford-Smith) Airport. The extent of any constraints was not specified.

The only other areas of differentiation for the Type 3 sites are that:

- no form of public road access currently exists to the Dendrobium site, which is wholly within a water catchment area (other sites adjoin water catchment areas);
- airport platform costs are assessed as likely to be higher at the Wilton site than the other sites;

- the Wilton site, as currently defined, appears to have a partial overlap with a designated Mine Subsidence District and all these sites are underlain by coal measures which are actively being mined, albeit not necessarily located directly under these sites at present;
- neither the Dendrobium site nor the Southend site is considered capable of being expanded to a maximum Type 1 airport, due to their limited site areas; and
- airports at the Wilton and Wallandoola sites would require closure of the Wilton Parachute Centre and the Wedderburn Airfield.

Notwithstanding these latter considerations, Wilton and Wallandoola are assessed as being the more suitable Type 3 airport sites in the Cordeaux-Cataract locality.

Table 55 provides a summary comparison and qualitative assessment of the Cordeaux-Cataract suitable sites for a maximum Type 1 airport.

Table 55 Cordeaux-Cataract locality suitable sites – Maximum Type 1 airport

	Type 1 airport sites	
Criterion	Wilton	Wallandoola
1 –Comparative transport upgrade costs ($ millions)	✓✗ $460 (road) $1,100 (rail)	✓✗ $460 (road) $1,630 (rail)
2 – Proximity to growth centres	✓✓ Not affected	✓✓ Not affected
3 – Earthworks platform comparative cost ($ millions)	✓✗ $810	✓✗ $560
4 – Noise impacts (PEI: N70, person-events)	✓✓ 81,500	✓✗ 324,800
5 – Mine subsidence areas (MSAs)	✗✗ Partially affected	✓✗ Not directly affected
6 – Property acquisition (number of lots)	✓✓ 40	✓✓ 10
7 – Airspace interaction capacity (movements per hour)	✓✓	✓✓
8 – Potential to expand to maximum Type 1 airport	✓✓ n/a	✓✓ n/a
9 – Major flood risk	✓✓ Not affected	✓✓ Not affected
10 – Other major costs	✗✗ Water catchment areas Wilton and Wedderburn Airfields closure Holsworthy, Camden and Bankstown operations affected Major power lines	✓✗ Water catchment areas Wilton and Wedderburn Airfields closure Holsworthy, Camden and Bankstown operations affected

Source: WorleyParsons/AMPC and Airservices Australia.

There are two sites within the Cordeaux-Cataract locality capable of accommodating a Type 1 airport – Wilton and Wallandoola. Neither site is capacity constrained through interaction with Sydney (Kingsford-Smith) Airport. In the maximum Type 1 airport configuration, these sites were assessed as suitable with little differentiation between them in all aspects other than that:

- Wilton is close to the M5 freeway, although Wallandoola is located an equal distance between the M5 motorway and the M6 freeway;
- earthworks platform costs have been assessed to be higher at Wilton than at Wallandoola;
- rail access cost would be higher for Wallandoola than for Wilton;
- as with its Type 3 form, the maximum Type 1 airport site at Wilton has an overlap with a designated Mine Subsidence District; and
- there are major transmission lines to be relocated at Wilton, in addition to the need to close both the Wilton Parachute Centre and the Wedderburn Airfield.

The major point of differentiation, however, is in terms of N70 effects, with Wilton generating about a quarter of N70 person-events compared to Wallandoola, based on current population distributions and runway orientations. The suitability of Wilton as a maximum Type 1 airport site would be subject to further detailed checking on the occurrence and effects of mining.

Summary of progressive assessment of the more suitable sites by locality

Table 56 summarises the progressive assessment of the suitable Type 3 and maximum Type 1 airport sites and those sites which have been assessed to be more suitable than others in the same locality.

Table 56 Sites identified as more suitable by locality

	Central Coast	Hawkesbury	Nepean	Burragorang	Cordeaux-Cataract
Type 3 airport					
Suitable sites	Peats Ridge Somersby Wallarah	Wilberforce 09/27 Castlereagh (including RAAF)	Badgerys Creek Luddenham Kemps Creek Bringelly Greendale	The Oaks Silverdale Mowbray Park	Wilton Southend Wallandoola Dendrobium
Sites considered more suitable	Wallarah	Wilberforce 09/27[1]	Badgerys Creek Luddenham Bringelly Greendale	Silverdale (a) Mowbray Park (b)	Wilton Wallandoola
Key reason(s) for being considered more suitable	Airspace relationship to Sydney (Kingsford-Smith) Airport	Compatibility with RAAF Base Richmond	Ability to expand to Type 1 airport with parallel runways	(a) Least noise impact (b) Ability to expand to Type 1 airport with parallel runways	Ability to expand to Type 1 airport with parallel runways
Maximum Type 1 airport					
Suitable airport Sites	Somersby Wallarah	Wilberforce 01/19 with RAAF precinct on new airfield	Badgerys Creek Luddenham Bringelly Greendale	Mowbray Park	Wilton Wallandoola
Sites considered more suitable	Wallarah	Wilberforce 01/19 with RAAF precinct on new airfield	Badgerys Creek Luddenham Bringelly Greendale	Mowbray Park	Wilton
Key reason(s) for being considered more suitable	Airspace Relationship to Sydney (Kingsford-Smith) Airport	Only available suitable site for a maximum Type 1 airport with parallel runways	Differences may be able to be resolved through design refinements and/or identification of a site that comprises parts of some or all these sites	Only available suitable site for Type 1 airport with parallel runways	Much lower noise impact

Note: 1. Two Type 3 airports and one maximum Type 1 airport site were identified for the Hawkesbury locality. However, it should be noted that while not specifically analysed as a separate option for a Type 3 airport at Wilberforce, possible first stages to develop from a Type 3 to a Maximum airport could be a Type 3 Wilberforce runway with a 10/28 alignment (to be later used as a cross-runway). This alignment would have greater compatibility with RAAF Base Richmond, while the preferred 01/19 orientation would have greater compatibility with Sydney (Kingsford-Smith) Airport.
Source: WorleyParsons/AMPC.

Economic assessment of suitable sites

Drawing on the information collected on each site as described above, an economic appraisal was undertaken in a rapid (or high-level) CBA framework. Reflecting the challenges monetising some of the key aspects of an airport operation at the sites an analysis, featuring both quantitative and qualitative assessment, was undertaken.

As with the rapid CBA undertaken in Phase 3, the purpose of the appraisal undertaken of suitable sites was to provide a relative comparison between localities. Given the rapid nature of the economic appraisal, a RBCR of less than 1.0 is not considered to definitively suggest a site would be unviable; likewise a high RBCR was not considered to definitively suggest economic viability.

The methodology for the monetised analysis took account of the following costs and benefits.

Costs

- Capital cost of constructing a generic airport.
- Ongoing operation and maintenance of a generic airport.
- Renewal cost of generic airport.
- Land acquisition.
- Earthworks costs to develop a platform.
- Supporting infrastructure capital cost.
- Supporting infrastructure operation and maintenance.
- Supporting infrastructure renewal.

Benefits

- Value of aviation movements, including:
  - consumer surplus realised by Australian residents who will be able to fly if new capacity is added, but whose demand will be suppressed in the base case;
  - tourism spend of non-Australian residents who will otherwise not visit Australia; and
  - value of freight that is able to be transported to and from Sydney which will have otherwise not been transported.
- Reduction in aviation movement costs:
  - reduction in delay of passengers that would have flown in the base case;
  - reduction in delays to aircraft operators; and
  - reduction in the percentage of passengers that have to alter their preferred flight times due to supply constraints.
- Increased externality costs on the wider community and society:
  - additional landside transport costs (including congestion or delays on the land transport network, realised by additional passenger vehicle movements and additional freight vehicle movements that can now be accommodated);
  - environmental impact of additional flights; and
  - cost to mitigate noise impacts on local areas.

While generally the methodology and inputs applied in the economic appraisal were in line with those incorporated in the Phase 2 rapid CBA of localities, a greater level of detail was incorporated into some elements in order to assess the suitable sites. This included the application of specific land footprint sizes identified by WorleyParsons/AMPC for each suitable site in order to develop costs. In addition, some costs were developed specifically for the suitable sites; in particular, road and rail connecting infrastructure and earthworks. The benefit methodology applied was the same as that applied in Phase 2, though greater detail was incorporated on the inputs and assumptions used to estimate noise mitigation and land transport impacts.

The methodology for the qualitative assessment was the same as that used for the rapid CBA of localities, with a focus to enable comparison of the sites. The criteria used are listed below.

- **Strategic growth alignment:** considering site proximity to aviation capacity to NSW commercial growth centres.
- **Social and cultural:** assessing the potential impact on existing residents and other land users as a result of land acquisition.
- **Noise:** noise impacts on residents or sensitive uses.

Interpreting rapid appraisal results

Full service international airport (maximum Type 1 airport) sites

The rapid CBA assessed suitable sites identified as possible locations for maximum Type 1 airports. These are located within the five previously identified priority localities (Cordeaux-Cataract, Burragorang, Nepean, Hawkesbury and Central Coast). Table 57 summarises the RBCR and the Net Present Values (NPVs) derived from assessment of each of the suitable Type 1 airport sites (capable of accommodating parallel runways).

Table 57 Summary outcomes of quantitative analysis (Type 1)

Locality	Site	RBCR	NPV ($ billions)
Nepean	Luddenham	2.7	4.9
Nepean	Badgerys Creek	2.7	4.8
Nepean	Bringelly	2.6	4.9
Hawkesbury	Wilberforce	2.6	4.7
Nepean	Greendale	2.4	4.3
Central Coast	Somersby	2.0	3.3
Cordeaux-Cataract	Wilton	2.0	3.0
Burragorang	Mowbray Park	1.9	2.7
Cordeaux-Cataract	Wallandoola	1.9	2.8
Central Coast	Wallarah	1.6	1.5

Note: Based on unconstrained analysis, which assumed all sites can provide the same passenger access and capacity with no operating, planning or engineering restrictions. Results presented are discounted costs and benefits (seven per cent discount rate). To allow for comparison across sites on a like basis, land acquisition costs were included in the appraisal of Badgerys Creek so these results do not reflect that acquisition has already occurred. Results are in order of the RBCRs. In some instances NPV results do not result in the same ranking of sites.

Source: Ernst & Young.

This quantitative economic assessment shows that three of the four suitable sites in the Nepean locality have the highest RBCRs as well as the highest NPVs. These sites are Luddenham, Badgerys Creek and Bringelly.

The next best ranking site in the quantitative CBA was in the Hawkesbury locality, where the Wilberforce site had a higher RBCR and NPV than Greendale in the Nepean and sites in the other localities.

While Wilberforce performed well relative to other sites in terms of the strategic growth alignment criteria (which considers factors such as proximity to NSW commercial growth and commercial opportunities nearby), it was the lowest-ranking site against both the qualitative criteria considering noise impacts on residents and sensitive uses, as well as the social and cultural criteria considering potential impacts due to land acquisition.

The four Nepean sites, along with Wilberforce in the Hawkesbury, ranked higher than the other sites in terms of proximity of potential aviation capacity to NSW growth centres, one element of the qualitative assessment. However, these sites generally rated mid-range against the other qualitative criteria. It should be noted that no adjustment in the quantitative assessment was made for the fact that the land required at the Badgerys Creek site has already been acquired. Any such adjustment would increase the relative suitability of this site, compared to others assessed.

Following the four Nepean sites and Wilberforce, the next best ranking sites in the quantitative CBA were Somersby in the Central Coast locality, and Wilton in the Cordeaux-Cataract locality. While Wallarah and Wallandoola are in the same respective localities, both of these sites have lower RBCRs and NPVs. Somersby had a relatively mid-range ranking against the qualitative criteria, performing lower than Wilton in terms of the social and cultural and noise criteria. Wilton was the highest-ranking site for the qualitative CBA criteria related to noise impacts on residents, had a relatively mid-range ranking for the social and cultural criteria, but was the lowest-ranking site against the strategic growth alignment criteria.

Mowbray Park, as the only suitable site in the Burragorang locality, along with Wallandoola and Wallarah, were the lowest-ranked sites in terms of both RBCR and NPV. In terms of the qualitative criteria, Mowbray Park had a relatively mid-range ranking for the strategic growth alignment criteria but quite high ranking against the noise and social and cultural criteria. Wallandoola had similar qualitative rankings as Wilton but resulted in lower quantitative results due to the higher costs to connect supporting rail infrastructure and reduced benefits for potential airport users. Like Somersby, Wallarah had a relatively mid-range ranking against the qualitative criteria, though was highest ranking in terms of the social and cultural criteria. However, relative to Somersby it resulted in lower quantitative CBA results due to its more distant location.

Limited service RPT airport (Type 3) sites

The smaller land area required for a Type 3 airport relative to a Type 1 full service, parallel runway airport means there are more opportunities to locate such airports in the Sydney region. Table 58 summarises the RBCR and NPV for each of the suitable Type 3 airport sites resulting from the unconstrained quantitative assessment.

Table 58 **Summary outcomes of quantitative analysis (Type 3)**

Locality	Site	RBCR	NPV ($ billions)
Nepean	Kemps Creek	1.4	0.7
Nepean	Badgerys Creek	1.2	0.3
Hawkesbury	Wilberforce	1.2	0.3
Nepean	Luddenham	1.2	0.3
Nepean	Bringelly	1.1	0.2
Hawkesbury	Castlereagh	1.1	0.2
Cordeaux-Cataract	Southend	1.0	-0.1
Nepean	Greendale	1.0	-0.1
Central Coast	Somersby	0.9	-0.1
Burragorang	Silverdale	0.8	-0.4
Burragorang	The Oaks	0.7	-0.6
Cordeaux-Cataract	Wilton	0.7	-0.6
Cordeaux-Cataract	Wallandoola	0.7	-0.6
Cordeaux-Cataract	Dendrobium	0.7	-0.6
Central Coast	Peats Ridge	0.7	-0.7
Burragorang	Mowbray Park	0.6	-0.7
Central Coast	Wallarah	0.5	-0.8

Note: Based on unconstrained analysis, which assumed all sites can provide the same passenger access and capacity with no operating, planning or engineering restrictions. Results presented are discounted costs and benefits (seven per cent discount rate). To allow for comparison across sites on a like basis, land acquisition costs were included in the appraisal of Badgerys Creek so these results do not reflect that acquisition has already occurred. Results are in order of the RBCRs. In some instances NPV results do not result in the same ranking of sites.

Source: Ernst & Young.

As with the maximum Type 1 airport sites, the Type 3 sites in the Nepean locality were generally the highest ranking in terms of RBCR. However, the highest-ranking site of Kemps Creek does not have the potential for expansion beyond a Type 3 airport.

Sites in the Hawkesbury locality were the next highest rating in terms of the quantitative CBA results. Unlike Castlereagh, Wilberforce is the only site in this locality capable of further expansion.

In the Cordeaux-Cataract locality, Southend ranked much higher than Wilton, Wallandoola and Dendrobium. However, unlike the Wilton site, it is not capable of further expansion beyond a Type 3 airport.

In the Central Coast locality, the best site was Somersby.

The Silverdale and The Oaks sites in the Burragorang locality were better-ranked sites compared to Mowbray Park, though Mowbray Park is the only site capable of expansion to a maximum Type 1 airport.

8.8 The role and size of a new airport

CAPA Consulting analysis suggests that it is less likely a secondary facility would quickly become either a dedicated international gateway or a mixed long-haul-international/domestic airport because of the relatively high establishment costs for infrastructure (such as longer runways, more taxiways and complex terminals as well as Customs, Immigration and Quarantine, and security).

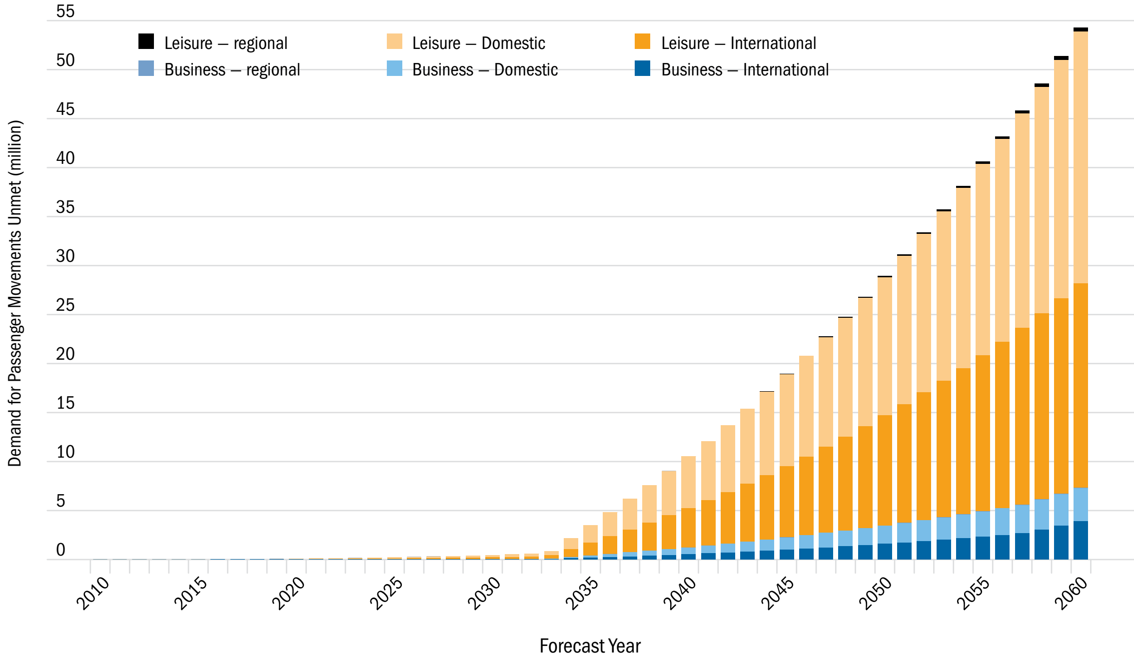
Initially, there may be potential for a relocation of some regional services to a secondary facility, assuming it is located within a reasonable distance of the Sydney CBD. However, the capping of charges imposed on regional operators at Sydney (Kingsford-Smith) Airport makes them relatively low (representing an estimated one per cent of a typical regional fare) and access to the primary gateway is assured with its advantages of convenience and a wide spread of onward linkages. It is not clear whether regional services would remain viable if relocated to a second airport with less efficient interlining, and lower access to the CBD. Importantly, regional airlines need to be able to offer interline services and network connections to meet regional market demand for on-carriage connections. Accordingly, they are unlikely to relocate to a secondary airport with limited connection options as this would mean a smaller number of connecting services compared with Sydney (Kingsford-Smith) Airport.

While freight is an intrinsic part of the demand served at Sydney (Kingsford-Smith) Airport, the airport's curfew creates impediments for night-time movements of freight due to restrictions on the size of aircraft operating during the curfew. Depending on the location, this suggests an opportunity exists for a 24-hour freight facility to be established at a secondary airport in the Sydney region. The development of warehousing districts and distribution bases for major companies in Western Sydney may provide support for such a facility, with potential to efficiently process and transfer goods from air to road transport. Curfew-free status will be critical to creating a freight airport. The issue of whether or not a curfew would be required at any new airport is a matter that would need to be explored at the stage of detailed environmental assessment.

In an Australian context, it may be more difficult to establish a freight-only airport (compared to what has occurred in the United States and Europe) due to the difference in overall freight volumes. As described in Part Three, approximately 70 to 80 per cent of freight is currently carried in the cargo hold of passenger RPT aircraft; the accessibility to a variety of connecting services options is key to this utilisation level.

Figure 140 presents a profile of unmet passenger demand, by purpose of travel. Leisure demand for both international and domestic travellers is estimated to comprise the most significant portion of unmet demand. Booz & Company suggests that as Sydney (Kingsford-Smith) Airport becomes increasingly constrained, it is likely to continue to service predominantly full service airlines and favour higher yielding passengers, resulting in the share of business traffic at the airport increasing relative to leisure.

Figure 140 **Sydney (Kingsford-Smith) Airport expected demand for passenger movements unmet by type and purpose of travel, 2010 to 2060**

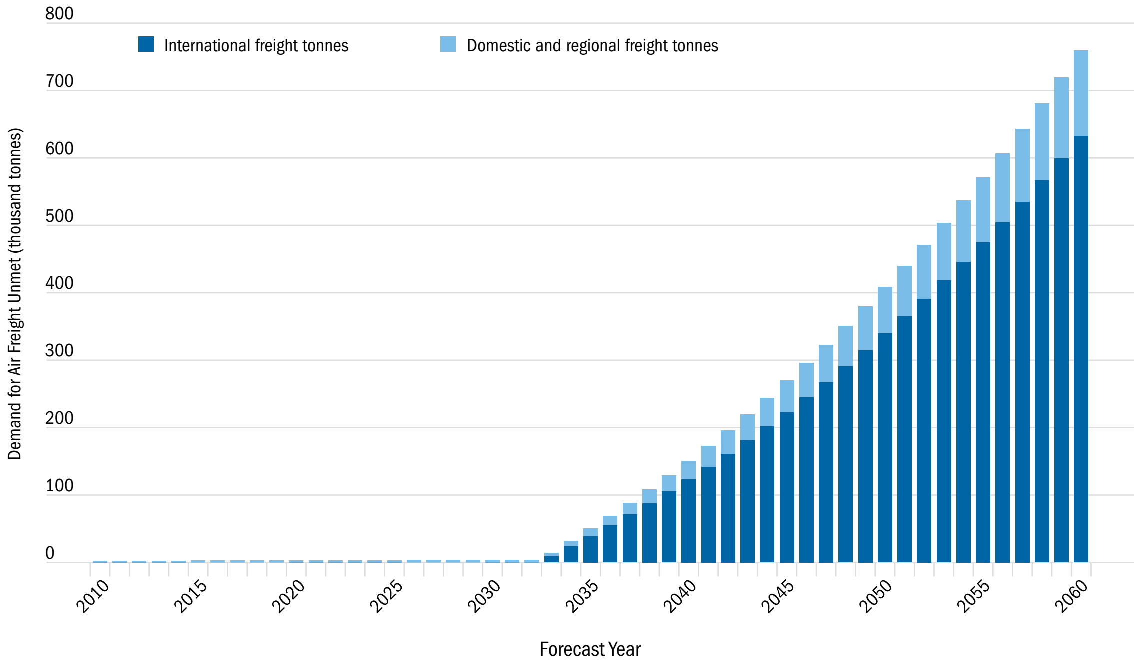


Note: Unmet demand was derived from analysis of the unconstrained demand discussed in Part Three, and assumptions about factors including aircraft upgauging, peak spreading, load factors and traveller share under a constrained scenario, as discussed in Part Four. Further detail is in Technical PaperA3.

Source: Booz & Company analysis.

Figure 141 presents estimates of the volume of air freight that may be unmet in the region over the period to 2060.

Figure 141 **Sydney (Kingsford-Smith) Airport expected demand for air freight unmet, 2010 to 2060**



Note: Unmet demand was derived from analysis of the unconstrained demand discussed in Part Three, and assumptions about factors including aircraft upgauging, peak spreading, load factors and traveller share under a constrained scenario, as discussed in Part Four. Further detail is in Technical Paper A3.

Source: Booz & Company analysis.

The unmet demand presented above (54 million passengers and around 760,000 tonnes of air freight) presents the potential demand a greenfield – in particular, a Type 1 airport – may service in the Sydney region.

Airservices Australia has suggested nominal runway capacity for various runway configurations, as presented in Table 59. This represents an estimated operational nominal capacity in good weather conditions in a mixed traffic environment. The figures will vary subject to local conditions; such variance would not be expected to exceed (+/-) 5 movements per hour. Further information on the nominal capacities is contained in Technical Paper B2.

Table 59 Nominal runway capacity

Nominal capacity	Single runway	Cross-runways	Parallel runways (VMC)
Arrivals	25	30	42
Departures	25	25	42
Total	50	55	84

Source: Airservices Australia.

WorleyParsons/AMPC have developed high level estimates of the number of aircraft movements and passengers per year by airport type. As it is considered that each of the shortlisted Type 3 limited service RPT airport sites could accommodate a single runway with 2,600-metre length and 45-metre width, WorleyParsons/AMPC estimated that each of them has the unconstrained, theoretical capacity to accommodate between 20 million and 35 million passengers, or around 240,000 aircraft movements, per year. For the sites considered suitable to locate a Type 1 airport, WorleyParsons/AMPC estimated potential unconstrained capacity of around 370,000 aircraft movements and between 40 and 70 million passengers per year, depending on runway length and layout.

As runway capacity will vary depending on factors, such as the runway layout and supporting taxiways, aircraft fleet mix, weather and airspace and air traffic control procedures, these are indicative runway capacities for planning purposes used in this Study.

Implications for capacity in the region

Development of a greenfield airport site could provide theoretical, unconstrained capacity for up to 70 million passengers and around 370,000 aircraft movements per year in the Sydney region, assisting with aviation capacity issues in the region.

However, the effectiveness of a greenfield airport to provide aviation capacity for the Sydney region will be driven by the level of demand that will take up the new capacity. Should the airline service offering and level of demand attracted to a Type 3 greenfield site reach, for example, 25 million passengers per year (similar to the level estimated by Booz & Company to be attracted to a single north-south runway developed at RAAF Base Richmond, as described in Part Six), it could delay capacity constraints in the region for up to 20 years. The capacity of a Type 1 greenfield site has the potential to accommodate a service offering of more significant passenger levels, and if airlines and passengers demand these services then constraints could be delayed for between 20 and 30 years. If induced demand in the area surrounding a greenfield site takes up some of the capacity, the timing of this impact could be reduced.

The sites enabling initial development as a limited service RPT airport, followed by expansion to a full service international airport (such as for all of the Type 1 sites), would allow for greatest flexibility to meet unmet demand. Booz & Company suggests that international passenger demand could comprise 20 to 30 per cent of total unmet demand at Sydney (Kingsford-Smith) Airport over the period to 2060, and this could not be accommodated at a Type 3 limited service RPT airport.

Provided the physical and airspace capacity of a greenfield airport site can cater for the level of associated aircraft movements, the level of unmet passenger movement demand at Sydney (Kingsford-Smith) Airport could support a progressive increase in the airline service offering to an airport for domestic, short-haul and long-haul international passengers and air freight.

This means that for better long-term flexibility, there is merit to preference Type 3 RPT sites that have scope to be later expanded, subject to airline demand, to a maximum Type 1 full service airport serving all RPT segments. In analysis, quantitative CBA results for the Type 3 airports were generally weaker, as patronage was assumed to be at a far smaller level than for the maximum Type 1 airport sites. However, a Type 3 airport is expected to have lower capital and other operating costs compared to a full service RPT airport, with a Type 3 airport generally costing 60 per cent to 70 per cent of a maximum Type 1 airport.

As identifying maximum Type 1 full service RPT airport capacity has more complexity and has larger economic importance, there appears merit in focusing on resolving the full implications of locating this airport type first. Following this outcome, there may be a need to examine future sites for capacity requiring a limited service Type 3 RPT airport or minimum service Type 4 GA and limited RPT aerodrome. It will be important to locate these facilities in areas that do not create airspace management issues with the aviation network at that time.

8.9 Timing for a greenfield airport

There are already capacity issues for RPT demand to access Sydney (Kingsford-Smith) Airport in peak periods. By around 2027, it is estimated that slot allocation will have reached capacity, and by 2033 growth in movements is expected to cease under current policy settings. However, a second airport will require many years of development and construction and, in order to relieve capacity issues in the Sydney region, may require early commencement of the development phase.

Development timing

The development stage for an airport is considered to be from the initial announcement to the start of construction. During this period all environmental investigations, consultation, planning approvals and preliminary design is assumed to be undertaken. The duration of this period would be dependent on a number of variables, including the airport type and size, location of the site and proximity to exiting communities, and the existing use of the site.

Reflecting the potential variability, Table 60 presents a range of possible durations. These durations are considered to be consistent regardless of whether the airport type is a Type 1 full service airport serving all RPT segments or a Type 3 limited service RPT airport.

Table 60 Indicative airport development timing

Stage	Example timeline (15th percentile)	Example timeline (85th percentile)
Site location study and confirmation	2 years	2 years
Draft environmental impact statement	2 years	3 years
Public consultation	Included in environmental impact statement	2 years
Final environmental impact statement	1 year	1 year
Planning application and rezoning	1 year	2 years
Preliminary design	Included in environmental impact statement/planning	2 years
Total duration	6 years	12 years

Source: Ernst & Young analysis

Construction timing

Considering construction cost estimates to develop a generic full service international airport and a generic limited service RPT airport, Airbiz suggests the following construction periods:

- **Type 1:** assuming all site acquisition, clearing and levelling, and project definition and all pre-approval processes have been completed, an indicative time frame for detailed design, construction and commissioning is a minimum of five years.
- **Type 3:** assuming all site acquisition, clearing and levelling, and project definition and all pre-approval processes have been completed, an indicative time frame for detailed design, construction and commissioning is a minimum of three years. The reduced time frame compared to the full service international airport is based on a smaller scale scope, hence reduced complexity in design, construction and commissioning.

The time it takes to undertake earthworks depends on the area and topography of the land. However, broadly, a full service international airport may require four years of site preparation and levelling, and the limited service RPT may require two years.

Development and construction of supporting infrastructure such as road and rail connections would also involve time prior to operation of the airport, which would likely need to be undertaken concurrently with airport development and construction. Ernst & Young estimated up to four years may be required to undertake supporting infrastructure developments.

Implication on timing of need for a greenfield airport

A new airport facility will need to be opened some time before capacity is reached at Sydney (Kingsford-Smith) Airport, to enable a ramp-up in the airline service offering and attraction of demand in order to ensure the second airport's contribution is noticeable in the region. There are already capacity issues being experienced in peak periods at Sydney (Kingsford Smith) Airport. Around 2027, the airport will reach capacity in terms of the number of additional slots that can be allocated, and around 2033 it will reach capacity in terms of the growth of additional aircraft movements.

However, as described above, development and construction of a second airport could require:

- Type 1: development period of six to 12 years, around four years to undertake site preparation and levelling, and a construction period of around five years (a total of 15 to 21 years); and
- Type 3: development period of six to 12 years, around two years to undertaken site preparation and levelling, and a construction period of around three years (a total of 11 to 17 years).

There will be a need to commence the development phase for a greenfield site almost immediately.

8.10 Indicative costs to develop a greenfield site

The development of an airport in a greenfield location requires the:

- construction of the airport infrastructure itself;
- purchase of land;
- excavation and remediation of the land so that it is able to accommodate an airport; and
- construction of supporting infrastructure such as surface transport and water/wastewater connections.

To efficiently run and operate an airport, the site would need to be connected to a range of infrastructure networks and services (such as transport, water and power). Furthermore, the existing infrastructure networks and services may need to be upgraded if the additional demand from airport users and employees requires additional network capability/capacity (for example, the power network needs upgrading to accommodate the increased demand from the airport).

Some capital expenditure will be relatively similar for a generic type of airport, and some will be site specific. In the Ernst & Young report which is Technical Paper C14, it has estimated indicative capital cost estimates required to develop generic airport types in Australia. These have been supplemented by high-level, desktop-based estimates of the scale and nature of the generic airport types and some site-specific elements, developed by WorleyParsons/AMPC.

The cost estimates are of a high-level, strategic nature, based on a benchmarking process using relevant airports for defined airport types, and they are not based on detailed design. As the costs relate to indicative developments and site locations likely to be refined in an Environmental Impact Statement process, they are by nature more preliminary than costs developed for this Study relating to existing aerodromes.

Generic airport construction costs

Estimates of costs to construct a generic greenfield airport, regardless of location, are presented in Table 61.

Table 61 Indicative generic airport capital costs ($ millions)

Cost category	Type 1 airport	Type 3 airport
Runways/taxiways	551.0	84.0
Apron surfaces	274.1	130.6
Car parking	201.6	48.0
Landing aids/lighting	84.1	21.1
Terminal international	1,811.6	0.0
Terminal domestic	583.2	852.2
Other capital costs	27.5	13.2
Contingency	1,059.9	344.7
Project management and design	706.6	229.8
Total	5,299.7	1,723.6

Note: Risk and contingency costs have been estimated at 50 per cent of total development costs.

Source: Ernst & Young, based on Airbiz and Arup analysis.

Site-specific construction costs

Site-specific costs include:

- land acquisition;
- land remediation/excavation; and
- construction of associated infrastructure necessary to support the operations of an airport.

Land acquisition

One of the first costs of developing an airport is the costs associated with the acquisition of land. WorleyParsons/AMPC analysis of suitable sites indicates that a full service Type 1 international airport at the sites identified may require between 1,300 and 2,200 hectares of land depending on an individual site characteristics such as topography, and also the number of runways. A limited service Type 3 RPT airport at the suitable sites identified and assessed could require between 680 and 1,150 hectares.

For the five shortlisted localities in which suitable sites have been identified, historical sales data suggests there are a range of land values, with Ernst & Young analysis suggesting it could range from between $40,000 to $70,000 per hectare in the Central Coast, Nepean and Cordeaux-Cataract localities, to between $140,000 to $215,000 per hectare in the Hawkesbury and Burragorang localities identified.

With the addition of a 25 per cent factor to take into account risk and contingency, indicative land acquisition costs for a representative full service international airport site could range from $70 million to $600 million, and for a limited service RPT airport site could range from $30 million to $350 million.

Earthworks for site preparation

Any greenfield airport site will require cut and fill earthworks to suitably level or grade the land for use as an airport. The cost and hence volume of earthworks provides a threshold for comparison. This is a cost that can vary significantly by site dependent on topography.

WorleyParsons/AMPC indicative estimates of the amount of earthworks needed to create a platform, or area of land, to configure airport infrastructure at the suitable sites in the Sydney region suggests:

- indicative earthworks costs for a full service (Type 1) international airport that can accommodate parallel runways and potentially also a cross-runway at one of the suitable sites are estimated to range from $280 million to $810 million;
- indicative earthworks costs for a limited service (Type 3) RPT airport site could range from $100 million to $510 million.

Earthworks costs to prepare sites for airport infrastructure will vary significantly by site, owing to the unlevel nature of the land. For example, land preparation costs for the development at a location such as Wilton could range from $350 million for Type 3 development to $810 million for the Type 1 site preparation. In contrast, earthworks costs at a site such as Wallarah could range from $180 million for a Type 3 airport to $280 million for Type 1 earthworks.

With the addition of a 50 per cent allowance of total costs to consider risk, contingency and management costs, the indicative earthworks cost estimates total $420 million to $1,210 million for a Type 1 airport, and $140 million to $760 million for a Type 3 airport.

Construction of associated infrastructure necessary to support the operations of an airport

A range of other infrastructure will have to be constructed and connected to the existing infrastructure networks to support an operational airport.

Road and rail

WorleyParsons/AMPC prepared indicative estimates of the level of investment in road and rail infrastructure to connect the more suitable sites to existing rail links and existing state roads/highways. These are preliminary estimates based on a consideration of the number of kilometres between the site and existing surface transport. The estimates assume that a rail service to support an airport will only be developed in the case of a full service international airport.

This cost analysis suggests:

- indicative road infrastructure costs to connect a full service (Type 1) international airport at one of the suitable sites to existing state roads/highways are estimated to range from $80 million to $455 million;
- indicative rail infrastructure costs for a Type 1 airport are estimated to range from $440 million to $1,290 million; and
- indicative road infrastructure costs for a limited service (Type 3) RPT airport site could range from $80 million to $460 million.

Given the distances to existing infrastructure, the surface transport connection costs were estimated to be highest for sites located in Cordeaux-Cataract, such as Wilton and Wallandoola, and lowest for sites located in the Central Coast, such as Wallarah and Somersby.

With the inclusion of a 50 per cent allowance of total costs to consider risk, contingency and management costs, the indicative road and rail connection cost estimates are $770 million to $2.6 billion for a Type 1 airport. For a Type 3 airport, the indicative road connection costs with this level of risk allowance incorporated are $110 million to $680 million.

Other supporting infrastructure costs

Arup developed indicative costs for other supporting infrastructure required to develop a Type 1 or Type 3 airport in each shortlisted locality, which included estimates for the following:

- water;
- wastewater;
- power;
- communications;
- gas; and
- fuel (bulk supply and storage of aviation fuel to the airport).

These estimates for the five shortlisted localities suggest:

- indicative utilities and fuel infrastructure costs for a full service (Type 1) international airport at one of the suitable sites are estimated to range from $560 million to $660 million; and
- indicative utilities and fuel infrastructure costs for a limited service (Type 3) RPT airport site could range from $140 million to $180 million.

With the addition of a 50 per cent allowance of total costs to consider risk, contingency and management costs, these supporting infrastructure cost estimates total $840 million to $980 million for a Type 1 airport and $220 million to $270 million for a Type 3 airport.

Greenfield airport construction cost elements

Considering the cost elements above, the development of an airport in a greenfield location could require the following levels of upfront investment.

Construction of the airport infrastructure itself could require investment of around $5.3 billion for a full service international airport and $1.7 billion for a limited service RPT airport.

Indicative land acquisition costs for a representative full service international airport site could range from $70 million to $600 million, and for a limited service RPT airport site could range from $30 million to $350 million.

Earthworks costs to prepare land to accommodate an airport could require costs of $420 million to $1.2 billion for a representative full service international airport, and $140 million to $760 million for a limited service RPT airport.

Construction of surface transport infrastructure to connect sites to the existing road and rail network could require investment of $770 million to $2.6 billion for development of both road and rail connections for a Type 1 airport, and $110 million to $680 million for road connections for a Type 3 airport site.

Investment in other supporting infrastructure, including bulk supply and storage of aviation fuel to the airport, and utilities such as water, wastewater, power, communications and gas, could involve investment of $840 million to $980 million for a full service international airport and $220 million to $270 million for a limited service RPT airport.

This suggests investment ranging from $7 billion to $11 billion for a Type 1 full service international airport and $2 billion to $4 billion for a Type 3 limited service RPT airport. These are high-level, indicative costs not based on detailed design. Excluding allowances for project management, design, contingencies and risks, the development cost estimates range from $5 billion to $7 billion for a Type 1 airport and $1 billion to $3 billion for a Type 3 airport.

PART NINE

FUTURE USE OF THE COMMONWEALTH-OWNED BADGERYS CREEK SITE

P9

Key points

- The Steering Committee's assessment is that the Badgerys Creek site, acquired by the Commonwealth for an airport, remains the best site for the development of a supplementary airport within the Sydney basin.
  - There is a strong ratio of benefits to costs, and land acquisition and planning controls have already occurred.
  - The site's location adjacent to the residential growth areas of South West Sydney, and to the key transport corridors of the M7 motorway and the future Outer Sydney Orbital corridor, as well as its proximity to the Western Sydney Employment Area (WSEA), means it remains the location best placed to meet Sydney's spatial demand growth for aviation services at a relatively unconstrained site.
  - The Committee notes the site will be some 10 kilometres from the Leppington terminus for the South West Rail Link now being constructed. The site would provide the economic development node and accelerated employment attraction which South West Sydney requires and which, on current planning, will not be provided in the region.
- The site is not currently zoned for urban development and not part of any planned land release strategy of the NSW Government and is not considered by NSW agencies as being required to meet current planned land supply requirements for residential and employment lands for the next 25 years.
- The Steering Committee notes the views expressed by governments that the site is no longer viable for an airport development. Should governments re-affirm that policy position, then the Committee finds the Australian and NSW governments should now settle an agreement for the land to be part of an orderly land release in the medium term as part of the South West Growth Centre development.
- The single ownership and title to the site means it has significant potential for future development as an economic employment zone. The site has the potential to be brought to the market and significantly increase the supply of employment lands, affordable housing and community amenity facilities in the locality. The strategic planning of the site for future land release will provide an important capacity to control the release of future residential land and employment land into the Sydney market to meet employment and residential growth requirements.

  The release of the total available Commonwealth-owned Badgerys Creek site into the market in the short term, such as within the next 10 years, would be expected to have an adverse impact on the current NSW Government land supply and infrastructure investment strategy.
- The urban development of the site will require considerable investment in transport access, both road and public transport, and investment in utilities, including significant extensions for services such as water and sewerage. Timing and cost of the provision of this infrastructure will determine the ability to bring the site into the market within the short to medium term.
- The site could be retained and 'land banked' by the Australian Government to optimise its potential and impact on meeting Sydney's land release needs in the future.

- The Steering Committee considers the best primary use of the site, based on current NSW planning for the South West Growth Centre, would be for economic employment activities, with a majority (for example at least 60 per cent) of the available site being planned for manufacturing and distribution/logistics-based employment uses and non-residential land use (including town centre/retail).
- If the site is not to be used for an airport, planning controls which were implemented on surrounding lands to address the potential impact of aircraft noise could be removed.

In 1986, following an extensive site selection process, the Australian Government announced that a location at Badgerys Creek, west of Sydney's CBD, had been chosen as the site for a second major airport for Sydney. A site of approximately 1,700 hectares was subsequently acquired between 1986 and 1991. Since that time urban growth has continued in the areas surrounding the site. However, analysis conducted as part of this Joint Study indicates that the Badgerys Creek location remains the best greenfield site for the development of an airport within the Sydney basin.

Key reasons for this result include:

- strong transport links following the development of the M7, planning for the future Outer Sydney Orbital Road and the extension of the South West Rail Link to Leppington;
- land acquisition has already occurred, with accompanying costs and social impacts addressed;
- planning restrictions on properties around the site have limited, to some extent, the effects of urban growth;
- the site is well located to serve the aviation needs of the growing population of Western Sydney; and
- the establishment of an airport at the site would provide employment, directly and through flow-on impacts, which will be required in the west, and particularly the south west, of Sydney.

The Steering Committee recognises, however, the development which has occurred in the locality since the acquisition of the site and the community concerns regarding adverse effects of aircraft operations. The Committee also recognises that in the *National Aviation Policy White Paper – Flight to Path to the Future* released in December 2009, the Australian Government set out the position that urban growth in the area had made use of the site for an airport no longer an option.

Should governments re-affirm that policy position, alternative development of the site still presents major opportunities for the economic development of Western Sydney, particularly in providing employment nodes.

On current policy settings, adequate residential and employment land has already been identified in NSW planning documents to accommodate demand to at least 2036 without access to the Commonwealth-owned Badgerys Creek site. In that context, the planning for the site needs to be viewed from the perspective of its long-term potential, with additional consideration of possible interim uses.[195]

195 Further information can be found in Technical Paper D1.

9.1 Background

The site at Badgerys Creek is located approximately 50 kilometres west of the Sydney CBD in the Liverpool Local Government Area (LGA). The site covers an area of approximately 1,700 hectares.

The land was originally acquired by the Commonwealth as the site for a major airport. This involved the acquisition of properties at the site under the Commonwealth *Lands Acquisition Act 1989*. Many of these were acquired as voluntary purchases at fair value.

The site has now been consolidated into a single title. In August 2008, the total consolidated single title site was gazetted Zone SP1 Special Activities (Commonwealth Activities) under the Liverpool Local Environment Plan 2008, and that zoning remains in place.

Since the acquisition of the site, the Commonwealth has negotiated approximately 250 short term commercial (including grazing, horse agistment, a winery, shop, piggery, duck farm and market gardens) and residential rural leases over the site. The bulk of the properties on the site are rural residential, on lots of around two hectares or greater. The duration of the leases was originally between one and three years to provide flexibility for decisions to proceed with development on the site. Since June 2007, some commercial leases with slightly longer terms have been entered into (five years with options of five year extensions).

Built structures on the leases are generally houses and other outbuildings, many constructed in the 1950–1980 period in keeping with the building regulations of that time. A number are in relatively poor condition, while those that have been let have been kept to minimum lettable standard, in keeping with the general requirements of the *NSW Residential Tenancies Act 2010*.

From a surface transport corridor perspective, the site is located 10 kilometres west of the M7, 10 kilometres south of the M4 motorways and adjacent to the proposed future Outer Sydney Orbital road/rail corridor. The site is also located 10 kilometres north-west of the to-be-developed Leppington Station on the future South West Rail Link.[196]

While any road and rail network requirements for Badgerys Creek will depend upon the land uses proposed for this site, the site is essentially a greenfield site with current access and utilities consistent with its current rural land use. For example, existing water and sewerage infrastructure is located a significant distance from the site, so any development of the site for residential purposes would require a considerable investment in additional infrastructure.

The current roads and public transport linkages are also unsuitable for high-volume traffic, and substantial upgrading would be required to provide ready access to all areas of the site.

Approximately 20 per cent of the site (some 354 hectares) is now considered environmentally sensitive because of ecologically endangered communities, sites of Aboriginal significance and a riparian corridor running along Badgerys Creek. Taking away these sensitive areas leaves approximately 1,400 hectares of land capable of supporting urban development of some form, if it were not to be used as an airport.

Recent valuation of the site suggests its potential value, if it were to be sold immediately and under its current zoning, would be in the order of $50 million to $180 million. A lack of infrastructure devalues the site and is an impediment to its development. Any development of the site would require extensive planning, rezoning and the provision of utilities and access services infrastructure.

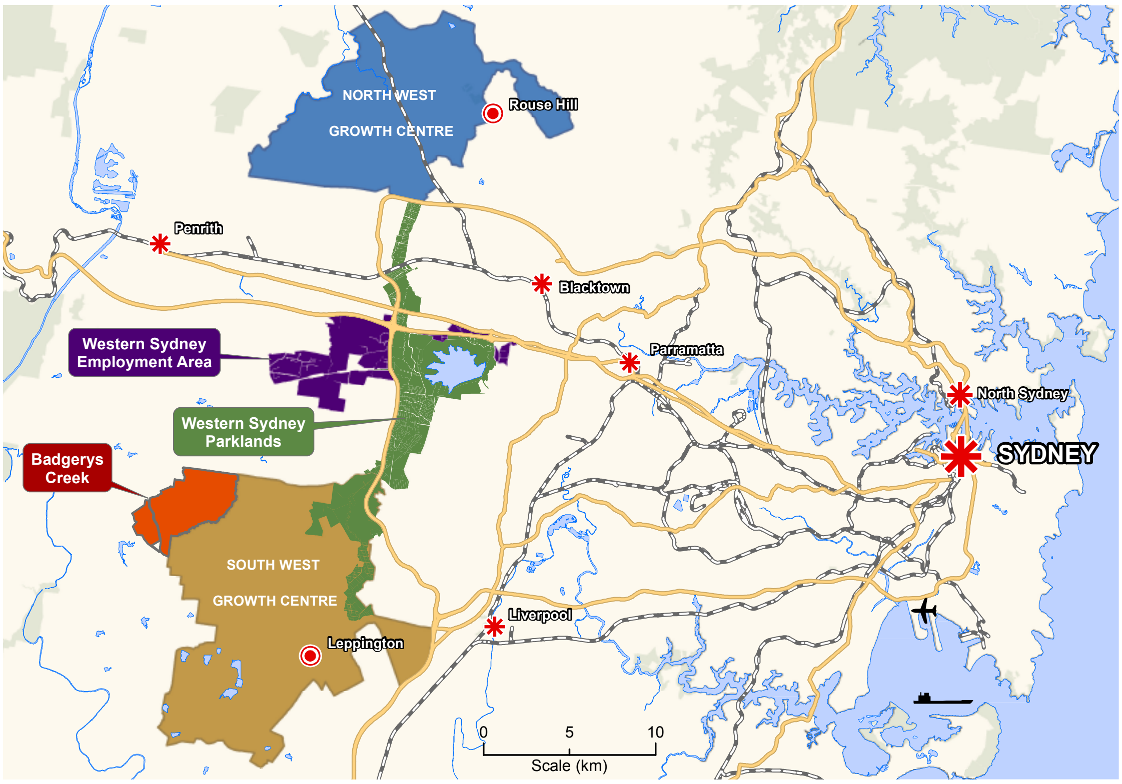
The site sits adjacent to the north-western boundary of the South West Growth Centre and at the far western edge of the WSEA.

196 The South West Rail Link is currently under construction and is due for completion in 2016.

As outlined in Part Two of this Report, the South West Growth Centre covers approximately 17,000 hectares and is expected to provide up to 110,000 new dwellings, a new major centre providing up to 13,000 jobs, seven town centres in addition to a number of neighbourhood centres and other employment land. Land to accommodate almost 20,000 new dwellings and 9,000 jobs has already been rezoned. Planning is well advanced to provide a further 20,000 dwellings and construct the proposed major centre in Leppington. The WSEA, including potential expansion areas, covers 110 square kilometres, an area equivalent to the entire east subregion of Sydney running from Sydney Harbour to Botany Bay.

The location of the site within metropolitan Sydney is highlighted in Figure 142.

Figure 142 Commonwealth-owned site at Badgerys Creek



Source: Australian Department of Infrastructure and Transport.

9.2 Potential uses of the Commonwealth-owned Badgerys Creek site

Housing options

Expected demand for housing land

Current forecasts indicate the population of the Sydney metropolitan area is expected to grow by approximately two million people by 2036. This is projected to require 770,000 additional dwellings and 760,000 more jobs.

Greenfield development will continue to play a significant role in meeting Sydney's needs for additional dwellings, as will infill or brownfield development. The settings adopted in the current NSW Metropolitan Plan are that at least 70 per cent of the 770,000 dwellings required over the period to 2036 should be located in established areas. These settings are now under review.

The greenfield housing targets for metropolitan Sydney equate to 175,000 dwellings (excluding housing releases on the Central Coast). More than adequate capacity has already been identified and committed in metropolitan Sydney to meet those targets, with 230,000 potential dwellings already provided. They consist of:

- 125,000 dwellings in existing release areas (those listed on the NSW Metropolitan Development Program, including 69,000 in the precincts of the growth centres that have already been released); and
- 105,000 dwellings in precincts in the growth centres that have been identified but are yet to be released.

Existing release areas outside the growth centres have been released, rezoned and under development for significantly longer than the growth centre precincts. It is, therefore, expected those areas will be built out before the full potential of the growth centres is utilised.

Of the 105,000 as yet unreleased lots in the identified growth centres, it is estimated only another 50,000 dwellings will be required by 2036 (in addition to releases outside of the growth centres and precincts already released within the growth centres).

Opportunities for redevelopment for housing

It is estimated 80 per cent of the site would be suitable for housing development. Assuming an average gross or neighbourhood density of 15 dwellings per hectare and subject to detailed mapping of constraints and precinct planning, the site could possibly accommodate up to 20,000 dwellings. At an average occupancy rate of 2.3 people per dwelling, this would result in accommodation for approximately 46,000 residents.

However, this is only likely to be achieved with the provision of a new major centre located on a rail extension into the site from Leppington.

On current planning, demand for residential use seems unlikely before the take-up of supply in the South West Growth Centre, which is not expected until after 2040. Should the current policy settings change, so that the percentage of additional dwellings in greenfield locations is increased from 30 per cent to a figure closer to 50 per cent, an additional 154,000 dwellings would be required in Sydney over the life of the NSW Metropolitan Plan. In that case, demand for additional greenfield sites, such as the Badgerys Creek site, would be accelerated.

Employment options

Expected demand for employment land

The total number of jobs located in land identified as employment lands in Sydney (land zoned for industrial or related uses) is approximately 470,000 at present, which represents a little over 20 per cent of all jobs across metropolitan Sydney. About 57 per cent of these 470,000 jobs are located in employment lands in Western Sydney. One of the objectives of the NSW Metropolitan Plan is for half of Sydney's future jobs growth to be accommodated in Western Sydney.

The NSW Metropolitan Plan identifies 8,500 hectares of new employment lands will be required over the 30 years to 2036, based on an annual take-up in the range of 275 to 300 hectares per year. A take-up rate of 300 hectares per year would represent a high growth scenario – data for the last three years shows take-up rates of 264 hectares in 2008, 205 hectares in 2009 and 110 hectares in 2010 (preliminary estimate).

As at January 2010, Sydney had around 4,480 hectares of zoned and undeveloped (or relatively undeveloped) employment land, with a further 3,540 hectares of land that has been identified, but not yet zoned, for employment land in the future. This primarily comprises the land identified in the structure plans for the North West Growth Centre and South West Growth Centre.

This combination of the zoned developable land with the identified potential future land totals just over 8,000 hectares. On the high-growth scenario of a 300-hectare-per-year take-up rate, this represents over 26 years of supply. If the land directly available for development were reduced to 7,000 hectares in recognition of the need to reserve some of the 8,000 hectares to provide for roads, drainage and other infrastructure and conservation protection, this would still represent 23 years of supply.

Opportunities for redevelopment for employment

If the current review of the policy settings should lead to an expansion of the target for greenfield development, this would require an expansion into new areas. In that context, the development of the site for employment purposes could also become commercially feasible sooner. In particular, there is an opportunity for the site to be used to promote self-containment for employment in Western Sydney and the South West subregion. The site could also be used to accommodate large floor plates for extensive industrial and semi-industrial uses.

This possibility has, irrespective of the expected supply take-up rates, become more likely due to the increased demand for accessible employment lands close to WSEA following the uptake of Erskine Park and other employment land at the M4/M7 freight hub, as well as any possible construction of the Outer Sydney Orbital motorway, providing an improved link between the regional cities of Liverpool and Penrith.

Key constraints, however, include the requirement for investment in infrastructure. Any industrial development, for example, could not be serviced by the existing transport network. Investment requirements are likely to be approximately $1 billion depending on rail linkages to the site, which should be considered given the proximity of the new South West Rail Link.

Opportunities for redevelopment as an agribusiness park

The site currently accommodates some agricultural uses and has good land capability for additional agricultural activities because of its favourable conditions and location. Given the minimal infrastructure investment to maintain such industry, increased agribusiness is a potential use in the short term. However, the site will be under-utilised if limited to agribusiness in the long term.

Options matrix

A broad summary of the key options and issues is set out in Table 62. It is important that steps are taken to resolve an agreed strategy on the future of the Badgerys Creek site. The current arrangements are not viable on an ongoing basis and would lead to the under-utilisation of a valuable piece of land and the continued rundown of the existing properties. There is no incentive under the current arrangements for tenants to invest in anything beyond minimal maintenance.

Table 62 **Option comparison matrix (medium- to long-term use options)**

Criteria	Residential only	Employment only	Mixed use-growth centre extension
Site capability	80 per cent of site potential.	80 per cent of site potential.	80 per cent of site potential.
Strategic alignment	Not consistent with NSW Metropolitan Plan. Long-term possibility to extend the South West Growth Centre subject to demand.	Broadly consistent with the NSW Metropolitan Plan but in short and medium term would represent an oversupply.	Not consistent with NSW Metropolitan Plan. Long-term possibility to extend the South West Growth Centre subject to demand.
Demand	Beyond 20 years.	Beyond 20 years.	Beyond 20 years.
Infrastructure scheduling	Able to be scheduled as extension to South West Growth Centre.	Able to be scheduled following rezoning of more accessible lands.	Able to be scheduled as extension to the South West Growth Centre.
Infrastructure costs[1]	Approx.$1 billion. This includes approximately $300 million for regional roads, $700 million for utilities, minor social infrastructure upgrades and no rail upgrade.	Over $1 billion. This includes approximately $300 million for regional roads, $700 million for utilities, significant infrastructure upgrades and uncosted rail link from Leppington.	Over $1 billion. This includes approximately $300 million for regional roads, $700 million for utilities, significant infrastructure upgrades and uncosted rail link from Leppington.
Transport accessibility	Road and bus network derived from the South West Growth Centre requires capacity improvements. Outer Sydney Orbital corridor linking key centres of Liverpool and Penrith has potential to serve the site. Rail–potential for a passenger rail link to Leppington.	Access to motorway network is critical – such as improved links to M7 and connection with Outer Sydney Orbital. Improved access to any Western Freight Line Intermodal Terminal in the vicinity of WSEA is critical.	Road and bus network derived from the South West Growth Centre. Needs capacity improvements. Outer Sydney Orbital corridor has potential to serve the site. Rail–potential for a passenger rail link to Leppington.

Note 1: Further modelling required. More detail on costings can be found in Technical Paper D1.

Source: NSW Department of Planning and Infrastructure.

Given the time frames and the current planning of the adjacent areas, the best use of the site is for a majority of the land (at least 60 per cent) to be as employment lands with agribusiness in the short term and more manufacturing/industrial in the medium to longer term.

However, any decision on the development of another major airport in the west or south-west will have a fundamental impact on the planning, staging and delivery of development and infrastructure across this area and more widely. Another airport will also influence the timing of release of the land for urban development and associated investment by government and the private sector.

Should a decision on another airport be made, the necessary adjustments to local and regional planning to accommodate implications would need to be made.

Off-airport planning controls

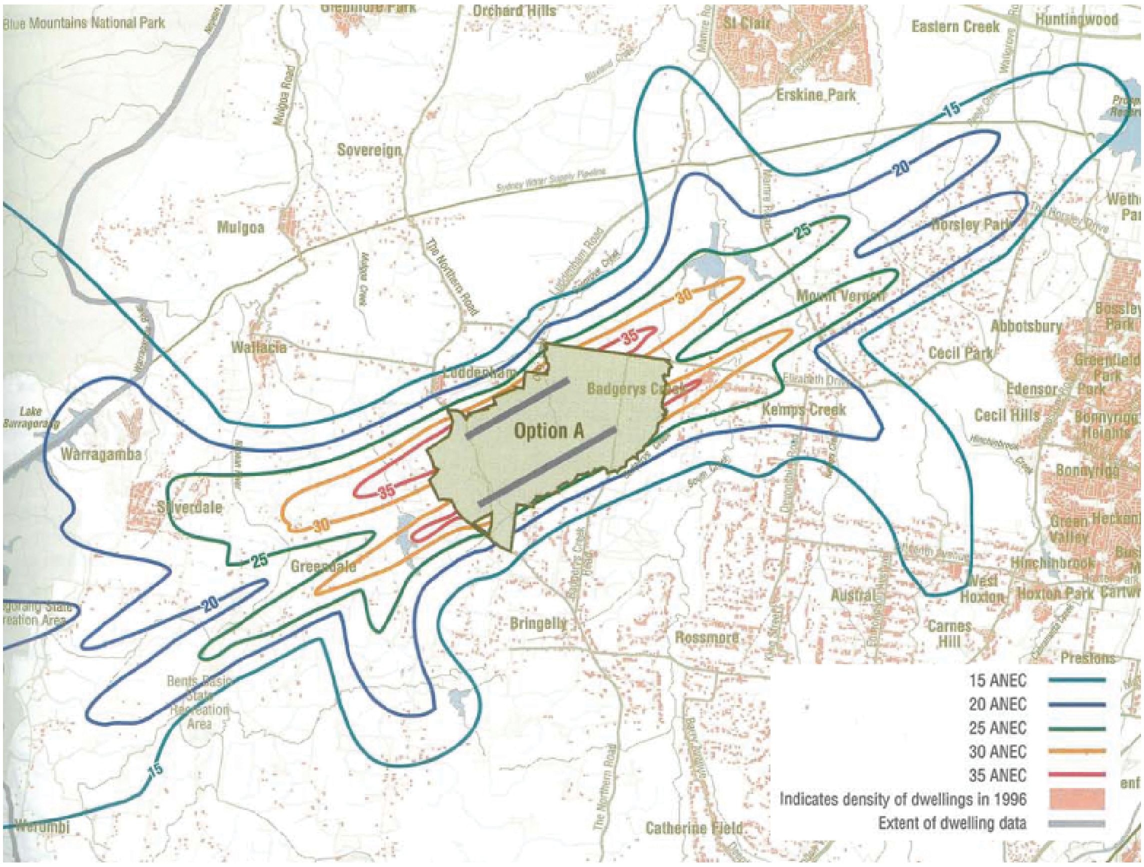
There are a number of local and state government development restrictions in place on properties in areas around the site. These restrictions reflect the Commonwealth's intended use for the site as a potential future airport and hence the anticipated exposure of residents in those areas to levels of aircraft noise. The restrictions were aimed to prevent developments which would expose residents to levels of aircraft noise in excess of acceptable levels. Consistent with the approach adopted at other major airport sites in Australia (and to a large extent overseas as well), the ANEF/ANEC system was used to identify the noise affected areas, with the ANEF/ANEC 20 contour used as the indicator of the community standard.

The restrictions limit the development of new residential properties in the ANEC 20 contour and require noise reduction attenuation on extensions of existing homes in the ANEC 20 contour.

The NSW Government has kept these zoning restrictions in place under Ministerial Directions 117(2) of the *NSW Environment Planning and Assessment Act 1979* (EPA Act).

The off-airport planning controls under the EPA Act, together with the notification on s149 certificates on each parcel of land within the affected areas, ensure any potential purchaser of land within the ANEC zone is aware of the anticipated exposure of the property to aircraft noise and the limitations applying to development. The surrounding councils are also required to ensure there is no incompatible development that could hinder the potential for development of an airport on the site. Figure 143 shows the modelled ANEC contours for a 30 million passenger airport. It is expected that, with quieter aircraft than envisaged in 1985, the contours would have actually reduced.

Figure 143 Noise contours for an airport at Badgerys Creek



Source: Department of Aviation, Sydney Second Airport Site Selection Programme Draft Environmental Impact Statement, prepared by Kinhill Stearns, 1985

PART TEN

SUMMARY OF FINDINGS AND KEY POINTS

P10

10.1 Overview

The Steering Committee's objective has been to develop a strategy for addressing aviation demand in the Sydney region to support economic growth and increased productivity. The Steering Committee recognises the need to balance the development of aviation services with the needs of communities and the environment. It also recognises that planning for aviation development needs to be integrated with the broader land use and land transport plans for the region, including the development of future growth areas and employment zones.

The Steering Committee's work has involved examination of the:

- pace and pattern of likely growth of Sydney and the planning for how growth will be accommodated;
- forecast future demand for aviation in the region;
- capacity of existing infrastructure, including airports and supporting ground transport networks, to cope with the demand;
- extent to which there will be gaps in capacity to meet that demand;
- practical and economic implications if the demand is not met; and
- options for addressing the demand into the future.

Regular Public Transport (RPT) passenger operations (of the aviation sectors) have the greatest effect on economic and social outcomes, particularly since the majority of air freight is carried in the cargo hold of RPT aircraft. The Steering Committee's work has focused mainly on RPT, but also recognises the importance of capacity for freight-only, General Aviation (GA) and Defence operations.

The relationship between aviation demand and capacity is not static. Airport operators, airlines, passengers and surface transport service providers will seek to adapt to changing circumstances, including the growing capacity pressures. Developments in the aviation markets, both international and domestic, will affect patterns of demand over time. The Steering Committee has examined strategies to address demand into the long term, while also considering options to address the short- and medium-term challenges.

Part Two of this Report examines the forecast growth of Sydney and the planned patterns of development for residential population, employment and transport networks. The greatest population growth will occur to the west, with substantial growth also to the north. The siting of Sydney (Kingsford-Smith) Airport does not provide ready access to these areas. There are also targets for substantial infill in existing areas, including those close to the airport, which will add further pressure to the road network servicing Sydney (Kingsford-Smith) Airport.

Part Three examines the forecast demand for aviation in the Sydney region. Even on conservative estimates, demand for RPT services is expected to double to nearly 88 million passengers by 2035 and again to more than 165 million passengers by 2060. Continued demand growth is also forecast for freight services. The focus of this demand will remain on Sydney (Kingsford-Smith) Airport.

Part Four examines the capacity of existing airports to cope with the forecast demand. A key issue is the extent to which there is scope to expand capacity at the existing airports. It also identifies growing capacity issues at Sydney (Kingsford-Smith) Airport in the areas of terminal gates and aprons, aircraft parking, taxiways and runways. The effects of the capacity pressures are already evident to some extent and will grow.

Part Five considers the impacts of these pressures. These include practical impacts such as increasing delays for passengers, disruption of the network and incapacity to accommodate new services, in particular international services. The impacts also include substantial economic costs over time and affect broader productivity, employment outcomes and growth.

Part Six discusses options for upgrading or facilitating more efficient operations at Sydney (Kingsford-Smith) Airport to meet the expected demand. Issues addressed include both the scope for infrastructure improvement and change to the regulatory settings. Part Six also deals with options for upgrading the ground transport links to Sydney (Kingsford-Smith) Airport.

Part Seven outlines that Canberra and Newcastle airports will assist in meeting specific elements of the demand but are too far from the population base to serve a major share of the Sydney demand. While there are options for Bankstown Airport and RAAF Base Richmond to assist in meeting the demand, neither provides a long term solution.

Part Eight outlines the process for identifying potential sites for a new supplementary airport and the analysis of sites against key criteria.

Part Nine discusses potential use of the Commonwealth-owned Badgerys Creek site if it is not to be used for an airport.

A summary of the key points against each of these parts in set out below. The Committee's recommended strategy and conclusions are then set out in Part Eleven.

Part Two – Sydney now and in the future – Key points

- The aviation sector drives employment and economic growth. Nationally, it contributes more than $6.5 billion per year to the economy, generating direct employment for around 60,000 people across Australia. It also indirectly stimulates a variety of other industries, including tourism (which alone directly contributes more than $35 billion to the economy).
- Access to aviation is essential to the Sydney economy. Aviation supports the services sector, which will form 85 per cent of Sydney's economy by 2020. It is essential to Sydney's continued growth as a commercial and financial centre and to Australia's position as a pre-eminent tourist destination.
- Sydney (Kingsford-Smith) Airport is the centre of the Australian aviation network, with almost 43 per cent of Australia's international passenger movements and 23 per cent of domestic passenger movements in 2010. Approximately 50 per cent of Australia's international air freight was also transported through the airport.
- The population of the Sydney Metropolitan Area will continue to grow and is alone expected to increase from 4.2 million to 6.2 million by 2036. The greatest growth will occur in Sydney's South West, North West and West Central subregions. Proportional growth is also expected in the Central Coast subregion.
- The spatial growth of the Sydney region will need to be supported by strategic integrated land use planning and transport infrastructure investment strategies. Provision for aviation industry growth will be a key element.
- As a result of the rapid population growth that is projected to occur in Western Sydney over the next 25 years, 384,000 new jobs will be required for the area.
- The Western Sydney unemployment rate (5.9 per cent) is higher than the Sydney average of 5.0 per cent. Few jobs are currently located within the area, resulting in an average commuting time for Western Sydney residents that is 35 per cent to 50 per cent longer than the Sydney average.
- Western Sydney needs employment generators and infrastructure investment to provide local employment for its growing population and to support community development.

- The North West Growth Centre, South West Growth Centre and the Western Sydney Employment Area (WSEA) will require expanded road and rail links and improved public transport access to employment areas and major facilities, including aviation facilities, to meet population and income growth.
- The population growth projections for the Hunter and Central Coast regions indicate that significant investment in infrastructure, facilities and employment zones will also be required in those regions.
- Sydney (Kingsford-Smith) Airport is located within the Global Economic Corridor (GEC) – the key economic precinct for Sydney and an important employment zone. Growth of business in the GEC – in particular, around Sydney (Kingsford-Smith) Airport and Port Botany – will add to traffic congestion.
- The employment and residential infill density targets for City of Sydney, East, South and Inner West subregions will put additional pressure on the roads and public transport systems in these locations, which will add to congestion unless effective investment and demand management measures are put in place.
- The growing population to the west and north of the city will require efficient access to aviation services. Planning for aviation infrastructure will need to be aligned with the spatial growth of the region and linked to investment in required surface transport infrastructure.
- In the long term, Sydney's growth is expected to spread to the southwest, with potential to accommodate land for a range of urban activities including residential, employment, open space, conservation and industry. The metropolitan planning review process will provide the context for considering future urban investigation areas.
- Additional airport capacity close to the areas of major population growth would improve access to services for the residents, provide additional employment opportunities for those areas and help ameliorate the growth of road traffic and congestion in the areas around Sydney (Kingsford-Smith) Airport.
- Employment impacts would be on localised direct aviation jobs, supporting local communities and economic activity in those areas with airports and more widely dispersed indirect jobs, including in sectors such as tourism.

Part Three – Demand for aviation in the Sydney region

- Aviation activities in the Sydney region have been growing over the past decade. As at 2010, the sector consisted of:
  - 40.1 million Regular Public Transport (RPT) passenger movements and 344,000 RPT aircraft movements accommodated through Sydney (Kingsford-Smith) Airport, Canberra Airport and Newcastle Airport;
  - 400,000 tonnes of international freight and more than 100,000 tonnes of domestic freight, accounting for 50 per cent and 30 per cent of Australia's international and domestic air freight tonnage respectively;
  - more than 400,000 General Aviation (GA) movements across a number of aerodromes in the region.
- With the continued economic and population growth, there will be increased aviation demand in the region. On an unconstrained basis (presuming all necessary capacity is provided to meet growth), estimated demand in the Sydney region would be for:
  - 57.6 million passenger and 421,200 RPT aircraft movements by 2020;
  - 87.4 million passenger and 528,600 RPT aircraft movements by 2035; and

  - 165 million passenger and 800,800 RPT aircraft movements by 2060.
- This exceeds the total number of current domestic and international passenger movements across Australia (135 million in 2010).
- It is estimated that unconstrained demand for air freight tonnage would quadruple between 2010 and 2060.
  - Demand for international and domestic air freight tonnage in the region is forecast to grow rapidly by approximately 3.2 per cent per year between 2010 and 2060.
  - The majority of air freight demand in the Sydney region is expected to continue at Sydney (Kingsford-Smith) Airport. However, the roles of Bankstown, Newcastle and Canberra airports in serving air freight demand are expected to increase.
- GA growth in the Sydney region has been modest compared to RPT but is expected to increase by 50 per cent between 2010 and 2060.
  - Bankstown Airport is forecast to continue to provide the largest volume of GA activity in terms of aircraft movements, with modest growth expected at Canberra and Camden airports and RAAF Base Richmond.
- With the exception of RAAF Base Williamtown, military movement growth in the region is likely to remain relatively constant throughout the forecast period. It is expected that military operations at RAAF Base Williamtown will rapidly increase as a result of the introduction of the Joint Strike Fighter program from around 2017.
- Sydney (Kingsford-Smith) Airport will continue to be the primary airport in the region in terms of both RPT and freight services.
- While Canberra and Newcastle airports will see continuing growth in demand for RPT services, this is not expected to reduce demand at Sydney (Kingsford-Smith) Airport.
- Unconstrained demand for passenger movements at Sydney (Kingsford-Smith) Airport, which already facilitates 89 per cent of passenger movements in the Sydney region, is forecast to more than double by 2035 and quadruple by 2060, to 76.8 and 145.7 million passenger movements respectively.
  - This correlates with expected unconstrained demand for approximately 430,000 and 650,000 RPT aircraft movements in 2035 and 2060 respectively.
- As Sydney's spatial and economic growth continues to increase population and income growth in Western Sydney, demand for usage of the airport from this area will increase.
- Continued growth in business, the strength of emerging international markets such as China and India and the development of new innovative Low Cost Carrier (LCC) markets will be significant drivers of demand growth which will need to be accommodated in the Sydney region.

Part Four – Capacity of existing airports to cope with forecast demand – Key points

Sydney (Kingsford-Smith) Airport

- The *Sydney Airport Master Plan 2009* (the Master Plan) includes a program of upgrades to terminals, taxiways, aprons and gates, reflecting Sydney Airport Corporation Limited's (SACL's) assessment that, with those changes, the airport can cope with forecast demand to 2029.
- This Joint Study has identified that a range of capacity pressures will have significant implications well before 2029 and these will continue to increase with growth at the airport.

- Investment in infrastructure upgrades is important to help address the impacts of those capacity pressures, but the constraints of the site mean that the capacity of the airport will not be able to be upgraded to meet the level of demand forecast in the longer term.
- At current demand levels, the existing gates, stands and apron areas are already heavily utilised at each terminal during peak times. Specifically:
  - all available contact gates at the current International Terminal (T1) are utilised during the morning peak period 7.30am to 10.00am;
  - all available contact gates at current Domestic Terminal 2 (T2) are utilised at various times during the day. Some stand-off capacity is available at these times, although much of it is limited to turboprop operations at 'walk out' stands;
  - gates at the current Qantas Domestic Terminal 3 (T3) are consistently in use throughout the day; and
  - individual apron areas are already virtually at full capacity during peak times.
- It is estimated, by 2015, there will be a shortfall of 25 aircraft stands compared to projected demand based on the infrastructure shown in the Master Plan. This shortfall could be reduced if terminal and apron work proposed in the Master Plan is brought forward.
- By 2020, there will be an estimated shortfall of 18 stands, even if works proposed in the Master Plan for 2014 to 2019 have been completed.
- There is already a requirement to tow aircraft off to remote stands, particularly from the International Terminal, to free up gate availability in peak periods. This has flow-on effects to the runways and taxiways.
- Taxiway capacity also becomes an issue where there is congestion and delay arising from a shortage of gates or parking stands or when queues develop as a result of the imbalance between usage of the two parallel runways.
- There are significant limitations on runway 16L/34R due to its shorter length. Standard operating procedures generally preclude aircraft above B767 from using runway 16L/34R. On runway 16L/34R the taxiway fillet design does not cater for long wheel base aircraft such as the B777-300. This creates an imbalance between the two runways and reduces the capacity to operate the parallel runway system efficiently.
- Currently, delays on the taxiways and apron areas are estimated to be approximately six minutes for each arrival and 12 minutes for each departure during peak period movements.
- Capacity pressures at the airport will contribute to increases in these delays. The delays will be exacerbated when the airport experiences reduction in capacity due to factors such as non-visual conditions due to rain, storms, low cloud or fog, or when winds require use of the cross runway.
- Over the Master Plan period, taxiway delays can only be kept within tolerable (but far from ideal) limits if airspace and air traffic management procedures can be changed and the fleet mix allows a more even spread of traffic flow onto the main and parallel north-south runways.
  - Airservices Australia has advised that there remains significant challenges to achieve the required runway rebalancing.
- The site of Sydney (Kingsford-Smith) Airport measures some 907 hectares, small by comparison to other major airports in Australia and overseas.
  - Any further extension of the site is limited by urban development and by Botany Bay to the south, the Cooks River to the west and Port Botany to the south-east.

- The constraints of the small airport site rule out any significant realignment of runways or major rationalisation of the taxiway and apron systems. A change to the movement cap could provide some additional capacity, provided the necessary gate, taxiway and parking capacity can be made available.
  - Analysis by Airservices Australia indicates that, in good weather conditions, the parallel runway system could process between 85 and 87 runway movements per hour and that sustainable capacity of the runway system would be around 85 movements per hour.
  - An increase in the maximum movement rate would require substantial investment in taxiway, apron and gate capacity as the current infrastructure struggles to handle for sustained periods even the current peak movement levels of close to 80 movements per hour.
- The limited space at the airport affects the scope to provide appropriate wingtip clearance for very large aircraft along certain taxiways, which may affect the scope for continued upgauging to those aircraft types in the medium and longer term.
- The scope for operations at the airport to recover following periods of reduced capacity will progressively decrease as movements increase, leading to longer periods of disrupted operations at the airport and flow-on impacts throughout the aviation network.
- Capacity pressures will limit the scope for airlines to schedule new services. Under the Slot Management Scheme operating at Sydney (Kingsford-Smith) Airport, the slot allocations which are a prerequisite for scheduling operations are limited to 80 per hour, consistent with the runway movement cap.
- Allocations for peak periods (7.00am to 9.00am and 5.00pm to 7.00pm) are already at or close to this limit – for example:
  - on Fridays, the allocations for the 7.00am and 8.00am hours are full; and
  - on Thursdays, the allocations for the 7.00am hour are full.
- As demand continues to grow, airlines will increasingly be unable to schedule new services at their preferred times. Assuming the airlines are able to reschedule proposed services to the nearest available slots, the peak will continue to spread.
  - By 2020, all slots on weekdays between 6.00am and 12.00noon and between 4.00pm and 7.00pm would be fully allocated.
  - By 2027, there would effectively be no slots unallocated, with unmet demand for more than 100 flights per day.
- In practice, the scope for airlines to shift proposed services to suboptimal schedules will often be limited and the proposal for new services may be shelved if the preferred slot is not available.
  - The impacts of limited capacity will be seen in foregone services well before the projected allocation of all slots. As fewer slots become available, Sydney will increasingly miss out on the benefits from new services.
- The lack of available capacity means that, for the busiest hour (8.00am to 9.00am):
  - demand for an estimated four movements in that hour will not be met by 2015;
  - demand for an estimated 12 movements will not be met by 2020; and
  - demand for an estimated 85 movements will not be met by 2060.
- Demand is likely to increase in all hours of the day.
  - Demand will first exceed the maximum that can be allocated in peak hours, then in the hours around peak times.
  - By 2035, it is unlikely that there will be usable capacity available for new services at Sydney (Kingsford-Smith) Airport.

- As movement numbers grow over time at the airport, the scope to use the noise-sharing modes under the Long Term Operating Plan (LTOP) will decrease. Airservices Australia analysis on the effect of forecast demand on the LTOP suggests:
  - By 2015, nine hours of the day will have scheduled movements above 55 movements per hour, approximately the rate above which the noise sharing modes cease to be viable options for managing the air traffic.
  - By 2035, only two hours in the late evening will operate at less than 55 movements.
- Assessments undertaken for the Sydney Airport Community Forum (SACF) have found the LTOP targets are not being met with the levels of traffic demand now presenting at the airport.
- In the absence of major investment in the surface transport networks serving the airport, continued growth of passenger air services would also lead to overloading of the road and rail systems.
  - Increasingly, road traffic to and from the airport will be subject to substantial delays.
  - At the current train capacity of eight trains per peak hour to the CBD, by 2013 services past the airport in the morning peak will be full before they reach the airport stations.
  - By 2018, even with the increase proposed by the NSW Government to 12 trains per hour, trains would be at capacity during peak hours unless additional rolling stock and train paths can be allocated to the airport rail link.
  - Sometime between 2015 and 2023, the capacity of existing road junctions at the entrance to the Domestic Terminal precinct will be exceeded, resulting in a near constant traffic jam on key roads to the CBD and the motorway (this does not include the impacts on the M5 motorway itself).

Canberra and Newcastle airports

- Canberra Airport and RAAF Base Williamtown (Newcastle Airport) have physical capacity to meet the level of their projected demand, but the scope for growth of civil operations at Newcastle Airport is limited by agreement with RAAF, reflecting the projected requirement of RAAF Base Williamtown as an operational base.
  - The scope for RAAF Base Williamtown (Newcastle Airport) to support the demand in the growing Hunter and Central Coast regions over the longer term is unclear.

Part Five – Impacts if demand is not met

- If no additional capacity is made available, demand would exceed capacity by 54 million passenger movements and more than 760,000 tonnes of air freight per year in 2060.
  - The cumulative total of unmet demand would be more than 665 million passenger movements and nine million tonnes of air freight between 2035 and 2060.
- By 2060, the economy-wide (direct and flow-on) impacts of the Australian economy could accumulate to a total of $59.5 billion in foregone expenditure and $34.0 billion in foregone gross domestic product (GDP) (in 2010 discounted dollars and considering a medium elasticity scenario).
  - The NSW economy would be the worst affected, with losses across all industries totalling $30.6 billion in foregone expenditure and $17.5 billion in foregone gross state product (GSP) (discounted).
  - In terms of employment impacts, an annual average of 12,700 full time equivalent (FTE) positions in NSW and 17,300 FTE positions nationally could be foregone.

- Any delay in acting would have adverse economic impacts for NSW and Australia.
- By 2035, the economy-wide impacts could accumulate to as much as $2.3 billion in foregone NSW GSP and $6.0 billion in foregone GDP for the Australian economy. In terms of expenditure within the economy, over the period to 2035 foregone expenditure could total $2.6 billion for NSW and $8.9 billion for Australia.
  - Over the period to 2035, 400 FTE jobs per year could be foregone in NSW and 600 FTE jobs per year nationally. This means that employment is expected to be lower than would otherwise be the case if capacity were made available.
- In the short term, other cities could gain a boost to passenger numbers and consequent economic activity from services, passengers and freight operators that cannot access Sydney. However, given a portion of unmet Sydney region demand would be diverted overseas instead of interstate, and some travel will be suppressed, overall, Australia would experience a net economic loss.
- These estimates are considered conservative, given the use of medium scenarios for redistribution and suppression of unmet demand. In addition, a wide range of impacts associated with aviation infrastructure is difficult to monetise due to the role of aviation as a facilitator for trade and economic activity.
- Delay brings the risk that the remaining options to add aviation capacity will disappear, as Sydney's spatial growth and associated land use development encroach on the few potential sites remaining.
  - Delay in action would constrain the ability of governments to provide additional airport capacity in the future.

Part Six – Options to better utilise Sydney (Kingsford Smith) Airport to gain capacity to meet forecast demand

- SACL, Airservices Australia and airline operators are continuing to work on ways to improve efficiencies in operations at the airport. Efficiencies available include airside infrastructure works to add new gates, terminals, taxiway and apron capacity, improved Air Traffic Management procedures, better coordination of arrivals and departures traffic and improved airport ground movements coordination.
  - These are important to help manage congestion and contain delays to some extent but will not address the capacity shortfall in the medium and longer term. This includes the proposed new infrastructure concept outlined by SACL in December 2011.
- There is no real option to increase the capacity of Sydney (Kingsford-Smith) Airport significantly, as:
  - There is no scope to build new runways or to substantially reconfigure or upgrade runways in the existing airport footprint.
  - Options to expand the airport into surrounding suburbs would be prohibitively expensive and would not add any significant new capacity to the airport.
- Options have been raised in the past for an additional runway or new airport at Kurnell, but this would have major environmental impacts and would be prohibitively expensive.
  - Furthermore, airspace interactions with Sydney (Kingsford-Smith) Airport would reduce the level of additional capacity attained.
- Options for changing the legislated operational requirements at Sydney (Kingsford-Smith) Airport could provide some additional capacity but would not meet the medium- to long-term capacity gap, particularly in the peak periods.

- Increasing the movement cap and slot allocations to allow 85 movements per hour in the weekday morning and evening peaks (a one per cent increase in total slots per day) would postpone the impacts of capacity pressures by only one year; however this would be targeted to provide additional capacity at times with the greatest constraint (that is, six per cent increase in total peak slots).
  - Increasing the movement cap to 85 movements per hour for all non-curfew hours would provide a six per cent increase in total slots available to be allocated. This would be expected to result in approximately a three-year postponement of the impacts.
- Increasing the permitted movements during the curfew shoulder periods would have minimal impact on capacity pressures.
  - Allowing movements in the morning shoulder period (5.00am to 6.00am) to the maximum limit permitted under the curfew legislation would only add 0.1 per cent in available slots, although it would assist in clearing the morning international peak arrivals.
  - Allowing movements in the evening shoulder period would have even less impact on the capacity gap, as there are less slots available under the *Sydney Airport Curfew Act 1995* as compared to the morning shoulder.
- Limiting access to Sydney (Kingsford-Smith) Airport by smaller aircraft would potentially open up a small amount of additional capacity for international and domestic services using larger aircraft.
  - A large proportion of regional services are operated with small aircraft. NSW intrastate aircraft movements comprise approximately 20 per cent of all slot allocations and RPT activity at the airport yet only carry about six per cent of total airport passengers. While the current arrangements support access by regional passengers to Sydney and connecting services, they do not promote efficient economic use of the airport's constrained capacity.
  - Achieving a 30 per cent reduction in the number of movements by aircraft up to 40 seats could free up to two per cent of total airport slots depending on the level of services merged or withdrawn, providing for growth of larger aircraft movements for approximately one year.
- A reduction in the protection of access to Sydney (Kingsford-Smith) Airport by intrastate services would raise broader issues for government consideration, including the impacts on:
  - regional centres which rely on convenient aviation links to the state capital for a range of social and economic activity;
  - viability of regional aviation operators; and
  - regional passengers, a high proportion of whom transfer onto domestic and international flights at Sydney (Kingsford-Smith) Airport.
- There is a need to address the growth of congestion in the road network serving Sydney (Kingsford-Smith) Airport.
  - A key element is to increase the use of public transport – in particular, the train services operating to stations at the Domestic and International Terminals but also bus services.
  - Investment in upgrading roads and intersections around the airport will also be essential.

Part Seven – Options to better utilise other existing infrastructure to gain capacity to meet forecast demand

- Bankstown Airport could be upgraded and made available to accommodate a limited level of operations by turboprop Regular Public Transport (RPT) aircraft.
  - A proposal by the airport operator for a 220 metre extension of the main runway would enable up to Code 3C aircraft to operate at the airport.
  - Airservices Australia advises that the operation of RPT jet aircraft at Bankstown would conflict with operations at Sydney (Kingsford-Smith) Airport in some conditions.
- Bankstown is Sydney's major GA airport, with a large volume of Visual Flight Rules (VFR) flights, including a high proportion of training flights. The operation of Instrument Flight Rules aircraft at levels of more than 10 to 12 per hour would create significant disruption and risks to VFR activity.
  - If a significant level of RPT services – above about 10 per hour – were to commence at Bankstown, provision would need to be made to relocate GA activity to other airports.
- The commencement of any significant level of RPT activity at Bankstown and any extension of the runway would require regulatory approvals, with public consultation and assessment of the environmental impacts.
  - Given the location of Bankstown Airport in a heavily urbanised area, aircraft noise and impacts on road congestion are likely to be significant issues of local concern.
- Utilisation of Bankstown Airport for RPT services would require upgrades of airport and road access infrastructure to the airport. Any upgrades should also consider linkages with Sydney (Kingsford-Smith) Airport and be consistent with NSW Government transport plans.
- RAAF Base Richmond is presently capable of accommodating jet RPT services but would require a significant upgrade of airport infrastructure to accommodate civil traffic.
  - The RAAF supports opening up the Richmond base to civil access, as it is compatible with its plans for a reduced presence and would extend the life of the RAAF Base at the location.
- Based on preliminary cost estimates, an initial investment of around $150 million would provide a functional joint civil/RAAF facility able to handle around one million passengers per year.
  - An investment of $500 million would extend the capacity to an estimated five million passengers per year.
- RAAF Base Richmond has significant operational limitations, including:
  - the prevalence of fog at certain times of the year and the proximity to the Blue Mountains;
  - operations on the east-west runway would have some impact on flight paths to Sydney (Kingsford-Smith) Airport.
- In addition, the communities of Richmond and Windsor, which are located close to the ends of the current east-west runway, would experience a level of additional aircraft noise from civil operations.

- Better noise outcomes and additional capacity could be achieved if additional land was acquired and a new runway was constructed on a north-south alignment. This would provide a major airport able to service all market segments. However, it could cost around $4.0 billion for a single 2,600 metre runway with a terminal suitable for up to 20 million passengers per year, or around $10.0 billion for a single 4,000 metre runway and terminal facilities suitable for 30 million passengers per year.
- RAAF Base Richmond will remain a constrained site and it would be challenging to develop it into a parallel runway airport. However, providing civilian access to the site based on use of the existing runway would serve the growth of North West Sydney and Western Sydney.
- Canberra and Newcastle (Williamtown) airports are important airports serving RPT markets to the south and north of Sydney. Neither is located close enough to the population of Sydney to take the role of Sydney's second RPT airport, but both will provide additional options for a small proportion of passengers who are prepared to travel the extra distance.
- Canberra Airport is the only curfew-free airport within reach of Sydney and provides the potential for night-time services which cannot be accommodated at Sydney (Kingsford-Smith) Airport, including overnight freight services, and possibly some international Low Cost Carrier (LCC) services . It is important that Canberra's 24-hour unrestricted curfew-free status be protected.
- Newcastle Airport serves the growing population in the Hunter Valley region and parts of the Central Coast. The civil operations are conducted under an agreement with the RAAF. However, because of RAAF requirements, the scope for continued growth of civil services is unclear.
- Other aerodromes in the region may also want to attract some RPT (such as Illawarra Regional Airport). However, even if a combination of the options considered for maximising the use of existing airports is implemented, they do not provide sufficient additional capacity to meet the long-term demand for aviation services in the Sydney region.

Part Eight – Options to develop new infrastructure to gain capacity to meet forecast demand

- Initially, all parts of the Sydney region were considered to find a site suitable for either:
  - a 'Type 1' airport – a full service airport serving all market segments capable of handling a future parallel runway layout; or
  - a 'Type 3' airport – a single runway airport serving all market segments.
- Eighteen localities were identified for further assessment, from which five were shortlisted. A small number of specific sites were identified within these five localities as offering the best potential for a new airport.
- Key issues in the shortlisting and site assessment included proximity to demand (within 90 minutes travel time of Sydney's population centre); site suitability; aviation development capacity; airspace conflicts with existing airports and flight paths; environment impacts; and proximity to growth centres.
- The sites listed below are assessed as the more suitable sites in each locality.

Table 63 Sites identified as more suitable (on technical analysis), by locality

	Localities				
	Central Coast	Hawkesbury	Nepean	Burragorang	Cordeaux-Cataract
More suitable Type 3 Airport(s) sites	Wallarah	Wilberforce	Badgerys Creek Luddenham Bringelly Greendale	Silverdale Mowbray Park	Wilton Wallandoola
More suitable Type 1 Airport(s) sites	Wallarah	Wilberforce	Badgerys Creek Luddenham Bringelly Greendale	Mowbray Park	Wilton

Source: Australian Department of Infrastructure and Transport.

- A quantitative assessment was made against the criteria that could be monetised, to arrive at Relative Cost Benefit Ratios for these sites. An additional qualitative analysis was made of the sites against the criteria that cannot be monetised.
- The sites in the Nepean locality were assessed as clearly superior against most criteria compared with the sites in any other locality. The key advantage of these sites is their relative proximity to the sources of potential demand and the associated benefits that would accrue to airport users. Site development costs were also estimated to be relatively lower than for compared with most of the sites in other localities.
- The next best ranking site in the quantitative assessment was Wilberforce in the Hawkesbury locality. Its main advantage was also proximity to potential demand including nearby commercial growth opportunities. Its main disadvantages were noise impacts on communities and sensitive uses as well as the potential social impacts of land acquisition. Furthermore, a Type 3 site located at Wilberforce would require its runway alignment to be parallel or near parallel to RAAF Base Richmond with coordinated control between the two airports in order to operate both facilities. A Type 1 airport located at Wilberforce is likely to require closure of RAAF Base Richmond or relocation of RAAF activities to the Wilberforce site.
- Following the four Nepean sites and Wilberforce, the next best ranking site in the quantitative analysis was Somersby in the Central Coast, which had relatively high development costs but also reasonable levels of economic benefits. It also received a relatively mid-range ranking against the qualitative criteria. However, Somersby would be constrained in operational capacity terms due to airspace interaction with Sydney (Kingsford-Smith) Airport.
- Wilton in the Cordeaux-Cataract locality rates just behind the Nepean and Hawkesbury sites and level with Somersby on BCR (although with a slightly lower NPV) in the quantitative assessment for a Type 1 airport. It has the best ranking in terms of noise impacts on existing communities. Its capacity would not be constrained through airspace interaction with Sydney (Kingsford-Smith) Airport.
  - Wilton is located further from the potential market under existing planning instruments but would be well located if Sydney's longer-term growth is to the south-west.
- Mowbray Park in the Burragorang locality rated mid-range in the quantitative analysis and had mixed ratings on the qualitative analysis. It has a relatively lower noise impact on local communities compared to most other sites but is not well located in terms of potential demand.
- The Relative Cost Benefit Ratios were higher for Type 1 airport developments than for Type 3 developments, reflecting the high economic value that a major airport would provide in the long term.

- Sites that enable initial development as a Type 3 airport with the capacity to be extended to a full Type 1 airport in the future would best allow for the medium- and long-term growth in the Sydney market.
- Given the analysis of capacity pressures on Sydney (Kingsford-Smith) Airport, the supplementary airport would need to be available for initial use between 2025 and 2030.
- To finalise a decision on the best location for a supplementary airport, additional work will be required on detailed site studies and environmental assessment.
- Indicative costs of land acquisition for the shortlisted sites range from $40,000 to $70,000 per hectare for sites in the Central Coast, Nepean and Cordeaux-Cataract localities; to $140,000 to $215,000 per hectare for sites in the Hawkesbury and Burragorang localities. Including an allowance for risk and contingency suggests costs per site between $30 million and $600 million, dependent on airport type and location.
- Based on high-level, strategic cost estimates, indicative generic construction costs of airport infrastructure would be in the order of $1.7 billion for a limited service Type 3 airport and $5.3 billion for a maximum Type 1 airport with parallel runways.
- A large additional cost in most locations would be the earthworks costs to prepare sites for airport infrastructure owing to the undulating nature of the land. For example, land preparation costs for the development at a location such as Wilton could range from $350 million for a Type 3 airport development to $810 million for the ultimate Type 1 airport site preparation. For the range of shortlisted localities and airport types, and factoring in an allowance for risk and contingency, indicative earth-works costs are between $140 million and $1.2 billion.
- Supporting infrastructure such as road, rail and utilities costs would be additional to the above high-level costs. These could comprise significant cost elements of up to $950 million for a Type 3 airport and up to $3.6 billion for a Type 1 airport (assuming inclusion of a rail connection and incorporating an allowance for risk and contingency) in a suitable site.
- Totalling these key cost elements, the capital investment to develop an airport and supporting infrastructure could total between $7 billion and $11 billion for a Type 1 airport and between $2 billion and $4 billion for a Type 3 airport.

Part Nine – Future use of the Commonwealth-owned Badgerys Creek site

- The Steering Committee's assessment is that the Badgerys Creek site, acquired by the Commonwealth for an airport, remains the best site for the development of a supplementary airport within the Sydney basin.
  - There is a strong ratio of benefits to costs, and land acquisition and planning controls have already occurred.
  - The site's location adjacent to the residential growth areas of South West Sydney, and to the key transport corridors of the M7 motorway and the future Outer Sydney Orbital corridor, as well as its proximity to the Western Sydney Employment Area (WSEA), means it remains the location best placed to meet Sydney's spatial demand growth for aviation services at a relatively unconstrained site.
  - The Committee notes the site will be some 10 kilometres from the Leppington terminus for the South West Rail Link now being constructed. The site would provide the economic development node and accelerated employment attraction which South West Sydney requires and which, on current planning, will not be provided in the region.
- The site is not currently zoned for urban development and not part of any planned land release strategy of the NSW Government and is not considered by NSW agencies as being

required to meet current planned land supply requirements for residential and employment lands for the next 25 years.

- The Steering Committee notes the views expressed by governments that the site is no longer viable for an airport development. Should governments re-affirm that policy position, then the Committee finds the Australian and NSW governments should now settle an agreement for the land to be part of an orderly land release in the medium term as part of the South West Growth Centre development.
- The single ownership and title to the site means it has significant potential for future development as an economic employment zone. The site has the potential to be brought to the market and significantly increase the supply of employment lands, affordable housing and community amenity facilities in the locality. The strategic planning of the site for future land release will provide an important capacity to control the release of future residential land and employment land into the Sydney market to meet employment and residential growth requirements.

  The release of the total available Commonwealth-owned Badgerys Creek site into the market in the short term, such as within the next 10 years, would be expected to have an adverse impact on the current NSW Government land supply and infrastructure investment strategy.
- The urban development of the site will require considerable investment in transport access, both road and public transport, and investment in utilities, including significant extensions for services such as water and sewerage. Timing and cost of the provision of this infrastructure will determine the ability to bring the site into the market within the short to medium term.
- The site could be retained and 'land banked' by the Australian Government to optimise its potential and impact on meeting Sydney's land release needs in the future.
- The Steering Committee considers the best primary use of the site, based on current NSW planning for the South West Growth Centre, would be for economic employment activities, with a majority (for example at least 60 per cent) of the available site being planned for manufacturing and distribution/logistics-based employment uses and non-residential land use (including town centre/retail).
- If the site is not to be used for an airport, planning controls which were implemented on surrounding lands to address the potential impact of aircraft noise could be removed.

Freight and General Aviation

- While the majority of air freight is carried in the cargo hold of RPT aircraft, the number of movements by dedicated freighter aircraft is growing. Because numbers are relatively low and freight operations can usually be scheduled outside of the RPT peak periods, the expected level of demand for dedicated freight aircraft at Sydney (Kingsford-Smith) Airport can be accommodated in the short to medium term. There will be growing pressure in the longer term as slots become less available and there is growing demand to use the limited available space for gates, apron and handling facilities for passenger operations.
- The curfew means that Sydney (Kingsford-Smith) Airport cannot provide for overnight freight hub activities.
- It will be important to preserve adequate airport capacity for GA activities in the region, including flight training, business aviation, charter, aerial work, emergency services and recreational flying.
- Bankstown Airport and Camden aerodrome can continue to be the main GA airport for the next 20 years, if the progressive introduction of RPT services at Bankstown does not exceed a level compatible with the GA operations.

- Over the medium term, Bankstown Airport is likely to become increasingly focused on smaller RPT and IFR business traffic which will increasingly require GA flying training and recreational operations to operate to other airports in the region.
- The preferred sites for development of supplementary airport capacity raise potential airspace conflicts for operations at some existing GA aerodromes, which could put further pressure on GA capacity in the future.
- The future operation of GA airports in Sydney and outside Sydney but within reach, including Wollongong, Cessnock, Maitland and Goulburn, should be protected.
- Should RAAF Base Richmond no longer be required for RAAF purposes at some time in the future, consideration should be given to retaining the aviation infrastructure for civil use, including GA.

PART ELEVEN

STRATEGIES FOR MEETING SYDNEY'S AVIATION INFRASTRUCTURE NEEDS

P11

The Summary of Key Points in Part Ten highlights the complexity of addressing the Sydney region's aviation infrastructure requirements to meet the forecast demand.

The Committee considers that there are three key parts of the strategy which needs to be put in place by Australian and NSW governments, the aviation industry and the community to meet Sydney's long term aviation infrastructure requirements and maximise community economic and environmental outcomes. These are:

- Optimise the use of Sydney (Kingsford-Smith) Airport for RPT international, domestic and regional passengers by ensuring that it operates efficiently and safely and can grow to its practical maximum operational capacity;
- Protect and optimise the use of the other existing airports in the Sydney region; and
- Select and confirm the site for a new supplementary airport for the Sydney region. The new site should be capable of eventually accommodating a full service airport serving all market segments.

The Committee makes the following recommendations in relation to this strategy.

Optimising Use of Sydney (Kingsford-Smith) Airport

Ensuring that Sydney (Kingsford-Smith) Airport operates efficiently and safely, and can continue to grow to its maximum practical statutory capacity is critical to Sydney's and Australia's economic development.

SACL's Master Plan and program of investment in airport infrastructure

Investment is required urgently in airport infrastructure to address current pressures and the additional demands of continuing growth. In the Master Plan, SACL identified a range of works to upgrade taxiways, gates and terminals. These works were to be undertaken on a staged basis, with some identified for completion by 2019 and the balance by 2029. These works need to be brought forward.

More recently, SACL announced that it is developing a revised concept for use of the terminals. SACL's objectives for the proposal are to improve passenger experience through faster connection times and more efficient airline and airport operations. SACL is working with its stakeholders to progress the proposal. However, a number of key issues remain to be resolved, with details and funding arrangements to be negotiated, before any formal decisions can be made to proceed.

The Steering Committee welcomes the intentions to improve the passenger experience and efficiency of operations on the site but notes the need to finalise issues quickly so that essential investment is not delayed.

Recommendation 1

A plan of investment for Sydney (Kingsford-Smith) Airport needs to be settled as quickly as possible to meet the growth in larger aircraft types and the current and forecast shortfall in gates and parking at the airport. The Minister for Infrastructure and Transport (Commonwealth) should exercise the power under the *Airports Act 1996* to require that a new Master Plan process be initiated immediately by SACL. There is a need, highlighted in this review, to bring forward investments in terminals, aprons and parking for aircraft to ensure that Sydney (Kingsford-Smith) Airport is able to meet the forecast growth in aircraft movements and passenger throughput.

This Master Plan process should include the development of a definite program of works, with clear performance timeframes for each project, to support the expansion of the capacity of the terminals, gates and taxiways. The program should take account of the plans and scope for continued upgauging of aircraft, in particular the requirements to accommodate Code E and F aircraft.

Under normal arrangements, the next Master Plan is due for endorsement in 2014. While acknowledging that the Master Plan process is complex and time-consuming, the Committee is concerned that a firm program for upgrade works be resolved without unnecessary delay. The program should address the clear need to provide for the expected shortfall of gates, manage the runway balance utilisation requirements and limit any increase in taxiway congestion in the short term.

Air traffic management enhancements

Recommendation 2

SACL, Airservices Australia and airlines should accelerate plans for the implementation of advanced technologies and air traffic management practices including satellite based systems at Sydney (Kingsford-Smith) Airport. These do not significantly change the capacity of the airport, but help to maintain traffic handling rates and efficiency of operations as capacity pressures build. System performance measures such as target levels of congestion and delays should be identified which guide the implementation of efficiency measures. A 20 year investment plan should be developed to address both current proposals and long-term enhancements.

Surface transport links to Sydney (Kingsford-Smith) Airport

Sydney (Kingsford-Smith) Airport sits within the key economic precinct for Sydney and NSW, alongside Port Botany. Road congestion in the areas around the airport will increasingly impact on operations at the airport and affect the activity within the economic precinct. Increased activity at the airport will itself contribute to the problem. A key element of the strategy for making Sydney (Kingsford-Smith) Airport work into the future will be to increase the take-up of public transport by passengers, airport workers and others travelling to the airport precinct.

The Australian and NSW Governments need to urgently undertake joint planning to develop a long-term surface transport investment and operations management strategy for the Sydney (Kingsford-Smith) Airport/Port Botany economic precinct.

Recommendation 3

The Steering Committee recommends that the NSW Government, in consultation with the Australian Government and SACL, develop and implement a strategy for increasing the patronage of the airport rail system which includes removing the existing access fee to the two airport rail stations. This would mean that fares for services to and from the airport stations would be comparable to normal CityRail fares.

- Consideration should be given to the appropriate long term funding arrangements for this measure, with costs of removing the station access fee to be met by the airport operator.
- The strategy should set annual targets for airport rail patronage growth and system performance measures which are transparent and reported.

Recommendation 4

The Steering Committee recommends that the Australian and NSW governments, in consultation with SACL, immediately commence work on the detailed planning required for a program of surface transport works to improve the connections to the airport and the surrounding precinct. This should include:

- a program to upgrade roads and intersections in the locality of the airport, including key connections such as the M4 and M5 motorways. This should include road widening and traffic flow measures to reduce congestion around the domestic terminal precinct and to provide additional bus lanes and capacity for improved bus services;
- a commitment by the governments to the investment in suitable rolling stock and train paths to enable the airport rail link to provide at least 20 peak hour trains per hour by 2020, with a long term investment plan for increase of an additional ten trains per hour by 2035;
- expansion of the Sydney bus network to the airport, in particular to link the airport directly to the CBD, Parramatta, St George/Sutherland area and the Lower North Shore. This will need to be undertaken in parallel with the strategy on the removal of the station access fee; and
- development and implementation of a plan to facilitate bus and mini-bus access to a centralised transit point or points at the airport terminal precincts.

The Committee notes that Transport for NSW has already put a submission to Infrastructure Australia for funding for a major transport study for the Sydney (Kingsford-Smith) Airport/Port Botany precinct.

Changes to regulatory measures

The Steering Committee has considered a range of proposals for change to the regulatory arrangements which apply to operations at Sydney (Kingsford-Smith) Airport. These proposals include change to the level of protection of access to the airport by intrastate NSW services from regional areas, removal or relaxation of the movement cap and the approval for extra movements in curfew shoulder periods. These changes would not provide long term solutions, but could defer the impacts of capacity pressures for a few years. They could help Sydney (Kingsford-Smith) Airport to meet the need to lift its peak hour handling capacity and also maximise passenger throughput.

The existing regulatory arrangements have been implemented to strike a balance between the use of the airport and the protection of other community interests and amenity. The Committee is aware that governments may not support change to these arrangements, particularly if alternatives are available. However, since regulatory measures including the movement cap were put in place there has been a significant investment by the aviation industry in new, quieter aircraft types which have reduced the noise impacts of operations and air navigation procedures and technologies to better distribute aircraft operations. These need to be recognised as part of achieving the balance in managing the airport's environmental impacts.

Recommendation 5

The Steering Committee recommends that the Australian Government initiate legislative amendments to the *Sydney Airport Demand Management Act 1997* to lift the statutory movement cap from 80 to the 85 movements per hour in the peak hours of 6.00 to 10.00am and 3.00 to 8.00pm each weekday to enable greater rates of handling of peak hour traffic.

Consideration was given to whether the movement cap should be lifted to 85 movements per hour for the whole day, not just for the peak periods. The Steering Committee considers that the proposal to lift the cap only for the peak periods means that the additional capacity is targeted to the periods of greatest demand. It is unrealistic to expect the airport to operate effectively at its maximum rate for the full day. In practice, there will inevitably be some level of disruption of the schedule, due to external factors such as weather or to operational issues affecting aircraft, the airfield or terminals. The proposal as recommended allows a small but important margin to help cope with these inevitable events and allow recovery.

Recommendation 6

The arrangements for implementing and monitoring the Sydney Airport Slot Management process and movement cap should be reviewed to ensure they are effective in preventing movements beyond the levels set, but are workable and consistent with safe and efficient operation of the airport and the surrounding airspace and do not lead to perverse environmental outcomes.

Recommendation 7

The Steering Committee recognises the continued importance of access by regional communities to Sydney (Kingsford-Smith) Airport both for access to the CBD and for transfers to flights to other destinations. The Committee does not recommend any reduction to the existing level of protection of slots for intrastate services; nor does the Committee support the forced relocation of any regional services to other airports.

The Steering Committee notes that a staged reduction in the level of use of small aircraft over time would assist in maximising the passenger throughput at the airport.

The Committee recommends that the Australian Government take action including amendments to the Slot Management Scheme to further limit access to new runway slots for smaller aircraft types, to maximise passenger throughput at the airport.

- The Committee supports preventing the allocation of slots for new services operated by aircraft of less than 50 seats from 2015, increasing to 70 seats from 2020.
- Recognising that the main use of aircraft up to 70 seats is for regional air services, slots allocated for services that are already operating should be grandfathered.

Aircraft Noise and the Long Term Operating Plan

Managing the balance between the needs of the airport and the impacts of aircraft noise on the surrounding communities is a key element in the planning for growth at Sydney (Kingsford-Smith) Airport. The Steering Committee does not support changes to the legislated curfew.

The use of alternate runway operating modes under the LTOP to enable the sharing of aircraft noise in the areas around the flight paths to Sydney (Kingsford-Smith) Airport has been a key measure in providing some respite to the communities most affected.

With the level of traffic growth expected, the scope to operate the noise sharing modes will be very limited by 2020. In the absence of new initiatives, the periods of respite offered for some communities will progressively become more and more limited, particularly for communities to the north of the airport. The impacts of this increased activity will be reduced somewhat by the fact that newer aircraft types have a smaller noise footprint.

Recommendation 8

The Steering Committee recommends that the LTOP for Sydney (Kingsford-Smith) Airport be reviewed with the aim of determining new, more effective measures of aircraft noise impacts and respite than the current runway end movement numbers.

- International experience regarding alternative approaches such as determining "noise budgets" and setting operating parameters for aircraft operations based on noise intensity and frequency of operation in noise sensitive hours should be examined, with a view to setting achievable noise reduction targets for the airport based on the use of new generation quieter aircraft types.

Protecting airspace around Sydney (Kingsford-Smith) Airport

It is important that the future operations of aircraft to and from Sydney (Kingsford-Smith) Airport are not restricted as a result of developments which intrude into protected airspace, create hazards to safe aircraft and airport operations or interfere with the operation of radar and other air navigation facilities.

Recommendation 9

The Steering Committee recommends that the Australian and NSW government agencies undertake an audit of existing and potential intrusions into the protected airspace for Sydney (Kingsford-Smith) Airport (addressing both the Procedures for Air Navigation Services – Aircraft Operations (PANS-Ops) and obstacle limitation surfaces (OLS)).

An agreement should be developed on statutory provisions in Australian and NSW government legislation to protect operations to and from the airport and on the administrative arrangements to support the implementation of those provisions and ensure their effective implementation.

- The arrangements should be extended to protect the operation of radar and other air navigation systems from interference arising from inappropriate location or design of structures in the airport vicinity.
- The Committee notes the pressure for continuing urban renewal in Australian cities, including in areas around airports. The Committee advocates appropriate strategic planning to support renewal opportunities without prejudicing the operation and development of airports as a result of airspace penetrations or inappropriate exposure to aircraft noise.

Optimising Use of Other Existing Airports in the Sydney Region

Airport sites are scarce and are difficult to replace or supplement. It is important that planning for each of the other existing airports, and the areas around them, should allow aviation activities to develop to the full practical potential of the sites, having regard to the physical capacity of each site and to the impacts on nearby communities.

The Australian and NSW governments need to urgently develop and agree policy and planning approaches, including airport noise amenity criteria, to guide development around airports particularly for Greenfield sites. It is critical to prevent inappropriate development within flight corridors which restrict the opportunities for future airport development.

Canberra Airport

Canberra Airport is an important airport with infrastructure capable of handling the full range of services, but is not located close enough to the Sydney market to take the role of Sydney's second RPT airport. It will serve a growing RPT market in southern NSW and will provide an additional option for a small proportion of Sydney passengers who are prepared to travel the extra distance.

Canberra Airport is the only curfew-free airport within reach of Sydney and provides the potential for night-time services which cannot be accommodated in Sydney, in particular international LCC services and overnight freight services. It is important that Canberra's 24 hour unrestricted curfew-free status be protected.

Recommendation 10

The Steering Committee recommends that the Australian, ACT and NSW governments work together to ensure that Canberra Airport is protected from encroaching noise-sensitive urban development which would be incompatible with 24-hour jet aircraft operations and could restrict the expansion of the airport over time into a significant domestic and international aviation centre for both passenger and freight services for south-eastern Australia.

- In particular, the current undeveloped approach and departure corridors to the north and south of the airport should be protected (as appropriate) from residential or other noise-sensitive development.
- The Australian, ACT and NSW governments should undertake a joint strategic planning study of these and other areas potentially affected by aircraft noise to ensure that appropriate zoning and infrastructure planning is put in place to avoid creating problems for the future.
- Measures to protect the future growth at Canberra Airport should be put in place quickly, recognising that there is already pressure for approval of greenfield residential developments in the southern corridor.
- The Committee considers that greenfield residential development in currently undeveloped approach and departure corridors, are not appropriate, having regard to the expected growth of operations at the airport and its role as an overnight hub for jet freight, noting the particular sensitivity of night-time noise.

RAAF Base Williamtown (Newcastle Airport)

Newcastle Airport is also too far from the Sydney market to serve as Sydney's second RPT airport, but will serve an important and growing market for the Hunter and Central Coast regions.

Given the aerodrome's role as the primary operational RAAF fighter base and the focus of future Joint Strike Fighter operations, its capacity to accommodate continued growth of civil operations is unclear.

Recommendation 11

The Steering Committee recommends that the Australian and NSW governments develop a joint strategy for accommodating growth in aviation demand for the Hunter and Central Coast regions, addressing short and long-term needs. Any opportunity for expansion of civil services has to be based on the aerodrome being able to meet its primary role as a RAAF fighter base.

- As an initial step, RAAF, Newcastle Airport and the aviation safety agencies should conduct a study to examine strategies to assist in meeting demand in the short-term, such as lifting the arrival rate permitted from six to eight per hour in defined peak periods.
- For the long term, the Australian and NSW governments, in consultation with RAAF and Newcastle Airport, should initiate a study to reach a clear assessment of whether the Williamtown site can meet the future needs of civil operations for the region north of Sydney, with regard to the forecast growth in the Hunter Valley and Central Coast. If the assessment is that Williamtown is not adequate to provide the necessary capacity, a strategy should be initiated for securing an alternative site for a civilian airport to service the region.

Action is also needed to ensure that Newcastle Airport is protected from encroaching urban development which would be incompatible with the airport's expansion and its operations as the primary RAAF Base in south-eastern Australia and a significant RPT airport.

Recommendation 12

The Steering Committee recommends that the NSW and Australian governments should develop a land use strategy, in consultation with Newcastle Airport, RAAF and the local councils, for land use and statutory protections in the areas around RAAF Base Williamtown and its flight-paths.

Bankstown Airport

The capacity of Bankstown Airport to accommodate services beyond the current General Aviation (GA) operations is affected by factors such as the short length of the three runways and potential airspace conflicts arising from the airport's proximity to Sydney (Kingsford-Smith) Airport flight-paths. The airport's location in a highly developed part of Sydney and the potential community impacts are also factors.

Subject to approval through the Master Plan process, Bankstown Airport could support up to about ten Instrument Flight Rules movements per hour by turboprop RPT aircraft. The airport is not suitable to accommodate jet RPT operations.

The Steering Committee supports further development of proposals for Bankstown Airport to be made available as a site for a level of turboprop RPT operations. The Committee does not support any forced relocation of RPT operations, but considers that Bankstown could provide an option for growth of operations by smaller RPT aircraft, including in particular regional services, as slots for additional services become unavailable at Sydney (Kingsford Smith) Airport.

A new Bankstown Airport Master Plan process is due to be conducted in 2012, with full public consultation, and a revised plan to be lodged early in 2013.

Recommendation 13

The Steering Committee recommends that Bankstown Airport and the Australian Government use the Master Plan process to resolve a strategy to allow Bankstown Airport to accommodate RPT operations by turbo-prop aircraft, with the following issues to be explored:

- the extent to which RPT operations might be permitted at Bankstown and any conditions which might be imposed on the operation of RPT services;
- the extent to which the main runway and associated infrastructure might be extended or upgraded to accommodate RPT aircraft, freight aircraft and business jets;
- any implications arising from the operation of RPT aircraft, freight aircraft or business jets for airspace and air traffic management in the region;
- the adequacy of existing surface transport links to allow RPT passengers to travel between Bankstown Airport and Sydney (Kingsford-Smith) Airport or the Sydney CBD;
- any implications for congestion affecting roads and intersections around the airport from the commencement of RPT services;
- an investment plan to support the changes required to accommodate RPT operations; and
- a surface transport investment plan for the upgrade of airport road links and key intersections to improve access between Sydney (Kingsford-Smith) Airport and Bankstown Airport.

NSW Government transport and planning agencies and Australian Government aviation agencies will need to work with Bankstown Airport in preparation of relevant analysis for the Master Plan process. This process also involves extensive public consultation.

The NSW Government should also initiate a strategic planning review to address the potential implications of the use of Bankstown for a level of RPT operations. This should be linked to any surface transport investment plan.

The proposal to open Bankstown to operations by turbo-prop RPT aircraft complements the proposal to prevent growth of additional small aircraft operations at Sydney (Kingsford-Smith) Airport. If new turboprop services, which typically serve regional routes, cannot be accommodated at Sydney (Kingsford-Smith) Airport, it is important that an alternative airport is available for those services.

In the initial years at least, the level of RPT operations at Bankstown Airport is likely to be at a level compatible with Bankstown's role as the major general aviation airport for the Sydney region.

RAAF Base Richmond

RAAF Base Richmond is an important economic driver for the North West subregion of Sydney. The RAAF's operational use of the site has decreased over time, and it is questionable whether the costs of maintaining the site as a base can be sustained if limited to the current range of uses. RAAF would support shared use of the site with some civil operations as a way to defray the operational costs and meet the investment needed to maintain the facility.

Given the loss of aviation facilities for the Sydney region over the past 20 years, it is critical to meeting Sydney's aviation growth and Australia's military response capability that Richmond be retained as an aerodrome to help serve Sydney's aviation needs. The Australian Government needs to ensure that the RAAF is able to continue to operate at the site and that other aviation users can utilise the aerodrome consistent with RAAF operational requirements.

For a relatively modest investment, civil services could be supported on the existing runway, providing RPT services up to something like five million passengers per year.

The location of Richmond in the northwest subregion of Sydney would provide an immediate market, improving access to services for residents of West and North West Sydney, rather than divert demand from Sydney (Kingsford-Smith) Airport. Initially, Richmond is likely to attract low cost carrier services to a small number of major domestic destinations. The market is likely to grow over time in line with projected population growth in the region.

The Steering Committee is conscious of the likely sensitivities in the local communities about the introduction of RPT services, particularly in relation to the additional exposure to aircraft noise. The Committee notes that an environmental assessment under Commonwealth law would be required for the change, which would include an extensive process of public consultation.

The Committee's expectation is that a curfew would be required for RPT services at Richmond.

Recommendation 14

The Committee recommends that the Australian Government initiate action to progressively open RAAF Base Richmond to a level of civil traffic using the existing east-west runway alignment. The civil traffic would be operated in parallel with continued Defence operations and under conditions agreed with the RAAF.

- As a first step, the Australian Government should undertake an environmental impact assessment process for the opening up of civil operations based on the investment and traffic scenarios set out in this Report for operations on the existing runway configuration. The assessment should include consideration of a curfew and any other appropriate conditions to protect amenity.
- Following the assessment, the Australian Government should move to formalise the arrangements for joint civil and RAAF use of the site, drawing on the example of the other federal leased airports, which accommodate both civil and military activity.
- The civil facility could be leased and operated under the Commonwealth *Airports Act 1996* with arrangements similar to the lease for Canberra Airport with RAAF's long term access to the airfield and the facilities it requires on the base and the civil airport lessee taking responsibility for the balance of the site.
- The arrangements should include development obligations to ensure provision of facilities for GA operations and RPT capacity without undue delay.
- The Australian and NSW governments, working closely with local government in the region, should initiate a strategic planning review to address the potential implications of the use of RAAF Base Richmond for a level of RPT operations.

Consideration was also given to an option of adding a new north-south runway at Richmond. This would allow a longer runway to be built, up to a length that would accommodate a full range of international and domestic services. A north-south alignment would also result in better outcomes for aircraft noise exposure, with flights avoiding the Richmond and Windsor townships.

For a north-south runway, acquisition of additional land and major relocations to existing road and rail systems would be required. As a result, this would be a high cost option for something that would not meet all of the projected long term aviation needs of the Sydney region.

Should RAAF Base Richmond be no longer required for RAAF use at some stage in the future, the aviation infrastructure must be retained and made available for civil use, including for GA.

A Greenfield Airport Site in the Sydney Region

None of the above changes would meet the projected long term demand for aviation in the Sydney region. The initiatives to make the most of Sydney (Kingsford-Smith) Airport and other existing airports will delay the impacts of a shortfall in airport capacity for some years, but by about 2030 or soon thereafter, a new airport will be required to supplement capacity.

The need for a new airport would not be overcome with the construction of a HSR network. HSR and additional aviation capacity should not be considered mutually exclusive, as shown in the number of countries constructing both HSR networks and new airports. These countries, and this Steering Committee, recognise both offer important economic and social benefits.

HSR is not a substitute for all air travel, especially international travel. A range of factors including frequency, travel time, cost, station location, and the likely competitive airline response, mean HSR will not remove the need for a supplementary airport.

Although previous studies have assessed a wide range of sites for a possible second RPT airport for the Sydney region, a fresh assessment was conducted *ab initio*. The search addressed the broader Sydney region, from the Hunter region in the north to Canberra in the south and the Blue Mountains to the west.

Localities were assessed to find a site suitable for either a:

- Type 1 airport – a full service airport with a runway length up to 4,000 metres, capable of serving all market segments and accommodating a future parallel runway layout; or
- Type 3 airport – a limited service airport with a runway length of up to 2,600 metres, capable of serving all market segments but with a single runway layout only.

Key issues in the shortlisting and site assessment included, but were not limited to:

- site suitability, in particular suitability of the terrain for airport construction;
- air navigation issues, including airspace conflicts with existing airports;
- environment and amenity impacts and protected ecosystems;
- proximity to demand;
- proximity to planned growth centres; and
- aviation development capacity.

A total of 18 locations were identified in the initial round of assessment, from which five were taken forward for further assessment. These comprised large areas of broadly suitable land identified in the Nepean and Hawkesbury localities, with smaller areas identified in the Cordeaux-Cataract, Burragorang and Central Coast.

The best sites in each locality were then assessed in more detail.

Figure 144 Five localities identified for site-specific analysis

Source: WorleyParsons/AMPC

Type 1 airport options

Site analysis was undertaken, including a technical analysis of the sites and an economic appraisal (rapid Cost Benefit Analysis) to compare suitable sites. The results showed that for a Type 1 airport, potential sites in the Nepean locality (including Badgerys Creek and Luddenham sites) were ranked the best in terms of proximity to Sydney's growth areas and had the highest Relative Benefit Cost Ratios (RBCRs). The RBCRs for the Nepean locality sites ranged from 2.7 for Luddenham to 2.4 for Greendale.

The next best site based on the quantitative economic analysis was located in Hawkesbury (Wilberforce). However, a Type 1 airport located at Wilberforce is likely to require closure of RAAF Base Richmond

The next best sites were Somersby on the Central Coast and the Wilton site in the Cordeaux Cataract locality. However, a Type 1 airport at Somersby would be constrained due to airspace interaction with Sydney (Kingsford-Smith) Airport;

The Wilton site in the Cordeaux-Cataract locality was best placed with regards to noise impacts and is also one of the least constrained sites in terms of airspace interactions, making it a strong overall site. It currently ranks lower on proximity to market, including the Sydney area growth centres, but would be well located if the south-west corridor becomes the key focus for long-term development beyond the life of existing planning instruments.

In light of the capacity forecasts and the economic cost if demand is not met, it is important that the process be initiated without delay, notwithstanding the cost and likely opposition from some in the areas around the preferred site.

The range of potential sites for consideration has continued to shrink as development has proceeded in the Sydney basin.

Figure 145 Potential new Sydney aviation sites previously identified

	Benefit/Cost Study of alternative Airport Proposals for Sydney (1971–74)			Major Airport needs of Sydney Study (1977–79)			Second Sydney Airport Site Selection Programme (1983–85)	
	Medium list	Select list	Short list	Zones	Sites/layouts	Short list	Nominated locations	Short list
North and west of city centre	Wyong*						Warnervale	
	Somersby						Somersby	
	Richmond**			NW: Londonderry	Londonderry		Londonderry	
	St Marys			NW: Richmond				
	Blue Gum Ck+	Blue Gum Ck	Blue Gum Ck	N: Scheyville	Scheyville	Scheyville	Scheyville	
	Marsden Pk	Marsden Pk	Marsden Pk					
	Rouse Hill			N				
	Galston	Galston		N: Galston				
	Prospect	Prospect				Sites foregone		
	Duffys Fst							
South and west of city centre	Towra Pt	Towra Pt	Towra Pt					
	Wattamolla							
	Long Point++	Long Point	Long Point	S: Holsworthy			Holsworthy	
	Bringelly	Bringelly	Bringelly	SW: Bringelly	Bringelly		Bringelly	
	Badgerys Ck			SW: Badgerys Ck	Badgerys Ck	Badgerys Ck	Badgerys Ck	Badgerys Ck
							Darkes Forest	
							Wilton	Wilton
	Canberra – Goulburn						Goulburn	

* Later called Warnervale.
** East of the Londonderry site.
\+ Later called Scheyville.
\+\+ Later called Holsworthy.

Source: Department of Aviation, Sydney Second Airport Site Selection Programme Draft Environmental Impact Statement, prepared by Kinhill Stearns, 1985

Recommendation 15

The Steering Committee recommends that the Australian and NSW governments commit to establishing a supplementary airport for the Sydney region.

- The site selected for a supplementary airport should be one which is capable of accommodating a full service airport serving all market segments and with a parallel runway layout (a "Type 1" airport in the terms of the assessment conducted for this Study). This would allow staged development as aviation activity develops, with a single runway operation initially and parallel runways in the long term.
- The Badgerys Creek site (in the Nepean region), which was acquired for a future airport clearly remains the best location to provide significant additional capacity. It is located close to growing markets in the western regions of Sydney and close to road and rail transport links. In turn, it would provide much needed employment and economic opportunities for the growing residential population of Western Sydney. The site has been

protected from encroaching development and given that the Commonwealth owns the land it would be less costly and disruptive to the community as a development site than other options. In particular an airport at this site and its associated employment opportunities will provide a significant catalyst to increase much needed housing supply in the region.

- The Committee is conscious of policy statements indicating that both Australian and NSW governments no longer see the site as suitable for airport development. The decision is one for governments, but a definitive decision is required now to confirm whether or not an airport can be built at Badgerys Creek.
- If the Badgerys Creek site is not ruled out by governments, the Environmental Impact Statement should be updated immediately. Subject to the outcomes of that process, planning and other work should commence to development infrastructure so RPT operations can commence as soon as possible, thereby maximising the opportunities for increased access to aviation services and employment in Western Sydney.

Recommendation 16

If Badgerys Creek is ruled out, Wilton is the next best site. The airspace interactions with Sydney (Kingsford-Smith) Airport are less constrained than other sites, and a smaller number of people impacted by both land acquisition and aircraft noise. Sydney's growth is expected to spread further to the southwest in the long term.

If Badgerys Creek is ruled out, the Steering Committee recommends that the Australian and NSW governments proceed without delay to secure and protect the Wilton site for the development of a supplementary airport in the future.

The following initial steps should be taken in the next 12 months with regards to Wilton:

- An Environmental Impact Statement assessment, and preliminary land acquisition planning, should be initiated in order to identify potential environmental issues and strategies for managing them.
  - Processes should be put in place for identifying the properties that would need to be acquired and to make preparations for the acquisition program.
  - A review of strategic planning instruments should occur to take account of the preferred airport site, looking beyond the life of existing instruments and recognising the potential for an economic driver like an airport to contribute to planning outcomes. Planning should commence for controls on land use and development in the areas surrounding the preferred site.
  - An early comprehensive community consultation and engagement program including local government should immediately commence.
- As a minimum a supporting infrastructure plan should be developed between the Australian and NSW governments. This should include planning on surface transport links and connections to utilities, including identification of the service corridors to be protected.

Wilton is further than Badgerys Creek from Sydney and the current planned growth centres. While Sydney's growth is expected to spread to the southwest in the long term, the level of business for a new airport at Wilton is likely to be lower than for an airport at Badgerys Creek in the initial years and the commencement of operations might not be viable by 2030 for Wilton. Opening RAAF Base Richmond to RPT services would provide improved access to aviation services for the growing population of western Sydney in the interim.

Recommendation 17

The Steering Committee recommends that, if Wilton is selected as the site for a supplementary airport, it is important that action proceed in the interim to open RAAF Base Richmond to a level of RPT operations.

The development of an additional airport will require a strong ongoing commitment from both the Australian and NSW governments.

Recommendation 18

The Steering Committee recommends that when a firm decision is reached to proceed with development of a supplementary airport and the preferred site, the decision should be locked in as an ongoing commitment of both governments through legislative actions in both the Australian and NSW Parliaments. This will provide planning certainty to support the development of Sydney, both by allowing the effective development of housing, employment and transport in the areas around the selected site, and by removing conjecture over the future of other possible sites that have been suggested for an airport.

Recommendation 19

The Steering Committee recommends that, if governments confirm that the Badgerys Creek site is not to be used as an airport, an agreed approach be developed for future use of the site, recognising its potential contribution to the supply of employment lands, affordable housing and community amenity facilities.

- The Australian and NSW governments should immediately agree to a detailed planning and zoning strategy for the site which effectively preserves the site for future employment lands for the South West Growth Centre and Western Sydney.
- The Australian Government should, in consultation with the NSW Government, undertake a scoping study of the future land disposal and sale options, to determine the optimal timetable for the land to be brought to the market.
- The Australian and NSW governments should consider a suitable public-private partnership land development joint venture for the site to provide an optimal strategy for infrastructure provision, land release and financing for urban development of the site.
- The Australian and NSW governments should jointly plan infrastructure investment and programming for the site, including possible extension of the South West Rail Line from Leppington to the site.
- The current state and local government restrictions on land surrounding the site, which were put in place to protect the site for a future airport development, could be removed.

Governance, Monitoring and Reporting

It is important that the Australian and NSW governments continue to work together in taking forward the strategy for ensuring adequate aviation capacity for Sydney. A wide range of actions by both governments, airport operators and others will need to be monitored and coordinated over a long period.

Recommendation 20

The Steering Committee recommends that the Australian and NSW governments establish a joint body and an agreed process for managing and monitoring implementation of the strategy, with access to a broad-based reference group.

- Regular reports should be provided to both governments, advising on trends in aviation activity and their impact on timeframes identified in this Report; identifying progress on all elements of the strategy; and highlighting significant issues encountered.
- What is expected of airport operators should be made clear and, where practicable, formalised in instruments such as airport master plans or lease agreements.
- The monitoring should include coverage of the adequacy of airport capacity for general aviation operations as well as RPT and freight services.

Conclusions

The Steering Committee has undertaken a comprehensive integrated planning review of one of the most critical planning and investment decisions facing Sydney, New South Wales and Australia – the future aviation infrastructure needs of the Sydney region.

The work of this Joint Study seeks to ensure that sufficient future aviation capacity is in place so that Sydney and Australia can and will benefit from the growth in population, air travel and business and personal mobility. Importantly, this Study has set out to integrate for the first time aviation planning with planning for Sydney's spatial growth and its surface transport investment.

Aviation is an economic driver and a social enabler for Australia. It creates jobs and underpins the future industries and communities which Australia needs. For Sydney, NSW and Australia to be positioned as global centres of finance, trade, high value technology and manufacturing, and to support the communities we want in the region, Sydney's aviation needs must be met now and into the future.

The Steering Committee well understands why solving the issues raised in this review have been contentious. However, the option of doing nothing is no longer available and the costs of deferring action are unacceptable.

The need for both short and long-term actions is clear.

The economic costs of inaction outweigh the costs and controversy of expanding airport capacity.

The spread of urban development in the Sydney basin means it is already very difficult to find a suitable site for a second RPT airport. The Joint Study has found that there is no optimal site that satisfies everyone. However, the options have now become very limited.

The opportunity to secure a suitable site is likely to disappear altogether if action is not put in train now.

The following presents the impact of the capacity constraints identified over the short, medium and long term and the subsequent actions recommended to address them. The Committee considers that these measures recommended can be implemented in parallel.

Timeframe	Issue	Impact	Action Recommended
Short Term (0–10 years)	Shortfall in Sydney (Kingsford-Smith) Airport aircraft stands	Increasing congestion and delays with some activity constrained by lack of stands	1. Initiate a new Master Plan process to develop a definite program of works at Sydney (Kingsford-Smith) Airport, bringing forward investments in terminals, aprons and parking for aircraft, providing for management of runway balance utilisation requirements and limiting taxiway congestion
	Weekday peak slots to access Sydney (Kingsford-Smith) Airport fully allocated	New entrants excluded from peak, only some will accept other times	2. Accelerate implementation of technologies and air traffic management practices to maintain traffic handling rates / efficiency 5. Lift Sydney (Kingsford-Smith) Airport statutory movement cap from 80 to 85 in peak hours to enable greater rates of handling of peak hour traffic 6. Review the slot management process and movement cap to ensure they are effective in preventing movements beyond set levels, ensuring efficient airport operations
	Roads and intersections at entrance to Sydney (Kingsford-Smith) Airport domestic terminal near constant traffic jam in peak periods	Increasing travel time and cost between Sydney (Kingsford-Smith) Airport and the CBD / other key locations	4. Develop agreed program of surface transport works, including: • Upgrade of roads and intersections in airport locality • Investment in suitable rolling stock/train paths to provide at least 20 peak airport trains per hour by 2020 and a further 10 per hour by 2035 • Expansion of public bus network to the airport • Facilitation of centralised bus/mini-bus transit point at the airport
	CBD-bound train services from Sydney (Kingsford-Smith) Airport at capacity in the morning peak	Train travel undesirable due to crowded carriages, greater road use increasing congestion	3. Develop strategy to increase rail patronage to access Sydney (Kingsford-Smith) Airport. This should include removal of the station access fee.
	Activity at Sydney (Kingsford-Smith) Airport consistently above level required for LTOP	Capacity to share noise and provide respite only available for few hours of the day	8. Review LTOP to determine more effective measures of aircraft noise impacts and noise respite, such as noise budgets and aircraft operating parameters
	Development occurring around few remaining options for future airport sites	Options for development of current and future sites compromised	14. Undertake environmental and other assessments for opening of RAAF Base Richmond east-west runway for civil traffic 15. and 16. Undertake environmental and other assessments; and land acquisition planning to secure site for future additional airport
	Development near Sydney (Kingsford-Smith) Airport, Canberra Airport and RAAF Williamtown / Newcastle Airport	Constraints on operations at existing airports due to inappropriate development	18. Decision to proceed with supplementary airport and preferred site locked in as an ongoing commitment of the Australian and NSW governments 9. Develop and implement Australian and NSW statutory provisions to protect operations to and from Sydney (Kingsford-Smith) Airport 10. Protect current undeveloped approach and departure corridors to Canberra Airport, to enable 24-hour aircraft operations and future expansion 12. Develop strategy for land use and statutory protections in areas around RAAF Base Williamtown
	Protected regional slots full at Sydney (Kingsford-Smith) Airport	Constraints on new regional services accessing Sydney region	13. Use Master Plan process to resolve a strategy to allow Bankstown Airport to accommodate RPT operations by turbo-prop aircraft
	Fragmented planning	Uncertainty for the community and businesses	20. Australian and NSW governments establish a joint body and agreed process

Timeframe	Issue	Impact	Action Recommended
Medium Term (10–25 years)	Civilian operations at RAAF Williamtown/ Newcastle Airport reach capacity in the peak	No new civilian services possible in peak times at Newcastle Airport	11. Develop strategy to meet aviation demand in the Hunter and Central Coast regions, on the basis of the current aerodrome's primary role as a RAAF base: • Examine short term strategies such as lifting arrival rate to 8 per hour in defined peak periods • Assess the site's ability to meet future civil demand, and if capacity deemed inadequate, initiate strategy to secure alternative site for a civilian airport
	Around 2027, all slots to access Sydney (Kingsford-Smith) Airport fully allocated Around 2033 aircraft movements at Sydney (Kingsford-Smith) Airport estimated to reach legislated cap of 80 movements per hour	New entrants excluded from flying to Sydney, with no opportunities for new carriers No new flights able to operate, growth only possible through fuller or larger aircraft $2.3 billion in foregone GDP for Australia ($6.0 billion foregone in NSW GSP)	7. Further limit access to new Sydney (Kingsford-Smith) Airport runway slots for smaller aircraft: • Prevent allocation of slots for new services operated by aircraft less than 50 seats (from 2015), increasing to 70 seats (from 2020) • Grandfather slots already allocated to regional air services operating aircraft up to 70 seats 15. Commence operations at supplementary airport at Badgerys Creek **or** 14. and 17. Progressively open RAAF Base Richmond to a level of civil traffic using the existing east-west runway alignment and 16. Progress development of Wilton as supplementary airport and 19. Agree approach for future use of Badgerys Creek site
Long Term (25–50+ years)	Demand cannot be met at Sydney (Kingsford-Smith) Airport if additional capacity is not operational by 2035	Unmet demand of approximately 665 million passenger movements and 9 million tonnes of air freight $34.0 billion foregone GDP for Australia ($17.5 billion foregone NSW GSP) 17,300 foregone jobs per annum in Australia (12,700 pa in NSW)	

PART TWELVE
APPENDICES

P12

A. Glossary of terms

Aircraft movement	One landing or one take off by an aircraft
Airport Master Plan	The principle planning document required under the *Airports Act 1996* setting out a 20-year plan for each leased federal airport.
Airservices Australia	The Australian Government agency providing air traffic control and related air traffic services, and airport rescue and fire fighting services.
Aprons	Defined areas for the safe parking of aircraft, where the passengers and freight are transferred between aircraft and terminal facilities, and where maintenance of aircraft takes place in between flights.
Australian Noise Exposure Concept (ANEC)	Similar to the ANEF except the word concept refers to the levels of noise exposure which would occur if particular future scenarios eventuated.
Australian Noise Exposure Forecast (ANEF)	A system developed as a land use planning tool aimed at controlling encroachment on airports by noise sensitive buildings. The system underpins Australian Standard AS2021 'Acoustics – Aircraft noise intrusion – Building siting and construction'. The Standard contains advice on the acceptability of building sites based on ANEF zones. ANEFs are the official forecasts of future noise exposure patterns around an airport and they constitute the contours on which land use planning authorities base their controls. It takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location.
Benefit cost ratio (BCR)	The ratio of benefits and costs of a project or proposal, expressed in monetary terms and discounted to bring the value to current day dollars. Commonly used to aid comparison of initiatives.
Bureau of Infrastructure, Transport and Regional Economics (BITRE)	Part of the Policy and Research Division of the Department of Infrastructure and Transport, BITRE provides economic analysis, research and statistics on infrastructure, transport, regional development and local government issues to inform both Australian Government policy development and wider community understanding.
Civil Aviation Safety Authority (CASA)	An independent statutory authority responsible for regulating aviation safety in Australia and the safety of Australian aircraft overseas.
Constrained forecast demand	Projections which take into account the impact of limited infrastructure availability. In the case of the Joint Study, this applies mainly to the long-term annual aviation forecasts, and the hourly aircraft movement and slot allocation forecasts.
Controlled airspace	Airspace of defined dimensions within which air traffic control services are provided in accordance with airspace classifications.
Cost benefit analysis (CBA)	Analysis, in monetary terms, of the benefits and costs to society of a proposed initiative.
Curfew	A restriction on certain flights taking off or landing from specified airports at designated times.
Dedicated freighter	Aircraft providing only air freight services
Direct economic impact	Economic impacts resulting from the initial, immediate economic activities (jobs and income) generated by a project or development. Direct impacts associated with the development coincide with the first round of spending in the economy. For example, a direct economic impact of tourists is the impact from expenditures at hotels, cafes, galleries and museums etc. Direct economic impact can be measured in terms of expenditure or value-added (See *indirect economic impact, expenditure, value add*)
Domestic passenger movements	For the purposes of the Joint Study, RPT passenger movements to and from capital cities and interstate (outside of NSW).

Environmental Impact Statement (EIS)	A detailed written statement prepared in accordance with relevant legislation which analyses the environmental impacts of a proposed action, including adverse effects of the initiative that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity and any irreversible and irretrievable commitment of resources. A period of public comment is required for an EIS to be finalised; consequently, it may be considered complete whilst the publication is draft.
Expenditure	Expenditure is the broadest measure of economic activity. It includes the full (gross) level of business revenues, which pays for costs of materials and costs of labour, as well as generating net business income (profits). Because of this, it is difficult to avoid double and triple counting. For example, the expenditure of tourists is the full dollar amount spent at hotels, cafes, galleries and museums etc.
Full service carrier airline	An airline service model which typically provides a price and seating structure based on varying levels of service, food and other facilities. (See *low-cost carrier*)
Gates	The physical location where passengers depart or arrive at a terminal to access aircraft either directly via aerobridges for contact stands or via bus or walking for remote stands.
General Aviation (GA)	A coverall term used to refer to the range of aviation operations not included in the definition of RPT passenger or air freight. This may include activities such as private leisure or sightseeing operations, emergency (aero-medical, search and rescue, fire-fighting) services, pilot training, surveying and aerial photography, and aero-agriculture services. They may also refer to niche charter or freight services operated on an ad-hoc basis.
Generalised trip cost	The sum of money price and user cost, with any additional costs to complete the door-to-door journey valued at money prices.
Global Economic Corridor (GEC)	A key employment zone, identified by the NSW Government as including commercial centres at Macquarie Park, Chatswood, St Leonards, North Sydney, Central CBD and Green Square / Mascot (including Sydney (Kingsford-Smith) Airport and Port Botany)
Global Financial Crisis	The global credit, banking, currency, and trade crisis which emerged in September 2008.
Indirect economic impact	Economic impacts resulting from the production, employment and income changes occurring in other businesses/industries in the community that supply inputs to the project industry. For example, an indirect impact of tourist expenditure at cafes is the impact on producers of food and coffee. (See *direct economic impact*).
Instrument flight rules (IFR)	A set of regulations under which the navigation of an aircraft is based on flight instruments, for example, ground based radio or satellite based navigational capability.
International passenger movements	RPT passenger movements to and from destinations outside Australia.
Leased federal airports	The 21 airports privatised under the *Airports Act 1996* where the airport operators lease the airport land from the Australian Government. Within the Sydney region, Sydney (Kingsford-Smith), Bankstown, Camden and Canberra airports are leased federal airports.
Load factors	Proportion of seats on an aircraft that are occupied by passengers.
Local Environment Plan	An environmental planning instrument prepared and administered by local governments.
Long Term Operating Plan (LTOP)	Introduced in 1997 to address concerns raised regarding aircraft noise at Sydney (Kingsford-Smith) Airport. It is a runway usage protocol designed to distribute aircraft noise as equitably as possible.
Low cost carrier (LCC)	An airline service model which traditionally has sought to pare back the benefits of all-inclusive fares in exchange for lower ticket prices. (See *full service carrier airline*)
Metropolitan Plan for Sydney 2036	The *Metropolitan Plan for Sydney 2036* was released in December 2010 and set out an integrated planning framework to provide the land use, services and infrastructure required to support future growth throughout Sydney to 2036.

Movement Cap	The Commonwealth *Sydney Demand Management Act 1997* provides a framework for the regulation of aircraft movements (take-offs and landings) at Sydney (Kingsford-Smith) Airport. The Act prescribes a maximum of 80 movements for every operating hour. This is measured in fifteen minute intervals, such that no more than 80 movements may operate at 7.00am to 8.00am, 7.15am to 8.15am, and 7.30am to 8.30am and so on.
Maximum Take-off Weight (MTOW)	The maximum gross weight, due to design or operational limitations, at which an aircraft is permitted to take off.
National Aviation Policy White Paper	The Australian Government released the *White Paper – Flight Path to the Future* on 16 December 2009 which brought together all strands of aviation policy into a single, forward-looking document providing planning, regulatory and investment certainty for the aviation industry out to 2020 and beyond.
Net present value (NPV)	The difference between a future stream of benefits and a future stream of costs, discounted to bring the value to current day dollars.
North West Growth Centre	A growth area defined by the NSW Government to be located within the boundaries of three local government areas The Hills, Blacktown and Hawkesbury. It comprises 16 precincts, is approximately 10,000 hectares in size and will contain about 70,000 new dwellings for 200,000 people.
N70	The number of times on an average day that an area may experience noise levels of 70 dB (A) or more from overflying aircraft, and generally expressed as a set of contours on a map. 70 dB (A) is the external noise level threshold for an average residence with doors and windows closed.
Obstacle Limitation Surfaces (OLS)	A series of surfaces that define the volume of airspace at and around an aerodrome to be kept free of obstacles in order to permit the intended aircraft operations to be conducted safely and to prevent the aerodrome from becoming unusable by the growth of obstacles around the aerodrome.
Passenger airlines / aircraft	Airlines or aircraft providing services for RPT passengers; typically, there is scope to transport freight in the cargo hold of such aircraft.
Performance Based Navigation (PBN)	A framework for defining performance requirements in 'navigation specifications'. PBN framework can be applied to an air traffic route, instrument procedure, or defined airspace. PBN provides a basis for the design and implementation of automated flight paths as well as for airspace design and obstacle clearance.
Planning day	Identified as the typical 'busy day' for airport planning purposes. There are a number of metrics used by airports to select a typical busy day for planning. For the purposes of the Joint Study, this was identified as the 30^{th} busiest day, to ensure considerations would accommodate the majority of services required, without overcatering for peaks such sa seasonal holidays.
Precision Runway Monitor (PRM)	A radar system that enables ATC to monitor simultaneous close parallel instrument approaches to airports. Under PRM procedures, ATC uses high resolution radar (with accuracy of about one milliradian) to ensure that aircraft on final approach to different runways do not come into conflict. The reduced separation standards enable the best possible movement rates.
Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS)	A set of rules set out by the International Civil Aviation Organization for designing instrument approach and departure procedures at aerodromes.
Regional passenger movements	Intrastate-NSW RPT passenger movements, that is to and from destinations within NSW. For the purpose of the Joint Study, flights between Canberra and the rest of NSW are defined as regional. Flights between Canberra and Sydney (Kingsford-Smith) Airport are defined as domestic.
Regional 'ring fence'	Provisions within the Slot Management Scheme to protect slots for intrastate NSW air services.
Regular Public Transport (RPT)	The movement of passengers or freight on a scheduled basis for a fee. For the purpose of this Report, RPT is limited to the discussion of passenger movements, with passengers on such services referred to as RPT passengers. Freight movements are considered separately.
Relative benefit cost ratio (RBCR)	In the context of the Joint Study, benefit cost analysis, providing a comparison between localities (rather than individually).

Runway mode of operation	The direction and flow of aircraft arriving and departing on the available runways, determined subject to weather conditions and/or level of traffic demand at any point in time.
Seat capacity	Number of seats available on an aircraft for sale
Separation standards	Minimum distances between aircraft to ensure safe operations, including avoiding the effects of wake turbulence from the preceding aircraft on the same route.
Slot Management Scheme	Under the *Sydney Airport Demand Management Act 1997*, allocates a specific time for flights to operate so as to minimise any bunching of demand and to ensure the airport operates with an efficient use of finite facilities thus avoiding unnecessary delay, while complying with the cap of 80 runway movements.
South West Growth Centre	A growth area defined by the NSW Government to be located within the boundaries of three local government areas Liverpool, Camden and Campbelltown. It comprises 18 precincts, is approximately 17,000 hectares and has capacity for around 110,000 new dwellings for 300,000 people.
Stands	The physical location of an aircraft parking position for either passenger or cargo aircraft.
Station access fee	Surcharge paid by rail users when accessing airport stations. It was part of the terms and conditions agreed to by the then NSW Government when it commissioned the construction of the line.
Sydney Airport Curfew Act 1995 (C'wlth)	The Act and the associated regulations regulate movements at Sydney (Kingsford-Smith) Airport between 11:00pm and 6:00am each day. The Act essentially prohibits the operation of large jet aircraft at Sydney (Kingsford-Smith) Airport during this period. There are very limited exceptions.
Sydney Airport Demand Management Act 1997 (C'wlth)	Sets a cap of 80 movements per hour on the runway and requires that the slot management scheme is consistent with the runway movement cap. In effect, this means that 80 is the maximum for both the runway movements and slot allocation.
Sydney Control Zone	The zone is controlled airspace approximately 10 nautical miles radius around Sydney (Kingsford-Smith) Airport.
Sydney region	For the purposes of this Report, the Sydney region is defined as far north as Williamtown in the Hunter and as far south as Canberra.
Taxiways	The links between the apron areas and the runways that facilitate the movement of aircraft around the surface of the aerodrome.
Upgauging	Replacing smaller aircraft with larger aircraft within the fleet of aircraft operated by an airline. In the context of passenger aircraft, this is usually associated with increasing seats available on an aircraft.
Unconstrained forecast demand	Projections which assume no capacity limitations (that is, presuming that adequate infrastructure will be available to meet demand) (see *constrained demand*)
Value add	Value-added is the wages and profit of expenditure, removing costs to avoid double counting. It nets out cost of goods sold and other expenses e.g. rent and utilities to avoid double-counting.
Visual Flight Rules (VFR)	A set of regulations under which a pilot operates an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going. The pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other aircraft.
Western Sydney Employment Area	An employment area defined by the NSW Government located near the intersection of the M4 and M7 motorways and is expected to eventually accommodate some 40,000 workers.

B. Characteristics by aerodrome reference code

Aerodrome code	Aircraft wingspan	Most common routes	Aircraft examples	Approx seat capacity
Code A	Up to 15 metres	General Aviation	Cessna Citation CJ1 Cessna 340/404 Beechcraft 390/55/Beechjet	5-10
Code B	15-24 metres	Regional	Saab 340 BAe Jetstream 32 Beechcraft SKA 200	13-37
Code C	24-36 metres	Domestic	Airbus A320 Boeing 737 Bombardier Dash 8	50-213
Code D	36-52 metres	Domestic	Boeing 767	214-249
Code E	52-65 metres	International	Airbus A330 Boeing 747 Boeing 777	253-400
Code F	65-80 metres	International	Airbus A380	489
Helicopter	N/A	General Aviation	Eurocopter EC-120 Robinson 44	N/A

Source: Airservices Australia, Booz & Company analysis

C. Abbreviations and acronyms

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ANEC	Australian Noise Exposure Concept
ANEF	Australian Noise Exposure Forecast
A-SMGCS	Advanced Surface Movement Guidance and Control System
ATC	Air Traffic Control
BCR	Benefit Cost Ratio
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CASA	Civil Aviation Safety Authority
CBA	Cost Benefit Analysis
CGE	Computable General Equilibrium
COAG	Council of Australian Governments
EIS	Environmental Impact Statement
FTE	Full Time Equivalent
GA	General Aviation
GDP	Gross Domestic Product
GEC	Global Economic Corridor
GSP	Gross State Product
HSR	High Speed Rail
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IVS	International Visitor Survey
LCC	Low Cost Carrier
LGA	Local Government Area
LTOP	Long Term Operating Plan
MTOW	Maximum Take-off Weight
NPV	Net Present Value
NSW	New South Wales
NSW BTS	NSW Bureau of Transport Statistics
NVS	National Visitor Survey
OLS	Obstacle Limitation Surfaces
PEI	Persons-Event Index
PRM	Precision Runway Monitor
RAAF	Royal Australian Air Force
RBCR	Relative Benefit Cost Ratio
RPT	Regular Public Transport
SACL	Sydney Airport Corporation Limited
SLA	Statistical Local Area
SODPROPS	Simultaneous Opposite Direction Parallel Runway Operations
VFR	Visual Flight Rules
WSEA	Western Sydney Employment Area

D. Technical papers

Paper group	Paper number	Paper title	Paper author
Volume 1			
A	1	Airport infrastructure in the Sydney region	WorleyParsons / AMPC
A	2	Aviation users: profile of aviation users in the Sydney region	BITRE
A	3	Forecast growth estimates for aviation activity in the Sydney region	Booz & Company
A	4	Variation in the realisation of identified capacity constraints	Booz & Company
Volume 2			
B	1	Sydney (Kingsford-Smith) Airport airfield capacity review	Landrum & Brown
B	2	Sydney (Kingsford-Smith) Airport additional demand and runway capacity analysis	Airservices Australia
B	3	Planning day peak spreading at Sydney (Kingsford-Smith) Airport	Booz & Company
B	4	Effect of forecast demand on the Long Term Operating Plan for Sydney (Kingsford-Smith) Airport	Airservices Australia
B	5	Effect of weather on aircraft delays at Sydney, Canberra and Newcastle Airports	Airservices Australia
B	6	Newcastle Airport planning day peak spreading	Booz & Company
B	7	Economic impact of not proceeding with additional aviation capacity in the Sydney region	Ernst & Young
B	8	Flow-on impact of delay based on passenger, aircraft and associated services at Sydney (Kingsford-Smith) Airport	Booz & Company
Volume 3			
C	1	Assessment of options for meeting aviation needs in the Sydney region	PwC
C	2	Sydney (Kingsford-Smith) Airport land transport capacity 2006–2036	Transport for NSW
C	3	Airspace requirements to support regular passenger transport operations at Bankstown Airport	Airservices Australia
C	4	Bankstown Airport and RAAF Base Richmond regular passenger transport scenarios	Airservices Australia
C	5	RPT Aviation Operations RAAF Base Richmond East West Runway Scenario	WorleyParsons/AMPC
C	6	Sydney (Kingsford-Smith) Airport current capacity and potential capacity enhancement Air traffic management implications of the civil use of RAAF Base Richmond	Airservices Australia
C	7	Effect of civil operations at RAAF Base Richmond on Sydney (Kingsford-Smith) Airport operations	Airservices Australia
C	8	Nature and extent of unmet demand that could be accommodated at an additional regular passenger transport facility	Booz & Company
C	9	RPT Aviation Operations RAAF Base Richmond North South Runway Scenarios	WorleyParsons/AMPC
Volume 4			
C	10	Airline-related cost and revenue issues at primary and non-primary airports	CAPA Consulting
C	11	Analysis of airport suitable sites: specified localities	WorleyParsons/AMPC
C	12	Report on initial location analysis: airspace considerations	Airservices Australia
Volume 5			
C	13	Aviation capacity cost benefit economic assessment	Ernst & Young
D	1	Preliminary evaluation of potential future uses of Commonwealth Land at Badgerys Creek	NSW Department of Planning and Infrastructure

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F Greenfield site analysis matrices

F – GREENFIELD SITE ANALYSIS MATRICES

The matrices presented in this Appendix are based on analysis undertaken by WorleyParsons/Airport Master Planning Pty Ltd (AMPC), with the purpose of providing comparative information to assess potential greenfield airport sites in the Sydney region. The matrices represent analysis that was undertaken over a number of phases and over a period of time. They are based on a limited set of data, and relate to indicative developments and site locations likely to be refined with environmental, commercial and other further assessments.

Matrix 1 Comparative assessment of localities identified in Phase 1 of the greenfield assessment process

Matrix 1 Comparative assessment of greenfield localities identified in Phase 1

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
General Locality Attributes	Geographic locality descriptor	Ellalong	Watagan Mountains	Yengo National Park and Macpherson State Forrest	Central Mangrove - Kulnura	Central Coast	Putty Road	Newnes State Forest and Plateau	Great Western Highway	Bell's Line of Road, Bilpin	Northern Hawkesbury River valley and slopes	Ku-ring–gai National Park and surrounds	Nepean River valley and slopes	The Oaks and surrounds	Wilton - Appin and surrounds	Mittagong, Moss Vale, Berrima and surrounds	North and south of the F5 between Goulburn and Marulan	North and south of the F5 between Marulan and Illawarra Highway Junction	West of Kiama Bypass
	Principal local government area	Cessnock	Cessnock Lake Macquarie Wyong	Cessnock Gosford Hawkesbury	Gosford Wyong	Lake Macquarie Wyong Gosford	Hawkesbury Lithgow Singleton	Blue Mountains Lithgow	Blue Mountains Lithgow	Blue Mountains Hawkesbury	Baulkham Hills Blacktown Hawkesbury Hornsby Penrith	Hornsby Gosford Pittwater Warringah	Blue Mountains Liverpool Penrith Wollondilly	Camden Wollondilly	Campbelltown Wingecarribee Wollondilly Wollongong	Wingecarribee	Goulburn – Mulwaree Upper Lachlan Wingecarribee	Goulburn – Mulwaree Upper Lachlan	Shellharbour
	Representative significant population centres within locality	Cessnock, Ellalong	Nil	Nil	Somersby/Central Mangrove, Kulnura	Gosford Wyong, Morisset, Toronto	Nil	Lithgow, Mt Victoria	Blackheath, Katoomba and townships of the city of the Blue Mountains	Nil	Penrith, Richmond, Windsor, Hills District	Hornsby, Berowra, Terrey Hills	Glenmore Park, Luddenham, Bringelly	Oakdale and The Oaks	Wilton and Appin	Mittagong, Bowral, Berrima, Moss Vale, Bundanoon, Hilltop and Colo Vale	Marulan	Marulan	Kiama
	Key transport system/s existing within locality	Local roads	Remote from existing systems; only fire trails	Wollombi Road; Great North Road SR33; fire trails	Peats Ridge Road (SH36); George Downes drive (33)	F3 Sydney-Newcastle Freeway; Pacific Highway; Main North Railway	Putty Road	Bells Line of Road; fire trails	Great Western Highway; Main Western Railway	Bells Line of Road	M7 Western Sydney Orbital; Bells Line of Road; Windsor Road; Blacktown Road; Putty Road; Old Northern Road; Richmond Railway Line	F3 Sydney-Newcastle Freeway (SH1); Pacific Highway (SH83); Mona Vale Road; Main North Railway	M4 Western Motorway; M7 Sydney Western Orbital; The Northern Road ; Elizabeth Drive; Bringelly Road	Burragorang Road; Montpellier Road; Silverdale Road	F5 Hume (South Western) Freeway; Main Southern Railway	F5 Hume (South Western Freeway); Illawarra Highway; Main Southern Railway	F5 Hume (South Western) Freeway; Main Southern Railway	F5 Hume (South Western) Freeway; Main Southern Railway	Princes Highway (SH1) Illawarra Railway
	Approximate size of locality (ha)	4,413	6,062	24,288	17,892	28,618	30,113	28,513	14,768	4,683	56,704	7,755	22,083	17,712	23,524	102,521	52,165	45,763	4,633
	General terrain description	Open rural land in undulating valley	Heavily dissected montane plateau with some long linear ridge lines	Heavily dissected montane plateau with some long linear ridge lines	Dissected montane plateau with some open, undulating rural land along long linear ridge lines	Undulating coastal plain with some areas of higher ground, with some areas of dissected montane plateau	Heavily dissected montane plateau with some long linear ridge lines	Heavily dissected montane plateau with some long linear ridge lines	Ridge line between major mountain valleys, dissected montane plateau with some open, undulating terrain along long linear ridge lines	Ridge line between major mountain valleys; dissected montane plateau with some open, undulating terrain along long linear ridge lines	Broad river valley with open rural land and gently undulating terrain in the west rising to higher ground in the east	Heavily dissected montane plateau with some long linear ridge lines	Broad river valley and gently undulating terrain to the east of the Nepean River with higher ground rising west from the river	Undulating plateau with open rural land - dissected rural land to the east and rising rugged forested terrain to the west	Heavily dissected montane plateau with open rural land and some long linear ridge lines adjoining the deep gorges of the major rivers	Cleared and open rural land on undulating hill slopes, with some river gorges and some forested higher ground	Cleared and open rural land on undulating hill slopes with some river gorges and some forested higher ground	Cleared and open rural land on undulating hill slopes with some river gorges and some forested higher ground	Cleared and open rural land on undulating hill slopes
	Typical elevation: above mean sea level (MSL)	~130 – 160m	~350 – 450m	~200 – 300m	~150 – 340m	~10 – 50m on coastal plain	~250 – 450m	~1,000 – 1,100m	~190 (Glenbrook) – 1,070 (Mt Victoria) m	~650 – 750m	~5 – 50m and up to 200 m on ridge lines	~100 – 200m on ridge lines	~40 – 100m on the eastern side with terrain rising to ~200m on the western side	~180 – 300m	~ 200m rising to 300m in the southeast	~600 – 750m	~600 – 750m	~600 – 700m	~10m to the north rising to 200m in the south
	Major river systems present	Sandy Creek	Many creeks	Many creeks	Many tributary creeks of the Macdonald River and Mangrove Creek	Narara, Ourimbah, Wyong, Dora, Wallarah, Wyee Creeks and tributaries flowing to the Central Coast lake system	Large number of tributary creeks to the MacDonald and Colo River Systems	Large number of tributary creeks to the MacDonald and Cox's River systems	Large number of tributary creeks to the Grose and Cox's River systems	Large number of tributary creeks to the Grose and Colo River systems	Hawkesbury River, Eastern and South Creeks and tributaries	Hawkesbury River Estuary and tributary creeks	Nepean River, Oakey, Badgerys and South Creeks	Monkey and local Creeks	Nepean, Avon, Cordeaux, Cataract Rivers; Allen Creek and tributaries; Cascade Creek	Wingecarribee River, Medway Rivulet; Nattai river tributaries; Wollondilly river tributaries	Wollondilly River tributaries; Paddy's River	Wollondilly River tributaries	Jerrara and local Creeks; Minnamurra River
	Existing or nearest airport in locality	Cessnock	Nil	Nil	Warnervale (private airfield) Cooranbong (now closed)	Warnervale (private airfield) Cooranbong (now closed)	Nil	Katoomba Airfield	Katoomba Airfield	RAAF Base Richmond	RAAF Base Richmond	Nil	Camden Airport; Wallacia and St Mary's (private airfields)	The Oaks (private airfield)	Wilton Parachuting Centre; Wedderburn (private airfield)	Mittagong Airport (private airfield)	Goulburn	Goulburn	Illawarra Regional Airport (north) HMAS Albatross (south)
	Previous airport proposals (SSA = Department of Aviation 1985 Second Sydney Airport Site Selection Program: Draft Environmental Impact Statement)	Nil	Nil	Nil	Somersby (SSA)	Warnervale (SSA)	Nil	Newnes Plateau	Nil	Nil	Londonderry; Richmond; St Mary's; Marsden Park; Scheyville; Galston; Rouse Hill/Nelson (SSA)	Duffy's Forest	Badgerys Creek airport sites (SSA)	Nil	Wilton; Darkes Forest (further to east and not in locality) (SSA)	Wells Creek (SSA)	Goulburn (SSA)	Goulburn (SSA)	Nil
Representative Airports Possible in Locality (OK means that, given a higher standard airport can be accommodated, it is assumed airport smaller Type may also be accommodated)	Airport Type 1 Runway/s; Site name (site number for reference purposes); Runway alignment	1 x 4000m **Ellalong** (1) 10/28	No airport sites identified	No airport sites identified	2 x 4000m **Kulnura** (4) 12/30 1 x 4000m **Priests Ridge** (5) 14/32 2 x 4000m **Mangrove Mountain** (7) 11/29 1 x 4000m **Peats Ridge** (8) 17/35	2 x 4,000m **Somersby** (9) 18/36	No airport sites identified	1 x 4,000m **Wollongambe** (31) 12/30	No airport sites identified	No airport sites identified	1 x 4,000m **Wilberforce** (10) 09/27	No airport sites identified	1 x 4,000m and 1 x 2,500m **Luddenham** (12) 01/19 2 x 4,000m **Bringelly** (13) 03/21 1 x 4,000m and 1 x 2,500m **Badgerys Creek** (21) 05/23	1 x 4,000m **The Oaks** (14) 17/35 1 x 4,000m **Silverdale** (16) 17/35	1 x 4,000m and 1 x 3,500m **Wilton**(15) 06/24 1 x 3,500m **Appin** (17) 14/32	2 x 4,000m **Belanglo**(19) 03/21 2 x 4,000m **Sutton Forest** (20) 17/35	3 x 4,000m **Marulan** (18) 17/35	1 x 4,000m **Towrang** (28) 04/22	No airport sites identified
	Airport Type 2 Runway/s; Site name (site number for reference purposes); Runway alignment	OK	No airport sites identified	No airport sites identified	OK	1 x 3000m **Cooranbong** (2) 01/19	No airport sites identified	OK	No airport sites identified	No airport sites identified	OK	No airport sites identified	OK	OK	OK	OK	OK	OK	1 x 3,000m **Kiama** (29) 16/34
	Airport Type 3 Runway/s; Site name (site number for reference purposes); Runway alignment	OK	1 x 2,500m **Watagan Forest Road** (33) 15/33	1 x 2,200m **Bucketty** (30) 11/29 1 x 2,500m **Mt Manning** (27) 17/35	OK	1 x2,500m **Wyee** (3) 03/21	1 x 2,600m **Mile Ridge** (23) 08/26 1 x2,500m **Mellong** (25) 18/36	1 x 2,500m **Sunnyside Ridge** (32) 01/19	1 x 2,500m **Mount Victoria** (34) 17/35 1 x 2,500m **Blackheath** (24) 04/22	1 x 2,500m **Warawalong** (26) 16/34	1 x 2,500m **West Portland** (22) 06/24	No airport sites identified	OK	OK	OK	OK	OK	OK	OK
	Airport Type 4 Runway/s	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	No airport sites identified	OK	OK	OK	OK	OK	OK	OK
	Other sites possible? (No, Probably not, Possibly yes, Yes)	No	Possibly yes	Possibly yes	Possibly yes	Yes	Yes	Yes	Yes	Yes	Yes	Probably not	Yes	Yes	Yes	Yes	Yes	Yes	Probably not

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Primary Criterion 1 – Capacity Created	Aircraft movements	**Ellalong** (1) up to 50 per hour or 240,000 pa	**Watagan Forest Road** (33) A up to 50 per hour or 240,000 pa	**Bucketty** (30) up to 50 per hour or 240,000 pa **Mt Manning** (27) up to 50 per hour or 240,000 pa	**Kulnura** (4) – up to 100 per hour or 370,000 pa **Priests Ridge** (5) – up to 50 per hour or 240,000 pa **Mangrove Mountain** (7) – up to 100 per hour or 370,000 pa **Peats Ridge** (8)– up to 50 per hour or 240,000 pa	**Somersby** (9)– up to 100 per hour or 370,000 pa **Cooranbong** (2) – up to 50 per hour or 240,000 pa **Wyee** (3) – up to 50 per hour or 240,000 pa	**Mile Ridge** (23) – up to 50 per hour or 240,000 pa **Mellong** (25) – up to 50 per hour or 240,000 pa	**Wollongambe** (31) – up to 50 per hour or 240,000 pa **Sunnyside Ridge** (32) – up to 50 per hour or 240,000 pa	**Mount Victoria** (34) – up to 50 per hour or 240,000 pa **Blackheath** (24) – up to 50 per hour or 240,000 pa	**Warawalong** (26) – up to 50 per hour or 240,000 pa	**Wilberforce** (10)– up to 50 per hour or 240,000 pa **West Portland** (22) – up to 50 per hour or 240,000 pa	No airport sites identified	**Luddenham** (12)– up to 100 per hour or 370,000 pa; **Bringelly** (13) – up to 100 per hour or 370,000 pa **Badgerys Creek** (21)– up to 100 per hour or 370,000 pa	**The Oaks** (16)– up to 50 per hour or 240,000 pa **Silverdale** (14) – up to 50 per hour or 240,000 pa	**Wilton** (15) – up to 100 per hour or 370,000 pa **Appin** (17) – up to 50 per hour or 240,000 pa	**Belanglo** (19) – up to 100 per hour or 370,000 pa **Sutton Forest** (20) – up to 100 per hour or 370,000 pa	**Marulan** (18) – up to 130 per hour or 500,000 pa	**Towrang** (28) – up to 50 per hour or 240,000 pa	**Kiama** (29) – up to 50 per hour or 240,000 pa
	Passengers (Based on *Sydney Airport Master Plan 2029* passenger forecasts and different fleet mix assumptions)	**Ellalong** (1) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million (based on 130 passengers per aircraft)	**Watagan Forest Road** (33) – up to 33 million pa (based on 140 passengers per aircraft mix). 19 million (based on 80 passengers per aircraft)	**Bucketty** (30) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million (based on 80 passengers per aircraft) **Mt Manning** (27) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million (based on 80 passengers per aircraft)	**Kulnura** (4) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million pa (based on 130 passengers per aircraft). **Priests Ridge** (5) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft) **Mangrove Mountain** (7) – up to 72 million pa (based on passengers per aircraft mix of 195). 48 million pa (based on 130 passengers per aircraft) **Peats Ridge** (8) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft)	**Somersby** (9) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million pa (based on 130 passengers per aircraft) **Cooranbong** (2) – up to 46.8M pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft) **Wyee** (3) – up to 33 million pa (based on 140 passengers per aircraft mix). 19 million pa (based on 80 passengers per aircraft)	**Mile Ridge** (23) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million pa (based on 80 passengers per aircraft) **Mellong** (25) Passengers – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million (based on 80 passengers per aircraft) (See note)	**Wollongambe** (31) – up to 46.8 million pa (based on passengers per aircraft mix of 195). 31 million pa (based on 130 passengers per aircraft) **Sunnyside Ridge** (32) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million pa (based on 80 passengers per aircraft) (See note)	**Mount Victoria** (34) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million (based on 80 passengers per aircraft) **Blackheath** (24) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million pa (based on 80 passengers per aircraft) (See note)	**Warawaralong** (26) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million pa (based on 80 passengers per aircraft) (See note)	**Wilberforce** (10) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft) **West Portland** (22) – up to 33 million pa (based on 140 passengers per aircraft mix.) 19 million pa (based on 80 passengers per aircraft)	No airport sites identified	**Luddenham** (12) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million pa (based on 130 passengers per aircraft) **Bringelly** (13) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million pa based on (130 passengers per aircraft) **Badgerys Creek** (21)– up to 65 million pa (based on passengers per aircraft mix of 195 on long runway and 140 passengers per aircraft mix on short runway (i.e. Type 1 plus Type 3).) 42 million pa (based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway)	**The Oaks** (16) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million based on 130 passengers per aircraft **Silverdale** (14) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft)	**Wilton** (15) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million at 130 passengers per aircraft **Appin** (17) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft)	**Belanglo** (19) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million based on 130 passengers per aircraft **Sutton Forest** (20) – up to 72 million pa (based on passengers per aircraft mix of 195.) 48 million pa (based on 130 passengers per aircraft)	**Marulan** (18) – up to 97.5 million (based on passengers per aircraft mix of 195.) 65 million pa (based on 130 passengers per aircraft)	**Towrang** (28) – up to 46.8 million pa (based on passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft)	**Kiama** (29) – up to 46.8 million pa (based passengers per aircraft mix of 195.) 31 million pa (based on 130 passengers per aircraft)
	Note: The higher elevation associated with the location may require a greater runway length for a given payload, compared to a location at a lower elevation. From a safety and efficiency perspective, locations in less mountainous terrain would be preferred.																		
	Ability to expand capacity in the future	**Ellalong** (1) Nil	**Watagan Forest Road** (33) Nil	**Bucketty** (30) Nil **Mt Manning** (27) Nil	**Kulnura** (4) Nil **Priests Ridge** (5) Nil **Mangrove Mountain** (7) Nil **Peats Ridge** (8) Nil	**Somersby** (9) Nil **Cooranbong** (2) Nil **Wyee** (3) Nil	**Mile Ridge** (23) Nil **Mellong** (25) Nil	**Wollongambe** (31) Nil **Sunnyside Ridge** (32) Nil	**Mount Victoria** (34) Nil **Blackheath** (24) Nil	**Warawaralong** (26) Nil	**Wilberforce** (10) Nil **West Portland** (22) - Nil	No airport sites identified	**Luddenham** (12) Possibly yes - 3rd runway **Bringelly** (13) Possibly yes - 3rd runway **Badgerys Creek** (21) Possibly yes - 3rd runway	**The Oaks** (16) Nil **Silverdale** (14) Nil	**Wilton** (15) Nil **Appin** (17) Nil	**Belanglo** (19) Nil **Sutton Forest** (20) Probably	**Marulan** (18)Already 3 runways	**Towrang** (28) Nil	**Kiama** (29) Nil
	Note: Nil capacity to expand relates to the representative airport in the ultimate configuration as nominated above on the nominated site only. It may or may not be possible to find a new and larger site elsewhere in the locality. It may be possible to commence with an airport at that site of a lower standard than that nominated and stage development.																		

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Primary Criterion 2 - Accessibility	Kilometres to connect locality reference point to existing rail links	27 km from Maitland Station and 32 km from Awaba station both on Main North Line	22 km from Morisset Station on Main North Line	63 km to Wyong Station on Main North Line and 75 km from Windsor Station on Richmond Line	17 km from Narara Station on Main North Line	2 km from Morisset Station on Main North Line	62 km from Windsor Station on Richmond Line	2 km from Newnes Junction Station on Main Western Railway	0 km from Wentworth Falls Station on Main Western Railway	28 km from Richmond Station on Main Western Railway	8 km from Windsor Station on Richmond Line	22 km from Pymble Station on North Shore Line	19 km from planned Leppington Station on South West Rail Link	20 km from Menangle Park Station and 25 km from Macarthur station on Main South Railway	12 km from Douglas Park Station on Main South Railway	Station on Main South Railway	Station on Main South Railway	Station on Main South Railway	<1 km from Kiama Station on Illawarra Line
	Rail connection difficulty: • Very remote >20 kms • Remote >10 kms • Proximate < 10kms • Very proximate < 5 kms Terrain difficulty: • Very difficult • Difficult • Relatively easy • Easy	Very remote Terrain very difficult Significant capacity constraint on Main North Line at Cowan Bank	Very remote Terrain very difficult Significant capacity constraint on Main North Line at Cowan Bank	Very remote Terrain very difficult Crossing of Hawkesbury River may be needed and duplication of Richmond Line	Remote Terrain very difficult Significant capacity constraint on Main North Line at Cowan Bank	Proximate Terrain difficult for Somersby – relatively easy for Cooranbong and Wyee Significant capacity constraint on Main North Line at Cowan Bank	Very remote Terrain very difficult Crossing of Hawkesbury River needed and duplication of Richmond Line	Proximate Terrain difficult Can be connected to Main West Railway which has capacity for additional four trains per hour	Proximate/very proximate Terrain difficult Can be connected to Main West Railway which has capacity for additional four trains per hour	Very remote Terrain very difficult Crossing of Hawkesbury River needed and duplication of Richmond Line	Remote/proximate 50 % of locality = very difficult 50% of locality = relatively easy Crossing of Hawkesbury River and full duplication of Richmond Line	Proximate Very difficult Urban areas and difficult terrain en route, with connection to existing at Pymble on 2.5% grade	Remote/proximate Relatively easy if connected to Extension of South West Rail Link Difficult if connected to Main West - Urban areas en route	Remote Difficult Areas of concern to connect to Menangle Park: Crossing Navigation Creek and Foot Onslow Creek, as well as Nepean River Areas of concern to connect to Macarthur station: Crossing Nepean River, Mount Annan Botanic Garden and Hume Highway	Proximate Relatively easy if incomplete existing alignment for Maldon - Dombarton line adopted	Proximate Relatively easy Main Southern Railway does not have sufficient capacity to serve a new airport	Proximate Relatively easy Main Southern Railway does not have sufficient capacity to serve a new airport	Proximate Relatively easy Main Southern Railway does not have sufficient capacity to serve a new airport	Very Proximate Relatively easy Single track railway between Kiama and Coniston needs duplication
	Capacity of the rail links and requirements for additional capacity	Requirements for providing additional capacity for 4 trains per hour A tunnel between Hawkesbury River and Berowra, due to the limit of capacity in Cowan Bank on Main Northern Railway	Requirements for providing additional capacity for 4 trains per hour A tunnel between Hawkesbury River and Berowra, due to the limit of capacity in Cowan Bank on Main Northern Railway	Requirements for providing additional capacity for 4 trains per hour On Main North Line: a tunnel between Hawkesbury River and Berowra, due to the limit of capacity in Cowan Bank on Main Northern Railway Or if connected to Richmond Line: duplication of Richmond Line If Western Express project goes ahead, there will not be capacity issues on the Western Line	Requirements for providing additional capacity for 4 trains per hour A tunnel between Hawkesbury River and Berowra due to the limit of capacity in Cowan Bank on Main Northern Railway	Requirements for providing additional capacity for 4 trains per hour A tunnel between Hawkesbury River and Berowra due to the limit of capacity in Cowan Bank on Main Northern Railway	Requirements for providing additional capacity for 4 trains per hour Duplication of Richmond Line If Western Express project goes ahead, there will not be capacity issues on the Western Line	Enough capacity for additional 4 trains per hour on the line Re-signalling and electrification If Western Express project goes ahead, there will not be capacity issues on the Western Line	Enough capacity for additional 4 trains per hour on the line Re-signalling and electrification If Western Express project goes ahead, there will not be capacity issues on the Western Line	Requirements for providing additional capacity for 4 trains per hour Duplication of Richmond Line If Western Express project goes ahead, there will not be capacity issues on the Western Line	Requirements for providing additional capacity for 4 trains per hour Duplication of Richmond Line With Western Express project going ahead there will not be capacity issues on the Western Line	Requirements for providing additional capacity for 4 trains per hour Quadruplication on North Shore Line Second harbour crossing	Requirements for providing additional capacity for 4 trains per hour on the Main South Line Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Requirements for providing additional capacity for 4 trains per hour on the Main South Line Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Requirements for providing additional capacity for 4 trains per hour on the Main South Line Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification New refuges south of Macarthur	Requirements for providing additional capacity for 4 trains per hour on the Main South Line Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification New refuges south of Macarthur	Requirements for providing additional capacity for 4 trains per hour on the Main South Line Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification New refuges south of Macarthur	Requirements for providing additional capacity for 4 trains per hour on the Main South Line Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification New refuges south of Macarthur	Requirements for providing additional capacity for 4 trains per hour on the Illawarra Line Duplication of single track railway between Kiama Re-signalling and electrification
	Kilometres to connect locality reference point to existing designated state roads/highways	28 km to Sydney Newcastle Freeway (F3)	18 km to Sydney Newcastle Freeway (F3)	60 km to Sydney Newcastle Freeway (F3) and 93 km to M7 Motorway	12 km to Sydney Newcastle Freeway (F3)	<5 km to Sydney Newcastle Freeway (F3)	80 km to M7 Motorway	18 km to Great Western Highway	0 km to Great Western Highway	47 km to M7 Motorway	24 kms to M7 Motorway	17 kms to M2 Motorway 16kms to F3 Freeway	15 kms to M7 Motorway	26 kms to Hume Highway	9 kms to Hume Highway	<5 kms to Hume Highway	<5 kms to Hume Highway	<5 kms to Hume Highway	3 kms to Princes Highway
	Road connection difficulty to freeway system: • Very remote >20 km • Remote >10 km • Proximate < 10km • Very proximate < 5km Terrain difficulty: • Very difficult • Difficult • Relatively easy • Easy	Very remote Terrain difficult Areas of concern: Sugarloaf range and Watagan National Park (the average speed on the existing connection is 55 km/h)	Remote Terrain very difficult (ascending Watagan Mountains) Areas of concern: Dora Pinnacle, Martinsville Hill and Watagan National Park (average speed of 25 km/h on Watagan Forest Road)	Very remote Terrain very difficult Areas of concern for northern connection: Mongo Creek, Hunter Range Areas of concern for M7 connection: Terrain, Yengo National Park, Hawkesbury River (average speed of 50 km/h on Wollombi Road)	Remote Terrain relatively easy Representative sites are close to main roads which would require upgrading	Very proximate Terrain relatively easy Areas of concern: Hunter Range, Ourimbah State Forest and Somersby residential area	Remote Difficult Areas of concern: Putty Road on a poor alignment; Hawkesbury River, Comleroy State Forest, Wollemi National Park	Remote Very difficult Areas of concern: Blue Mountains National Park and heights With Great Western Highway being upgraded there will be enough capacity for the generated traffic	Very proximate N/A With Great Western Highway being upgraded there will be enough capacity for the generated traffic	Very proximate Relatively easy Areas of concern: winding alignments on Bells Line of Road; Hawkesbury River, Kurrajong Heights, Hills and North Richmond residential areas	Proximate (Richmond Windsor) Very Remote (beyond Richmond/Windsor) Relatively Easy Areas of concern: Road system beyond Richmond Windsor; upgrading roads to Richmond/Windsor; Hawkesbury River, Windsor and Riverstone residential	Proximate (Mona Vale Road) Very remote (to Freeway) Terrain Relatively Easy Areas of concern: upgrade Mona Vale Road and connections to freeway system; Ku-Ring-Gai National Park, St Ives, Gordon and Pymble residential areas	Remote (freeway system) Very proximate (major roads e.g. The Northern Road) Easy Areas of concern: average speed on the connecting road is 60 km/h	Very remote (freeway system) Very proximate (major roads e.g. Burragorang Road) Easy The average speed on the connecting road is 60 km/h Areas of concern: Spitters Gully, Flaggy Creek, Nepean River, Camden South residential area and Mount Annan residential area	Very proximate Easy Areas of concern: The average speed on the connecting road is 50 km/h Areas of concern: capacity of exit and entrance ramps from and to Douglas Park Road	Very proximate (though this is a large locality and remote sites could be found) Easy to relatively easy	Very proximate (though this is a large locality and remote sites could be found) Easy to relatively easy	Very proximate (though this is a large locality and remote sites could be found) Easy to relatively easy	Very proximate Easy to relatively easy

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Primary Criterion 3 - Commercial opportunities	Existing employment land	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 0ha Zone 4 – 287ha	Zone 3 – 0ha Zone 4 – 1,700ha	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 0ha Zone 4 – 0ha	Zone 3 – 50 ha Zone 4 – 662 ha	Zone 3 – 12 ha Zone 4 – 6 ha	Zone 3 – 12 ha Zone 4 – 137 ha	Zone 3 – 0 ha Zone 4 – 0 ha	Zone 3 – 6 ha Zone 4 – 0 ha	Zone 3 – 81 ha Zone 4 – 425 ha	Zone 3 – 0 ha Zone 4 – 0 ha	Zone 3 – 0 ha Zone 4 – 0 ha	Zone 3 – 50 ha Zone 4 – 87 ha
	Potential employment land	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 62ha	Potential Employment Land – 0ha	Potential Employment Land – 1,062ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha	Potential Employment Land – 0ha
	Land capable of being converted to employment lands zoned (1) Rural (6) Public Open Space (7) Environment Protection (8) National Park	Rural – 3,950ha Open Space – 81ha Environment Protection – 0ha National Park – 0ha Total 4,031	Rural – 4,725ha Open Space – 0ha Environment Protection – 0ha National Park – 456ha Total 5,181	Rural – 4,487ha Open Space – 0ha Environment Protection – 0ha National Park – 18,281ha Total 22,769	Rural – 6,987ha Open Space – 2,537ha Environment Protection – 325ha National Park – 7,387ha Total 17,237	Rural –13,531ha Open Space – 4,437ha Environment Protection – 4,944ha National Park – 25ha Total 22,937	Rural –3,587ha Open Space – 1,319ha Environment Protection – 10,150ha National Park – 419ha Total 15,475	Rural –394ha Open Space – 187ha Environment Protection – 0ha National Park – 675ha Total 1,256	Rural –0ha Open Space – 6ha Environment Protection – 0ha National Park – 3,537ha Total 3,544	Rural –0ha Open Space – 0ha Environment Protection – 1,419ha National Park – 3,094ha Total 4,592	Rural – 36,206ha Open Space – 1,794ha Environment Protection – 6,287ha National Park – 2,831ha Total 47,119	Rural – 656ha Open Space – 3,581ha Environment Protection – 56ha National Park – 31ha Total 4,325	Rural – 12,556ha Open Space – 256ha Environment Protection – 19ha National Park – 419ha Total 13,250	Rural – 4,137ha Open Space – 19ha Environment Protection – 1,200ha National Park – 11,862ha Total 17,219	Rural – 5,694ha Open Space – 200ha Environment Protection – 969ha National Park – 15,694ha Total 22,556	Rural – 39,887ha Open Space – 975ha Environment Protection – 32,944ha National Park – 18,894ha Total 92,700	Rural – 48,212ha Open Space – 87ha Environment Protection – 675ha National Park – 0ha Total 48,975	Rural – 43,044ha Open Space – 0ha Environment Protection – 0ha National Park – 281ha Total 43,325	Rural – 831ha Open Space – 394ha Environment Protection – 1,175ha National Park –0ha Total 2,400
	Note: Existing employment land is land currently zoned (3) Commercial; and (4) Industrial. Whilst Zone (1) Rural (5) Special Use may contain employment opportunities, for the purpose of this project it has not been included in the employment land calculations. Note: Potential employment land includes investigation areas as identified in the Sydney Metropolitan Strategy 2036 (NB draft subregional strategies will be included when finalised).																		
Primary Criterion 4 - Proximity of Users	Average raw road travel time (2010) – Ermington (ABS 2010 Sydney Statistical Division centre of population) to locality reference point	116	113	111	64	76	100	99	68	64	48	49	39	68	62	81	102	115	102
	Average raw rail travel time (2010) from Parramatta to nearest station to locality (See note)	195	95	35	105	100	35	145	85	45	35	60	45	65	70	115	150	160	160
	Proportion and number of residents with a faster travel time to the locality than to Sydney (Kingsford-Smith) Airport (Of total of 4,470,155 people)	15% 682,402	15% 682,127	15% 665,105	17% 752,276	15% 684,231	4% 186,580	3% 136,968	6% 250,044	7% 297,894	32% 1,430,219	23% 1,034,043	28% 1,241,975	8% 351,603	9% 413,279	4% 164,980	4% 156,880	2% 73,187	6% 269,208
	Rank of localities in terms of size of population being closer than Sydney (Kingsford-Smith) Airport (See note)	6	7	8	4	5	14	17	13	11	1	3	2	10	9	15	16	18	12
	Attractiveness Index: i) actual average road travel speed ii) adjusted for different average speeds (Note: Sydney (Kingsford-Smith) Airport = 95)	i) 44 ii) 46	i) 53 ii) 54	i) 59 ii) 57	i) 66 ii) 70	i) 54 ii) 62	i) 50 ii) 52	i) 44 ii) 49	i) 54 ii) 65	i) 58 ii) 71	i) 80 ii) 81	i) 85 ii) 83	i) 79 ii) 81	i) 63 ii) 75	i) 65 ii) 75	i) 46 ii) 59	i) 29 ii) 42	i) 18 ii) 30	i) 47 ii) 52
	Ranking by locality attractiveness, assuming actual average road travel speed (Note: Sydney (Kingsford-Smith) Airport = 1)	16	12	8	5	10	13	17	11	9	3	2	4	7	6	15	18	19	14
	Ranking by locality attractiveness, adjusted for different average road speeds (Note: Sydney (Kingsford-Smith) Airport = 1)	17	13	12	8	10	14	16	9	7	4	2	3	5	6	11	18	19	15
	Note 1: As the attractiveness measure was based on distance-based data rather than time, and there are marked differences in the average speeds of travel along the major radial arterial roads leading away from Sydney, an adjustment was made. This was in the form of a reduction of distance along the travel path from Ermington to each locality, equivalent to the additional distance that could be travelled towards that locality as compared to travel to Sydney (Kingsford-Smith) Airport — in effect making those localities relatively closer to Ermington – this is an approximate way of compensating for the differences in average travel and generally has the effect of improving that locality's Attractiveness Index, particularly for those localities which are astride the major road system. Note 2: Ranking of localities is against one to another, not in comparison to Sydney (Kingsford-Smith) Airport which has by far the largest population for whom it is the closest locality. Note 3: For raw rail times, many localities are remote from a railway station hence additional time for non-rail component must be considered.																		

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Primary Criterion 5 – Restrictions Due Nature of Sites	Key restrictions on airport development Note: Takeoff and approach surfaces only assessed against terrain using 1:25,000 topographic maps (various survey dates)	**Ellalong** (1) – **Major** Terrain Obstacle limitation surface infringement at eastern approach near Sugarloaf Range – further assessment required. Minor terrain infringement at outermost western approach near Millfield.	**Watagan Forest Road** (33) **- Minor** Overhead high voltage power lines in south east approach and horizontal section. Preliminary assessment indicates no OLS terrain infringements.	**Bucketty** (30) **– Minor** Overhead high voltage power lines in south east approach horizontal section. Preliminary assessment indicates no OLS terrain infringements. **Mt Manning** (27) **– Major** Overhead high voltage power lines in south approach. Terrain OLS infringements on both north and south approaches will require further assessment.	**Kulnura** (4) **- Minor** Power lines in south east and north west approach. Removed from Sydney Newcastle oil and gas pipelines. Preliminary assessment indicates no OLS terrain infringements. **Priests Ridge** (5) **- Moderate** Overhead power line at southern end of airport needs relocation or undergrounding. Minor OLS terrain infringement at northern runway end requires earthworks. **Mangrove Mountain** (7) **-Moderate** Two power lines need to be undergrounded or relocated. Very minor OLS terrain infringement in the north west approach of the southern runway. **Peats Ridge** (8) **- Moderate** Overhead 330kV power lines on the north east and south west approach some 7 kms from the runway ends. Minor terrain OLS infringements on the north east approach. This may require some earthworks	**Cooranbong** (2) – **No Restriction** Proximity to Eraring Power Station to the east. Close to Sydney Newcastle oil and gas pipelines. Trunk cables across site. **Wyee** (3) - **Moderate** Proximity to Eraring Power Station to the east and possible danger area needs to be assessed. Close to Sydney Newcastle oil and gas pipelines. Close to the Main Northern Railway. Anticipated minor OLS terrain infringements for south west approach. **Somersby** (9) **- Moderate** Two power lines need to be relocated and undergrounded. The Sydney Newcastle oil and gas pipelines run immediately to the east of the airport. Preliminary assessment indicates a very minor OLS terrain infringement on the north west approach of the western runway.	**Mile Ridge** (23) **- Minor** Overhead high voltage power lines in west approach. Major terrain infringement in horizontal section of west approach. Further assessment is required. **Mellong** (25) **- Major** Overhead power lines in south approach and to the east of the runway. Preliminary assessment indicates no OLS terrain infringements. **Caution:** Notwithstanding it may be physically possible to site a runway/airport in these locations which meets the prescribed geometric requirements, there could be significant and as yet unassessed meteorological issues associated with conducting aircraft operations. These would include matters such as mechanical turbulence, wind shear potential and the propensity for fog events.	**Wollongambe** (31) **– Major** Preliminary assessment indicates no OLS terrain infringements **Sunnyside Ridge** (32) **– Major** Major overhead high voltage power lines to Wallerawang Power Station in horizontal section of south west approach require further investigation. This approach is also over the Marrangaroo Restricted Area R520 (Army Explosives Demolition Facility) which is assumed will be relocated. Preliminary assessment indicates no OLS terrain infringements. Height of Wallerawang Power Station stacks needs to be further investigated in regard to the OLS horizontal surface and also in regard to the impact of the stack's exhaust plumes in accordance with Civil Aviation Safely Authority guidelines. **Caution:** Notwithstanding it may be physically possible to site a runway/airport in these locations which meets the prescribed geometric requirements, there could be significant and as yet unassessed meteorological issues associated with conducting aircraft operations. These would include matters such as mechanical turbulence, wind shear potential and the propensity for fog events.	**Mt Victoria** (34) **– Major** Overhead high voltage power line in north approach. Terrain OLS infringements in south approach. Further assessment is required. **Blackheath** (24) **– Major** Overhead high voltage power line traverses the site. Requires relocation or undergrounding. Preliminary assessment indicates no OLS terrain infringements. **Caution:** Notwithstanding it may be physically possible to site a runway/airport in these locations which meets the prescribed geometric requirements, there could be significant and as yet unassessed meteorological issues associated with conducting aircraft operations. These would include matters such as mechanical turbulence, wind shear potential and the propensity for fog events.	**Warawaralong** (26) **– Minor** Overhead power lines traverse the airport site and require undergrounding or relocation; Preliminary assessment indicates no OLS terrain infringements **Caution:** Notwithstanding it may be physically possible to site a runway/airport in this location which meets the prescribed geometric requirements, there could be significant and as yet unassessed meteorological issues associated with conducting aircraft operations. These would include matters such as mechanical turbulence, wind shear potential and the propensity for fog events.	**Wilberforce** (10) - **Major** Three overhead HV powerlines in east approach and one in west approach require further investigation. Terrain OLS infringement in horizontal sections of east approach and west approaches, subject to further assessment. **West Portland** (22) **- Minor** Overhead HV powerlines in east approach and west approach require further investigation. Preliminary assessment indicates no OLS terrain infringements.	No airport sites identified	**Luddenham** (12) – **Major** Assumes Defence establishment for explosives at Orchard Hills is relocated and associated danger area extinguished. Overhead power lines in eastern and western approaches. Terrain OLS infringement in horizontal section of western approach of northern runway. Further assessment is required. **Bringelly** (13)**- Major** Overhead high voltage power lines on airport site and in west and east approaches of northern runway will need to be relocated or undergrounded. In designing PANS-OPS it is possible that Orchard Hills establishment will need to be relocated. Further risk/operational assessment is required. Terrain OLS infringement in horizontal section of west approach of northern runway. Further assessment is required. **Badgerys Creek** (21) **– Major** Overhead high voltage power lines lie in the west approaches of both runways and on the northern runway alignment and will need to be relocated or undergrounded. Overhead high voltage power lines lie in the horizontal section of both east approaches and will require further investigation. Terrain OLS infringements occur in horizontal sections of the west approaches of both runways. Further assessment is required.	**Silverdale** (14) – **Minor** Power lines on north east approach. Power lines immediately east of the south west approach. Preliminary assessment indicates no OLS terrain infringements. **The Oaks** (16) – **Minor** power lines on north east approach. Power lines immediately east of the south west approach. Preliminary assessment indicates no OLS terrain infringements.	**Wilton** (15) - **Moderate** Possible OLS terrain infringement at south west approach. **Appin** (17) - **Moderate** Terrain OLS infringements on south east approach - further assessment required. High voltage power lines and radio tower infringe OLS on south east approach.	**Belanglo** (19) – **Moderate** Terrain/OLS infringement in southern approach of eastern runway, subject to further assessment. **Sutton Forest** (20) **– Major** Power line and railway line on the eastern approach, immediately north of airport is Gingenbullen mountain and to east between runways is Mt Broughton. Subject to further terrain OLS assessment.	**Marulan** (18) – **Moderate** Two overhead high voltage powerlines in north approach of all runways. Four overhead high voltage power lines in south approaches to all runways. Requires further investigation.	**Towrang** (28) – **Moderate** Overhead high voltage power lines in south east approach and horizontal section. Three terrain OLS infringements in horizontal section of south east approach require further assessment.	**Kiama** (29) – **Major** Tallawarra Power Station is in the north approach. The possible stack plume issue needs further assessment using CASA guidelines.
	• **Major** – Difficult terrain environment close to cliffs and mountains and with potential significant meteorological issues. Major civil works may be required. • **Moderate** – Local terrain OLS infringement which may need some major civil works. • **Minor** – Local Infrastructure (overhead power line) OLS infringement which may need relocation and civil works. • **No Restriction** – No terrain / OLS infringement.																		
	Comparison of representative airports based on interaction with existing air traffic management arrangements (preliminary comparison)	**Ellalong** (1) – Major	**Watagan Forest Road** (33) – Major	**Bucketty** (30) – Major **Mount Manning** (27) - Major	**Kulnura** (4) - Major **Priests Ridge** (5) – Major **Mangrove Mountain** (7) – Major **Peats Ridge** (8) – Major	**Cooranbong** (2) – Major **Wyee** (3) - Major **Somersby** (9) – Major	**Mile Ridge** (23) – Major **Mellong** (25) – Major	**Wollangambe** (31) - Major **Sunnyside Ridge** (32) - Major	**Mount Victoria** (34) - Major **Blackheath** (24) - Major	**Warawaralong** (26) - Major	**Wilberforce** (10) - Major **West Portland** (22) – Major	No airport sites identified	**Luddenham** (12) – Major **Bringelly** (13) – Major **Badgerys Creek** (21) – Major	**Silverdale** (14) – Major **The Oaks** (16) - Major	**Wilton** (15) – Major **Appin** (17) – Major	**Belanglo** (19) – Minor **Sutton Forest** (20) – Minor	**Marulan** (18) – Minor	**Towrang** (28) - Minor	**Kiama** (29) - Major
	• **Major -** Airspace where there are significant levels of civil air transport traffic and military activity, such as around Sydney, Williamtown, Nowra and Richmond, together with their respective CTR/CTA, and operational procedures and requirements; or Restricted Areas particularly those with provisional classifications of RA3 and RA2; or Danger Areas associated with military flying training. • **Minor -** Airspace where there are lower levels of civil traffic and non-towered aerodromes; or Danger Areas.																		

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Primary Criterion 6 – Noise Impact on Residents – Type 1 and 3 Airports only	Ability to avoid or mitigate noise (Not Applicable = noise sharing not considered an issue)	Runway alignment optimised to minimise noise impacts at Ellalong, Paxton and Millfield. Limited ability to minimise / avoid noise impact.	Not Applicable	Not Applicable	**Kulnura** Runway alignment optimised to minimise noise impact in Central Mangrove and Mangrove Mountain. Limited ability to minimise/avoid noise impact.	**Cooranbong** Runway alignment optimised to minimise noise impact on the Lake Macquarie areas. Limited ability to further minimise/avoid noise impact.	Not Applicable	Not Applicable	**Mount Victoria** Runway alignment optimised to minimise noise impact in Blackheath and Mount Victoria, limited ability to minimise /avoid noise impact.	Not Applicable	**Wilberforce** Runway alignment optimised to avoid noise impact on Wilberforce, Kurrajong, Windsor and Richmond. Limited ability to minimise /avoid noise impact.	No airport sites identified.	**Luddenham** Runway alignment optimised to minimise the impact on Penrith and Luddenham. Limited ability to minimise /avoid noise impact.	**Silverdale** Runway alignment optimised to minimise impact on Silverdale and The Oaks for a Type 1 airport. Limited ability to minimize /avoid noise impact.	**Wilton** Runway alignment optimised to minimise noise impact on Bargo. Limited ability to further minimise/avoid noise impact.	**Belanglo** Runway alignment optimised to minimise noise impact on Berrima. Limited ability to further minimise/avoid noise impact.	Runway alignment optimised to minimise noise impact on Marulan and Tallong.	Runway alignment optimised to minimise noise impact on residents in Marulan and Goulburn area. Limited ability to further minimise /avoid noise impact.	Runway alignment optimised to minimise impact on the Shell Harbour. Limited ability to further minimise/avoid noise impact.
	Type 1 airports Total population within 20 (25) Australian Noise Exposure Forecast (ANEF) contour/s. (Note: all airports assumed to be single runways). (Not Applicable = noise sharing not considered an issue).	Ellalong 444 (155)	Not Applicable	Not Applicable	Kulnura – 738 (266) Priests Ridge – 616 (164) Mangrove Mountain – 592 (213) Peats Ridge – 947 (372)	Cooranbong – 4,071 (1,930) Somersby – 10,390 (5,727)	Not Applicable	Wollangambe – 61 (23)	Not Applicable	Not Applicable	Wilberforce – 5251 (1,892)	No airport sites identified.	Luddenham – 11564 (592) Bringelly – 7,024 (624) Badgerys Creek – 4,444 (1,493)	Silverdale – 2,427 (346) The Oaks – 3370 (1,342)	Wilton – 2,351 (438) Appin – 3,087 (281)	Belanglo – Not available Sutton Forest – 712 (170)	Marulan – 166 (71)	Towrang – 355 *(58)*	Kiama – 9,683 *(585)*
	Comments (ANEF contours are based on an Australian Noise Exposure Concept (ANEC)).	May affect residents in Ellalong, Paxton and Millfield in the west, Kitchener and Abernethy in the north and Mulbring in the east.	No major urban areas close to the possible airport	No major urban areas close to the possible airports	**Kulnura** Southwest of the airport, may affect residents in Central Mangrove, and Mangrove Mountain.	**Cooranbong** North of airport may affect residents in Barnsley, West Wallsend, Killingworth. South of the airport may affect residents in Morisset, Dora Creek and Cooranbong.	No major urban areas close to the possible airports.	No major urban areas close to the possible airports.	Close to Blackheath in the south and Mount Victoria in the west.	No major urban areas close to the possible airport.	**Wilberforce** Close to Wilberforce, Windsor and Richmond areas in the south and Kurrajong and Glossodia in the west, likely to affect residents at Glossodia.	No airport sites identified.	**Luddenham** Residents in South Penrith, Werrington and Claremont Meadows northeast of the airport will be within the 20-25 ANEC contours. Close to Mulgoa, Wallacia and Luddenham.	**Silverdale** Residents in Silverdale will be within the 25 ANEC contour. South of the airport, residents at the Oaks will be within the 20 ANEC contour.	**Wilton** Residents at Bargo would be within the 20 ANEC contour west of the airport.	**Belanglo** Close to Berrima north of the airport.	Close to Marulan and Tallong south of the airport.	Close to Marulan and Kenmore in the east.	Residents in Kiama, Kiama Heights, Kiama Downs, and Werri Beach will within the 25 ANEC contour, and residents at Oaks Flats in the north will be within the 20 ANEC contour for a type 1 airport
	Ability to share noise (Not Applicable = noise sharing not considered an issue)	Not Applicable	Not Applicable	Not Applicable	**Kulnura** Limited ability for noise sharing	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Wilberforce** Not Applicable	No airport sites identified.	**Luddenham** Limited ability to noise share.	**Silverdale** Not Applicable	**Wilton** Limited ability to noise share	**Belanglo** Some ability to noise share	Some ability to noise share	Not Applicable	Not Applicable
	Type 3 airports Total population within 20 (25) ANEF contour/s. (Note: all airports assumed to be single runways)	Ellalong 91 (42)	Watagan Forest Rd 243 (9)	Bucketty 15 (7) Mt Manning 4 (2)	Kulnura 175 (77) Priests Ridge 95 (42) Mangrove Mountain 126 (61) Peats Ridge 212 (86)	Cooranbong 935 (193) Wyee 2,816 (1073) Somersby 1,624 (166)	Mile Ridge 5 (2) Mellong 5 (2)	Sunnyside Ridge 5 (2) Wollangambe 16 (8)	Mount Victoria 243 (9) Blackheath 26 (3)	Warawaralong 69 (34)	West Portland 292 (104) Wilberforce 884 (299)	No airport sites identified.	Luddenham 389 (179) Bringelly 415 (221) Badgerys Creek 821 (372)	Silverdale 198 (76) The Oaks 1036 (530)	Wilton 194 (53) Appin 148 (66)	Belanglo 52 (26) Sutton Forest 70 (32)	Marulan 43 (20)	Towrang 32 (14)	Kiama 420 (143)
	Comments: (ANEF contours are based on a noise exposure concept (ANEC)).	Close to Ellalong, Paxton and Millfield in the west.	No major urban areas close to the airport	No major urban areas close to the airports	**Kulnura** Southwest of the airport, close to Central Mangrove, and Mangrove mountain.	**Cooranbong** South of the airport may affect residents in Dora Creek	No major urban areas close to the airports	No major urban areas close to the airports	Close to Blackheath in the north and Mount Victoria in the west	No major urban areas close to the airport	**Wilberforce** Close to Wilberforce, Windsor and Richmond areas in the south and Kurrajong and Glossodia in the west.	No airport sites identified.	**Luddenham** Residents in Claremont Meadows northeast of the airport will be affected. Close to South Penrith area, Mulgoa, Wallacia and Luddenham.	**Silverdale** Close to Silverdale, the Oaks.	**Wilton** Close to Bargo west of the airport.	**Belanglo** Close to Berrima north of the airport.	Close to Marulan and Tallong south of the airport.	Close to Marulan and Kenmore in the east.	Close to Kiama, Kiama Heights, Kiama Downs, and Werri Beach in the south.
	Ability to share noise (Not Applicable = noise sharing not considered an issue).	Not Applicable	Not Applicable	Not Applicable	**Kulnura** Limited ability for noise sharing.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Wilberforce** Not Applicable	No airport sites identified.	**Luddenham** Limited ability to noise share.	**Silverdale** Not Applicable	**Wilton** Limited ability to noise share.	**Belanglo** Some ability to noise share	Some ability to noise share	Not Applicable	Not Applicable
Primary Criterion 7 – National/State Parks	World Heritage Areas	No sites	No sites	**Greater Blue Mountains** (listed 2000)	No sites	No sites	No sites	**Greater Blue Mountains** (listed 2000)	**Greater Blue Mountains** (listed 2000)	**Greater Blue Mountains** (listed 2000)	*On edges of* **Greater Blue Mountains** (listed 2000)	No sites	*On edges of* **Greater Blue Mountains** (listed 2000)	*On edges of* **Greater Blue Mountains** (listed 2000)	No sites	No sites	No sites	No sites	No sites
	National Park Area of land within the locality (ha)	Yes 1,337 ha	Yes 2,294 ha	Yes 19,731 ha	Yes 15,969 ha	Yes 4,406 ha	Yes 1,494 ha	Yes 4,481 ha	Yes 4,425 ha	Yes 3,087 ha	Yes 2,937 ha	Yes 5,575 ha	Yes 269 ha	Yes 3,212 ha	Yes 7,069 ha	Yes 12,669 ha	Yes 531 ha	Yes 1,600 ha	No 0 ha
	Note: the National Park criterion includes National Parks, Conservation Areas, State Conservation Areas and Nature Reserves (as provided by the NSW Government Office of Environment and Heritage –January 2011).																		
	State Forests – area affected	No	3,562 ha	594 ha	775 ha	2,100 ha	237 ha	No	No	No	No	No	No	No	No	5,231 ha	5,606 ha	No	No
	State Parks – area affected	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Killalea State Park
	RAMSAR wetland	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

		Northern Localities					Western and North-Western Localities				Sydney Basin Localities			South-Western Localities					Southern Localities
	Refer to Part 8 for maps of localities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Primary Criterion 8 – Flora/Fauna	Land zoned (7) Environment Protection	0 ha	0 ha	0 ha	325 ha	4,944 ha	10,150 ha	0 ha	0 ha	1,419 ha	6,287 ha	56 ha	19 ha	1,200 ha	969 ha	32,944 ha	675 ha	0 ha	1,175 ha
	'Protected' flora and fauna (as defined under National Parks and Wildlife Act 1974 (NPW Act 1974) and Threatened Species Conservation Act 1995 (TSC Act 1995))	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha
	'Vulnerable' flora and fauna (as defined under NPW 1974 and the TSC Act 1995)	Flora – 79ha Fauna – 64ha	Flora – 1ha Fauna – 162ha	Flora – 7ha Fauna – 146ha	Flora – 42ha Fauna – 118ha	Flora – 189ha Fauna – 437ha	Flora – 891ha Fauna – 3,002ha	Flora – 80ha Fauna – 392ha	Flora – 284ha Fauna – 255ha	Flora – 26ha Fauna – 18ha	Flora – 1,512ha Fauna – 863ha	Flora – 133ha Fauna – 178ha	Flora – 25ha Fauna – 91ha	Flora – 33ha Fauna – 21ha	Flora – 90ha Fauna – 305ha	Flora – 95ha Fauna – 246ha	Flora – 93ha Fauna – 105ha	Flora – 3ha Fauna – 95ha	Flora – 1ha Fauna – 22ha
	'Endangered' flora and fauna (as defined under NPW 1974 and the TSC Act 1995)	Flora – 0ha Fauna – 5ha	Flora – 0ha Fauna – 1ha	Flora – 24ha Fauna – 10ha	Flora – 25ha Fauna – 1ha	Flora – 816ha Fauna – 4ha	Flora – 167ha Fauna – 57ha	Flora – 74ha Fauna – 50ha	Flora – 255ha Fauna – 89ha	Flora – 22ha Fauna – 0ha	Flora – 1,234ha Fauna – 164ha	Flora – 75ha Fauna – 109ha	Flora – 91ha Fauna – 75ha	Flora – 0ha Fauna – 8ha	Flora – 106ha Fauna – 24ha	Flora – 193ha Fauna – 18ha	Flora – 29ha Fauna – 3ha	Flora – 0ha Fauna – 2ha	Flora – 88ha Fauna – 33ha
	'Critically Endangered' flora and fauna (as defined under NPW 1974 and the TSC Act 1995)	Flora – 0ha Fauna – 9ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 4ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 0ha	Flora – 17ha Fauna – 22ha	Flora – 1ha Fauna – 0ha	Flora – 4ha Fauna – 1ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 38ha	Flora – 0ha Fauna – 2ha	Flora – 0ha Fauna – 1ha	Flora – 0ha Fauna – 0ha	Flora – 0ha Fauna – 1ha	Flora – 71ha Fauna – 1ha	Flora – 16ha Fauna – 1ha	Flora – 1ha Fauna – 1ha	Flora – 0ha Fauna – 0ha
Primary Criterion 9 – State Significant Sites	State Significant Site (SSS, gazetted or potential)	No	No	No	No	Potential SSS Mount Penang Parklands, The Avenue, Somersby.	Potential SSS Mount Penang Parklands, The Avenue, Somersby	No	No	No	No	No	No	No	No	Gazetted SSS Southern Highlands Regional Shooting Complex Wattle Ridge Road, Hill Top	No	No	No
	Specified site	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
	Comment on impact on new capacity created/unlocked.	None	None	None	None	Not relevant to and no effect on new capacity created/unlocked in this locality.	Not relevant to and no effect on new capacity created/unlocked in this locality	None	None	None	None	None	None	None	None	Not relevant to and no effect on new capacity created/unlocked in this locality.	None	None	None
Primary Criterion 10 – Unexploded Ordnance Risks	Risk of incomplete site remediation for unexploded ordnance (UXO).	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	Substantial UXO potential on Thales Group site in south of Methven Street, Lithgow; Other UXO potential within Newnes State Forest and west of Bilpin	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	Slight and other UXO potential at Agnes Banks Nature Reserve, west of Londonderry.	Slight UXO potential off the coast North of Palm Beach.	Slight and other UXO potential in Narellan and Campbelltown area (maybe outside this locality).	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	Other UXO potential in Bowral area along the railway line.	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	Other UXO potential in area offshore and north of the Blowhole.
	Comment on impact on new capacity created/unlocked.	None	None	None	None	None	None	Neither identified representative airport sites (31 or 32) close to above sites with UXO risks.	None	None	None – no representative airports located close to Agnes Banks Nature Reserve.	None – no representative airports identified in this locality.	None – no representative airports identified close to this area.	None	None	None – no representative airports identified close to this area.	None	None	None – no representative airports identified close to this area.

Source: WorleyParsons/AMPC analysis

Matrix 2 Comparative assessment of localities shortlisted in Phase 2 of the greenfield assessment process

Matrix 2 Comparative assessment of greenfield localities shortlisted in Phase 2
Part A: Site evaluation

Locality number Geographic locality descriptor		Northern Localities	Sydney Basin Localities		South-Western Localities	
		5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
General Locality Attributes	Geographic place name of representative airport site.	Somersby	Wilberforce	Luddenham	The Oaks	Wilton
	Local government areas (LGAs) within locality (principal LGA/s shown **bold**).	**Gosford** Lake Macquarie **Wyong**	Baulkham Hills Blacktown **Hawkesbury** Hornsby Penrith	Blue Mountains **Liverpool** Penrith Wollondilly	Camden **Wollondilly**	Campbelltown Wingecarribee **Wollondilly** Wollongong
	Representative significant population centres within locality.	Somersby / Gosford Wyong, Morisset and Toronto.	Penrith, Richmond, Windsor, The Hills District, and NW Metro Sydney.	Glenmore Park, Luddenham and Bringelly.	Oakdale and The Oaks.	Wilton and Appin.
	Population within 30km radius of site reference point (Census 2006) (rounded to nearest ‘00).	315,600	553,300	1,083,900	144,600	277,000
	Population within 15km radius of site reference point (Census 2006) (rounded to nearest ‘00).	141,000	62,200	141,800	29,300	10,400
	Key transport system/s existing within locality.	F3 Sydney-Newcastle Freeway; Pacific Highway; Main North Line.	M7 Western Sydney Orbital; Bells Line of Road; Windsor Road; Blacktown Road; Putty Road; Old Northern Road; Richmond Railway Line.	M4 Western Motorway; M7 Sydney Western Orbital; The Northern Road ; Elizabeth Drive; Bringelly Road.	Burragorang Road; Montpellier Road; Silverdale Road.	F5 Hume (South Western) Freeway; Main Southern Railway.
	Approximate size of locality (rounded to nearest ‘00 ha).	28,600	56,700	22,000	17,700	23,500
	General terrain description.	Dissected montane plateau with some open undulating rural land along linear ridge lines and undulating coastal plain with some areas of higher ground.	Broad river valley with open rural land and gently undulating terrain in the west rising to higher ground in the east.	Broad river valley and gently undulating terrain to the east of the Nepean River with higher ground rising west from the river	Undulating plateau with open rural land - dissected rural land to the east and rising rugged forested terrain to the west	Heavily dissected montane plateau with open rural and some long linear ridge lines adjoining the deep gorges of the major rivers.
	Major river systems.	Narara, Ourimbah, Wyong, Dora, Wallarah, Wyee Creeks and tributaries flowing to the Central Coast lake system.	Hawkesbury River, Eastern and South Creeks and tributaries.	Nepean River, Oakey, Badgerys and South Creeks.	Monkey and local creeks.	Nepean, Avon, Cordeaux, Cataract Rivers; Allen Creek and tributaries; Cascade Creek.
	Existing or nearest airport in locality.	Warnervale (private airfield) Cooranbong (now closed).	RAAF Base Richmond	Camden Airport; Wallacia and St Mary’s (private airfields).	The Oaks (private airfield)	Wilton Parachuting Centre; Wedderburn (private airfield).
	Previous airport proposals. (SSA = Department of Aviation 1985 Second Sydney Airport Site Selection Program: Draft Environmental Impact Statement).	Warnervale (SSA)	Londonderry; Richmond; St Mary's; Marsden Park; Scheyville; Galston; Rouse Hill/Nelson (SSA).	Badgerys Creek Airport Sites; Bringelly (SSA).	Nil	Wilton; Darkes Forest (further to east and not in locality) (SSA).
Preferred Representative Airport Site in Locality (OK means that, given a higher standard airport can be accommodated, it is assumed airport smaller Type may also be accommodated**)**	Typical elevation of representative site (metres above sea level).	230-260	50	70-110	285-300	300-320
	Maximum Type 1 airport (parallel runways) (Runway/s; name, alignment).	2 x 4,000m **Somersby** 18/36	1 x 4,000m **Wilberforce** 09/27	1 x 4,000m and 1 x 2,500m **Luddenham** 01/19	1 x 4,000m **The Oaks** 17/35	1 x 4,000m and 1 x 3,500m **Wilton** 06/24
	Airport Type 1 (one runway) (Runway/s; name, alignment).	1 x 4,000m **Somersby** 18/36	1 x 4,000m **Wilberforce** 09/27	1 x 4,000m **Luddenham** 01/19	1 x 4,000m **The Oaks** 17/35	1 x 4,000m **Wilton** 06/24
	Airport Type 2 (Runway/s; name; alignment).	OK plus 1 x 3000m **Cooranbong** 01/19	OK	OK	OK	OK
	Airport Type 3 (Runway/s; name; alignment).	OK plus 1 x2,500m **Wyee** 03/21	OK	OK	OK	OK
	Airport Type 4 (Runway/s; name; alignment).	OK	OK	OK	OK	OK
	Other sites possible within the locality? (No, Probably not, Possibly yes, Yes).	Yes	Yes	Yes	Yes	Yes
	Note: Unless specifically noted, for the purposes of this study, it is assumed that the representative site would remain as is and would, where possible, permit the development of an airport from Type 4 up to Type 3, up to Type 2, up to Type 1 and finally to a “maximum” configuration.					

Locality number Geographic locality descriptor		Northern Localities	Sydney Basin Localities		South-Western Localities	
		5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
Criterion **1** **Capacity Created (preliminary analysis)** **PRIMARY CRITERION**	Type 1 - Aircraft movements per hour and per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 100 per movements hour or 370,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.
	Type 1 - Passengers per year (based on *Sydney Airport Master Plan* forecast for 2029 and a passenger per aircraft mix of 195); and Passengers per year (130 passengers per aircraft based on airport type possible).	Up to 72 million per year (based on passengers per aircraft mix of 195). Up to 48 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).	Up to 72 million per year (based on passengers per aircraft mix of 195). Up to 48 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).
	Type 1 - Ability to expand capacity in the future.	Nil beyond a parallel runway airport.	Nil beyond a single runway.	Nil beyond a parallel runway airport.	Nil beyond a single runway.	Nil beyond a parallel runway airport.
	Type 2 - Aircraft movements per hour and per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.
	Type 2 - Passengers per year (based on *Sydney Airport Master Plan* forecast for 2029 and a passengers per aircraft mix of 195). Passengers per year (based on 130 passengers per aircraft mix).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).	Up to 46.8 million per year (based on passengers per aircraft mix of 195). Up to 31 million per year (based on 130 passengers per aircraft).
	Type 2 - Ability to expand capacity in the future.	Yes to Type 1.	Yes to Type 1.	Yes to Type 1.	Yes to Type 1.	Yes to Type 1.
	Type 3 - Aircraft movements per hour and per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.
	Type 3 - Passengers per year (based on *Sydney Airport Master Plan* forecast for 2029 passengers per aircraft mix of 140). Passengers per year (based on 80 passengers per aircraft mix).	Up to 33 million per year based on 140 passengers per aircraft mix. Up to 19 million per year based on 80 passengers per aircraft.	Up to 33 million per year based on 140 passengers per aircraft mix. Up to 19 million per year based on 80 passengers per aircraft.	Up to 33 million per year based on 140 passengers per aircraft mix. Up to 19 million per year based on 80 passengers per aircraft.	Up to 33 million per year based on 140 passengers per aircraft mix. Up to 19 million per year based on 80 passengers per aircraft.	Up to 33 million per year based on 140 passengers per aircraft mix. Up to 19 million per year based on 80 passengers per aircraft.
	Type 3 – Ability to expand capacity in the future.	Yes to Types 2 and 1.	Yes to Types 2 and 1	Yes to Types 2 and 1.	Yes to Types 2 and 1.	Yes to Types 2 and 1.
	Type 4 – Aircraft movements per hour and per year (Note 2).	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.
	Type 4 – Passengers per year (based on 35 passengers per aircraft mix).	1 million per year as primarily used for flying training and due runway length and Class D airspace limitations.	1 million per year as primarily used for flying training and due runway length and Class D airspace limitations.	1 million per year as primarily used for flying training and due runway length and Class D airspace limitations.	1 million per year as primarily used for flying training and due runway length and Class D airspace limitations.	1 million per year as primarily used for flying training and due runway length and Class D airspace limitations.
	Type 4 – Ability to expand capacity in the future.	Yes to Types 3, 2 and 1.	Yes to Types 3, 2 and 1	Yes to Types 3, 2 and 1	Yes to Types 3, 2 and 1.	Yes to Types 3, 2 and 1.
	Note 1: Joint Study forecasts were undertaken separately. As such, assumptions have had to be made as to the type and levels of activity which may occur at the greenfield localities/sites. Note 2: *ICAO Airport Planning Manual Part 1 Master Planning* is used for higher order planning only primarily for Regular Public Transport (RPT) aircraft and will require consideration of the airport's role, aircraft fleet mix, flight paths and noise impacts, environmental impacts, airspace management and policy settings when a detailed site evaluation is undertaken. Note 3: For comparison with an existing airport with parallel runways – *2009 Sydney Airport Master Plan* indicates 402,000 RPT movements in 2029–30. Higher annual volumes are possible with intensive airspace management and appropriate technology. Note 4: Bankstown Airport with three runways, but with two operating primarily with training circuits, historically, had 484,000 General Aviation (GA) movements in 1989–90. The *Preliminary Draft Master Plan 2010* indicates 457,000 movements in 2029/30 with the impacts of recent Class D airspace policies introduced by Civil Aviation Safety Authority (CASA) to be considered in the next Master Plan. Airservices Australia indicates the capacity is 480,000–500,000 movements per year prior to the introduction of Class D airspace. Higher annual volumes are possible with intensive airspace management and appropriate technology.					

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		5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
Criterion **2** **Applicability to potential demand segments of new capacity**	Airport Type 1	ILH – Yes ISH – Yes Dom– Yes Regional– Yes LCC – Yes Freight – Yes GA – No	ILH – Yes ISH – Yes Dom – Yes Regional – Yes LCC – Yes Freight – Yes GA – No	ILH – Yes ISH – Yes Dom– Yes Regional– Yes LCC – Yes Freight – Yes GA – No	ILH – Yes ISH – Yes Dom– Yes Regional– Yes LCC – Yes Freight – Yes GA – No	ILH – Yes ISH – Yes Dom – Yes Regional – Yes LCC – Yes Freight – Yes GA – No
	Airport Type 2	ISH – Yes Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – No	ISH – Yes Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – No	ISH – Yes Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – No	ISH – Yes Dom – Yes Regional – Yes LCC – Yes Freight – Yes GA – No	ISH – Yes Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – No
	Airport Type 3	Dom – Yes Regional – Yes LCC – Yes Freight – Yes GA – Limited	Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – Limited	Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – Limited	Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – Limited	Dom – Yes Regional– Yes LCC – Yes Freight – Yes GA – Limited
	Airport Type 4	Regional – Yes LCC – Yes Freight – Yes GA – Yes	Regional – Yes LCC – Yes Freight – Yes GA – Yes	Regional – Yes LCC – Yes Freight – Yes GA – Yes	Regional – Yes LCC – Yes Freight – Yes GA – Yes	Regional – Yes LCC – Yes Freight – Yes GA – Yes
	Note: ILH = International Long Haul; ISH = International Short haul; Dom = Domestic Interstate; Regional = Intrastate; LCC = Low Cost Carrier; Fr = Freight (non RPT Belly freight) NB Most freight transiting Sydney (Kingsford-Smith) Airport is RPT belly freight. There are relatively few dedicated freighters. International Freight operators may not favour splitting operations to two airports (need to duplicate freight sheds, equipment, add personnel etc). For Domestic, there may be some small overnight freight (e.g. bank couriers).					
Criterion **3** **Ease of connectivity between Sydney (Kingsford-Smith) Airport and the airport site**	Average road travel time (2011, mins)	90	70	40	60	50
	Note: Refer also to Criteria 6 and 10.					
	Average rail travel time (if possible) (2011, mins)	120	90	75*	70*	75*
	Note: Refer also to Criteria 6 and 10 – most sites do not have any, let alone a direct or even reasonably proximate, connectivity to the rail system – values quoted are from the nearest railway station; sites having or having a prospect of being connected with a direct service to Sydney (Kingsford-Smith) Airport are marked * Note: availability or not of a rail link is not likely to be an issue for Type 4 airports.					

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Criterion **4** **Development costs**	Type 1 (one runway) Comparative cost of earthworks to create airport platform, $ millions (2010–11 prices)*	~$534	~$939	~$203	~$430	~$293
	Type 3 Comparative cost of earthworks to create airport platform, $ millions (2010–11 prices)*	~$413	~$680	~$135	~$298	~$212
	Type 1 (one runway) Estimated airport airside works cost, $ millions (2010–11 prices)*	~$4,346	~$4,352	~$4,358	~$4,353	~$4,345
	Type 3 Estimated airport airside works cost, $ millions (2010–11 prices)*	~$1,396	~$1,401	~$1,399	~$1,400	~$1,397
	Type 1 (one runway) Estimated land acquisition cost (related to air services and facilities), $ millions (2010–11 prices) *	~$394	~$292	~$848	~$1,012	~$938
	Type 3 Estimated land acquisition cost (related to air services and facilities), $ millions (2010–11 prices) *	~$305	~$212	~$562	~$702	~$678
	Type 1 (one runway) Road and rail – access infrastructure and rollingstock costs, $ millions (2010–11 prices)*	~$1,400	~$1,129	~$1,380	~$1,524	~$858
	Type 3 Road and rail – access infrastructure and rollingstock costs, $ millions (2010–11 prices)*	~$1,094	~$784	~$1,056	~$918	~$526
	Fuel pipeline infrastructure costs, $ millions (2010–11 prices) *	~$4	~$135	~$151	~$267	~$267
	Potential cost to remove or relocate specified obstacles, $ millions (2010–11 prices) *	~$18	~$0	~$44	~$28	~$13
	*Note: Excludes allowances for risk, contingency, preliminaries, fees etc. *Note: These estimates are based on prefeasibility level assessments for comparative purposes only and necessarily may not include all procedural, internal and externality costs required for delivery of an operational airport. Given the preliminary stage, there are a number of exclusions and limitations and assumptions. For example, the total cost estimates exclude a number of costs such as maintenance and operational works, contaminated land remediation/demolition costs, relocations of existing services or costs that may be required for upgrading of the existing rail, power, etc. networks.					

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Criterion **5** **Accessibility of the Sydney land transport network** **(all airport types)** **PRIMARY CRITERION**	Kilometres to connect site reference point to existing rail link	10 km from Gosford Station on Main North Line.	9 km from Windsor Station on Richmond Line.	18 km from planned Leppington Station on South West Rail Link.	20 km from Menangle Park Station and 25 km from Macarthur station on Main South Railway.	12 km from Douglas Park Station on Main South Railway.
	Likelihood of a rail link being constructed to or near to the site	Depends on the outcome of high speed rail assessment underway.	Would have to be an airport-specific line.	Links to the Badgerys Creek site have been proposed and investigated. This link could be extended to Luddenham.	Would need an extension of South West Rail Link or an airport-specific line connected to Main South Railway.	Site is traversed by alignment for incomplete Maldon–Dombarton Railway, which is connected to Main South Railway.
	Rail connection difficulty: • Very remote >20 km • Remote >10, <20 km • Proximate >5, <10km • Very proximate <5km Terrain difficulty: • Very difficult • Difficult • Relatively easy • Easy	Proximate Difficult Existing railway is about 240 metres different in elevation, requiring construction in mountainous terrain.	Proximate Difficult Existing railway is about 45 metres different in elevation. Major extension of the Richmond line required, including crossing of Hawkesbury River and construction in hilly terrain.	Proximate Relatively easy if connected as extension of South West Rail Link. More difficult if connected to Main West with urban areas en route. Existing railway is about 45 metres different in elevation.	Remote Difficult Areas of concern to connect to Menangle Park: Crossing Navigation and Foot Onslow Creeks and Nepean River. Areas of concern to connect to Macarthur station: Crossing Nepean River, Mount Annan Botanic Garden and Hume Highway. Existing railway is about 150 metres different in elevation.	Very proximate Relatively easy if incomplete existing alignment for Maldon–Dombarton line adopted, as this alignment runs through the site.
	Capacity of the existing rail links and requirements for additional capacity	Requirements for providing additional capacity for 4 trains per hour: A tunnel between Hawkesbury River and Berowra due to the limit of capacity in Cowan Bank on Main Northern Railway.	Requirements for providing additional capacity for 4 trains per hour: Duplication of Richmond Line. With Western Express Project going ahead, there will not be any capacity issue on the Western Line.	Requirements for providing additional capacity for 4 trains per hour on the Main South Line: Quadruplication between Revesby and Glenfield. Sextuplication between Erskineville and Tempe. Re-signalling and electrification.	Main Southern Railway does not have sufficient capacity to serve a new airport. Requirements for providing additional capacity for 4 trains per hour on the Main South Line: Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield. Quadruplication between Revesby and Glenfield. Sextuplication between Erskineville and Tempe. Re-signalling and electrification.	Main Southern Railway does not have sufficient capacity to serve a new airport. Requirements for providing additional capacity for 4 trains per hour on the Main South Line: Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield. Quadruplication between Revesby and Glenfield. Sextuplication between Erskineville and Tempe. Re-signalling and electrification. New refuges south of Macarthur.
	Note: Applies for all airport types except for a Type 4 airport, where availability of a rail link is not likely to be an issue.					
	Kilometres to connect site reference point to existing designated state roads/highways	Less than 5 km to Sydney Newcastle Freeway (F3).	25 km to M7 motorway.	15 km to M7 motorway.	25 km to Hume Highway.	9 km to Hume Highway.
	Note: Assumes that high capacity link would need to be constructed from existing major road network either over existing road alignments or requiring new alignments.					
	Road connection difficulty: • Very remote >20 km • 10<Remote <20 km • 5<Proximate <10km • Very proximate <5km Terrain difficulty: • Very difficult • Difficult • Relatively easy • Easy	Very proximate Easy Site is very close to Newcastle Freeway (F3).	Very remote (from freeway system) Very proximate (Putty Road) Relatively easy *Areas of Concern:* Road system beyond Richmond/Windsor. Upgrading roads to Richmond/Windsor. Hawkesbury River, Windsor and Riverstone residential.	Remote (from freeway system) Very proximate (major roads such as The Northern Road and Elizabeth Drive) Easy Existing road to be upgraded.	Very remote (freeway system) Very proximate (major roads e.g. Burragorang Road) Easy The average speed on the connecting road is 60 km/h. *Areas of Concern:* Spitters Gully, Flaggy Creek, Nepean River, Camden South residential area and Mount Annan residential area.	Very proximate Easy *Areas of Concern:* Upgrading roads to Wilton and thence to F5 freeway. Capacity of F5 exit and entrance ramps from and to Douglas Park Road.

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Criterion **6** **Proximity of aviation capacity to NSW commercial growth centres**	Volume of employment at growth centres within 30 minutes of the site divided by access time from site, rounded to nearest '0'		480	1,440	3,050	170	170
	Nearest growth centre within 30 minutes Number of jobs		Gosford 6,000	Penrith 31,000	Penrith 31,000 Leppington (planned) 5,000#	Leppington (planned) 5,000#	Leppington (planned) 5,000#
	Distance (kms) and time to growth centre (mins)		15, 20	35, 45	15, 15 25, 25	30, 30	40, 30
	Note 1: This index measures the 2036 long-term employment capacity target for each of 31 Strategic Centres identified in the *Metropolitan Plan for Sydney 2036* within a maximum of 30 minutes of the site, divided by the road travel time to the new unlocked/created capacity, aggregated for all areas. The higher the aggregated value, the more accessible the site to areas of employment. Note 2: # indicates no data provided so the number of jobs is assumed to be comparable to other similar centres.						
Criterion **7** **Commercial opportunities near or on-site** **PRIMARY CRITERION**	Existing employment land within 15 km of the site boundary (ha) (rounded to nearest 10)	Zone 3 (or B1-B8)	200	40	80	90	40
		Zone 4 (or IN1-IN4)	910	260	1,590	90	140
		Total	1,110	290	1,660	180	190
	Existing employment land within 5 km of the site boundary (ha) (rounded to nearest 10)	Zone 3 (or B1-B8)	30	10	0	10	20
		Zone 4 (or IN1-IN4)	480	10	0	0	10
		Total	510	20	0	10	30
	Note: Land zoned (3) or B1-B8 is Business and Commercial; and land zoned (4) or IN1-IN4 is Industrial. While land zoned (1) Rural and (5) Special Use may contain employment opportunities, for the purpose of this project, it has not been included in the employment land calculations.						
	Potential Employment Land including investigation areas within 15 km of the site (ha) (rounded to nearest 10)		0	0	2,460	0	0
	Note: As identified in the Metropolitan Plan for Sydney 2036, Lower Hunter Regional Strategy 2006–2031, Central Coast Regional Strategy 2006–2031 and Illawarra Regional Strategy 2006–2031).						
	Potential Employment Land including investigation areas within 5 km of the site (rounded to nearest 10)		0	0	1,000	0	0
	Note: As identified in the Metropolitan Plan for Sydney 2036, Lower Hunter Regional Strategy 2006-2031, Central Coast Regional Strategy 2006-2031 and Illawarra Regional Strategy 2006-2031						
	Land within15 km of the site capable of being converted to employment lands (rounded to nearest 10)	Zone 1 or RU1-RU6	18,300	43,680	29,090	35,180	16,380
		Zone 6 or RE1-RE2	14,660	670	1,240	410	330
		Total	32,960	44,350	30,330	35,590	16,710

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Criterion **8** **Proximity of users to capacity** **a) In relation the centroid of population in Sydney (Ermington)** **b) In relation to the CBD of Sydney** **PRIMARY CRITERION**	**Regular Public Transport (RPT) airports** Per cent and rounded off number of residents with a faster travel time to the locality in which the site is than to Sydney (Kingsford-Smith) Airport (total of 4.47 million people)	15 per cent 684,500	32 per cent 1,430,500	28 per cent 1,242,000	8 per cent 352,000	9 per cent 413,500
	a) Average raw road travel time (2011) – Ermington to site reference point in minutes	60	50	40	65	60
	a) Average raw rail travel time (2011) from Parramatta to nearest station to locality in minutes	75	40	45	65	70
	a) Attractiveness Index i): actual average travel (Sydney (Kingsford-Smith) Airport = 95)	70	76	81	64	65
	a) Attractiveness Index **ii): adjusted for different average speeds** (Sydney (Kingsford-Smith) Airport = 95)	73	77	86	80	74
	b) Road travel time (mins) from airport site to CBD (Note: Sydney (Kingsford-Smith) Airport = 20 mins)	70	70	55	70	70
	b) Rail travel time (mins) from Airport site to Central Station (including station access time by road) (Note: Sydney (Kingsford-Smith) Airport = 10 to 12 mins)	10 km from Gosford Station on Main North Line. 85 (94)	9 km from Windsor Station on Richmond Line. 70 (78)	18 km from planned Leppington Station on South West Rail Link. 55 (71)	20 km from Menangle Park Station and 25 km from Macarthur station on Main South Railway. 65 (83)	12 km from Douglas Park Station on Main South Railway. 70 (81)
	Note: Applies to all RPT airports Types Maximum, 1, 2, 3, and 4.					
Criterion **9** **Airspace interactions** **PRIMARY CRITERION**	Airport Types 1 to 3 Interaction with existing air traffic management arrangements. (Some of the major issues which require further review are included under Primary Criterion 9 below.)	Major	Major	Major	Major	Major
	Airport Type 4 Interaction with existing air traffic management arrangements. (Some of the major issues which require further review are included under Qualifications Primary Criterion 9 below.)	Moderate	Major	Major The location of R536A and 536B within the nominal CTR boundary would not be compatible with the proposed 01/19 runway alignment. The Department of Defence Orchard Hills facility would have to be relocated for Luddenham to be operable.	Moderate	Major

Note: in all cases the preliminary observations listed need to be tested with relevant authorities Airservices Australia; Department of Defence; Office of Airspace Regulation; existing airport operators and users at the feasibility stage. Potential conflicts or dependencies with Richmond and Sydney (Kingsford-Smith) Airport's operations and Sydney Basin traffic would require more detailed analysis by Department of Defence, Airservices Australia and/or the Office of Airspace Regulation. The general complexity of existing airspace within and adjacent to the Sydney Basin makes this review necessary. Some of these major issues are included under Qualifications Primary Criterion 9 below.

Major
- Airspace where there are significant levels of civil air transport traffic and military activity, such as around Sydney, Williamtown, Nowra and Richmond, together with their respective CTR/CTA, and operational procedures and requirements; or

Restricted Areas, particularly those with provisional classifications of RA3 and RA2; or
- Danger Areas associated with military flying training.

Moderate
- Airspace where there are significant levels of GA traffic, such as around Bankstown and Camden, together with their respective CTR (note in practice as Bankstown and Camden are relatively close to the larger airports, a potential moderate ranking is effectively outweighed by the factors affecting the larger airports); or
- Restricted Areas with provisional classifications of RA1; or
- Danger Areas associated with civil flying training; or
- Visual flight rules (VFR) transit routes.

Minor
- Airspace where there are lower levels of civil traffic and non-towered aerodromes; or
- Danger Areas.

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Criterion **10** **Obstacle limitation surfaces** **PRIMARY CRITERION**	Key restrictions on airport development Airport Types 1 to 4		**Moderate** Two power lines need to be relocated and undergrounded The Sydney Newcastle oil and gas pipelines run immediately to the east of the airport site Preliminary assessment indicates a very minor OLS terrain infringement on the north west approach of the western runway for Type 1 only	**Major** Three overhead high voltage powerlines in east approach and one in west approach require further investigation. Terrain OLS infringement in horizontal sections of east approach and west approaches for Type 1, subject to further assessment. Terrain OLS infringement in horizontal section of west approach for Type 2.	**Major** Assumes the Department of Defence Establishment for explosives at Orchard Hills has been relocated and the associated danger area extinguished. Overhead power lines in both eastern and western approaches. Terrain OLS infringement in horizontal section of western approach of northern runway. Further assessment is required. Terrain OLS infringement to the north-west for the Type 4 airport site.	**Minor** Power lines on north-east approach. Power lines immediately east of the south-west approach. Preliminary assessment indicates no OLS terrain infringements for Types 1 to 3. Terrain OLS infringement to the north west for Type 4 which is on the ultimate airport site.	**Moderate** Possible OLS terrain infringement at south west approach for Type 1.
	Note: OLS/Terrain Restriction: take-off and approach surfaces only assessed against terrain. (Based on desktop studies using 1:25,000 topographic maps – various survey dates.) Major – difficult terrain environment close to cliffs and mountains and with potential significant meteorological issues. Major civil works may be required. Moderate – local terrain OLS infringement which may need some major civil works. Minor – local infrastructure (overhead power line) OLS infringement which may need relocation and civil works. No restriction – no terrain / OLS infringement.						
Criterion **11** **Frequency of meteorological conditions (fog, wind, hail) affecting new and unlocked capacity**	Airport Types 1 to 3 Based on historical records, annual number of days when locality/site experiences meteorological conditions (including wind, fog and thunderstorms) which would constrain airport operations	Location/distance to Bureau of Meteorology (BoM) Station (km)	Gosford Narara BoM station (4km) had unusually high incidence of low-speed winds, suggesting the BoM site is located in a wind shadow area so not usable for this analysis. No BoM Automatic Weather Station site is located within a reasonable distance of Somersby records, either ceilometers or visibility data, and so estimates of either IMC conditions or airport closed to landings are not able to be made.	Richmond – 10	Badgerys Creek – 7	Camden – 14	Bellambi – 22
		Compliance with wind usability	Yes	Yes	Yes	Yes	Yes, except from 1100–1930 for gust speed.
		Cross-wind limit is exceeded	For average wind speed nil. For gust wind speed 0.01 per cent (1 hour per year).	For average wind speed 0.03 per cent (3 hours pa). For gust wind speed 0.49 per cent (43 hours per year).	For average wind speed 0.19 per cent (17 hours pa). For gust wind speed 1.08 per cent (95 hours per year).	For average wind speed 0.17 per cent (15 hours pa). For gust wind speed 1.27 per cent (111 hours per year).	For average wind speed 2.07 per cent (181 hours per year). For gust wind speed 5.05 per cent (442 hours per year) – from approximately 1100 to 1930 the 95 per cent availability rule is not met.
		Instrument meteorological conditions (IMC) conditions and airport closed to landings	IMC no data available. Airport closed to landings: no data available.	IMC conditions exceeded 7.9 per cent (692 hours pa). Airport closed to landings 1.27 per cent (111 hours pa).	IMC no data available. Airport closed to landings: no data available.	IMC conditions 9.15 per cent (802 hours pa). Airport closed to landings 1.72 per cent (151 hours pa) – based on records only available from 21 Nov 2007.	IMC conditions 16.1 per cent (1410 hours pa). Airport closed to landings 0.60 per cent (53 hours pa).
	Airport Type 4 Based on historical records, annual number of days when locality/site experiences meteorological conditions (including wind, fog and thunderstorms) which would constrain airport operations	Compliance with wind usability	Yes	Yes with cross-runway.	Yes with cross-runway.	Yes with cross-runway.	Yes with cross-runway.
		Cross-wind limit is exceeded	For average wind speed 0 per cent (0 hours per year) or 0 per cent (0 hours per year) with cross-runway. For gust wind speed 0.8 per cent (70 hours per year) or 0.01 per cent (1 hour pa) with cross-runway.	For average wind speed 1.22 per cent (107 hours per year) or 0.07 per cent (6 hours per year) with cross-runway. For gust wind speed 5.61 per cent (491 hours per year) – for GA aircraft from approximately 0800 to 1730 the 95 per cent availability rule is not met – or 0.65 per cent (57 hours per year) with cross-runway.	For average wind speed 2.35 per cent (206 hours per year) – for GA aircraft from approximately 1300 to 1700 the 95 per cent availability rule is not met – or 0.09 per cent (8 hours per year) with cross-runway. For gust wind speed 7.49 per cent (656 hours per year) – for GA aircraft from approximately 1030 to 1930 the 95 per cent availability rule is not met – or 0.69 per cent (60 hours per year) with cross-runway.	For average wind speed 2.78 per cent (244 hours per year) – for GA aircraft from approximately 1200 to 1630 the 95 per cent availability rule is not met – or 0.21 per cent (18 hours per year) with cross-runway. For gust wind speed 8.42 per cent (738 hours pa) – for GA aircraft from approximately 0900 to 1930 the 95 per cent availability rule is not met – or 1.14 per cent (100 hours per year) with cross-runway.	For average wind speed 12.03 per cent (1,054 hours per year) – for GA aircraft from approximately 1200 to 1700 the 95 per cent availability rule is not met, runway 06/24 would be unavailable over 15 per cent of the time – or 1.26 per cent (110 hours per year) with cross-runway. For gust wind speed 19.39 per cent (1699 hours per year) – for GA aircraft runway unavailability occurs throughout due crosswind – or 3.17 per cent (278 hours per year) with cross-runway.
	Note 1: BoM stations were generally established in 1990. Where this varies, as in The Oaks, or where some data is not available, this is noted for the relevant locations/site. Note 2: Overall based on wind direction, a north-east/south-west runway orientation is favoured in the Sydney Region. ICAO recommends that, for single-direction runways of the Type contemplated, a 95 per cent usability criterion with a cross-wind component of 20 knots for Type 1 to 3 Airports and 13 knots for Type 4 Airports. Cloud base and visibility when compared with average Instrument Landing System (ILS) minima to determine whether the airport would be closed due weather conditions. ILS minima used for all airports (whether or not they are equipped with an ILS) is a cloud base of 300 feet Above Ground Level and a visibility of 800 metres. Provision of a CAT II ILS system and additional supporting infrastructure for one of the runways is a worthwhile enhancement and would reduce airport closures to nearly zero. Note 3: Cross-wind issue will be of greater concern for small GA aircraft – a Type 4 airport or larger may need a cross-wind runway at site if GA is to be accommodated. A cross-runway has been provided for usability not capacity reasons.						

Locality number Geographic locality descriptor			Northern Localities	Sydney Basin Localities		South-Western Localities	
			5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
Criterion **12** **Potential impact on existing residents and other land users as a result of land acquisition**	Population in airport footprint (based on 2006 Census) (rounded to nearest 10)	Maximum Type 1 Airport	170	290	210	530	60
		Type 1	140	280	140	530	30
		Type 2	130	250	120	510	30
		Type 3	110	200	100	430	20
		Type 4	70	110	60	280	10
	Note: in this analysis, all data related to effects on population must be considered as being for the purpose of making comparisons between localities and representative sites only. This is because the geographic cells containing population data do not distinguish between population being evenly spread through the cell or being mostly in a particular part of the cell – hence an overlap of the airport footprint may include population that is in a cell which is partially within the footprint but the population may in fact be located outside the footprint.						
	Cadastral information on number of properties within purchase (site) area (no. of allotments)	Zoned (1) Rural / Non Urban or (RU) Rural in Standard Instrument	157	151	79	152	10
		Zoned (2) Residential or (R) Residential in Standard Instrument	0	0	2	35	0
		Zoned (3) Commercial or (B) Business in Standard Instrument	0	0	0	0	0
		Zoned (4) Industrial or (IN) in Standard Instrument	21	0	0	0	0
		Zoned (5) Special Use (including School, Community, Classified Road, or Infrastructure) or (SP) in Standard Instrument	3	0	4	1	1
		Zoned (6) Open Space (Public and Private) or (RE) in Standard Instrument	2	0	0	1	0
		Zoned (7) Environment Protection or (E2, E3 or E4) Environment in Standard Instrument	7	11	3	1	19
		Zoned (8) Recreation Area or E1) Environment in Standard Instrument	0	0	31	0	0
		Zoned (DM) Deferred Matter	0	0	0	0	0
	Total number of allotments		190	162	119	190	30
	Community facilities such as churches, schools, and the like within the site area – as identified on zoning plans		Somersby Primary School (840 Wisemans Road).	None	Water Supply System, Elizabeth Drive, The Northern Road and Park Road.	Burragorang Road.	None
	Source of zoning information		Gosford IDO 22.	Hawkesbury LEP 1989.	Penrith LEP 2010 and Liverpool LEP 2008.	Wollondilly LEP 2011.	Wollondilly LEP 2011.

Locality number Geographic locality descriptor		Northern Localities 5 Central Coast	Sydney Basin Localities 10 Hawkesbury	Sydney Basin Localities 12 Nepean	South-Western Localities 13 Burragorang	South-Western Localities 14 Cordeaux-Cataract
Criterion **13** **Noise impact on residents (Type 1, 2, 3 and 4 Airports)** **PRIMARY CRITERION**	Ability to avoid or mitigate noise (by site selection or runway orientation)	Fairly large population nearby – potentially significant operational interaction with Sydney (Kingsford-Smith) Airport to the south may limit ability to avoid or mitigate noise.	Runway alignment optimised to avoid noise impact on Wilberforce, Kurrajong, Windsor and Richmond. Limited ability to minimise /avoid noise impact.	Runway alignment optimised to mitigate the impact on Penrith and Luddenham. Limited ability to minimise/avoid noise impact.	Population centres to the south and east and high terrain to the west constrains runway alignment options.	Runway alignment optimised to mitigate noise impact on Bargo. Further ability to mitigate/avoid noise impact may be limited by interaction with Sydney (Kingsford-Smith) Airport.
	Type 1 Airports – Total population within 20 ANEF contour (rounded to nearest 10)	10,390	5,250	11,560	3,390	1,650
	Type 1 Airports – Total population within 25 ANEF contour (rounded to nearest 10)	5,730	1,890	590	1,340	250
	Type 1 Airports – Comments (ANEF contours are based on a noise exposure concept [ANEC])	Mt Penang and Kariong are adjacent to the approach and take-off from the eastern runway.	Close to Wilberforce, Windsor and Richmond areas in the south and Kurrajong and Glossodia in the west; affect residents at Glossodia.	Residents in South Penrith, Werrington and Claremont Meadows north-east of the airport will be within the 20–25 ANEC contours. Close to Mulgoa, Wallacia and Luddenham.	South of the airport, residents at the Oaks will be within the 20 ANEC contour.	Residents at Bargo will be within the 20 ANEC contour west of the airport.
	Type 1 Airports – Ability to share noise	Interaction with Sydney (Kingsford-Smith) Airport to the south may limit ability to share noise.	Limited ability to noise share.	Limited ability to noise share.	Limited ability to noise share due to population to the south and high terrain to the west.	Becoming more distant to major population centres – some interaction with Sydney (Kingsford-Smith) Airport to the north. Limited ability to noise share.
	Note 1: For the purposes of the first filter of localities/sites, the Australian Noise Exposure Concept (ANEC) adopted for Airport Type 1 has been based on the currently approved 2029 Australian Noise Exposure Forecast (ANEF) for Sydney (Kingsford-Smith) Airport. For the comparative assessment where an airport site is capable of supporting two parallel runways, the ANEC has been applied to only one runway to achieve a more direct comparison with airport sites that are capable of supporting only one runway. There may also be significant populations immediately outside the 20 ANEF contour. Note 2: To eliminate the effects of the second runway on the ANEC at Sydney (Kingsford-Smith) Airport, the south-western quadrant of the 2029 ANEF has been used. This effectively only contains aircraft noise impacts due to departure runway 16R and arrivals 34L. The quadrant of the ANEF has been applied to all four quadrants of the adopted ANEC for the new airports. The resulting ANEC contours cover a greater area than the north-east or north-west quadrants of the Sydney ANEF for 2029 (that is, a more conservative representation of possible noise impacts for the single runway).					
	Type 2 Airports – Total population within **20** ANEF contour (rounded to nearest 100)	440	770	290	830	90
	Type 2 Airports – Total population within **25** ANEF contour (rounded to nearest 100)	140	260	140	460	30
	Type 2 Airports – Comments (ANEF contours are based on a noise exposure concept (ANEC))	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.
	Type 2 Airports – Ability to share noise	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.
	Type 3 Airports – Total population within 20 ANEF contour (rounded to nearest 10)	1,620	880	390	1,040	140
	Type 3 Airports – Total population within 25 ANEF contour (rounded to nearest 10)	170	300	180	530	40
	Type 3 Airports – Comments (ANEF contours are based on a noise exposure concept (ANEC))	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.
	Type 3 Airports – Ability to share noise	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.	As per Type 1.
	Note: For the purposes of the first filter of localities/sites, the ANEC adopted for Airport Types 2 and 3 has been based on the ANEC produced as part of this project for a new north-south runway at Richmond Airport. The runway use is therefore assumed to be the same as adopted for Richmond.					
	Type 4 Airports – Total population within 20 (25) ANEF contour/s (rounded to nearest 10)	240	380	260	900	50
	Type 4 Airports – Total population within 25 ANEF contour (rounded to nearest 10)	110	160	100	340	20
	Type 4 Airports – Comments (ANEF contours are based on a noise exposure concept (ANEC))	Cross runway provided for usability not capacity reasons. Use would be infrequent – up to 5 per cent of movements.	Cross-runway provided for usability not capacity reasons. Use would be infrequent – up to 5 per cent of movements.	Cross-runway provided for usability not capacity reasons. Use would be infrequent – up to 5 per cent of movements.	Cross-runway provided for usability not capacity reasons. Use would be infrequent – up to 5 per cent of movements.	Cross-runway provided for usability not capacity reasons. Use would be infrequent – up to 5 per cent of movements.
	Type 4 Airports – Ability to share noise	Limited ability to share noise as GA fight paths are concentrated on flying training circuits with low noise events but with concentrated and repetitive operations.	Limited ability to share noise as GA fight paths are concentrated on flying training circuits with low noise events but with concentrated and repetitive operations.	Limited ability to share noise as GA fight paths are concentrated on flying training circuits with low noise events but with concentrated and repetitive operations	Limited ability to share noise as GA fight paths are concentrated on flying training circuits with low noise events but with concentrated and repetitive operations.	Limited ability to share noise as GA fight paths are concentrated on flying training circuits with low noise events but with concentrated and repetitive operations.
	Note: For the purposes of the first filter of localities the ANEC adopted for Airport Type 4 was based on the ANEF for Bankstown Airport prepared for the Preliminary Draft Master Plan. The runway use is therefore assumed to be the same as adopted for Bankstown Airport.					

Locality number Geographic locality descriptor			Northern Localities	Sydney Basin Localities		South-Western Localities	
			5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
Criterion **14** **Noise impacts on 'sensitive uses'**	Area of sensitive land use within 1 kilometre of airport boundary (ha, to nearest 10) Zones 2 and 5 or R1-R5 or SP 1 and 3		40	0	10	70	0
	Area of sensitive land use within 5 kilometres of airport boundary (ha, to nearest 10) Zones 2 and 5 or R1-R5 or SP 1 and 3		930	90	550	140	280
	Area of sensitive land use likely to be affected by noise greater than 25 ANEF Zones 2 and 5 or R1-R5 or SP 1 and 3 (ha, to nearest 10)	Type 1 Airport	150	40	20	10	0
		Type 2 Airport	0	0	0	0	0
		Type 3 Airport	10	0	0	0	0
		Type 4 Airport	0	0	0	0	0
	Note: land use zoning data does not identify whether the land is intensively used for its purpose (e.g. school building accommodating large numbers of pupils) or passively (for example, for agricultural training). Detailed investigation is required to distinguish the intensity of usage.						
Criterion **15** **Risk and consequence of aviation accidents at or around airports**	Area of sensitive land use within public safety zone of runway end that are considered to be 'places of assembly' or hazardous, i.e. flammable (ha, to nearest 10) Zones 2 and 5 or R1-R5 or SP 1 and 3	Maximum Airport	0	0	0	0	0
		Type 1 Airport	0	0	0	0	0
		Type 2 Airport	0	0	0	0	0
		Type 3 Airport	0	0	0	0	0
		Type 4 Airport	0	0	0	0	0
	Note: area does not include 'Rural' but population affected includes population living within 'Rural' zones.						
	Population within public safety zone of runway (rounded to nearest 10)	Type 1 Airport	20	50	20	40	10
		Type 2 Airport	20	40	20	30	10
		Type 3 Airport	20	30	20	30	10
		Type 4 Airport	20	40	20	50	10
	Note: The UK NATS public safety zone has been used to establish the sensitive land. For the purposes of comparative populating of localities, only one runway has been used where an airport is capable of supporting two parallel runways. A detailed site analysis will require consideration of all runways. The Queensland Public Safety Area has been used in the Airport Type templates, which provide a basis for establishing site areas and as an indicative basis for high order costing.						

Locality number Geographic locality descriptor			Northern Localities **5** **Central Coast**	Sydney Basin Localities **10** **Hawkesbury**	 **12** **Nepean**	South-Western Localities **13** **Burragorang**	 **14** **Cordeaux-Cataract**
Criterion **16** **Greenhouse gas emissions / ozone** (Surface transport related only)	**Type 1 Airports** Estimated GHG emissions for road and rail (10 per cent of passengers)	Max tonnes per year	700,000	300,000	444,000	515,000	791,000
		Min tonnes per year	507,000	219,000	346,000	370,000	557,000
	Type 2 Airports Estimated GHG emissions for road and rail (10 per cent of passengers)	Max tonnes per year	497,000	300,000	339,000	515,000	546,000
		Min tonnes per year	371,000	219,000	249,000	370,000	392,000
	Type 3 Airports Estimated GHG emissions for road and rail (10 per cent of passengers)	Max tonnes per year	387,000	229,000	260,000	388,000	411,000
		Min tonnes per year	274,000	157,000	180,000	260,000	275,000
	Type 4 Airports Estimated GHG emissions for road usage – assumes no rail link	Max tonnes per year	75,000	48,000	53,000	86,000	91,000
		Min tonnes per year	9,000	6,000	6,000	10,000	11,000
	Note: Greenhouse gases (GHG) estimated on the basis of the airport passenger capacity assuming 90 per cent road and 10 per cent rail – as rail does not exit at most sites the computation assumes rail has been extended to the site from the nearest existing railway (see Criterion 5). Note: the likelihood of rail at some sites is rated as extremely low to low – however these data assume that such a link would exist (but not for Type 4 Airports).						
Criterion **17** **Local air quality (pollution, particulate, odours)**	Existing air quality conditions near sites	Nearest NSW Government Office of Environment and Heritage air monitoring site	Wallsend (90 km)	Richmond (15 km)	Bringelly (6 km)	Oakdale (6 km)	Wollongong (33 km)
		Carbon monoxide (CO)	0.10 (VG)	Not recorded.	Not recorded.	Not recorded.	0.5 (VG)
		Nitrogen dioxide (NO_2)	0.2 (VG)	0.5 (VG)	0.6 (VG)	0.1 (VG)	0.2 (VG)
		Sulphur dioxide (SO_2)	4.5 (VG)	Not recorded.	Not recorded.	Not recorded.	5.4 (VG)
		$PM_{2.5}$	14.7 (VG)	19.1 (G)	17.7 (G)	15.9 (VG)	15.5 (VG)
		PM_{10}	-0.1 (VG)	0.00 (VG)	0.00 (VG)	Not recorded.	0.00 (VG)
		Air quality index (AQI)	29 (G)	38 (G)	35 (G)	33 (VG)	31 (VG)
	Note: For Criterion 17, VG = Very Good, G = Good. $PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in diameter, PM_{10} = Particulate Matter less than or equal to 10 microns in diameter.						
	Regional air shed characteristics		Elevated site north of Sydney Basin – better ventilated.	Site within Hawkesbury River Valley and Sydney Basin – less well ventilated.	Site within Hawkesbury River Valley and Sydney Basin – less well ventilated.	Elevated site south of Sydney Basin – better ventilated but could add to pollution in south-western Sydney due to air drainage into the Basin from Southern Highlands.	Elevated site south of Sydney Basin – better ventilated but could add to pollution in south-western Sydney due to air drainage into the Basin from Southern Highlands.
Criterion **18** **Potential impact on quality of receiving waters**	Site overlies water body (Y/N and name)		Yes – Robinson Creek and Little Mooney Mooney Creek (leads to Mooney Dam).	Yes – Howes Creek, Chain Of Ponds Creek and Currency Creek.	Yes – Blaxland Creek.	Yes – Waterfall Creek.	Yes – Clemments Creek, Cascade Creek, Allens Creek and Cordeaux River.
	Water body(ies) site drains into...		Flows into Hawkesbury Nepean River.	Flows into Hawkesbury Nepean River.	Flows into Hawkesbury Nepean River.	Flows into Werri Berri Creek which flows into Hawkesbury Nepean River.	Flows into Upper Nepean River which flows into Hawkesbury Nepean River.
	Does site flow into Sydney, Hunter or Gosford/Wyong Drinking Water Catchment?		Yes within Gosford/Wyong Councils' Water Authority Drinking Water Catchment.	Not within Sydney, Hunter or Gosford/Wyong Drinking Water Catchment.	Not within Sydney, Hunter or Gosford/Wyong Drinking Water Catchment.	Yes within Sydney Drinking Water Catchment.	Yes within Sydney Drinking Water Catchment.

Locality number Geographic locality descriptor			Northern Localities 5 Central Coast	Sydney Basin Localities 10 Hawkesbury	Sydney Basin Localities 12 Nepean	South-Western Localities 13 Burragorang	South-Western Localities 14 Cordeaux-Cataract
Criterion 19 **Waterway and water supply catchment impact**	Airport site as a percentage (per cent) of water supply catchment	Catchment	Mooney	Airport locality not within water supply catchment boundary.	Airport locality not within water supply catchment boundary.	Warragamba	Upper Nepean
		Maximum Airport	3.623			0.110	2.455
		Type 1 Airport	2.409			0.109	1.368
		Type 2 Airport	2.148			0.089	1.103
		Type 3 Airport	2.079			0.087	1.064
		Type 4 Airport	0.989			0.043	0.529
	Note: Catchment areas are as follows: Warragamba Catchment 905,100 ha, Upper Nepean Catchment 68,300 ha, Mangrove Catchment 101,000 ha, Mooney Catchment 39,000 ha. Locality 13 lies within the 'Special Areas' Sydney Catchment Authority (SCA) designated area. 'Special Areas' are areas of land around the water storages, and the land around the SCA's canals and pipelines.						
	Distance from waterways to site (by waterway type) (km)		Overlies Little Mooney Mooney Creek. 4 km from Mooney Dam.	Overlies Howes Creek, Chain Of Ponds Creek and Currency Creek. 1 km from Hawkesbury River.	Overlies Blaxland Creek. 6 km from Nepean River.	Overlies Waterfall Creek. 16km from Lake Burragorang.	Overlies Clemments Creek, Cascade Creek, Allens Creek and Cordeaux River. 1km from Nepean River.
Criterion 20 **National and State Parks** **PRIMARY CRITERION**	World Heritage Areas		No areas.	On edges of Greater Blue Mountains.	On edges of Greater Blue Mountains.	On edges of Greater Blue Mountains.	No areas.
	National Park (includes National Parks, State Forests, State Conservation Areas and Nature Reserves as provided by the NSW Government Office of Environment and Heritage – January 2011).		McPherson State Forest, Yengo National Park, Dharug National Park.	Penrith Lakes Regional Park, Wollemi National Park, Castlereagh Nature Reserve, Agnes Banks Nature Reserve, Cattai National Park, Maroota Ridge State Conservation Area, Pitt Town Nature Reserve, Rouse Hill Regional Park, Scheyville National Park, Wianamatta Regional Park, Windsor Downs Nature Reserve, Marramarra National Park, Maroota Historic Site.	Bents Basin State Conservation Area, Burragorang State Conservation Area, Gulger Nature Reserve, Mulgoa Nature Reserve.	Burragorang State Conservation Area, Nattai National Park.	Upper Nepean State Conservation Area, Dharawal State Conservation Area.
	Area of land within the site (ha) (rounded to nearest 10)	Maximum Airport	1,410	1,040	1,680	1,040	1,680
		Type 1 Airport	990	970	1,060	1,010	940
		Type 2 Airport	900	900	920	930	840
		Type 3 Airport	760	710	700	700	680
		Type 4 Airport	390	390	390	390	360
	National Parks – area affected (ha) (rounded to nearest 10)	Maximum Airport	10	0	0	0	0
		Type 1 Airport	10	0	0	0	0
		Type 2 Airport	10	0	0	0	0
		Type 3 Airport		0	0	0	0
		Type 4 Airport	0	0	0	0	0
	State Conservation Areas and Parks – area affected (ha) (rounded to nearest 10)	Maximum Airport	0	0	0	0	480
		Type 1 Airport	0	0	0	0	290
		Type 2 Airport	0	0	0	0	250
		Type 3 Airport	0	0	0	0	250
		Type 4 Airport	0	0	0	0	220
	RAMSAR wetland (ha)		No	No	No	No	No
	Note: Refer also to Part B – Search of EPBC Act.						

Locality number Geographic locality descriptor			Northern Localities	Sydney Basin Localities		South-Western Localities	
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Criterion **21A** **Flora/Fauna Species in the locality** **PRIMARY CRITERION**	Land zoned (7) or E2-E4 Environment Protection in the locality (ha) (rounded to nearest 10)		4,940	6,290	20	2,190	14,690
	'Protected' Flora and Fauna (as defined under the *National Parks and Wildlife Act 1974* (NPW Act 1974) and the *Threatened Species Conservation Act 1995* (TSC Act 1995))	Flora	0	0	0	0	0
		Fauna	0	0	0	0	0
	'Vulnerable' Flora and Fauna (as defined under NPW 1974 and the TSC Act 1995)	Flora	189	1,512	25	33	90
		Fauna	437	863	91	21	305
	'Endangered' Flora and Fauna (as defined under NPW 1974 and the TSC Act 1995)	Flora	816	1,234	91	0	106
		Fauna	4	164	75	8	24
	'Critically Endangered' Flora and Fauna (as defined under NPW 1974 and the TSC Act 1995)	Flora	0	0	0	0	0
		Fauna	0	38	1	0	1
Criterion **21B** **Flora/Fauna Species within the representative <u>Site</u>** **PRIMARY CRITERION**	Land zoned (7) or E2-E4 Environment Protection (ha) (rounded to nearest 10)	Maximum Airport	30	60	0	10	1,460
	Protected flora within the footprint of airport (ha)	Maximum Airport	0	0	0	0	0
		Type 1 Airport	0	0	0	0	0
		Type 2 Airport	0	0	0	0	0
		Type 3 Airport	0	0	0	0	0
		Type 4 Airport	0	0	0	0	0
	Vulnerable flora within the footprint of airport (ha)	Maximum Airport	2	0	2	0	19
		Type 1 Airport	2	0	2	0	14
		Type 2 Airport	1	0	2	0	14
		Type 3 Airport	0	0	0	0	12
		Type 4 Airport	0	0	0	0	6
	Endangered flora within the footprint of airport (ha)	Maximum Airport	236	0	2	0	11
		Type 1 Airport	232	0	1	0	3
		Type 2 Airport	77	0	1	0	2
		Type 3 Airport	8	0	1	0	1
		Type 4 Airport	4	0	0	0	0

Locality number Geographic locality descriptor			Northern Localities	Sydney Basin Localities		South-Western Localities	
			5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
	Critically endangered flora within the footprint of airport (ha)	Maximum Airport	0	0	0	0	0
		Type 1 Airport	0	0	0	0	0
		Type 2 Airport	0	0	0	0	0
		Type 3 Airport	0	0	0	0	0
		Type 4 Airport	0	0	0	0	0
	Protected fauna within the footprint of airport (ha)	Maximum Airport	0	0	0	0	0
		Type 1 Airport	0	0	0	0	0
		Type 2 Airport	0	0	0	0	0
		Type 3 Airport	0	0	0	0	0
		Type 4 Airport	0	0	0	0	0
	Vulnerable fauna within the footprint of airport (ha)	Maximum Airport	36	18	3	1	11
		Type 1 Airport	34	18	0	1	6
		Type 2 Airport	24	17	0	1	6
		Type 3 Airport	6	16	0	1	6
		Type 4 Airport	3	13	0	0	3
	Endangered fauna within the footprint of airport (ha)	Maximum Airport	0	1	7	0	0
		Type 1 Airport	0	1	6	0	0
		Type 2 Airport	0	1	5	0	0
		Type 3 Airport	0	1	0	0	0
		Type 4 Airport	0	1	0	0	0
	Critically endangered fauna within the footprint of airport (ha)	Maximum Airport	0	2	0	0	0
		Type 1 Airport	0	2	0	0	0
		Type 2 Airport	0	2	0	0	0
		Type 3 Airport	0	2	0	0	0
		Type 4 Airport	0	2	0	0	0
Criterion **22** **Indigenous cultural heritage and heritage items**	Aboriginal objects, places and other heritage values within site boundary	Nearby	3 sites: Narara Creek – 45-3-1066 and 45-3-1066 Glen Allen – 45-3-1390 Belltrees – 45-3-1408	1 site: Ebenezer – 45-5-0069	No Indigenous cultural heritage and heritage items.	No Indigenous cultural heritage and heritage items.	No Indigenous cultural heritage and heritage items.
		Maximum	4 sites: Somersby – 45-3-2114 Somersby – 45-3-2115 SIE 12 – 45-3-3347 Somersby – 45-3-1394	No Indigenous cultural heritage and heritage items.	4 sites: OS2 – 45-5-3806 OS3 – 45-5-3808 Isolated Artefacts 1 – 45-5-3802 Isolated Artefacts 2 – 45-5-3803	No Indigenous cultural heritage and heritage items.	3 sites: TLC5 – 52-2-2117 TPA1 – 52-2-3188 Wallandoola Site 30 – 52-2-1265

Locality number Geographic locality descriptor			Northern Localities 5 Central Coast	Sydney Basin Localities 10 Hawkesbury	12 Nepean	South-Western Localities 13 Burragorang	14 Cordeaux-Cataract
		Type 1	As for Maximum airport.	No Indigenous cultural heritage and heritage items.	3 sites: OS2 – 45-5-3806 OS3 – 45-5-3808 Isolated Artefacts 1 – 45-5-3802	No Indigenous cultural heritage and heritage items.	As for Maximum airport.
		Type 2	As for Maximum airport.	No Indigenous cultural heritage and heritage items.	As for Type 1 airport.	No Indigenous cultural heritage and heritage items.	As for Maximum airport.
		Type 3	As for Maximum airport.	No Indigenous cultural heritage and heritage items.	As for Type 1 airport.	No Indigenous cultural heritage and heritage items.	As for Maximum airport.
		Type 4	3 sites: Somersby – 45-3-2114 Somersby – 45-3-2115 SIE 12 – 45-3-3347	No Indigenous cultural heritage and heritage items.	As for Type 1 airport.	No Indigenous cultural heritage and heritage items.	1 site: TPA1 – 52-2-3188
	Note: As listed in the Aboriginal Heritage Information Management System (AHIMS) managed by the NSW Government Office of Environment and Heritage (then the Department of Environment, Climate Change and Water (DECCW)) on public or private land. Note - this does not preclude the possibility of further sites at a given locality upon close examination, including possibly significant sites. 'Nearby' includes Aboriginal heritage items within 1km from boundary of maximum airport footprint. Information given is AHIMS site name and code.						
Criterion **23** **Non-Aboriginal heritage items**	Location of State cultural heritage items	Maximum Airport	No cultural heritage sites.	1 site: Stannix Park House, cattle tanks and site (partially within footprint).	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.
		Type 1 Airport	No cultural heritage sites.	As per Maximum airport.	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.
		Type 2 Airport	No cultural heritage sites.	As per Maximum airport.	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.
		Type 3 Airport	No cultural heritage sites.	As per Maximum airport.	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.
		Type 4 Airport	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.	No cultural heritage sites.
		Nearby	1 site: Mount Penang Parklands (The Farm Home for Boys, Girrakool, Kariong Juvenile Detention Centre)	4 sites: Wilberforce Cemetery Cattai Estate Former Macquarie Schoolhouse/Chapel and St. John's (Blacket) Church Ebenezer Church (United) Old Schoolhouse, Cemetery and Tree	3 sites: 2260126 - St Thomas' Anglican Church and Cemetery 2260128 - Fernhill, outbuildings and landscape 2260125 - The Cottage	No cultural heritage sites.	No cultural heritage sites.
	Source: State Heritage Register						
Criterion **24** **State Significant Sites** **PRIMARY CRITERION**	Does the site include a State Significant Site (gazetted under Schedule 3 of the *Major Development SEPP 2005*)		No	No	No	No	No
	Number of State specified sites (number and type)		None	None	None	None	None
	Identification of any State Significant Sites in the locality		Wyong Employment Zone Warnervale Town Centre	None	None	None	None
Criterion **25** **Flood risk at site**	Is site potentially flood affected (based on current LEP Flood mapping)		No	Yes	No	No	No

Locality number Geographic locality descriptor		Northern Localities	Sydney Basin Localities		South-Western Localities	
		5 **Central Coast**	**10** **Hawkesbury**	**12** **Nepean**	**13** **Burragorang**	**14** **Cordeaux-Cataract**
Criterion **26** **Bushfire risk at site**	Land that is shown as 'Bushfire prone land' under s 146 of the *NSW Environmental Planning & Assessment Act 1979*	Entire site is either Bushfire Prone Land – Vegetation Category 1; Bushfire Prone Land – Vegetation Category 2; or Bushfire Prone Land – Vegetation Buffer.	Entire site is Bushfire Prone Land – Vegetation Category 1; Vegetation Category 2; and Vegetation Buffer.	Parts of the site are Bushfire Prone Land – Vegetation Category 1; and Vegetation Buffer.	Parts of the site are Bushfire Prone Land – Vegetation Category 1; and Vegetation Buffer.	Parts of the site are Bushfire Prone Land – Vegetation Category 1 and Vegetation Buffer
Criterion **27** **Earthquake / other disaster**	Rating on the 'Earthquake hazard map of Australia – 1991' Acceleration coefficient (a) 10 per cent chance of being exceeded in 50 years	0.09	0.08	0.08	0.10	0.10
	Occurrence of historic earthquakes in locality or site Severity, Date	Nearest Reported: Newcastle 5.6, 1989	Nearest Reported: Newcastle 5.6, 1989	Nearest Reported: Newcastle 5.6, 1989	Nearest Reported: Robertson (5.6, 1961) Picton (5.6, 1973)	Nearest Reported: Robertson (5.6, 1961) Picton (5.6, 1973)
	Note: While there are differences between the seismicity potential across these sites, this factor is not likely to be a differentiator in respect of suitability of the site for an airport in overall terms and may only influence the engineering design of structures.					
Criterion **28** **Land remediation and contamination (i.e. leakages)**	Land that is included on: • List of NSW contaminated sites notified to the NSW Government Office of Environment and Heritage; and • Contaminated Land: Record of Notices	No contaminated sites (as per the *Contaminated Land Management Act 1997*) have been notified within the vicinity of the proposed locality.	No contaminated sites (as per the *Contaminated Land Management Act 1997*) have been notified within the vicinity of the proposed locality.	No contaminated sites (as per the *Contaminated Land Management Act 1997*) have been notified within the vicinity of the proposed locality.	No contaminated sites (as per the *Contaminated Land Management Act 1997*) have been notified within the vicinity of the proposed locality.	No contaminated sites (as per the Contaminated Land Management Act 1997) have been notified within the vicinity of the proposed locality.
	Note: The fact that there are notifications does not preclude the possibility that, on closer examination, a given site will have issues of land contamination that would need to be addressed.					
Criterion **29** **Presence of or potential for underground mining activity**	Principal resources on, or underlying the site	Coal	Coal	Coal	Coal	Coal
	Mining subsidence (according to information sourced from Mine Subsidence Board)	Not in designated mine subsidence area.	Not in designated mine subsidence area.	Not in designated mine subsidence area.	Not in designated mine subsidence area.	In designated mine subsidence district. This location will need to be investigated further regarding mine subsidence.
	Coal applications and titles covering the site	No – not at Somersby, but elsewhere in the locality.	No	No	Yes - Partially	Yes - Partially
	Minerals applications and titles covering the sites	Yes	Yes	Yes	Yes	Yes
	Petroleum applications and titles covering the site	Yes	Yes	Yes	Yes	Yes
	Note: Data sourced from http://www.minerals.nsw.gov.au/mv2web/mv2?cmd=MainMap&topic=min#. In addition, there are many major industrial minerals sites scattered throughout the Sydney Region, such as aggregates quarries, sand, and dimension stone.					
Criterion **30** **Unexploded Ordnance Risks (UXO)** **PRIMARY CRITERION**	Risk of incomplete site remediation for UXO	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.	Would occupy part of Commonwealth land at Orchard Hills which may contain UXO potential.	No UXO risk sites identified in the locality.	No UXO risk sites identified in the locality.
	Comment on impact on new capacity created/unlocked	None	None	None – no representative airports identified close to this area.	None	None

Source: WorleyParsons/AMPC

Matrix 2 Comparative assessment of greenfield localities shortlisted in Phase 2
Part B: Search of *Environment Protection and Biodiversity Conservation Act 1999* (Refer to actual EPBC Act reports for details unless listed)

The following data has been sourced from a database compiled under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act has national application and is the framework used to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as matters of national environmental significance (i.e. NES). The assessment was undertaken using a nominal 5km radius from a centre point of each airport site.

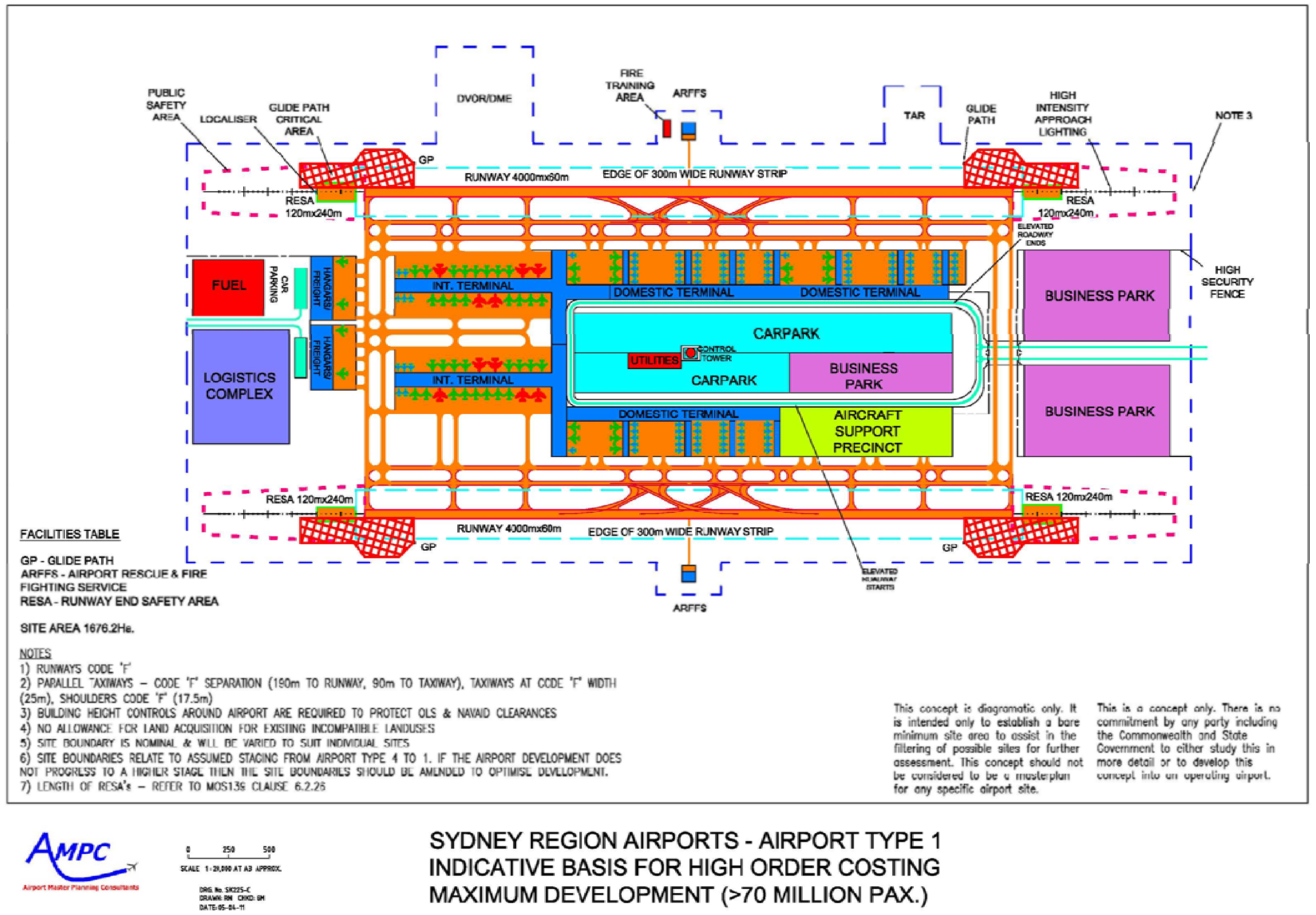
Note: there will be differences in the results of this assessment and those compiled using the NSW legislation for State important flora, fauna and heritage places (Criterion 21 in Part A) as assessments in Part A were undertaken based on State legislation and airport site footprints.

		Greenfield locality number				
		Northern Localities	Sydney Basin Localities		South-western Localities	
	Refer to Locality Identification map	**5**	**10**	**12**	**13**	**14**
Matters of National Environmental Significance	World Heritage Properties	None	None	None	None	None
	National Heritage Places	None	1 First Hawkesbury Farms NSW	None	None	None
	Wetlands of International Significance (Ramsar Wetlands)	None	None	None	None	None
	Great Barrier Reef Marine Park	None	None	None	None	None
	Commonwealth Marine Areas	None	None	None	None	None
	Threatened Ecological Communities	None	3	2	3	3
	Threatened Species	30	26	19	29	25
	Migratory Species	14	14	14	14	14
Other matters protected by the EPBC Act	Commonwealth Lands	1	1 Australian Telecommunication Commission	3 Defence 1CAD Orchard Hills Kingswood Defence – RANMME (DEOH) Commonwealth Land	2 Australian Telecommunication Commission Commonwealth Trading Bank of Australia	None
	Commonwealth Heritage Places	None	None	1 Orchard Hills Cumberland Plain Woodland NSW	None	None
	Listed Marine Species	12	12	12	12	12
	Whales and Other Cetaceans	None	None	None	None	None
	Critical Habitats	None	None	None	None	None
	Commonwealth Reserves	None	None	None	None	None
Report Summary for Extra Information	Place on the Register of the National Estate (RNE)	3 Brisbane Water National Park (1981 boundary) Howe Aboriginal Area Narara Area	6 Macquarie School House Manse of Ebenezer Church (former) Rose Cottage St Johns Anglican Church St Johns Anglican Church Group Uniting Church, Old Schoolhouse and Curtilage	6 Mulgoa Natural Area Orchard Hills Cumberland Plain Woodland Fernhill Setting Mulgoa Group and Landscape St Thomas Anglican Church and Cemetery The Cottage	2 St Matthews Church and Courtyard The Hermitage	1 Upper Nepean Water Catchment
	State and Territory Reserves	None	None	None	None	None
	Regional Forest Agreements	1	None	None	None	None
	Invasive Species	17	17	17	17	17
	Nationally Important Wetlands	None	None	None	None	None
	EPBC Act Referrals	4	2	9	1	2

Source: WorleyParsons/AMPC analysis

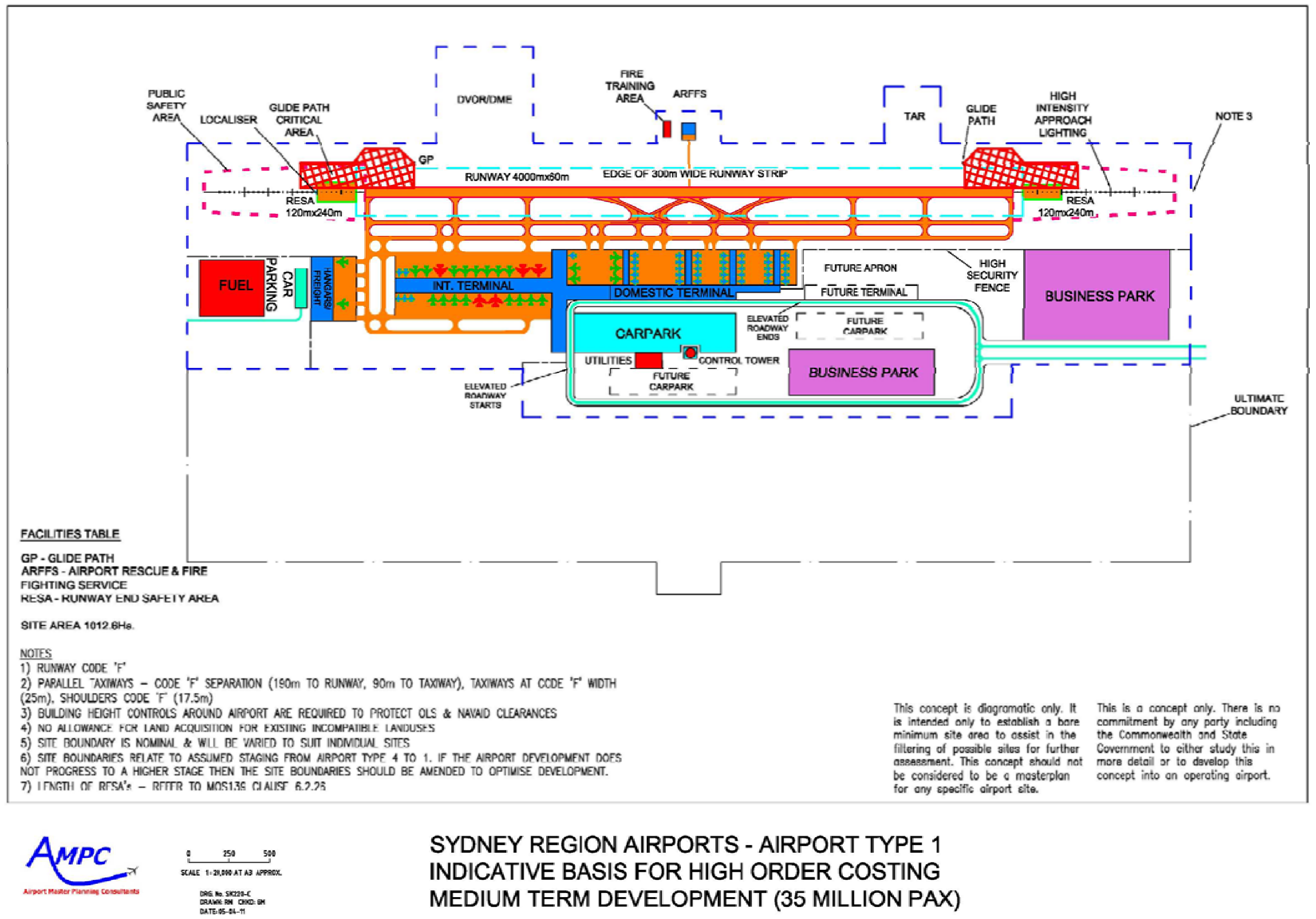
Matrix 2 Comparative assessment of greenfield localities shortlisted in Phase 2
Part C: Maps and Figures: Indicative airport type templates used to populate Matrix 2

Matrix 2 Indicative Maximum Type 1 Airport (parallel runways)



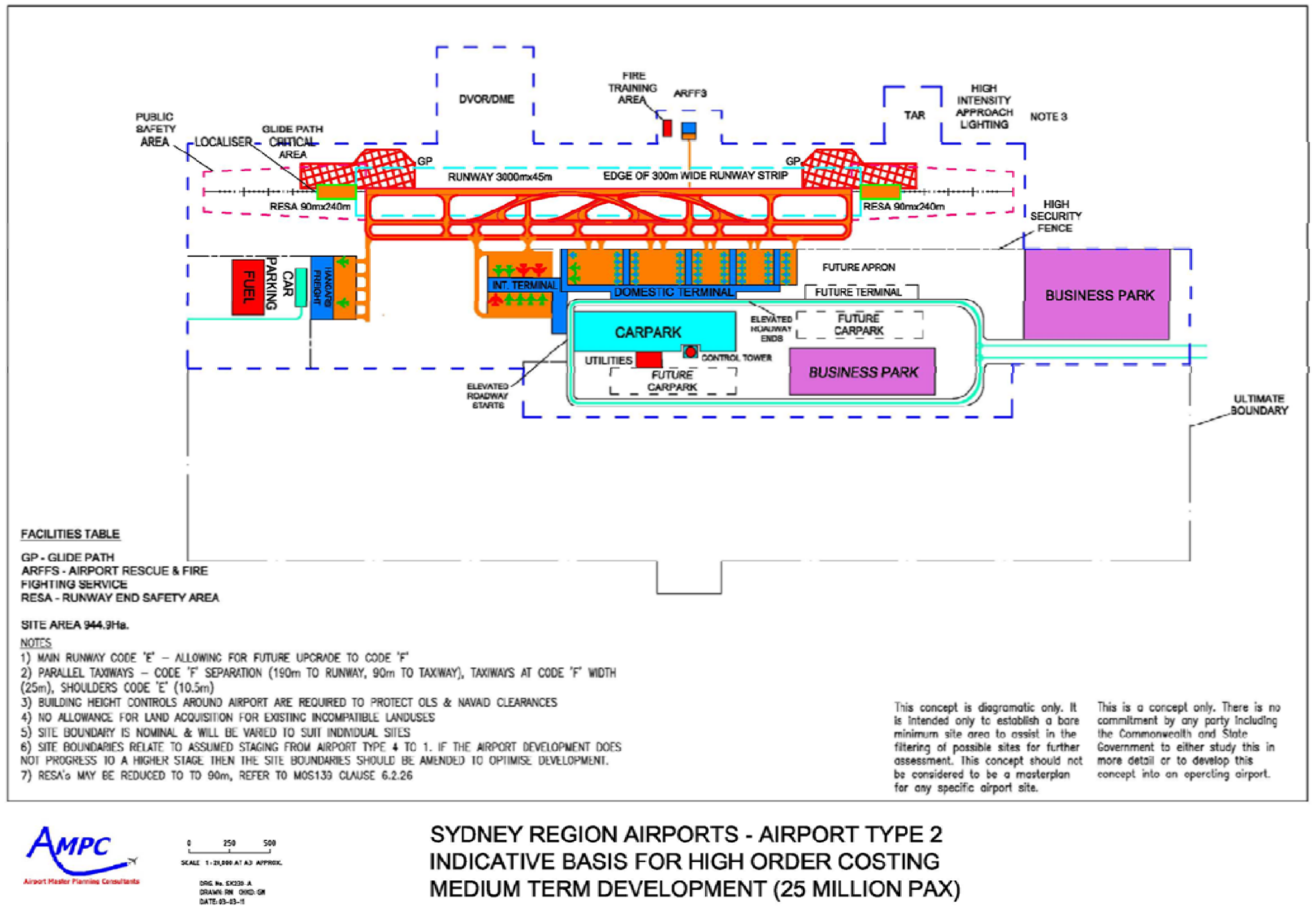
Source: WorleyParsons/AMPC

Matrix 2 Indicative Type 1 Airport (single runway)



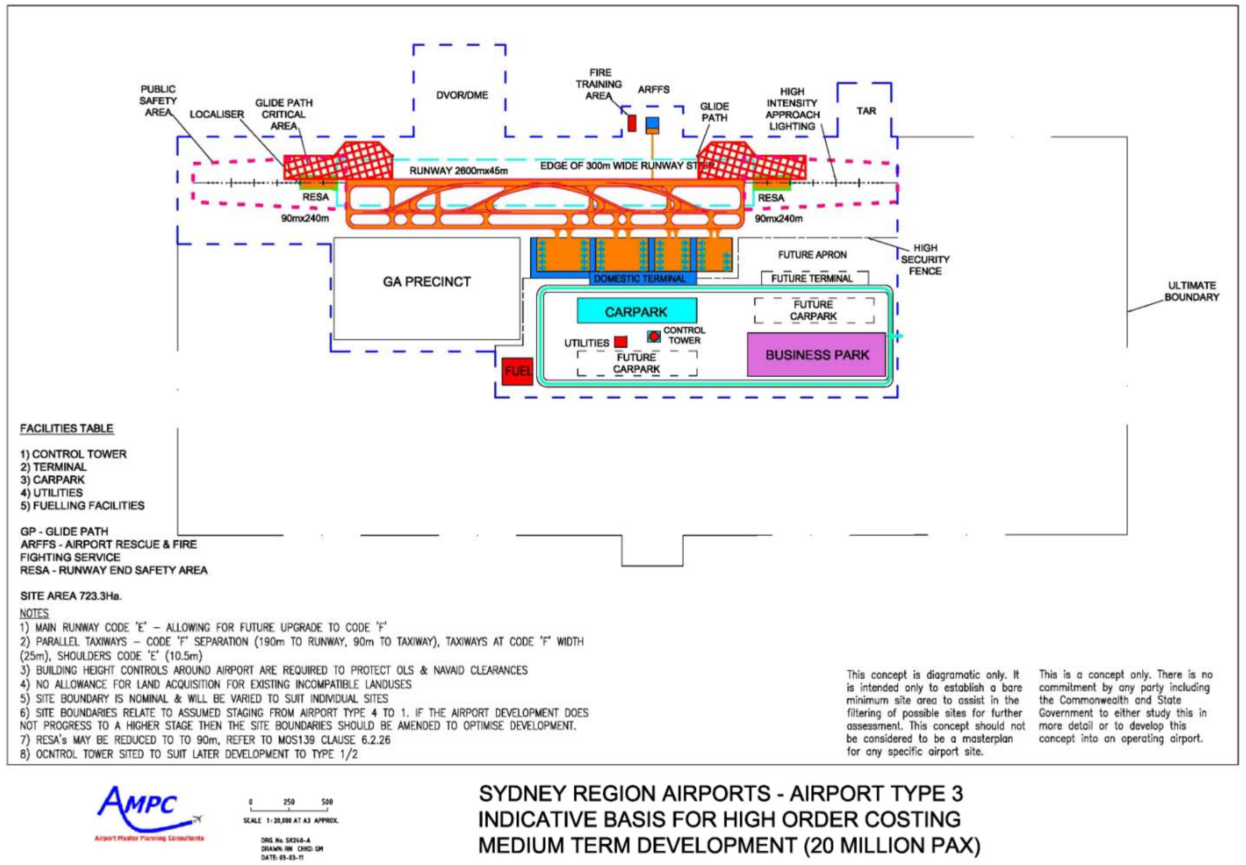
Source: WorleyParsons/AMPC

Matrix 2 Indicative Type 2 Airport



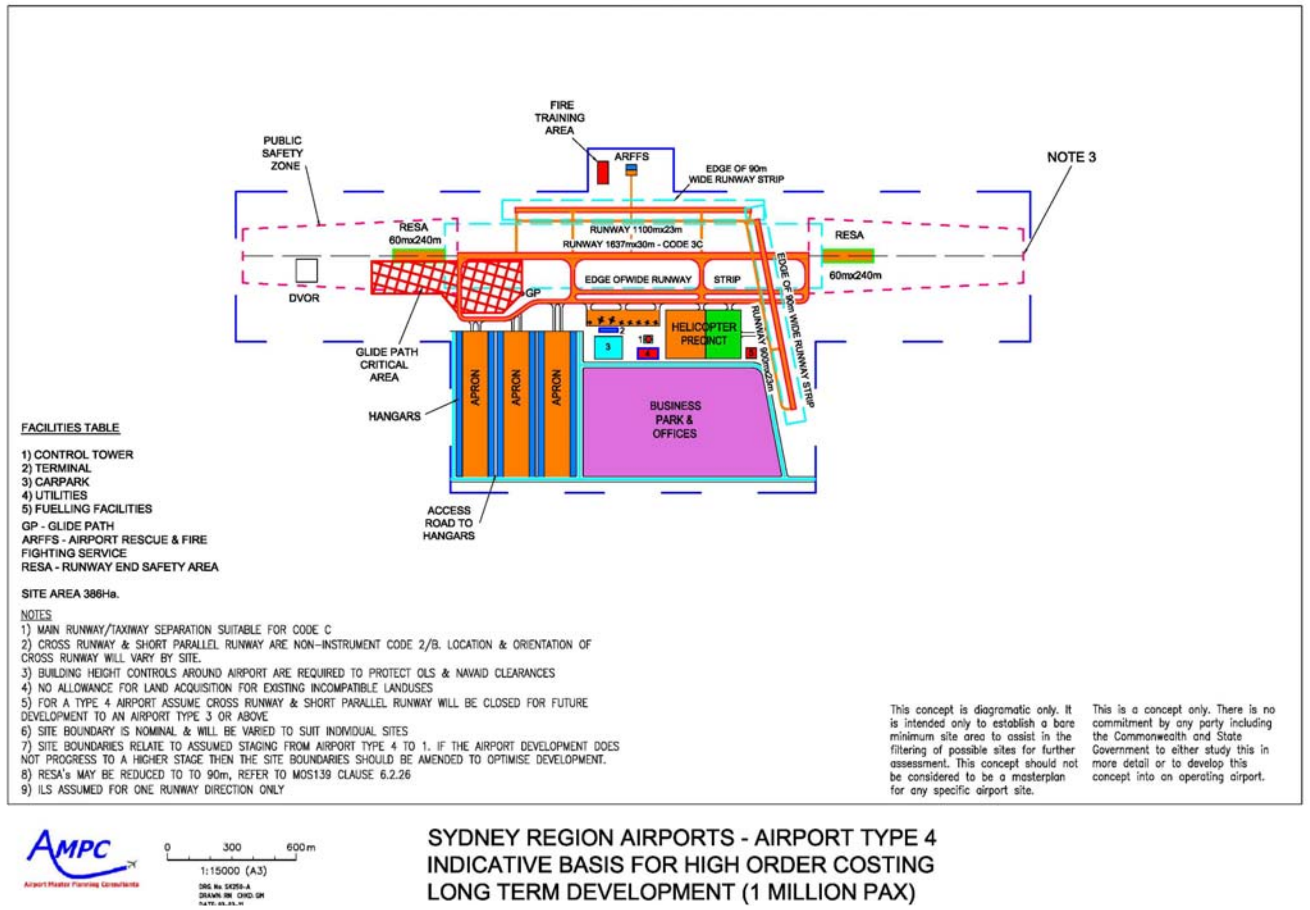
Source: WorleyParsons/AMPC

Matrix 2 Indicative Type 3 Airport



Source: WorleyParsons/AMPC

Matrix 2 Indicative Type 4 Airport



Source: WorleyParsons/AMPC

Matrix 3 Comparative assessment of suitable sites analysed in Phase 4 of the greenfield assessment process

Matrix 3 Comparative assessment of suitable sites analysed in Phase 4
Part A: Type 1 maximum airports

	Locality Name	Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
	Site Name	Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
General Site Attributes	Geographic Place Name	Wallarah	Somersby	Wilberforce	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wilton
	Local Government Area (LGA)	Wyong Shire	Gosford	Hawkesbury	Penrith Liverpool	Liverpool	Liverpool Camden	Liverpool Camden	Wollondilly Shire	Wollondilly Shire	Wollondilly Shire Wollongong
	Local Environmental Plan (LEP)	Wyong LEP 1991 SEPP (Major Projects) 2005	Gosford Interim Development Order 122	Hawkesbury LEP 1989	Penrith LEP 2010 Liverpool LEP 2008	Liverpool LEP 2008	Liverpool LEP 2008 Camden LEP 2010	Liverpool LEP 2008 Camden LEP 2010	Wollondilly LEP 2011	Wollondilly LEP 2011	Wollondilly LEP 2011 Wollongong LEP 2009
	Site Zoning	1(a) Rural 1(1) Rural (Production) 1(c) Non-Urban Constrained Land Zone 2(a) Residential 2(e) Urban Release Area 4(e) Regional Industry and Employment Development 5(a) Special Uses 5(b) Special Uses - Railway 5(c) Local Road Reservation 5(d) Arterial Road Reservation 6(a) Open Space and Recreation 7(2) Conservation (Secondary) 7(g) Wetlands Management 10(a) Investigation Precinct B2 Local Centre E2 Environmental Conservation IN1 General Industrial R1 General Residential RE1 Public Recreation SP2 Infrastructure (water management)	1(a) Rural - Agricultural 4(a) Industrial - General 5 Special Uses - General 6(b) Open Space - Special Purpose 7(b) Environmental Protection - Scenic Protection	1(b) Rural "B" 1(c1) Rural "C1" 5(a) Special Uses "A" 6(a) Open Space (Existing Recreation) 7(a) Environmental Protection (Wetlands) 7(d1) Environmental Protection (Scenic)	E2 Environmental Conservation R2 Low Density Residential R5 Large Lot Residential RU1 Primary Production RU2 Rural Landscape RU4 Rural Small Holdings SP1 Special Activities (defence) SP2 Infrastructure (classified road) SP2 Infrastructure (water supply system) Deferred Matter	RU1 Primary Production RU4 Rural Small Holdings SP1 Commonwealth Activities SP2 Infrastructure (classified road)	R5 Large Lot Residential RU1 Primary Production RU4 Rural Small Holdings SP1 Special activities (Commonwealth activities) SP2 Infrastructure (Educational establishment)	E1 National Parks and Nature Reserves RU1 Primary Production SP2 Infrastructure (Educational establishment)	RU1 Primary Production RU2 Rural Landscape SP2 Infrastructure (road)	E2 Environmental Conservation RU2 Rural Landscape SP2 Infrastructure (road)	E2 Environmental Conservation
	Draft LEP (that has been the subject of public consultation under the EP&A Act 1979)	N/A (not yet on exhibition)	Draft Gosford LEP 2009 E2 Environmental Conservation IN1 General Industrial RE1 Public Recreation RU1 Primary Production RU2 Rural Landscape RU5 Village SP2 Infrastructure (research station) SP2 Infrastructure (road)	Draft Hawkesbury LEP 2011 RU1 Primary Production RU2 Rural Landscape RU4 Rural Small Holdings SP2 Infrastructure (classified road) SP2 Infrastructure (water supply)	N/A	N/A	N/A	Draft Camden LEP 2009 RU1 Primary Production	N/A	N/A	N/A
	Estimated population within 30km radius of Site	347,900	306,500	553,500	1,114,300	1,146,200	1,001,200	693,100	122,200	285,700	292,500

Locality Name	Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
Site Name	Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
Estimated population within 15km radius of Site	119,800	111,800	66,300	139,000	132,300	104,100	43,200	28,000	9,700	43,400
Note: Estimated population based on radius from site centre. Source: ABS Census 2006 (rounded to nearest '00).										
Site Footprint	1,676ha	1,465ha	2,187ha	1,679ha	1,669ha Additional Area 281ha	1,676ha	1,368ha	1,676ha	1,783ha	1,883ha
Runway Length and Width (Alignment)	4,000 m x 60 m (17/35) 2,500 m x 60m (17/35)	2,500 m x 60 m (09/27) 3,500 m x 60 m (18/36) 4,000 m x 60 m (18/36)	2,500 m x 60 m (10/28) 3,500 m x 60 m (01/19) 4,000 m x 60 m (01/19)	2,500 m x 60 m (01/19) 4,000 m x 60 m (01/19)	2,500 m x 60 m (14/32) 2,500 m x 60 m (05/23) 4,000 m x 60 m (05/23)	4,000 m x 60 m (15/33) 2,500 m x 60m (15/33)	2,500 m x 60 m (17/35) 4,000 m x 60 m (17/35)	4,000 m x 60 m (18/36) 2,500 m x 60m (18/36)	2,500 m x 60 m (08/26) 2,500 m x 60m (18/36) 4,000 m x 60 m (18/36)	2,500 m x 60 m (07/25) 2,500 m x 60 m (17/35) 4,000 m x 60 m (17/35)
Key Airport Facilities (assumed in Site footprint)	2x Business Parks, Logistics Complex, Commuter Car Park.	3x Business Parks, Logistics Complex, Aircraft Support Precinct, Commuter Car Park.	2x Business Parks, Logistics Complex, Aircraft Support Precinct, Commuter Car Park.	3x Business Parks, Logistics Complex, Commuter Car Park.	2x Business Parks, Logistics Complex, Commuter Car Park.	2x Business Parks, Logistics Complex, Commuter Car Park.	2x Business Parks, Logistics Complex, Aircraft Support Precinct, Commuter Car Park.	2x Business Parks, Logistics Complex, Commuter Car Park.	2x Business Parks, Logistics Complex, Commuter Car Park.	Business Parks, Logistics Complex, Aircraft Support Precinct, Commuter Car Park
Site Capacity (aircraft movements)	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.	Up to 100 movements per hour or 370,000 movements per year.
Site Capacity (passenger movements)	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42 million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 72 million per year based on passengers per aircraft mix of 195 on long runway, as per 2009 Sydney Airport Master Plan). 48 million based on 130 passengers per aircraft.	Up to 72 million per year based on passengers per aircraft mix of 195 on long runway, as per 2009 Sydney Airport Master Plan). 48 million based on 130 passengers per aircraft.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42 million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan) 42 million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42 million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42 million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.	Up to 65 million per year based on passengers per aircraft mix of 195 on long runway and assuming 140 on short runway (as per 2009 Sydney Airport Master Plan). 42 million based on 130 passengers per aircraft on long runway and 80 passengers per aircraft on short runway.
Note: Site capacity (by passengers and aircraft movements) assumes nil interaction with existing airports and that operations can be managed, albeit with extra track miles and associated economic penalties to operators.										
Key Transport System/s within ~5kms of Site	F3 Sydney – Newcastle Freeway Sparks Road Main North Line	F3 Sydney – Newcastle Freeway Peats Ridge Road	Putty Road King Road	The Northern Road Elizabeth Drive	The Northern Road Badgerys Creek Road Elizabeth Drive	The Northern Road Greendale Road	Greendale Road The Northern Road	Montpellier Drive Barkers Lodge Road	Picton Road F5 Hume Freeway	Picton Road
General terrain of Site	Rolling coastal plain drained by Wallarah Creek to Tuggerah Lake. Some open, some forested and some developed lands. Existing Airfield to the south.	Large elevated rectangular area of undulating planar rural land, as part of a dissected montane plateau.	Undulating terrain on the slopes of the Hawkesbury River valley with some areas of floodplain and open rural land, rising to higher ground the west and north.	Rolling planar terrain on the watershed between the Nepean River and Badgerys Creek and other headwaters of South Creek mostly in use for rural land activities.	Rolling planar terrain on the watershed between the Nepean River and Badgerys Creek mostly in use for rural land activities.	Rolling planar terrain on the watershed between the Nepean River and Badgerys Creek mostly in use for rural land activities.	Open rolling planar terrain within the catchment of the Nepean River mostly in use for rural land activities.	Elevated rectangular area of sloping planar in the upper portion valley of Monkey Creek with mostly developed rural uses.	Heavily dissected montane plateau with open rural and some long linear ridge lines adjoining the deep gorges of the major rivers.	Heavily dissected montane plateau with open rural and some long linear ridge lines adjoining the deep gorges of the major rivers.
Geology	Multi-coloured chert sandstone quartzose sandstone shale and claystone	Multi-coloured chert sandstone quartzose sandstone shale and claystone	Sandstone and shale	Shale atop of sandstone	Sandstone and shale	Sandstone and shale	Sandstone and shale	Quartz sandstone with some shale	Sandstone and shale	Sandstone and shale
Note: Geological information sourced from the Department of Primary Industries website, 1:500 000 geological maps. (http://www.dpi.nsw.gov.au/minerals/geological/geological-maps/1-500-000)										
Soil Classification	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.7m	Topsoil thickness layer 0.15m Subsoil layer 1.2m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.4m Subsoil layer 0.7m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m
Note: Soil classification information sourced from the Australian Soil Resource Information System (ASRIS) digital atlas website (http://www.asris.csiro.au/themes/Atlas.html#Atlas_Digital)										
Major River Systems close to Site (e = Site well elevated above river systems)	Wyong River Wallarah Creek	Mooney Mooney Creek (e)	Bushells Lagoon Hawkesbury River	Nepean River Mulgoa Creek	Badgerys Creek Oaky Creek	South Creek Town Rural Storage Lowes Creek	Nepean River Bringelly Creek	Monkey Creek	Avon River Cordeaux River (e)	Lake Cataract Cataract River (e)

	Locality Name	Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
	Site Name	Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
CRITERION 1 Accessibility of the Sydney land transport network (rail and state roads)	Kilometres to connect Site boundary to existing rail link	~2.5km to Warnervale Station	~4.5km to Ourimbah Station	~8km to Windsor Station	~9km to Kingswood Station ~16km to proposed Leppington Station	~11km to Werrington Station ~13km to proposed Leppington Station	~13km to proposed Leppington Station	~13km to Macarthur Station ~15km to proposed Leppington Station	~7km to Picton Station	~20km to Menangle Park Station ~25km to Macarthur station on Main South Railway	~11km to Douglas Park Station
	Likelihood of a rail link being constructed to, or near to the Site Note: distances are approximate (~) and straight line – additional length will be needed to accommodate grades and other constraints	An airport could either be served by planning the Site such that direct access to the existing railway was possible, or by construction of an airport specific spur line or deviation of the main north to address the site.	Unless the Site is accessed by a new alignment, possibly as a part of Sydney – Newcastle High Speed Line, requires ~21km airport specific spur line branching from the Main North Line in the vicinity of Ourimbah.	Requires ~7km airport specific extension of the Richmond Line on the existing rail network from the existing Richmond station.	Requires ~18km extension of the South West Rail Link now under construction or a ~12km airport specific spur line branching from Western Line in the vicinity of Werrington.	Requires ~11km extension of the South West Rail Link now under construction.	Requires ~7km extension of the South West Rail Link now under construction.	Requires ~13km extension of the South West Rail Link now under construction.	Requires > 5km airport specific spur line branching from the existing Main South Line near Picton or ~18km to near Menangle.	The Site is adjacent or incorporates the alignment of the partially constructed Maldon – Dombarton Railway. A short spur to an airport terminal may be needed.	The Site is ~12km from the alignment of the partially constructed Maldon – Dombarton Railway. A ~12km spur to an airport terminal would be required generally along the alignment of the Picton Road.
	Specific issues in constructing a rail link	The existing railway is at a similar level to the airport Site and the terrain for connections would be relatively easy. A Site in the same vicinity has been investigated for a rail stabling facility.	Existing railway is about 240m different in elevation to the existing, requiring construction in mountainous terrain, necessitating long tunnels.	Existing Railway is about 45m different in elevation. Major extension of the Richmond line required including crossing of Hawkesbury River and construction in hilly terrain.	Surface construction through rural and semi rural areas in easy terrain.	Surface construction through rural and semi rural areas in easy terrain.	Surface construction through rural and semi rural areas in easy terrain.	Surface construction through rural and semi rural areas in easy terrain.	Construction through rural and semi rural areas, probably requiring tunnels in hilly terrain.	Completion of the Maldon - Dombarton Railway would enable diesel hauled but not electric traction service to access the site. Electric traction would require extension of the electrification system from Macarthur.	Completion of the Maldon - Dombarton Railway would enable diesel hauled but not electric traction service to access the site. Electric traction would require extension of the electrification system from Macarthur.
	Capacity of the existing rail systems and implications of additional airport traffic requirements for additional capacity (not costed)	Requirements for providing additional capacity for 4 trains per hour: A new alignment or a tunnel between Hawkesbury River and Berowra due to the limit of capacity in Cowan Bank on Main Northern Railway.	Requirements for providing additional capacity for 4 trains per hour: A new alignment or a tunnel between Hawkesbury River and Berowra due to the limit of capacity in Cowan Bank on Main Northern Railway.	Requirements for providing additional capacity for 4 trains per hour: Duplication of Richmond Line If the Western Express Project goes ahead, there may not capacity issues on the Western Line.	Requirements for providing additional capacity for 4 trains per hour on the East Hills Line: Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Requirements for providing additional capacity for 4 trains per hour on the East Hills Line: Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Requirements for providing additional capacity for 4 trains per hour on the East Hills Line: Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Requirements for providing additional capacity for 4 trains per hour on the East Hills Line: Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Main Southern Railway/East Hills Line does not have sufficient capacity to serve a new airport. Requirements for providing additional capacity for 4 trains per hour on the Main South Line: Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification	Main Southern Railway/East Hills Line does not have sufficient capacity to serve a new airport. Requirements for providing additional capacity for 4 trains per hour on the Main South Line: Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification New refuges south of Macarthur	Main Southern Railway/East Hills Line does not have sufficient capacity to serve a new airport. Requirements for providing additional capacity for 4 trains per hour on the Main South Line: Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield Quadruplication between Revesby and Glenfield Sextuplication between Erskineville and Tempe Re-signalling and electrification New refuges south of Macarthur
	Comparative order of cost for rail link including rollingstock	~$740	~$2,190	~$1,320	~$1,130	~$1,130	~$1,130	~$1,130	~$930	~$1,100	~$1,630
	Source: WorleyParsons/AMPC estimates for representative airport sites.										
	Kilometres to connect Site boundary to existing designated state roads/highways	~2.5m to F3	~2.5m to F3 (eastern boundary of Site)	~25km to M7	~8km to Western Motorway (M4) ~15km to M7	~11km to Western Motorway (M4) ~10km to M7	~13km to M7	~18km to Western Motorway (M4) ~20km to M7	~16km to Hume Highway	~9km to Hume Highway	~10km to Hume Highway
	Specific issues in constructing a road link	The existing roadway (F3) is at a similar level to the airport site. The F3 would need to be diverted and the diverted road connected to the airport. Connection would be relatively easy.	The existing roadway (F3) is at a similar level to the airport Site and connections would be relatively easy.	The existing roadways (Wilberforce and Windsor Roads) would require an upgrade. Upgrade to the road bridge over the Hawkesbury River, connection would be relatively easy.	The existing roadways (The Northern Road and Elizabeth Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (The Northern Road and Elizabeth Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (The Northern Road and Bringelly Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (Greendale Road, The Northern Road and Bringelly Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (Barkers Lodge Road, Remembrance Drive and Woodbridge Road) would require an upgrade, connection would be relatively easy.	The existing roadways (Picton Road) would require an upgrade, connection would be relatively easy.	The existing roadways (Picton Road) would require an upgrade, connection would be relatively easy.
	Works required	8km road diversion of the Pacific Highway and connection to airport.	3km upgrade to Peats Ridge Road and connection to airport.	9km upgrade to Putty Road, Wilberforce Road and Windsor Road and connection to airport.	15km upgrade to The Northern Road and Elizabeth Drive and connection to airport.	8km upgrade to Elizabeth Drive and connection to airport.	12km upgrade to Bringelly Road and connection to airport.	15km upgrade to Greendale Road and Bringelly Drive, 2km extension of Greendale Road and connection to airport.	14km upgrade to Bakers Lodge Road and Remembrance Drive, 5km extension road and connection to airport.	20km upgrade to Picton Road and connection to airport.	20km upgrade to Picton Road and connection to airport.
	Cost of works to nearest $ million	~$108 million	~$82 million	~$259 million	~$345 million	~$192 million	~$270 million	~$369 million	~$397 million	~$456 million	~$456 million

Locality Name		Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
Site Name		Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
	Note: Estimated costs for road construction are as follows: • Upgrade from a 2 lane corridor to 4 lane corridor - $22 million/km (based on NSW Roads and Maritime Services (NSW RMS) cost estimates of upgrade to the Oxley Highway). • Diversion/Extension of road, new two lane two way road - $11.5 million/km (based on NSW RMS cost estimate of diversion of The Camden Valley Way). • Airport connection, overpasses and connections - $15.5 million each (based on Canberra Airport connection cost). • Bridge widening - $114million/km (based on NSW RMS cost of Sea Cliff Bridge, Illawarra).										
CRITERION 2 Proximity to growth centres and commercial opportunities	Distance from Site boundary to identified commercial growth centres (Metro and Regional Strategies)	Tuggerah-Wyong Major Centre (~14km)	Gosford City Centre (~7km) Tuggerah-Wyong Major Centre (~14km)	Windsor Town Centre (~9km) Rouse Hill Planned Major Centre (~16km)	Penrith Regional City (~10km) Leppington Planned Major Centre (~16km) Mt Druitt Potential Major Centre (~14km)	Penrith Regional City (~15km) Leppington Planned Major Centre (~10km) Mt Druitt Potential Major Centre (~12km)	Leppington Planned Major Centre (~10km)	Leppington Planned Major Centre (~14km) Penrith Regional City (~21km) Mt Druitt Potential Major Centre (~22km)	Camden Town Centre (~23km) Campbelltown-Macarthur Major Centre (~35km)	Campbelltown-Macarthur Major Centre (~25km) Wollongong Regional City (~23km)	Campbelltown-Macarthur Major Centre (~22km)
	Percentage of footprint within North West or South West Growth Centre	0%	0%	0%	0%	0%	25%	0%	0%	0%	0%
	N70 - 10 Event Contour impact on North West or South West Growth Centre	Nil	Nil	Low	Medium	High	High	High	Nil	Nil	Nil
CRITERION 3 Comparative Earthworks Estimate	Comparative cut plus fill earthworks volume to level Site (m^3/ha) rounded to nearest '00.	97,800	177,500	87,300	80,900	115,400	126,900	119,000	197,900	208,900	149,200
	Comparative cost to prepare airport platform (nearest million)	~$280 million	~$530 million	~$343 million	~$284 million	~$356 million	~$407 million	~$304 million	~$680 million	~$805 million	~$564 million
	Note: Comparative cut plus fill earthworks volume in m^3/ha to create a completely level airport footprint. Note: In practice airport sites do not have to be completely level over their whole area. Costs are based on adjusted earthworks volumes to account for this and for the different geotechnical material expected to be encountered on that site.										
CRITERION 4 Noise Impact on Residents	20 ANEC	10,700	4,180	10,250	3,290	3,200	3,990	1,920	5,920	290	1,280
	25 ANEC	3,420	790	2,290	1,170	1,360	970	650	3,250	130	240
	30 ANEC	1,930	200	780	460	540	310	220	1,520	60	110
	35 ANEC	970	100	330	110	200	110	80	610	30	50
	40 ANEC	380	50	110	50	100	50	30	300	10	30
	Distance (m) from Site boundary to nearest urban areas (as defined by NSW Department of Planning and Infrastructure)	0	1,950	0	0	3,750	4,300	1,950	2,450	750	4,000
	Number of Persons Exposed to >10 Number of Events >70dB(A)	60,360	8,080	33,600	43,130	52,400	32,460	12,670	13,680	1,950	11,880
	N70 person events (nearest '00)	2,534,200	670,600	2,020,800	1,545,200	1,668,000	1,284,600	499,200	799,400	81,500	324,800
	AIE (N70/Persons exposed)	40	80	60	40	30	40	40	60	40	30
	Note 1: Approximate population within noise contour categories based on site specific orientation of runway (nearest '0). Refer Australian Standard AS 2021-2000 Acoustics - aircraft noise intrusion - building siting and construction. Note 2: This study has chosen specific sites for more detailed assessment and BoM wind data has become available for some Sites. This is for comparative assessment and do not represent ANEC with ANEF contours endorsed by Airservices Australia as per of Ministerial Direction M37/99 and the *Airports Act 1996*, as inputs from Airservices Australia/CASA on design flight tracks. Any interactions between airports etc. will still be required. Note 3: The Department of Infrastructure and Transport considers that further metrics to ANEF/ ANEC give the decision makers a much clearer picture of what the outcomes will be if they approve the project, e.g. showing actual flight paths and the use of N70 contours and the number of aircraft noise events above 70 dBA. Person-Events Index (PEI) then allows the total noise load generated by each airport to be computed by summing, over the exposed population, the total number of instances where an individual is exposed to an aircraft event above a specified noise level (in this case N70), over a given time period. Note 4: $PEI(70) = \Sigma P_N N$ where P_N is the number of persons exposed to N70.										
CRITERION 5 Mine Subsidence	Designated mine subsidence zone present within Site (Percentage of Site within designated mine subsidence zone)	Yes (~20%)	No	No	No	No	No	No	No	Yes (~25%) Site is close to mine subsidence areas and operating mines. Extent of any old or current mines needs to be established.	No Site is close to mine subsidence areas and operating mines. Extent of any old or current mines needs to be established.
CRITERION 6 Number of Lots Requiring Acquisition	Approximate number of allotments within Site	500	190	380	140	40	180	70	100	40	10
	Average number of allotments per hectare within Site	0.298	0.130	0.370	0.081	0.018	0.103	0.048	0.057	0.023	0.003

Locality Name		Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
Site Name		Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
Based on number of lots directly impacted by Site footprint	Population within Site boundary (Census 2006) (rounded to nearest '0)	1,120	170	940	210	490	250	150	130	70	130
CRITERION 7 Airspace Interaction	See also input from Airservices Australia in the WorleyParsons/AMPC technical paper: "Airport Suitable Sites - Specified Localities" Inputs from CASA and Defence have not been incorporated into this analysis	Major Probable interaction with military airspace to the north and east. Several power stations in vicinity (potential danger areas due high velocity exhaust).	Major Probable interaction with operations to Sydney (Kingsford-Smith) Airport..	Major Probable interaction with operations to Sydney (Kingsford-Smith) Airport. Site within military airspace with issues for access routes. For maximum airport assumes RAAF Base Richmond closed and relocated.	Major The location of R536A and 536B within the nominal CTR boundary would not be compatible with the proposed 01/19 runway alignment. The Department of Defence Orchard Hills facility would have to be relocated. Potential impacts on flying training areas and Camden Airport. Extent of interaction with Sydney (Kingsford-Smith) Airport may be improved in comparison to Badgerys Creek as runway alignment more northerly than Badgerys Creek.	Major Potential impacts on flying training areas and Camden Airport. See note below.	Major Site is aligned north west - south east with the intention of minimising interaction with Holsworthy Airspace to the south east. Potential impacts on flying training areas and Camden Airport.	Major Site well south of the RAAF Base Richmond military airspace and minimises interaction with Orchard Hills Explosives depot airspace. Potential impacts on flying training areas and Camden Airport. May need to consider wind turbulence due to high terrain to the west.	Major Site well south of the RAAF Base Richmond military airspace and minimises interaction with Orchard Hills Explosives depot airspace. Potential impacts on flying training areas and Camden Airport. May need to consider wind turbulence due to high terrain to the west.	Major	Major
	Note 1: In all cases the preliminary observations listed herein need to continue to be tested with relevant authorities: Airservices Australia; Department of Defence; Office of Airspace Regulation; existing airport operators and users at the feasibility stage. Potential conflicts or dependencies with RAAF Base Richmond and Sydney (Kingsford-Smith) Airport operations and Sydney basin traffic would require more detailed analysis by Department of Defence, Airservices Australia and/or the Office of Airspace Regulation. The general complexity of existing airspace within and adjacent to the Sydney Basin makes this ongoing review necessary. Major • Airspace where there are significant levels of civil air transport traffic and military activity, such as around Sydney, Williamtown, Nowra and Richmond, together with their respective CTR/CTA and operational procedures and requirements; or • Restricted Areas particularly those with provisional classifications of RA3 and RA2; or • Danger Areas associated with military flying training. Moderate • Airspace where there are significant levels of GA traffic, such as around Bankstown and Camden, together with their respective CTR (note in practice as Bankstown and Camden are relatively close to the larger airports, a potential moderate ranking is effectively outweighed by the factors affecting the larger airports); or • Restricted Areas with provisional classifications of RA1; or • Danger Areas associated with civil flying training; or • VFR transit routes. Minor • Airspace where there are lower levels of civil traffic and non-towered aerodromes; or • Danger Areas. Note 2: This assessment of Badgerys Creek has been prepared on the basis of demonstrating technical consideration of all possible sites considered in this study. The following consideration of airspace issues is based generally around the runway geometry determined during the various EIS processes undertaken since 1985 (i.e. a runway alignment of 05/23). The 18/36 runway option shown in the most recent EIS has not been considered.										
CRITERION 8 Capacity for Future Expansion	Capacity for future expansion to Maximum Airport	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
CRITERION 9 Flood Risk at Site		Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by Local Authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Part of the site identified as within 1 in 100 Year Flood and PMF Flood. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Site identified as within Flood Prone Land and Flood Planning Area (designated by Liverpool City Council). Site identified as within 5%, 1% and PMF Flood line (designated by Camden City Council). Note: Greendale - Flood prone land is land susceptible to flooding by the largest flood that could conceivably occur at a particular location estimated from the probable maximum precipitation.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Council Flood mapping does not include area of airport footprint. Not identified by Local Authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Council Flood mapping does not include area of airport footprint. Not identified local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.

	Locality Name	Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
	Site Name	Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
CRITERION 10 Additional potential infrastructure affected by airport footprint, causing dislocations relocations and other items likely to involve costs	Airservices and Defence	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Requires closure and relocation of RAAF Base Richmond.	Requires closure and relocation of Orchard Hills Explosives Depot.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.
	Minor Airports and Airfields in Close Proximity	Warnervale Airfield	Somersby Airfield	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	The Oaks Airfield.	Wedderburn Airfield. Wilton Parachuting Club.	Wedderburn Airfield. Wilton Parachuting Club.
	Railways	Realignment of Main North Line or grade separation may be needed.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Some realignment of the incomplete Maldon – Dombarton Railway may be needed	No major items as yet identified to be directly affected.
	Roads	F3 Freeway Motorway Link Road Sparks Road Mountain Road Dakara Road Bruce Cr Warnervale Road Hakone Road	Wisemans Ferry Road Anembo Road Silvesters Road Robinson Road Elwins Road Lackersteens Road Keighley Ave Grants Road Vitasalo Road Lutana Road Nyah Road Bimbil Road Debenham Road North Somersby Falls Road Howes Road Ulinga Road	Putty Road Singleton Road Kurmond Road Creek Ridge Road Blacktown Road Vollers Ln Reserve Road Godalla Road Old East Kurrajong Road Lamrock Ave Moles Road Kamrock Grv Hayes Road Wenban Road Uworra Road Rockyhall Pl Stannix Place Road Carrs Road Argents Road Sargents Road Salters Road McKinnons Road Roland Ln Stewarts Ln Geakes Road Joshua Road Thomas Road Reserve Road Sheppards Road	The Northern Road Elizabeth Dr Park Road Littlefields Road Adams Road Gates Road Galaxy Road Queenshill Dr Oaky Road	The Northern Road Badgerys Creek Road Taylors Road Winston Cl Gardiner Road Pitt St Longley Road Leggo Road Fuller St Ferndale Road Anton Road Jagelman Road Willowdene Ave Vicar Park Ln Dwyer Road	Greendale Road Dwyer Road Findlay Road Francis St	Wolstenholm Ave Orient Road Cut Hill Road	Bakers Lodge Road Mowbray Park Road Montpelier Dr Craigend Road Evelyns Ridge Road Victoria Park Road	Picton Road Macarthur Dr	No major items as yet identified to be directly affected.
	Water Supply	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Requires relocation or encasement of Sydney Water Supply Pipelines.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.
	Major Electricity Supply (OLS = possible conflict with obstacle limitation surface)	2 sets of 330 KV power lines need re-alignment. 2 sets of 330kV power lines (OLS) – north. 500kV power line (OLS) – north.	330kV power lines (OLS) – north west.	500kV power line (OLS) – east.	330kV power line needs re-alignment.	330kV power line needs re-alignment.	330kV power line needs re-alignment. 330kV power lines (OLS) south.	2 sets of 330kV power lines need re-alignment.	330kV power line needs re-alignment.	330kV power line needs re-alignment.	No major items as yet identified to be directly affected.
	Major Gas Supply Lines	Possible conflict with Sydney to Newcastle gas and oil pipeline. Further detailed investigation required.	Possible conflict with Sydney to Newcastle gas and oil pipeline. Further detailed investigation required.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Possible conflict with Eastern Gas Pipeline gas and oil pipeline. Further detailed investigation required.	Possible conflict with Eastern Gas Pipeline gas and oil pipeline. Further detailed investigation required.
	Rivers and Estuaries	2 reaches of Wallarah Creek	Robinson Creek Floods Creek Hunter Creek	Howes Creek Chain of Ponds Creek Currency Creek	Mulgoa Creek and tributaries Blaxland Creek and Tributaries	Oaky Creek Badgerys Creek	Duncan's Creek Bringelly Creek	Bringelly Creek and Tributaries	Monkey Creek Stonequarry Creek	Cordeaux River (Site elevated) Cascade Creek Clements Creek Allens Creek Third Point Creek	No major items as yet identified to be directly affected.

	Locality Name	Central Coast	Central Coast	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Burragorang	Cordeaux-Cataract	Cordeaux-Cataract
	Site Name	Wallarah	Somersby	Wilberforce (RAAF Relocated)	Luddenham	Badgerys Creek	Bringelly	Greendale	Mowbray Park	Wilton	Wallandoola
	Social and Educational Infrastructure	No major items as yet identified to be directly affected. Site is close to existing urban developments.	Rindean Quarry. Access to Pioneer Concrete Quarry. Adjacent to national parks.	River Oak Arabian Stud Farm. King Equestrian Academy. Sydney Equestrian Supplies. Hawkesbury High and Primary Schools (3.5km). Nature parks adjacent, existing quarry.	Luddenham Primary School (0.1km). Holy Family Primary School (0.3km).	Mendez Equestrian Centre. Crown Park Training Centre.	University of Sydney University Farms Leppington Pastoral Company. Bringelly Primary School (1km).	Sugar Loaf Equestrian Centre. University of Sydney University Farms. Site is aligned generally north / south. Location seeks to avoid and minimise noise on smaller urban areas to the north and south.	Mowbray Park Country Estate. Site is aligned generally north / south. Location seeks to avoid and minimise noise on smaller urban areas to the north and south.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.

Source: WorleyParsons/AMPC analysis

Matrix 3 Comparative assessment of suitable sites analysed in Phase 4

Part B: Type 3 airports

	Locality Name	Central Coast	Central Coast	Central Coast	Hawkesbury	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Nepean	Burragorang	Burragorang	Burragorang	Cordeaux - Cataract	Cordeaux - Cataract	Cordeaux - Cataract	Cordeaux - Cataract
	Site Name	Wallarah	Peats Ridge	Somersby	Wilberforce	Castlereagh (RAAF Relocated)	Luddenham	Kemps Creek	Badgerys Creek	Bringelly	Greendale	Silverdale	The Oaks	Mowbray Park	Southend	Wilton	Wallandoola	Dendrobium
General Site Attributes	Geographic Place Name	Wallarah	Peats Ridge	Somersby	Wilberforce	Londonderry	Luddenham	Kemps Creek	Badgerys Creek	Bringelly	Greendale	Silverdale	The Oaks	Mowbray Park	Cataract	Wilton	Wilton	Browns Road
	Local Government Area (LGA)	Wyong	Gosford	Gosford	Hawkesbury	Penrith	Penrith	Penrith Liverpool	Liverpool	Liverpool Camden	Liverpool	Wollondilly	Wollondilly	Wollondilly	Wollongong	Wollondilly	Wollondilly Wollongong	Wingecarribee
	Local Environmental Plan (LEP)	Wyong LEP 1991	Gosford PSO and Gosford IDO 122	Gosford IDO 122	City of Hawkesbury LEP 1989	Penrith LEP 2010	Penrith LEP 2010	Penrith LEP 2010 Liverpool LEP 2008	Liverpool LEP 2008	Liverpool LEP 2008 Camden LEP 2010	Liverpool LEP 2008	Wollondilly LEP 2011	Wollondilly LEP 2011	Wollondilly LEP 2011	Wollongong LEP 2009	Wollondilly LEP 2011	Wollondilly LEP 2011 Wollongong LEP 2009	Wingecarribee LEP 2010
	Site Zoning	1(c) Non-Urban Constrained Land Zone 2(e) Urban Release Area 4(e) Regional Industry and Employment Development 5(b) Special Uses – Railways 5(d) Arterial Road Reservation 6(a) Open Space and Recreation 7(g) Wetlands Management 10(a) Investigation Precinct B2 Local Centre RE1 Public Recreation R1 General Residential E2 Environmental Conservation	1(a) Rural – Agricultural 5 Special Uses - General 6(a) Open Space – Recreation 6(b) Open Space – Special	1(a) Rural – Agricultural 4(a) Industrial – General 5 Special Uses – General 5(b) Special Uses – Railways 6(b) Open Space – Special Purpose 7(a) Environmental Protection - Conservation 7(b) Environmental Protection – Scenic Protection	1(b) Rural "B" 7(d1) Environmental Protection (Scenic)	E1 National Parks and Nature Reserves E2 Environmental Conservation RU1 Primary Production RU4 Rural Small Holdings SP2 Infrastructure (future road) Deferred Matter	E2 Environmental conservation E3 Environmental management RU1 Primary Production RU2 Rural Landscape RU4 Rural Small Holdings SP2 Infrastructure (classified road) SP2 Infrastructure (water supply system) Deferred Matter	E2 Environmental conservation RU1 Primary Production RU2 Rural Landscape RU4 Rural Small Holdings SP2 Infrastructure (classified road)	RU1 Primary Production SP1 Special Activities (Commonwealth Activities) SP2 Infrastructure (classified road)	R5 Large Lot Residential RU1 Primary Production SP2 Infrastructure (Educational establishment)	RU1 Primary Production SP2 Infrastructure (Educational establishment)	E1 National Parks and Nature Reserves RU2 Rural Landscape	R5 Large Lot Residential RE1 Public Recreation RU1 Primary Production RU2 Rural Landscape RU4 Rural Small Holdings SP2 Infrastructure (road)	RU1 Primary Production RU2 Rural Landscape SP2 Infrastructure	E2 Environmental Conservation SP2 Infrastructure (road)	E2 Environmental Conservation SP2 Infrastructure (road)	E2 Environmental Conservation	E2 Environmental Conservation SP2 Infrastructure (water supply system)

Locality Name	Central Coast	Central Coast	Central Coast	Hawkesbury	Hawkesbury	Nepean	Nepean	Nepean	Nepean	Nepean	Burragorang	Burragorang	Burragorang	Cordeaux - Cataract	Cordeaux - Cataract	Cordeaux - Cataract	Cordeaux - Cataract
Site Name	Wallarah	Peats Ridge	Somersby	Wilberforce	Castlereagh (RAAF Relocated)	Luddenham	Kemps Creek	Badgerys Creek	Bringelly	Greendale	Silverdale	The Oaks	Mowbray Park	Southend	Wilton	Wallandoola	Dendrobium
Draft LEP (that has been the subject of public consultation under the EP&A Act 1979)	N/A (not yet on exhibition)	Draft Gosford LEP 2009 RU1 Primary Production RE1 Public Recreation SP2 Infrastructure (educational establishment) SP2 Infrastructure (road) RU5 Village	Draft Gosford LEP 2009 SP2 Infrastructure (research station) SP2 Infrastructure (road) RU1 Primary Production RU2 Rural Landscape E2 Environmental Conservation IN1 General Industrial RE1 Public Recreation	Draft Hawkesbury LEP 2011 RU1 Primary Production RU2 Rural Landscape	N/A	N/A	N/A	N/A	Liverpool LEP 2008 Draft Amendments 16 and 19 is not within the site.	Draft Camden LEP 2009 RU1 Primary Production Liverpool LEP 2008 Draft Amendments 16 and 19 is not within the site.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Estimated population within 30km radius	347,800	265,800	318,800	580,700	703,600	1,050,100	1,590,700	1,170,600	1,063,800	702,200	469,100	141,200	118,600	341,600	287,300	290,700	270,400
Estimated population within 15km radius	123,800	37,800	143,400	60,500	202,700	135,000	330,600	139,000	123,700	57,900	13,000	30,100	23,800	78,700	9,100	22,700	5,800
Note: Estimated population based on radius from site centre. Source: ABS Census 2006 (rounded to nearest '00).																	
Site Footprint	723.3ha	723.3ha	762.5ha	705.2ha	1,148.2ha	703.1ha	713ha	686.4ha Additional Area 6.4ha	723.3ha	687.8ha	709.3ha	702.3ha	723.3ha	704.2ha	677.8ha	727.5ha	723.3ha
Runway Length and Width (Alignment)	2,600 m x 45 m (17/35)	2,600 m x 45 m (18/36)	2,600 m x 45 m (18/36)	2,600 m x 45 m (09/27)	2,600 m x 45 m (18/36)	2,600 m x 45 m (01/19)	2,600 m x 45 m (16/34)	2,600 m x 45 m (05/23)	2,600 m x 45 m (15/33)	2,600 m x 45 m (17/35)	2,600 m x 45 m (17/35)	2,600 m x 45 m (17/35)	2,600 m x 45 m (18/36)	2,600 m x 45 m (05/23)	2,600 m x 45 m (18/36)	2,600 m x 45 m (17/35)	2,600 m x 45 m (12/30)
Key Airport Facilities (assumed in site footprint)	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	2x Business Parks, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.	Business Park, Commuter Car Park, Future Development area.
Site Capacity (aircraft movements)	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.	Up to 50 movements per hour or 240,000 movements per year.
Site Capacity (passenger movements)	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).	Up to 33 million passengers per year (based on 140 passengers per aircraft). 19 million passengers per year (based on 80 passengers per aircraft).
Note: Site capacity (by passengers and aircraft movements) assumes nil interaction with existing airports and that operations can be managed, albeit with extra track miles and associated economic penalties to operators.																	

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	Site Name	Wallarah	Peats Ridge	Somersby	Wilberforce	Castlereagh (RAAF Relocated)	Luddenham	Kemps Creek	Badgerys Creek	Bringelly	Greendale	Silverdale	The Oaks	Mowbray Park	Southend	Wilton	Wallandoola	Dendrobium
	Key Transport System/s within ~5kms of site	F3 Sydney - Newcastle Freeway Sparks Road Motorway Link Main North Line	Peats Ridge Road Gregory Downs Drive Wisemans Ferry Road	F3 Sydney - Newcastle Freeway Peats Ridge Road Wisemans Ferry Road Main North Line	Putty Road King Road	Londonderry Road Castlereagh Road	The Northern Road Elizabeth Drive Mamre Road	Elizabeth Drive The Northern Road Mamre Road	The Northern Road Badgerys Creek Road Elizabeth Drive	Greendale Road The Northern Road	Greendale Road The Northern Road	Silverdale Road	Burragorang Road	Montpellier Drive Barkers Lodge Road Mowbray Park Road	Appin Road Princes Highway	Picton Road Hume Highway	Picton Road	Hume Highway
	General Terrain of site	Rolling coastal plain drained by Wallarah Creek to Tuggerah Lake. Some open, some forested and some developed lands. Existing Airfield to the south.	Narrow ridge line as a part of a dissected montane plateau, with some open undulating rural land on the ridge and parallel to the Peats Ridge Road.	Large elevated rectangular area of undulating planar rural land, as part of a dissected montane plateau.	Undulating terrain on the slopes of the Hawkesbury River valley with some areas of floodplain and open rural land, rising to higher ground the west and north.	On the eastern side of the Hawkesbury River valley, mostly planar, gently undulating terrain with open rural and timbered lands.	Rolling planar terrain on the watershed between the Nepean River and Badgerys Creek and other headwaters of South Creek, mostly in use for rural land activities.	Open undulating land in floodplain of Kemps Creek, mostly developed for rural smallholding activities.	Rolling planar terrain on the watershed between the Nepean River and Badgerys Creek, mostly in use for rural land activities.	Rolling planar terrain on the watershed between the Nepean River and Badgerys Creek, mostly in use for rural land activities.	Open rolling planar terrain within the catchment of the Nepean River, mostly in use for rural land activities.	Undulating plateau with open rural land located on the escarpment above the Nepean river, with dissected rural land to the east and rising rugged forested terrain to the west.	Broad open valley of Monkey Creek with long parallel valley ridges, mostly developed for rural smallholding activities and rural uses. Existing airfield on valley floor.	Elevated rectangular area of sloping planar in the upper portion valley of Monkey Creek with mostly developed rural uses.	Area of gently sloping montane plateau, atop the Illawarra escarpment, comprising areas of forest and open heath.	Heavily dissected montane plateau with open rural and some long linear ridge lines adjoining the deep gorges of the major rivers.	Heavily dissected montane plateau with open rural and some long linear ridge lines adjoining the deep gorges of the major rivers.	Very isolated site lying on a long linear ridge parallel to the Cordeaux River gorge and along the alignment t of the Maldon - Dombarton railway.
	Geology	Multi-coloured chert sandstone quartzose sandstone shale and claystone	Quartz sandstone with some shale	Quartz sandstone with some shale	Quartz sandstone with some shale	Poorly consolidated sandstone conglomerate siltstone and "perched" alluvium	Sandstone and shale	Sandstone and shale	Sandstone and shale	Sandstone and shale	Sandstone and shale	Sandstone and shale	Quartz sandstone with some shale	Quartz sandstone with some shale	Quartz sandstone with some shale	Sandstone and shale	Sandstone and shale	Quartz sandstone with some shale
	Note: Geological information sourced from the Department of Primary Industries website, 1:500 000 geological maps. (http://www.dpi.nsw.gov.au/minerals/geological/geological-maps/1-500-000).																	
	Soil Classification	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.4m Subsoil layer 0.7m	Topsoil thickness layer 0.3m Subsoil layer 0.7m	Topsoil thickness layer 0.15m Subsoil layer 1.2m	Topsoil thickness layer 0.2m Subsoil layer 0.3m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.4m Subsoil layer 0.7m	Topsoil thickness layer 0.0m Subsoil layer 0.0m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.3m Subsoil layer 0.6m	Topsoil thickness layer 0.4m Subsoil layer 0.7m
	Note: Soil classification information sourced from the Australian Soil Resource Information System (ASRIS) digital atlas website (http://www.asris.csiro.au/themes/Atlas.html#Atlas_Digital).																	
	Major river systems close to site	Wallarah Creek Reach	Mooney Mooney Creek	Mooney Mooney Creek Site well elevated above river systems	Hawkesbury River Currency Creek	Nepean River	Nepean River Mulgoa Creek	Badgerys Creek Oaky Creek	Badgerys Creek Oaky Creek	South Creek Town Rural Storage Lowes Creek	Nepean River Bringelly Creek	Nepean River Forest Hill Creek Bushrangers Creek	Back Creek Monkey Creek	Monkey Creek	Lake Cataract Cataract River Stokes Creek	Avon River Cordeaux River Site well elevated above river systems	Lake Cataract Cataract River Site well elevated above river systems	Avon River Lake Avon
CRITERION 1 Accessibility of the Sydney surface transport network (rail and state roads)	Kilometres to connect site boundary to existing rail link	~2.5km to Warnervale Station	~4.5km to Ourimbah Station	~4.5km to Ourimbah Station	~8km to Windsor Station	~7km to Richmond Station ~11km to Penrith Station	~9km to Kingswood Station ~16km to proposed Leppington Station	~11km to Werrington Station ~13km to proposed Leppington Station	~11km to Werrington Station ~13km to proposed Leppington Station	~13km to proposed Leppington Station	~13km to Macarthur Station ~15km to proposed Leppington Station	~18km to Macarthur Station ~23km to proposed Leppington Station	~20km to Menangle Park Station ~ 25km to Macarthur Station on Main South Railway	~7km to Picton Station	~17km to Menangle Station	~20km from Menangle Park Station ~25km to Macarthur Station on Main South Railway	~11km to Douglas Park Station	~11km to Bargo Station
	Likelihood of a rail link being constructed to or near to the site, other than an airport specific line	Possible given proximity of existing Sydney - Newcastle Line.	Unlikely unless the site is accessed by a new alignment, possibly as a part of Sydney -Newcastle high speed rail line.	Unlikely unless the site is accessed by a new alignment, possibly as a part of Sydney -Newcastle high speed rail line.	Unlikely	Unlikely	Possible as an extension of South West Rail Link.	Possible as an extension of South West Rail Link.	Possible as an extension of South West Rail Link.	Possible as an extension of South West Rail Link.	Possible as an extension of South West Rail Link.	Very unlikely	Very unlikely	Very unlikely	Very unlikely	Possible – site adjacent to or incorporates the alignment of the partially constructed Maldon – Dombarton Railway.	Unlikely, although site is ~12kms from the alignment of the partially constructed Maldon – Dombarton Railway.	Possible – site adjacent to or incorporates the alignment of the partially constructed Maldon – Dombarton Railway.

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	Site Name	**Wallarah**	**Peats Ridge**	**Somersby**	**Wilberforce**	**Castlereagh (RAAF Relocated)**	**Luddenham**	**Kemps Creek**	**Badgerys Creek**	**Bringelly**	**Greendale**	**Silverdale**	**The Oaks**	**Mowbray Park**	**Southend**	**Wilton**	**Wallandoola**	**Dendrobium**
	Capacity of the existing rail systems and implications of additional airport traffic requirements for additional capacity (not costed)	Requirements for providing additional capacity for 4 trains per hour. A new alignment for a tunnel between Hawkesbury River and Berowra due to the limit of capacity in Cowan Bank on Main Northern Railway.			Assume no rail link.	Assume no rail link.	Requirements for providing additional capacity for 4 trains per hour on the East Hills Line: • Quadruplication between Revesby and Glenfield; • Sextuplication between Erskineville and Tempe; • Re-signalling and Electrification.					Assume no rail link	Assume no rail link	Assume no rail link	Assume no rail link	Main Southern Railway/East Hills Line does not have sufficient capacity to serve a new airport. Requirements for providing additional capacity for 4 trains per hour on the Main South Line: • Southern Sydney Freight Line needs to be in place as part of quadruplication to Glenfield; • Quadruplication between Revesby and Glenfield; • Sextuplication between Erskineville and Tempe; • Re-signalling and electrification; • New refuges south of Macarthur.			
	Note: The underlying assumption is that Type 3 airports would not have an airport specific rail link unless the Government deemed it necessary – accordingly costing for Type 3 rail connection has not been undertaken, although costs could be expected to be similar to the relevant Maximum Airport.																	
	Kilometres to connect site boundary to existing designated state roads and highways	Site footprint sits over F3	~7.5km to F3	~125m to F3 (eastern boundary of site)	~25km to M7	~18km to Western Motorway (M4)	~8km to Western Motorway (M4) ~15km to M7	~6km to M7 ~15km to Western Motorway (M4)	~11km to Western Motorway (M4) ~10km to M7	~13km to M7	~18km to Western Motorway (M4) ~20km to M7	~30km to Hume Highway	~25km to Hume Highway	~16km to Hume Highway	~5km to Southern Freeway	~9km to Hume Highway	~10km to Hume Highway	~4km to Hume Highway
	Specific issues in constructing a road link	The existing roadway (F3) is at a similar level to the airport site. The F3 would need to be diverted and the diverted road connected to the airport. Connection would be relatively easy.	The existing roadway (Peats Ridge Road) would require an upgrade, connection would be relatively easy.	The existing roadway (F3) is at a similar level to the airport site and connections would be relatively easy.	The existing roadways (Putty Road, Wilberforce Road and Windsor Road) would require an upgrade. Upgrade to the road bridge over the Hawkesbury River, connection would be relatively easy.	The existing roadway (Londonderry Road and The Northern Road) would require an upgrade, connection would be relatively easy.	The existing roadways (The Northern Road and Elizabeth Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (Mamre Road and Elizabeth Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (The Northern Road and Elizabeth Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (The Northern Road and Bringelly Drive) would require an upgrade, connection would be relatively easy.	The existing roadways (Greendale Road and Bringelly Drive) would require an upgrade, connection would be relatively easy.	The existing roadway (Greendale Road) would require an upgrade, connection would be relatively easy.	The existing roadway (Burragorang Road) would require an upgrade, connection would be relatively easy.	The existing roadways (Bakers Lodge Road and Remembrance) require an upgrade, connection would be relatively easy.	The existing roadways (Appin Road) would require an upgrade, connection would be relatively easy.	The existing roadways (Picton Road) would require an upgrade, connection would be relatively easy.	The existing roadways (Picton Road) would require an upgrade, connection would be relatively easy.	Connection to Hume Highway and Southern Freeway would need to be built.
	Required works	5km road diversion of the Pacific Highway and connection to airport.	11km upgrade to Peats Ridge Road and connection to airport.	3km upgrade to Peats Ridge Road and connection to airport.	9km upgrade to Putty Road, Wilberforce Road and Windsor Road, duplication of bridge over the Hawkesbury River, and connection to airport.	9km upgrade to Londonderry Road and The Northern Road and connection to airport.	15km upgrade to The Northern Road and Elizabeth Drive and connection to airport.	5km upgrade to Elizabeth Drive and connection to airport.	8km upgrade to Elizabeth Drive and connection to airport.	12km upgrade to Bringelly Road and connection to airport.	15km upgrade to Greendale Road and Bringelly Drive, 2km extension of Greendale Road and connection to airport.	15km upgrade to Greendale Road and Bringelly Drive, 7km extension of Greendale Road and connection to airport.	14km upgrade to Burragorang Road and connection to airport.	14km upgrade to Bakers Lodge Road and Remembrance Drive, 5km extension Road and Connection to Airport.	14km upgrade to Appin Road, 5km diversion of Appin Road, 6km extension to Appin road and connection to airport.	20km upgrade to Picton Road and connection to airport.	20km upgrade to Picton Road and connection to airport.	10km extension road to Hume Highway, 11km extension road to Cordeaux Road, upgrade to Cordeaux Road and connection to airport.
	Cost of works to nearest $ million	~$73 million	~$258 million	~$82 million	~$259 million	~$214 million	~$346 million	~$126 million	~$192 million	~$270 million	~$369 million	~$426 million	~$324 million	~$397 million	~$450 million	~$456 million	~$456 million	~$367 million
	Note: Estimated costs for road construction are as follows: • Upgrade from a 2 lane corridor to 4 lane corridor - $22 million/km (based on NSW RMS cost estimates of upgrade to the Oxley Highway); • Diversion/Extension of road, new two lane, two way road - $11.5 million/km (based on NSW RMS cost estimate of diversion of The Camden Valley Way); • Airport connection, overpasses and connections - $15.5 million each (based on Canberra Airport connection cost); • Bridge widening - $114million/km (based on NSW RMS cost of Sea Cliff Bridge, Illawarra).																	
CRITERION 2 Proximity to growth centres and commercial opportunities	Distance from site boundary to identified commercial growth centres (Metro and Regional Strategies)	Tuggerah-Wyong Major Centre (~14km)	Gosford City Centre (~15km)	Gosford City Centre (~7km) Tuggerah-Wyong Major Centre (~14km)	Windsor Town Centre (~9km) Rouse Hill Planned Major Centre (~16km)	Windsor Town Centre (~9km) Mt Druitt Potential Major Centre (~15km) (Penrith Regional City (~9km)	Penrith Regional City (~10km) Leppington Planned Major Centre (~16km) Mt Druitt Potential Major Centre (~14km)	Penrith Regional City (~13km) Leppington Planned Major Centre (~11km) Mt Druitt Potential Major Centre (~10km)	Penrith Regional City (~15km) Leppington Planned Major Centre (~10km) Mt Druitt Potential Major Centre (~12km)	Leppington Planned Major Centre (~10km)	Leppington Planned Major Centre (~14km) Penrith Regional City (~21km) Mt Druitt Potential Major Centre (~22km)	Leppington Planned Major Centre (~19km) Penrith Regional City (~21km)	Camden Town Centre (~12km) Campbelltown-Macarthur Major Centre (~25km)	Camden Town Centre (~23km) Campbelltown-Macarthur Major Centre (` 35km)	Campbelltown-Macarthur Major Centre (~24km) Wollongong Regional City (~17km)	Campbelltown-Macarthur Major Centre (~25km) Wollongong Regional City (~23km)	Campbelltown-Macarthur Major Centre (~22km)	Wollongong Regional City (~28km)
	Percentage of footprint within North West or South West Growth Centre	0%	0%	0%	0%	0%	0%	60%	0%	45%	0%	0%	0%	0%	0%	0%	0%	0%
	N70 - 10 Event Contour impact on North West or South West Growth Centre	Nil	Nil	Nil	Nil	Nil	Nil	High	Medium	High	Low	Nil	Nil	Nil	Nil	Nil	Nil	Nil

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	Site Name	Wallarah	Peats Ridge	Somersby	Wilberforce	Castlereagh (RAAF Relocated)	Luddenham	Kemps Creek	Badgerys Creek	Bringelly	Greendale	Silverdale	The Oaks	Mowbray Park	Southend	Wilton	Wallandoola	Dendrobium
CRITERION 3 Comparative Earthworks Estimate	Comparative cut plus fill earthworks volume to level site (m^3/ha) rounded to nearest 100	78,800	157,700	154,200	94,100	38,000	61,100	50,700	74,300	120,000	96,400	172,500	182,800	144,400	168,500	139,000	130,700	105,600
	Comparative cost to prepare airport platform rounded to nearest million	~$184 million	~$413 million	~$431 million	~$196 million	~$134 million	~$126 million	~$96 million	~$161 million	~$310 million	~$226 million	~$463 million	~$489 million	~$372 million	~$504 million	~$346 million	~$345 million	~$253 million
	Note: Comparative cut plus fill earthworks volume in m^3/ha to create a completely level airport footprint. Note: In practice airport sites do not have to be completely level over their whole area. Costs are based on adjusted earthworks volumes to account for this and for the different geotechnical material expected to be encountered on that site.																	
CRITERION 4 Noise Impact on Residents	20 ANEC	3,880	230	530	790	3,430	380	1,370	840	600	440	150	990	470	40	90	140	50
	25 ANEC	1,880	90	160	280	510	160	610	380	210	130	30	500	140	20	40	70	10
	30 ANEC	1,130	40	90	130	230	70	270	140	80	50	10	240	40	10	20	30	10
	35 ANEC	410	20	40	50	90	30	130	70	30	20	0	110	20	10	10	10	10
	40 ANEC	320	10	20	20	40	20	40	40	20	10	0	70	10	0	0	10	0
	Distance (m) from site boundary to nearest urban areas (as defined by NSW Department of Planning and Infrastructure)	0	9,400	1,950	1,100	2,200	0	4,800	5,000	5,950	2,700	350	100	3,650	2,250	2,900	5,100	7,600
	Number of Persons Exposed to >10 Number of Events >70dB(A)	22,320	640	5,560	2,990	29,950	7,870	6,440	3,560	4,560	2,220	1,200	2,440	4,390	880	370	430	530
	N70 person events (nearest '00)	1,048,700	45,500	236,600	172,800	1,085,400	206,300	330,300	200,700	179,200	104,800	42,100	194,900	159,600	27,200	19,800	29,400	26,100
	AIE (N70/Persons exposed)	47	72	43	58	36	26	51	56	39	47	35	80	36	31	54	69	50
	Note 1: Approximate population within noise contour categories based on site specific orientation of runway (nearest '0). Refer Australian Standard AS 2021-2000 Acoustics – aircraft noise intrusion – building siting and construction. Note 2: This study has chosen specific sites for more detailed assessment and BoM wind data has become available for some Sites. This is for comparative assessment and does not represent ANEC with ANEF contours endorsed by Airservices Australia, in the manner of endorsement of Ministerial Direction M37/99 and the *Airports Act 1996*, as inputs from Airservices Australia/CASA on design flight tracks. Any interactions between airports etc will still be required. Note 3: The Department of Infrastructure and Transport considers that further metrics to ANEF/ ANEC give the decision makers a much clearer picture of what the outcomes will be if they approve the project, e.g. showing actual flight paths and the use of N70 contours and the number of aircraft noise events above 70 dBA. Person-Events Index (PEI) then allows the total noise load generated by each airport to be computed by summing, over the exposed population, the total number of instances where an individual is exposed to an aircraft event above a specified noise level (in this case N70), over a given time period. Note 4: PEI(70) = $\Sigma P_N N$ where P_N is the number of persons exposed to N70.																	
CRITERION 5 Mine Subsidence	Designated mine subsidence zone present within site (percentage within zone)	Yes ~15%	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes (~10%) Site is close to areas of mine subsidence and operating mines. Extent of any old or current mines needs to be established	No Site is close to mine subsidence areas and operating mines. Extent of any old or current mines needs to be established	No
CRITERION 6 Number of Lots Requiring Acquisition Based on number of lots directly impacted by Site footprint	Approx. number of allotments in site	200	110	140	100	180	80	200	10	150	40	40	70	40	10	10	5	5
	Average number of allotments per hectare within site	0.282	0.156	0.178	0.142	0.160	0.117	0.276	0.007	0.209	0.063	0.062	0.095	0.059	0.007	0.007	0.003	0.001
	Population within site boundary (Census 2006, to nearest '0)	960	50	110	200	600	100	570	180	120	60	0	430	70	20	30	50	10

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CRITERION 7 Airspace Interaction	See also input from Airservices Australia in the WorleyParsons/AMPC technical paper: "Airport Suitable Sites - Specified Localities" Inputs from CASA and Defence have not been incorporated into this analysis	Major Probable interaction with Military Airspace to the north and east. Several power stations in vicinity (potential danger areas due high velocity exhaust).	Major Probable interaction with operations to Sydney (Kingsford-Smith) Airport.	Major Probable interaction with operations to Sydney (Kingsford-Smith) Airport.	Major Probable interaction with operations to Sydney (Kingsford-Smith) Airport. For type 3, assumes runway parallel to existing RAAF Base Richmond can be operated with coordinated control. Site within military airspace with issues for access routes. High terrain to the west – viability of approaches requires more assessment.	Major Requires closure / relocation of current RAAF Base Richmond. Northern flight paths would still enter military restricted airspace. The Department of Defence Orchard Hills facility would have to be relocated.	Major The location of R536A and 536B within the nominal CTR boundary would not be compatible with the proposed 01/19 runway alignment. The Department of Defence Orchard Hills facility would have to be relocated. Potential impacts on flying training areas and Camden Airport. Runway alignment more northerly than Badgerys Creek (and extent of interaction with Sydney (Kingsford-Smith) Airport may be improved in comparison to Badgerys Creek).	Major Close to Sydney (Kingsford-Smith) Airport and Bankstown, heading towards RAAF Base Richmond airspace. Feasibility of site problematic and subject to review / advice from ASA, CASA and Defence.	Major Potential impacts on flying training areas and Camden Airport. See note below.	Major Site is aligned north west / south east with the intention of minimising interaction with Holsworthy airspace to the south east. Potential impacts on flying training areas and Camden Airport.	Major Site well south of the RAAF Base Richmond military airspace and minimises interaction with Orchard Hills explosives depot airspace. Potential impacts on flying training areas and Camden Airport. May need to consider wind turbulence due high terrain to the west.	Major Site well south of the RAAF Base Richmond military airspace and minimises interaction with Orchard Hills explosives depot airspace. Potential impacts on flying training areas and Camden Airport. May need to consider wind turbulence due high terrain to the west.	Major Site well south of the RAAF Base Richmond military airspace and minimises interaction with Orchard Hills explosives depot airspace. Potential impacts on flying training areas and Camden Airport. May need to consider wind turbulence due high terrain to the west.	Major Site well south of the RAAF Base Richmond military airspace and minimises interaction with Orchard Hills explosives depot airspace. Potential impacts on flying training areas and Camden Airport. May need to consider wind turbulence due high terrain to the west.	Major Probable interaction with operations to Sydney (Kingsford-Smith) Airport and limitations due Holsworthy airspace. Feasibility of site problematic and subject to review/advice from ASA, CASA and Defence.	Major	Major	Major Site is on proposed railway alignment.
	Note 1: In all cases the preliminary observations listed herein need to continue to be tested with relevant authorities: Airservices Australia; Department of Defence; Office of Airspace Regulation; existing airport operators and users at the feasibility stage. Potential conflicts or dependencies with Richmond and Sydney (Kingsford-Smith) Airport's operations and Sydney Basin traffic would require more detailed analysis by Department of Defence, Airservices Australia and/or the Office of Airspace Regulation. The general complexity of existing airspace within and adjacent to the Sydney Basin makes this ongoing review necessary. Major • Airspace where there are significant levels of civil air transport traffic and military activity, such as around Sydney, Williamtown, Nowra and Richmond, together with their respective CTR/CTA, and operational procedures and requirements; or • Restricted Areas particularly those with provisional classifications of RA3 and RA2; or • Danger Areas associated with military flying training. Moderate • Airspace where there are significant levels of GA traffic, such as around Bankstown and Camden, together with their respective CTR (note in practice as Bankstown and Camden are relatively close to the larger airports, a potential moderate ranking is effectively outweighed by the factors affecting the larger airports); or • Restricted Areas with provisional classifications of RA1; or • Danger Areas associated with civil flying training; or • VFR transit routes. Minor • Airspace where there are lower levels of civil traffic and non-towered aerodromes; or • Danger Areas. Note 2: This assessment of Badgerys Creek has been prepared on the basis of demonstrating technical consideration of all possible sites. The following consideration of airspace issues is based generally around the runway geometry determined during the various EIS processes undertaken since 1985 i.e. a runway alignment of 05/23. The 18/36 runway option shown in the most recent EIS has not been considered.																	
CRITERION 8	Capacity for future expansion to Maximum Airport	Yes	No	Yes	No	No	Yes	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No
CRITERION 9 Flood Risk at Site		Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Part of site may be subject to 1-100 Flood, Probable Maximum Flood (PMF) unknown.	Part of site may be located within the Flood Planning Area.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Site identified as within Flood Prone Land as designated by Liverpool City Council. Site also identified as within Flood Planning Area as designated by Penrith City Council and Liverpool City Council.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittent.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Site identified as within Flood Prone Land as designated by Liverpool City Council. Site also identified as within Flood Planning Area as designated by Liverpool City Council.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.	Not identified by local authority as being flood prone by rising flood waters. Local minor creeks may flood intermittently.
	Note 1: Castlereagh (RAAF Relocated) - Flood planning area means the land shown as "Flood planning area" on the Flood Planning Land Map. Note 2: Windsor Downs (RAAF Relocated) - High Flood Risk Precinct is the land subject to a high hydraulic hazard (in accordance with the provisional criteria outlined in the NSW Government Floodplain Development Manual 2005) in a 100 year flood event and/or subject to potential evacuation difficulties during a flood. Medium Flood Risk Precinct is the land below the 100 year flood level subject to a low hydraulic hazard (in accordance with the provisional criteria outlined in the NSW Government Floodplain Development Manual 2005). Low Flood Risk Precinct is all land within the floodplain, i.e. within the extent of the Probable Maximum Flood (PMF) but not identified as either a high flood risk or medium flood risk precinct. Therefore the Low Flood Risk Precinct is all the land between the 100 year and the PMF flood extents. Note 3: Greendale and Kemps Creek - Flood prone land is land susceptible to flooding by the largest flood that could conceivably occur at a particular location, estimated from the probable maximum precipitation.																	

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CRITERION 10 Additional potential infrastructure affected by airport footprint causing dislocations relocations and other items likely to involve costs	Airservices and Defence	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Airservices Australia International Radio Transmitter Station. Closure or relocation of RAAF Base Richmond required.	Requires closure and relocation of Orchard Hills Explosives Depot.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.
	Minor Airports and Airfields in Close Proximity	Warnervale Airfield.	No major items as yet identified to be directly affected.	Somersby Airfield.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	The Oaks Airfield.	The Oaks Airfield.	Wedderburn Airfield. Wilton Parachuting Club.	Wedderburn Airfield. Wilton Parachuting Club.	Wedderburn Airfield. Wilton Parachuting Club.	Wedderburn Airfield. Wilton Parachuting Club.
	Railways	Realignment of Main North Line or grade separation may be needed.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Some realignment of the incomplete Maldon-Dombarton Railway may be needed.	No major items as yet identified to be directly affected.	Some realignment of the incomplete Maldon-Dombarton Railway may be needed.
	Roads	F3 Freeway Motorway Link Road Sparks Road Dakara Road Bruce Cr Warnervale Road Hakone Road	Peats Ridge Road Euloo Road Bushells Road Karee Road	Wisemans Ferry Road Elwins Road Lackersteens Road Keighley Ave Grants Road Lutana Road Nyah Road Bimbil Road Debenham Road North Somersby Falls Road Howes Road Ulinga Road	Sackville Road Stannix Park Road Stannix Park Ln Sargents Road Carrs Road	Proposed route for the M7 to Yarramundi Freeway Torkington Road Nutt Road Spencer Road Fire Trail Road Devin Road Boscobel Road Hinxman Road Smeeton Road Tadmore Road	The Northern Road Littlefields Road Galaxy Road Queenshill Road Oaky Road	Elizabeth Drive Western Road Lawson Road Martin Road Overett Road Sumbray Ave Cuthel Road Turnbull Ave Martin Road Bakefield Ave	The Northern Road Badgerys Creek Road Jagelman Road Fuller St Leggo St Longleys Road Anton Road	Greendale Road Dwyer Road Francis St Findley Road Tyson Road Carr Road	Cut Hill Road Orient Road	Silverdale Road Avoca Road Pineridge Cres	Burragorang Road Binalong Road Yallah St Wanawong St Daley Cl Wanawong St Waterfall Creek Road Quarry Road	Bakers Lodge Road Mowbray Park Road Montpelier Road	Appin Road	Picton Road	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.
	Water Supply	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Sydney Water Supply Pipeline requires relocation or encasement.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Site is within/or adjacent to Sydney drinking water catchment.	Site is within/or adjacent to Sydney drinking water catchment.	Site is within/or adjacent to Sydney drinking water catchment.	Site is within/or adjacent to Sydney drinking water catchment.
	Major Electricity Supply (OLS = possible conflict with obstacle limitation surface)	330KV power line needs re-alignment 3 sets of 330kV power lines (OLS) –north 500kV power line (OLS) – north	3 sets of 330kV power lines (OLS) – north west 2 sets of 330kV power lines (OLS) – north east	330kV power lines (OLS) – north west	500kV power line (OLS) – east	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	500kV power lines (OLS) - north	330kV power lines (OLS) - north	2 sets of 330kV power lines (OLS) - north and south	2 sets of 330kV power lines need re-alignment	330kV power lines need re-alignment	No major items as yet identified to be directly affected.	330kV power lines need re-alignment	330kV power lines (OLS) - east	330kV power lines need re-alignment	No major items as yet identified to be directly affected.	330kV power lines (OLS) - south east
	Major Gas Supply Lines	Possible conflict with Sydney to Newcastle gas and oil pipeline. Further detailed investigation required.	Possible conflict with Sydney to Newcastle gas and oil pipeline. Further detailed investigation required.	Possible conflict with Sydney to Newcastle gas and oil pipeline. Further detailed investigation required.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	Possible Conflict with Eastern Gas Pipeline gas and oil pipeline. Further detailed investigation required.	Possible Conflict with Eastern Gas Pipeline gas and oil pipeline. Further detailed investigation required.	No major items as yet identified to be directly affected.

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Rivers and Estuaries	2 reaches of Wallarah Creek.	No major items as yet identified to be directly affected.	Robinson Creek Floods Creek Hunter Creek	Chain of Ponds Creek	No major items as yet identified to be directly affected.	Mulgoa Creek	South Creek	Badgerys Creek Oaky Creek	No major items as yet identified to be directly affected.	Bringelly Creek	Forest Hill Creek Bushrangers Creek	Monkey Creek	Monkey Creek	No major items as yet identified to be directly affected.	Cordeaux River (site elevated) Cascade Creek Clements Creek Allens Creek Third Point Creek	No major items as yet identified to be directly affected.	Cordeaux River (site elevated)
Social and Educational Infrastructure	No major items as yet identified to be directly affected. Site is close to existing urban developments.	Adjacent to national parks. Greenhills Golf and Country Club Access to Boral Concrete Depot	Adjacent to national parks. Rindean Quarry Access to Pioneer Concrete Quarry	Sydney Equestrian Supplies King Equestrian Academy Hawkesbury High and Primary Schools (3.5km)	Unnamed Primary School (1km) St Pauls Grammar (1km) Cranebrook Cemetery (1km) Londonderry Cemetery (2.5km) Kindalin Christian School (2.5km) Note that there is a large existing urban area close to and around the site.	Luddenham Primary School (0.5km) Holy Family Primary School (0.4km)	Elizabeth Drive Landfill Facility Australian Native Landscape Argus Technologies Fleurs Radio Observation Field Station (University of Sydney) University of Sydney Fleurs Farm Sydney Catholic Lawn Cemetery Novaris Research Centre (Yarrandoo) Kemps Creek Primary (1.0km)	Mendez Equestrian Centre Crown Park Training Centre	Bringelly Primary School (1km)	Sugar Loaf Equestrian Centre University of Sydney University Farms Site is aligned generally north / south. Location seeks to avoid minimise noise on smaller urban areas to the north and south.	No major items as yet identified to be directly affected. Site is aligned generally north / south. Location seeks to avoid minimise noise on smaller urban areas to the north and south.	No major items as yet identified to be directly affected. Site is aligned generally north / south. Location seeks to avoid minimise noise on smaller urban areas to the north and south.	No major items as yet identified to be directly affected. Site is aligned generally north / south. Location seeks to avoid minimise noise on smaller urban areas to the north and south.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.	No major items as yet identified to be directly affected.

Source: WorleyParsons/AMPC analysis