Australian Government
Department of Infrastructure and Transport

Economic and social analysis of potential airport sites

ERNST & YOUNG

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Sydney Aviation Capacity Study

Commonwealth Department of Infrastructure and Transport

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Ernst & Young

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Introduction

The *Joint Study on aviation capacity for the Sydney region* presented to the Australian and NSW Governments in March 2012 highlighted the critical role that airports play in supporting economic growth and prosperity. The Study demonstrated that the promotion of efficient air services for passengers and freight is essential to maintaining Sydney's place as Australia's commercial centre and foremost tourist destination.

The Joint Study found that the population and economic growth projected to occur both locally and nationally – as well as the growth of the international tourism market – will result in a large increase in the demand for aviation services within the Sydney basin. The Study identified that demand for aviation services within the Sydney basin is anticipated to be greater than the potential supply by 2032, with annual unconstrained demand expected to increase from approximately 35 million passengers today to 69 million by 2030 and 145 million by 2060. At the same time, the 490 thousand tonnes of freight currently using aviation services within the Sydney basin is forecast to increase to 2,320 thousand tonnes of freight per annum by 2060. The Joint Study found this demand not being met will result in a loss of expenditure in the Australian economy of approximately $59.5 billion and $34 billion in foregone Gross Domestic Product (GDP).

In response to these issues, the Joint Study proposed a number of steps that could be undertaken to meet the Sydney region's aviation infrastructure requirements and maximise community, economic and environmental outcomes. This included a range of solutions to improve the delivery of aviation services in the short to medium term.

However, the Study found that even with the complete and effective implementation of these 'short to medium term' solutions, the only way to meet the future long-term demand for aviation services is through the development of a new civil aviation airport to service the Sydney basin.

A number of potential locations have been identified as being the most suitable for the investigation of additional aviation infrastructure in the Sydney region.

A program of work is underway to identify the best possible site for the development of an additional Sydney airport. To support this process, Ernst & Young has been engaged by the Commonwealth Department of Infrastructure and Transport to assess and document the scale and nature of a range of impacts on the surrounding region from the development of an airport at Wilton and RAAF Base Richmond. A range of impacts were also considered for the region around Badgerys Creek to provide an objective scale against which to interpret the Wilton findings and as a basis for the Government to consider them. It is noted the Australian Government has ruled out Badgerys Creek as an airport site. All references in this report to an airport development at Badgerys Creek are for these analytical purposes only.

This report presents our analysis of the operational, economic, employment and other impacts of the development of an airport at Badgerys Creek, Richmond and Wilton. Our analysis of the operational impacts considers those who are expected to use the services of an additional Sydney airport and the size, distribution and growth of the population in the airport's likely passenger catchment. The operational analysis also considers the implications for the development of supporting infrastructure and associated land use planning, as well as other local impacts such as changes to the transport network and issues associated with aviation noise. This phase of the analysis was informed by the demand analysis undertaken by Booz & Co and the technical, socioeconomic and environmental data that was provided by WorleyParsons.

This study presents a quantitative analysis of the changes to direct and indirect employment and income impacts as a result of the development of an airport during its construction and operations phases. This includes exploring the various types and locations of new employment opportunities likely to be generated by an additional airport and potential sources of employees for the airport and nearby commercial developments.

Other socio-economic impacts analysed include an assessment of the potential for land use change around each airport and the flow-on impacts for land values, as well as the increased opportunities created for new and existing businesses.

Using estimates of economic activity and employment provided by The Centre of Policy Studies (CoPS) at Monash University, the analysis also quantifies the expected impact on the NSW and national economies from the development of an airport at each of the three sites.

Lastly, this analysis considers the wider social benefits and impacts associated with each airport, including impacts on living standards, local communities and the future development and growth of Sydney.

Why airports matter

Airports are drivers of economic growth and competitiveness

Australia is a big and isolated country with a widely dispersed population, and the aviation sector provides an essential service by physically connecting Australian people and businesses to one another and to the rest of the world. In carrying out this role, airports are intrinsically linked to the social and economic performance of our cities and regions.

Airports directly contribute to economic growth and are major employment centres in their own right, while supporting flow-on benefits to almost all other sectors of the economy. They allow local businesses to supply goods or services to the market efficiently and productively, and play a central role in facilitating international and domestic trade through the movement of time-dependent goods and services.

Airports facilitate improved business competitiveness and productivity by providing better connections and accessibility to national and global transport networks. They are often critical factors in attracting new investment to a region and supporting the retention and expansion of existing businesses, spurring economic and employment growth.

The aviation industry plays a significant role in the movement of labour, enabling many businesses to operate effectively. Businesses use aviation to mobilise employees, including for fly-in fly-out employment operations and other business activities, as well as for accessing suppliers and customers.

The aviation industry also plays a vital part in the tourism market. This includes bringing tourists to Australia who contribute significantly to the national economy, as well as providing local residents with highly valued national and international tourism opportunities.

Airports influence the shape of our cities and patterns of economic activity

International airports are significant pieces of infrastructure that can transform the way cities are organised over the longer term. How an airport is placed within its immediate catchment can reinforce or redefine local and regional planning frameworks and affect the land available for future development.

A new airport requires major “surface access” connections to existing road and public transport networks, as well as energy, water and telecommunications infrastructure. These can be city-shaping initiatives in their own right, with the benefits of enhanced connectivity attracting business and residential development along these new infrastructure spines.

Airports also place a limit on certain kinds of developments in surrounding areas, whether through restrictions on land use and building heights or by dissuading residential development directly under newly created flight paths, or in close proximity to new surface access infrastructure or emerging industrial areas.

Proximity to an airport and/or its supporting infrastructure can be a major drawcard for a number of businesses and industries. This has led to an increasing trend to develop commercial business precincts directly adjacent to or nearby airports (the so called “Aeropolis”). In addition to supporting businesses that rely directly on aviation services, this has led to growth in other industries and businesses such as non-airport related retail, office and ancillary services. In a number of international capital cities, major airports often form the largest single economic precinct outside the central business district.

Airports have far-reaching environmental and social impacts

Beyond the basic provision of aviation services, airports affect people in a number of ways. At a simple level, airports have major impacts on urban form and amenity, as well as on the natural landscape. In turn, this impacts on the wellbeing of local communities by changing the way they view and interact with their local environments.

An obvious impact of airports is in relation to aircraft noise and its adverse consequences for residents living underneath or near airport flight paths and/or in close proximity to surface access infrastructure. Furthermore, both airside and landside operations have been historically associated with significant levels of greenhouse gas emissions.

The provision of new transport links in support of an airport can have positive benefits for the local community. However, there may also be issues of increased vehicle activity, which can generate negative impacts such as local traffic congestion, increased vehicle noise and pollution, and the possibility of more motor vehicle accidents.

Beyond supporting the wider State and national economies, airports provide a mix of direct and indirect employment opportunities for communities, cities and regions. This can have positive impacts on local unemployment rates and income levels, as well as on levels of social inclusion. These effects can enhance the attractiveness of some areas for further commercial and residential development, which can increase local land values and generate further investment and employment opportunities to the benefit of these communities.

Constrained airport capacity can have detrimental impacts

While airports generate positive economic and social benefits that extend well beyond their surrounding regions, constraints in airport capacity can have significant negative impacts that also extend to the broader community and economy. As the Joint Study noted, the failure of airport capacity to keep pace with demand has adverse economy-wide impacts reflected in foregone GDP (or GSP), 'lost' jobs and suppressed aviation-related economic activity. It can also damage the competitive position of businesses as access to customers, suppliers and markets becomes less efficient and less reliable. With global connectivity a critical factor in the success of knowledge intensive industries, accessibility to air services is increasingly likely to influence the investment and location decisions of firms in these high value sectors – making cities and regions facing aviation capacity constraints less attractive propositions.

As well as having a direct impact on the profitability and productivity of airlines, increased queuing, congestion and delays also have negative consequences for other industries – most notably the tourism industry, the freight and logistics industry and aviation-related services sectors. Passengers are also adversely affected by these constraints in time lost through flight delays and a reduced opportunity to access aviation services.

While noting the difficulties in quantifying these impacts, the Joint Study assessed the cost of not enhancing aviation capacity in the Sydney basin to be a reduction in economic activity from 2011 to 2060 of approximately $17.5 billion in foregone GSP for NSW and $34 billion in foregone GDP for Australia, illustrating the significant detrimental effects of failing to keep pace with the demand for airport capacity and aviation services.

Different airport locations involve different economic and social trade-offs

Determining an appropriate site for a major new airport in a highly populous and modern city such as Sydney involves managing a complex series of economic, environmental and social trade-offs. As with many other infrastructure decisions, the push for economically efficient outcomes may run counter to what parts of the community view as being socially acceptable. Nevertheless, as Sydney continues to develop and grow in areas further away from the traditional city centre and current airport location, the development of a second major airport presents a new opportunity to shape the future development of the city. Importantly, it also creates the potential to shape the development and direction of Sydney's growing regional cities, specialised centres and major centres, as well as opening up opportunities to develop new major centres.

This study presents an analysis of options for a new airport in the Sydney region against the economic and social factors outlined above. This is not a straightforward exercise given the time horizon over which these impacts will be felt and the wide range of possible planning and development pathways that could be pursued. It also requires understanding and summarising complex responses from and interactions between various economic, environmental and social agents.

In undertaking this study, Ernst & Young has sought to clarify and understand the strategic context for our analysis and how the situation in Sydney compares to other airport developments in Australia and globally. This has enabled us to form a view on the likely broad economic and social outcomes that can be expected to occur with the development of a major new airport at each of the sites.

Proposed airport options

Ernst & Young were directed by the Department to analyse the economic and social impacts of three specific airport development options. These airport development options were determined within the Joint Study as being the most economically efficient options to increase the supply of aviation services to the Sydney basin. Before reporting the results of our analysis, it is important to understand the types of airport being considered and the level of demand that each airport is expected to cater for over time.

In assessing how best to provide additional aviation capacity to the Sydney basin, the Department specified that the study be limited at this phase of the analysis to two types of airport: the complementary low cost carrier airport model and the large competitive international airport model. [1]

In the complementary airport model, each of the airports provides (broadly) mutually exclusive service offerings and (broadly) different market segments are serviced by each airport. Multiple airlines may be based at both airport sites, although some degree of airline exclusivity is likely. The competitive airport model provides a full duplication of services across both airports, with all market segments being serviced at both competing airports. Multiple airlines are based at both airports.

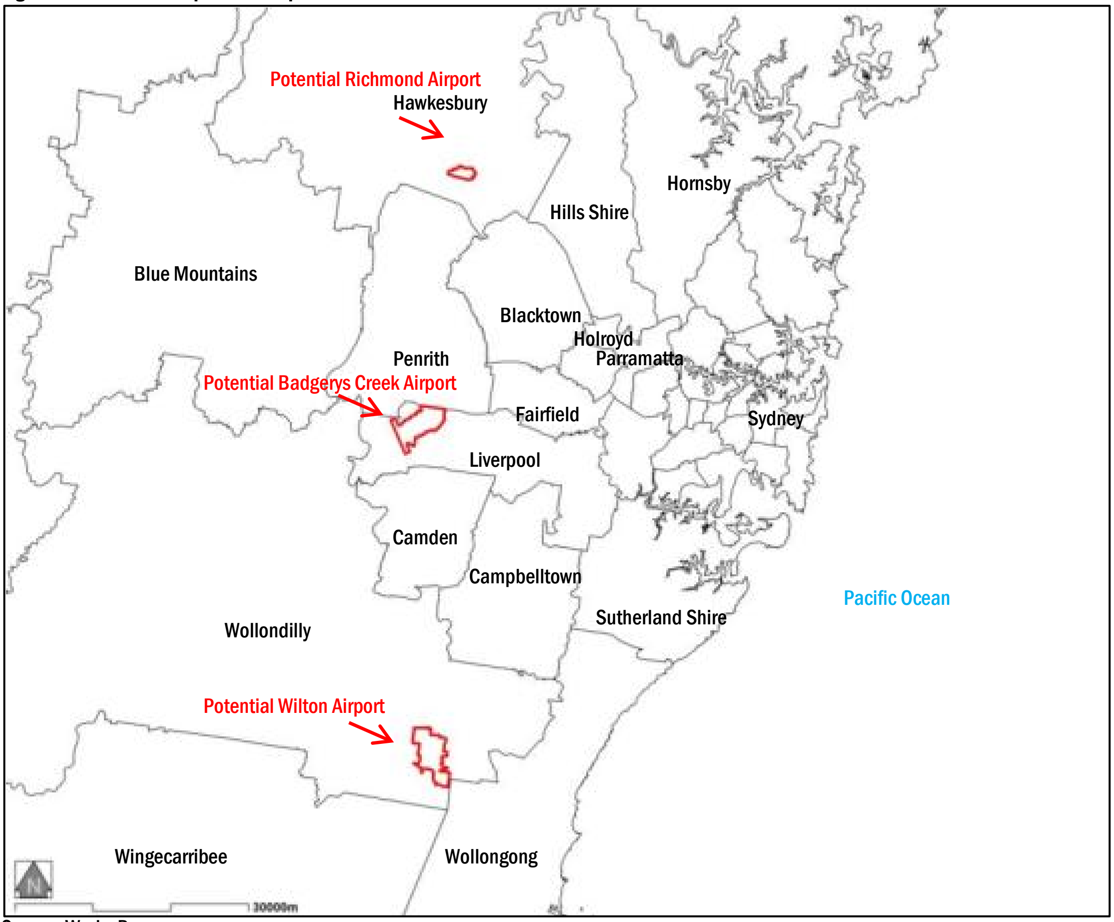
What are the options for a second airport that Ernst & Young have been asked to consider?

The alternative airport locations identified and analysed within this report to provide additional aviation capacity within the Sydney basin are Richmond and Wilton. Badgerys Creek was also considered to provide an objective scale against which to interpret the Wilton findings and as a basis for the Government to consider them. All references in this report ton an airport development at Badgerys Creek are for these analytical purposes only.

Each of these geographical options for the development of a secondary airport within the Sydney basin was assessed according to specific development and operational profiles.

[1] Ernst & Young assumption, based on the indicative design and service offering that the Richmond airport would act in a complementary manner within the Sydney aviation network

Figure 1: Location of the potential airport sites



Source: WorleyParsons

Badgerys Creek is located approximately 50 kilometres west of the Sydney CBD in the Liverpool Local Government Area (LGA). The site is accessed off the Westlink M7 and either Elizabeth Drive or Bringelly Road. The site was acquired by the Commonwealth Government between 1986 and 1991 for the development of a major airport, subsequent to the previous aviation study conducted in the early 1990s.[2] This site is designed to accommodate a fully international airport capable of catering for up to 70 million passengers per annum. The Department has specified that this analysis should assume that this airport would be set up and operate in competition with Kingsford-Smith Airport (KSA), with a duplication of services and all market segments being serviced at both airports.

Richmond is located approximately 48 kilometres north-west of the Sydney CBD in the Hawkesbury LGA. The site is accessed from Percival Street off Richmond Road. The site is currently used by the Royal Australian Air Force (RAAF) and is the only operational air force base in the Sydney basin. The air base supports a number of Defence units and a number of operational roles. The commencement of civil aviation operations on the site would be undertaken in conjunction with Defence operations on the site. The Department has specified that it should be assumed that this airport would be set up and operate in a complementary way with KSA, being able to cater for approximately 5 million passengers, with mutually exclusive service offerings and market segments.

Wilton is located approximately 57 kilometres south-west of the Sydney CBD in the Wollondilly LGA. This site is designed to accommodate a fully international airport capable of catering up to 70 million passengers per annum. The Department has specified that it should be assumed that this airport would be set up and operate in competition with KSA, with duplication of services and all market segments being serviced at both airports.

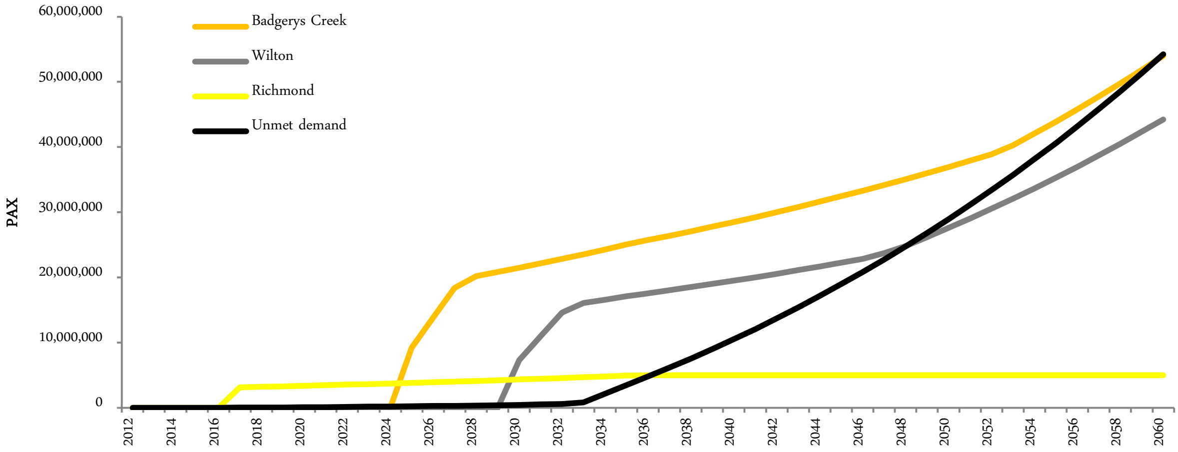
What is the expected demand for aviation services across each of the airports?

The number of passengers that will ultimately use the services at each of the airports will depend on population and economic growth in the Sydney region and the level of economic activity in other locations that are the main sources of inbound aviation traffic. Other important factors include the cost and convenience of the service, as well as the generalised cost to access the airport, which will impact on a potential passenger's willingness to use one of the proposed airport locations and the range of services offered at this alternative airport.

[2] Note that the Commonwealth Government commenced the acquisition of the site prior to the completion of the report

Booz & Co undertook an analysis for the Department to determine the potential level of demand for each of the alternative airport locations under the competitive and complementary operating models that have been assumed. The figure below shows the forecast demand for aviation services provided at each of the alternative airport sites relative to the projected level of unmet demand. The Department specified that this data should be used to underpin the analysis in this report.

Figure 2: Demand forecasts



Source: Booz & Co
Note: When aviation demand for a particular airport is above unmet demand it is a result of the inducement of additional trips. Demand for services at an airport below unmet demand results in suppressed demand.

The Booz & Co analysis within the Joint Study found that over the medium to longer term there will be enough demand for aviation services within the Sydney basin to support the operations of a secondary airport providing full international services and that demand is likely to reach 54 million passenger per annum by 2060. The analysis found that this level of demand will not be able to be supported by Kingsford-Smith Airport alone.

Furthermore, as shown in the figure above, the analysis found that – due to the nature of each of the alternative airport developments (location and capacity) – Badgerys Creek will realise a greater level of aggregate demand than that of an airport providing the same services at Wilton. A complementary low cost carrier airport at Richmond will reach its 5 million capacity constraint by 2036. Richmond airport will realise its natural capacity constraints soon after it commences operations: therefore, this option only represents a short to medium solution that will only service a segment of the domestic RPT market.

Our approach to this assessment

The Department tasked Ernst & Young with the analysis of the operational, social and economic impacts that are likely to affect a local and regional community with the development of an additional airport within the Sydney basin.[3]

This assessment is underpinned by extensive research and analysis of airport systems around Australia and internationally. In undertaking this analysis, Ernst & Young has also sourced a large and varied amount of information from publicly available sources (such as government statistics, planning documents, aviation-specific information and industry publications) as well as from a range of internal knowledge resources. We also developed statistical models to understand the relationships between the use of airports and their impacts on surrounding areas in terms of economic development and employment.

Additional sources of information to support the economic analysis included the demand analysis undertaken by Booz & Co; the technical, socioeconomic and environmental data provided by WorleyParsons; and estimates of economic activity and employment provided by The Centre of Policy Studies at Monash University, which were used to determine the flow-on economic and employment benefits that will result from the development of industrial activity near the airport at each of the sites analysed.

In assessing the operational and socioeconomic impacts for each of the airport sites, we adopted a five-phase process.

Figure 3: Assessment process

Regional Context	Airside & Landside Development	A Operational Impacts	B Employment Impacts
Socio-Economic Indicators Business & Industry Transport & Utilities LGA & State Government Plans	Airport Runway Footprint Terminals & Airside Infrastructure Utilities & Transport Connections Landside Commercial Development	Strategic (land use, population, demographics, spatial distribution) Environmental (air, water, meteorological) Social (displacement, noise, amenity)	Construction Direct Indirect Types Sources (of employees)

Source: Ernst & Young

The starting point for the analysis was to define the regional context for each of the airport sites. In doing this, we sought to define practical airport catchments that reflect the position of each airport within its own or nearby LGAs, and the propensity for the resident population to experience the more significant impacts of the airport.

Once the sub-regions for each airport were defined, their current and projected characteristics were investigated. This analysis established the baseline situation for the study and included a socio-economic analysis, an evaluation of the current and expected business and employment drivers for each region, and the level of infrastructure provision required.

After this, we considered the airside and landside development being proposed for each airport site. This included analysis of the specific aviation infrastructure footprints, utilities and required transport connections, and the capacity for landside commercial and industrial development.

[3] This analysis does not identify the full list of impacts that an airport would have on the local community to the level of analysis that would be required to progress this project to development phase. Furthermore this analysis did not look at potential operating models of the airport and impacts on airlines.

Phase A involved the assessment of the operational impacts of the proposed airport site, including the strategic, environmental and social impacts. Key environmental factors considered included the acoustic footprints, landscape and visual effects, and the impacts on air quality. The social impacts related to displacement, noise and other aspects of social amenity.[4]

Phase B examined the employment impacts of the proposed site. For this study, we quantified the main sources of new employment associated with each of the proposed airport developments. This included:

- Estimating the direct number of employees as a result of the construction of the airport and supporting infrastructure
- Estimating the number and type of direct employment opportunities provided by the operation of each of the proposed airports
- Estimating the number and type of commercial/industrial employment that will be realised near the site as a direct result of the airport development
- Applying the Monash University's Centre of Policy Studies general equilibrium model to measure the total number, type, location and remuneration of indirect jobs that will result from the development of an airport within each of the locations analysed.

We have also undertaken a high level analysis of the source of employees for the airport and nearby commercial developments in terms of where we expect they will reside.

Phase C related to the airport's potential economic impacts. We have extended the analysis of operational and employment impacts to make general statements regarding the impact that each site will have on the structure and characteristics of the local, state and national economies. This analysis was supported by a number of other social and economic indicators that measure the wider impacts of the development of an airport in alternative locations, including land use and land values, unemployment and equality factors.

The analysis assumes that each of the airports is mutually exclusive and that only the particular airport being assessed will be developed. As such, all of the findings of the analysis undertaken are presented for each of the potential airport sites in this report. While this involves some repetition, it allows each airport – and its impacts to be considered separately and on its own merits.

A summary of the assessment of each of the proposed sites is set out below.

[4] This part of the analysis was in large part based on socioeconomic, technical and environmental data provided by WorleyParsons

Assessment of Badgerys Creek – summary results

Regional context

The Badgerys Creek study region is defined as the area bounded by Liverpool, Penrith, Fairfield and Bankstown Local Government Areas (LGAs).

Socio-economic composition

In total, 685,240 people reside within the region within 224,636 households. Levels of unemployment in the region are higher than the Sydney and national averages. The region that supports Badgerys Creek currently has a 7.8% unemployment rate, while 39% of the working age population (18 to 64) are not in the labour force.[5] This compares to a Sydney-wide unemployment rate of 5.3% and an estimate that 31.8% of working age population not in the labour force.[6]

The Badgerys Creek site is located in close proximity to a number of employment centres in Sydney's west. Of the major employment centres within the region that supports Badgerys Creek, Penrith and Liverpool are already established 'regional cities' and Bankstown is an established 'major centre'. Leppington is a 'planned major centre' and Prairiewood, Fairfield and Cabramatta are seen as a 'potential major centres'. Manufacturing (19.8%) and retail trade (12.2%) are the region's largest employing industries.[7]

Current infrastructure provision

The Badgerys Creek sub-region is well-served by a number of major road and public transport links. Motorways in the study region include the M4 (to the north of Badgerys Creek) and the M5 and M7 (to the east of Badgerys Creek). The two state roads that connect with the site are Elizabeth Drive (linking with the M7) and The Northern Road (linking with the M4 and Hume Highway).

Public transport provides critical infrastructure that supports the region's development by providing residents with access to major centres across the region and elsewhere. The major rail links that support the region include the East Hills line to Macarthur, the Bankstown and Inner West lines to Liverpool, and the Cumberland line from Bankstown to Campbelltown.

The South West Rail Link (currently under construction) also lies within the region. This link will provide a new line from Leppington via Edmondson Park to Glenfield, where passengers will be able to access the rest of the network. This line is planned to commence operations by 2016.

Future growth

The number of persons living within the Sydney basin within the medium to long-term is anticipated to increase substantially in line with national population growth. The Australian Bureau of Statistics has forecast 9.2 million persons living in Sydney by 2056 – 46% more people than are currently living in the city today and an average annual growth rate of 1.27%.[8]

The South West Growth Centre and regional cities such as Liverpool and Penrith, as well as planned major centres such as Leppington, are all part of the region that surrounds Badgerys Creek.[9] State and local governments have a number of formal plans in place to grow and develop these centres over the coming decades.

The population in the Badgerys Creek region is forecast to increase by 31% to 1.01 million residents by 2036.[10] The LGAs with the greatest level of population growth in the region are anticipated to be Liverpool and Penrith.

The development

An airport (for the purpose of this analysis) at the Badgerys Creek site is capable of catering up to 70 million passenger movements per annum.

Demand forecasts

The demand analysis undertaken by Booz & Co found that 9.2 million passengers per annum will use aviation services at a Badgerys Creek airport when it first opens in 2025.[11] This will increase to 28.5 million passengers by 2040 and ultimately reach 54 million in 2060.[12]

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[5] Department of Planning and Infrastructure, Population Forecasts
[6] .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data
[7] .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data
[8] ABS forecasts (3222.0) – Population growth Scenario B
[9] Note that not all of the South West Growth Centre is within the Badgerys Creek Study area
[10] Department of Planning and Infrastructure population forecasts

Around 150,000 tonnes of freight will pass through the airport by 2040, increasing to 773,000 tonnes of freight in 2060. Approximately 85% of the freight forecast to move through a second airport at Badgerys Creek will have international origins or destinations.

By 2060, the number of daily passenger aircraft movements is expected to increase to 10 regional flights servicing five locations, 176 domestic flights servicing 11 locations and 99 international flights servicing 18 locations. Flights to/from Melbourne and China will be the most frequent domestic and international services respectively.[13]

Supporting infrastructure

The development of an airport at Badgerys Creek will require additional transport and other infrastructure to help support its operations.

The Joint Study found that the airport will require an 8 km upgrade of Elizabeth Drive and a connection to the airport, at a cost of $190 million. While the Joint Study found that planned upgrades to the M5 should cater for the increased traffic levels it will need to accommodate, further operational analysis by WorleyParsons suggests that upgrades to both the M5 and M4 could be required by 2060.[14]

The Joint Study analysis found that providing rail access to an airport at Badgerys Creek will require an 11 km extension of the South West Rail Link (currently under construction) at a cost of approximately $1.13 billion. It will also require an increase in the frequency of services, which will further increase rolling stock requirements and operating costs.

To service an operational airport at Badgerys Creek, a range of utility infrastructure in the area will have to be developed and/or upgraded, notably power (at a cost of $199 million) and fuel (at a cost of $423 million). [15]

Key operational impacts

This study has analysed a range of operational factors, including important environmental, social and land use impacts.

Air quality

Emissions of five of the six National Environmental Protection Measures (NEPM) (ambient air) pollutants were assessed for airport operations by Worley Parsons.

Worley Parsons' analysis found that the additional air emissions that result from a second airport will make a small contribution to four of the NEPM pollutants and total hydrocarbons in the Sydney region. The largest impact is expected from the 8% to 9% increase in nitrogen oxide (NOx) emissions for the Badgerys Creek option.

[11] As indicated by the Commonwealth Department of Infrastructure and Transport
[12] As indicated by the demand analysis of Booz & Co
[13] As indicated by the demand analysis by Booz & Co
[14] Operational analysis undertaken by WorleyParsons
[15] Operational analysis undertaken by WorleyParsons

Drainage and water quality

WorleyParsons assessed the impacts that a airport development at Badgerys Creek could have on existing surface water and ground water systems. The analysis found that the site has a low level of water catchment contamination risk.

Flora and fauna species within footprint

A WorleyParsons Environment Protection and Biodiversity Conservation (EPBC) search revealed the likely presence of one Endangered Ecological Community (EEC) in the Badgerys Creek study area. The EPBC search found that there could be 24 different threatened species; 5 bird, 2 fish, 2 frog, 7 mammal, 7 plant and 1 reptile that may exist within the footprint of the site.[16]

Noise

The noise impact of an airport is one of its major anticipated negative aspects, with residents living in the vicinity of airports or under busy flight paths being exposed to the ongoing impacts of aircraft noise.

Worley Parsons' analysis found a total 1,536 persons will experience 100 additional N70[17] events every day; 2,664 persons will experience 50 additional N70 events per day; and 69,660 persons will experience 10 additional N70 events each day. These N70 events will primarily be directed toward the north-east and south-west of the site due to the direction of the aircraft runways. [18]

Displacement

The construction of an airport at Badgerys Creek will require a number of properties to be compulsorily acquired under the powers governed by the *Land Acquisition Act 1989*.

Since the acquisition of the site between 1986 and 1991, the Commonwealth has negotiated approximately 250 short-term commercial leases that may have to be altered in the future to develop an airport on the site. The latest footprint of the site will still require additional property (30 lots) to be compulsorily acquired at the southern end of the site.

In line with Australian health and safety standards for noise pollution, properties located within Australian Noise Exposure Concept (ANEC) contours 40, 35 and 30 should be acquired by the Commonwealth Government. The analysis undertaken by WorleyParsons found that there could be up to a further 62 allotments[19] that should be considered for compulsory acquisition as a result of noise impacts from the airport.[20]

Commercial and industrial development

Should the site be selected for use as an airport, there is the potential for some of the land adjoining the site to be assessed and, if found suitable, rezoned to permit commercial and industrial land uses. The area of land to the north-west of the site could be investigated for such uses as it has good infrastructure connections. This area of land is approximately 378 hectares.

Analysis of the potential uptake of industrial/commercial development around an airport at this site found that by 2035 the level of demand for industrial land could be in the order of 110 to 270 hectares, growing in line with airport activity to 150 to 370 hectares by 2060.

[16] A full flora and fauna impact assessment and species impact statement (SIS) would be required as part of a potential Environmental Impact Statement conducted to address Commonwealth and NSW legislation. This would assess the significance of potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance.

[17] 70 decibel events – this noise level is equivalent to between a conversation at 2 metres and a truck at 7 metres.

[18] Maximum impacts based on current population and maximum capacity of the airport

[19] Note that the number of allotments does not equate to the number of households. For the purpose of this exercise, we have tallied the number of allotments in which housing is permissible.

[20] Furthermore this legislation states that that no new housing is to be developed within the Australian Noise Exposure Forecast (ANEF) ranges 25-30, and that all houses developed within the ANEF ranges 20-25 must be constructed with insulation.

Employment impacts

Development of an airport and associated industrial/commercial development will result in new direct and indirect employment opportunities during construction and operational phases.

Direct employment

Ernst & Young have calculated that approximately 2,300 to 3,300 Full Time Equivalent (FTE) persons will be employed to build the airport over the construction period. A further 1,300 to 1,800 FTE persons will be employed to construct the airport's supporting infrastructure (such as road and rail connections).

Ongoing operations at the airport will create a range of direct employment opportunities at the airport that will otherwise not be realised within the region. Between 16,293 and 29,096 FTE persons are anticipated to be employed on average at Badgerys Creek airport over the evaluation period, with up to 37,600 FTE persons employed at the airport in 2060.

Sub-regional (associated) development and employment

An airport also impacts the economy through flow-on effects from 'off-site' businesses in the region that supply the airport and its users or form part of a growing airport 'city' or sub-regional economic centre with close links to the airport.

Employment in these industrial/commercial developments near the airport is projected to grow to approximately 30,000 FTE employees[21] by 2060. The general business sector will have the highest employment levels in any industrial/commercial developments, with warehousing/logistics and light industrial activities also being key employment sectors.

Other indirect employment

The employment and economic activity derived from the development of the airport is expected to support an additional 3,000 to 11,000 jobs within the wider region by 2060.[22]

Sources of employment

To be conservative, the analysis assumes that the majority of people employed at the airport and associated industrial/commercial developments will reside in areas within 30 minutes travel time.[23]

Our analysis found that 757 persons within the labour force are looking for employment opportunities and a further 19,900 are underemployed. These workers could be redirected to potential employment opportunities associated with the airport. This level of regional underutilised labour supply is anticipated to rise to 46,700[24] by 2030 and 95,200 by 2060.

Economic impacts

The development of an airport at Badgerys Creek is forecast to increase NSW Gross State Product (GSP) by $1,566 million in 2025 in real terms, increasing to $20,296 million in 2060. From a national perspective, the development of the airport is forecast to increase GDP by $1,636 million in 2025 in real terms, increasing to $23,942 million in 2060.[25]

[21] In the medium case scenario – the high and low case scenarios forecast 24,600 and 34,400 FTE employees respectively by 2060
[22] These do not reflect additional employment opportunities created, but jobs that are somewhat supported by the activities of the airport. These reflect jobs outside of the airport and the associated business park. This analysis is unable to distinguish the exact location of these jobs within the Sydney basin (whether these jobs will be within the region as defined within this study or elsewhere within the Sydney basin).
[23] This assumption is broadly consistent with the geographic distribution of where employees of KSA reside, with approximately 70% of the airport's workforce residing within 30 minutes travel time[23] and approximately 90% residing within 45 minutes travel time.
[24] Taking into account the relative difference between population and jobs growth within the region
[25] Centre of Policy Studies general equilibrium modelling was used to determine the flow on economic and employment impacts

Social impacts

An operational airport within the Badgerys Creek region and the associated activity will result in a range of social impacts, including improved living standards, by strengthening communities and by supporting planned development within the region and beyond.

Living standards and quality of life factors

Living standards refer to the level of comfort, wealth and material goods that an individual or group experiences. A range of factors that affect living standards will be impacted through the development of an airport at Badgerys Creek, including:

- *Social and cultural benefits resulting from accessibility of aviation services* – the development of an airport at Badgerys Creek is forecast to increase accessibility to affordable aviation services for residents in outer Western Sydney. The number of flights taken by these residents of north and north-western Sydney is projected to increase by approximately 2.046 million flights per annum by 2030 and 6.545 million flights by 2060.[26] The benefits associated with increased travel include broader perspectives, new experiences that stimulate fresh ideas and innovation, and reduced personal stress.

- *Jobs closer to home and a positive impact on work/life balance* – the employment opportunities developed in the region as a consequence of the airport development[27] have the potential to save up to 1.43 million hours by 2030 as a result of people working closer to home, increasing to up to 3.92 million hours by 2060.[28] Other benefits include reduced energy use, increased productivity and more active lifestyles.

- *Land prices* – Residential properties surrounding the Badgerys Creek site that are affected by noise are likely to experience a decrease in value, whereas those that are not directly under airplane flight paths are likely to experience a small increase in value.

Strengthening communities and supporting development

The development of an airport at Badgerys Creek could generate a range of positive social impacts on the local region. As well as generating connectivity, employment and investment opportunities, an airport can improve social cohesion through the development of a regional 'economic identity'. Such an identity can contribute to a region's competitiveness, as well as being a driver for regional strategies and new investment. It can also help to sustain the resilience of communities when a region faces challenges.

More broadly, the airport could play a vital part in supporting regional NSW growth and improving access from regional communities to services and facilities in Sydney, including to Western Sydney's rapidly growing commercial sector.

Supporting development

A 'City of Cities' approach to the management of future growth attempts to develop a network of economic centres across the city and to direct future growth in and around those centres

A second airport at the Badgerys Creek will introduce significant pieces of infrastructure to a rapidly growing Western Sydney, developing over time into a thriving industrial and employment hub. This development will assist in the State Government's plans to realise future population and economic growth within Sydney through a 'City of Cities' approach.

Furthermore, the additional economic activity generated from the development of a Badgerys Creek airport is forecast to result in a potential increase in federal, state and local government tax revenue of $2,423 million per annum in 2040, rising to $6,871 million in additional tax revenue in 2060.[29]

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[26] As informed by the demand analysis of Booz & Co
[27] Either at the airport or the landside development
[28] Ernst & Young calculation based on Bureau of Transport Statistics (BTS) trip distribution matrix, assumed (current and future travel speeds)
[29] Average tax revenue collected as a result of a general increase in GDP by all levels of government. The values presented above are the mid-point between the range that was calculated within this analysis

Assessment of Richmond – summary results

The development of a civil-aviation airport in Richmond will utilise the site currently occupied and used by the Royal Australian Air Force base. This proposal envisages annual passenger throughput of 5 million per year co-existing on the site with its current and planned use by the RAAF. The base is located approximately 48 km north-west of the Sydney CBD and has a total area of 279.14 hectares.

Regional context

The Richmond study region is defined as the area bounded by Hawkesbury, The Hills, Blacktown and Penrith Local Government Areas (LGAs).

Socio-economic composition

In total, 534,986 people reside within the region within 180,124 households. Levels of unemployment within the region are slightly higher than the Sydney average. The region that supports Richmond currently has a 5.4% unemployment rate, while 32% of the working age population (18 to 64) are not in the labour force. [30] This compares to a Sydney-wide unemployment rate of 5.3%, with an estimated 31.8% of the working age population not in the labour force. [31]

The Richmond site is located in close proximity to a number of employment centres in Sydney's north-west. Of the major employment centres within the region that supports Richmond, Penrith, Castle Hill and Blacktown are already established 'major centres' and Rouse Hill is a 'planned major centre'. Mount Druitt is a 'potential major centre'. Retail trade (15%) and manufacturing (14%) are the region's largest employing industries. [32]

Current infrastructure provision

The Richmond sub-region is well-served by a number of major road and public transport links.

Motorways in the region include the M4, providing access from the east, and the M7, which links the region from the south. Access to the Richmond RAAF airbase is provided by Blacktown Road, which links the site to the main motorways via Richmond Road and The Northern Road.

Public transport provides critical support for the region's development by providing access for residents to major centres within the region and elsewhere. The Richmond Branch line connects with the main West line at Blacktown and, as a part of the North Shore and Western Line component of the network, provides direct services to the Sydney CBD via Parramatta, Strathfield and intermediate stations before continuing across the bridge to the North Shore and Hornsby.

The procurement of the North West Rail Link is underway, with the project expected to commence construction in 2013.

Future growth

The number of persons living within the Sydney basin within the medium to long-term is anticipated to increase substantially in line with national population growth. The Australian Bureau of Statistics has forecast 9.2 million persons living in Sydney by 2056 – 46% more people than live in the city today and an average annual growth rate of 1.27%. [33]

[30] Department of Planning and Infrastructure, Population Forecasts
[31] .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data
[32] .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data
[33] ABS forecasts (3222.0) – Population growth Scenario B

The population in the Richmond region is forecast to increase by 45% to 1.06 million residents by 2036, compared to a 38% projected population growth in the wider Sydney region over the same period. The LGAs with the greatest level of population growth in the region are anticipated to be Blacktown and The Hills. A number of government plans are in place to support this growth and develop the region.

Proposed development

The development of a civil aviation airport in Richmond will utilise the site currently occupied and used by the Royal Australian Air Force. An airport with annual passenger throughput of 5 million per year will be able to co-exist on the site alongside the current and planned use of the site by the RAAF.

Demand forecasts

The demand analysis undertaken by Booz & Co found that 3 million passengers will use aviation services at a Richmond airport when it first opens in 2017. [34] The airport will reach its capacity of 5 million passengers per annum by 2036. [35]

At this stage, it is anticipated by Booz & Co that the proposed site at Richmond will not be used to service freight. [36]

Because of the low cost carrier service operating model at this airport, it is assumed that all passengers using the airport will do so for leisure purposes. The services provided at an airport on the site will generally cater for smaller aircraft and provide short to medium haul east coast services (such as to and from Melbourne and Brisbane). As such, this airport will essentially complement services that will be provided at KSA. [37]

Supporting infrastructure

The analysis of the Richmond RAAF site found that, given the size of the airport development and the existing infrastructure that supports RAAF operations on the site, no major infrastructure will have to be constructed to support the proposed airport. However, the analysis by WorleyParsons found that a number of small upgrades and relocation of services will be required to allow RAAF and civil aviation operations to co-exist on the site – notably $36.38 million to relocate RAAF assets within the site and $1.5 million on power upgrades.

The analysis found that the development of the airport will require upgrades of Blacktown Road, Hawkesbury Valley Way, Macquarie Street, George Street and Richmond Road, and a road connection to the airport will be required.[38]

The existing rail network, along with proposed rail upgrades and the new North West Rail Link, will improve access to the site for passengers using public transport. All passengers will need to use a new shuttle service from Richmond station, similar to that used at Lidcombe to get to Sydney Olympic Park.[39]

Key operational impacts

Environmental

Residents living in the vicinity of airports or under busy flight routes are exposed to the ongoing impacts of aircraft noise. WorleyParsons' analysis has found a total 5,086 persons will experience 50 additional N70 events every day; 12,356 persons will experience 20 additional N70 events per day; and 24,131 persons will experience 10 additional N70 events each day. These N70 events will primarily be directed toward the east and west of the proposed airport site due to the orientation of the aircraft runways.

The largest environmental emissions as a result of the development of the Richmond option are expected to be the 0.9% increase in NOx emissions.

The analysis by WorleyParsons found that the proposed Richmond site has a low level of water catchment contamination risk. This is because the site is located downstream of the Warragamba Catchment; runoff generated from the site will not drain into the catchment. An EPBC search by Worley Parsons revealed the likely presence of no Endangered Ecological Communities in the Richmond study area. The EPBC search found that there could be 21 threatened species; 5 bird, 2 fish, 3 frog, 7 mammal, 3 plant and 1 reptile that may exist within the footprint of the site.

Displacement

[34] As indicated by the department
[35] As indicated by the demand analysis of Booz & Co
[36] As indicated by the department
[37] As indicated by the demand analysis by Booz & Co
[38] Analysis only takes into account passenger demands, not travel for employed personnel or freight.
[39] WorleyParsons analysis relating to public transport for the 5 million passengers airport has not been undertaken.

A number of alterations to the current airport will be required to accommodate both civil aviation and air force operations. The proposed footprint of the site will require some property (30 lots) to be compulsorily acquired at the southern end of the site under the *Land Acquisition Act 1989*.

In line with Australian health and safety standards for noise pollution, properties located within ANEC contours 40, 35 and 30 should be acquired by the Commonwealth Government. Our analysis found that there could be up to a further 30 allotments[40] that should be considered for compulsory acquisition as a result of noise impacts from the airport.[41]

Commercial and industrial development

Should the site be selected for use as an airport, there is the potential for some of the land to the south of the site to be assessed and, if found suitable, rezoned to permit business parks and industrial land uses. This area of land is approximately 93 hectares.

This analysis found that by 2035 the level of demand for industrial land will be in the order of 47 to 109 hectares. With the anticipated increases in airport activity, this land use demand is forecast to grow to 54 to 124 hectares by 2060.

Employment impacts

Direct employment

Ernst & Young estimate that approximately 350 to 500 FTE persons will be employed during the construction period.

Ongoing operations at the airport will create a range of direct employment opportunities at the airport that will otherwise not be realised within the region. Between 3,000 and 3,800 FTE workers are anticipated to be employed at Richmond airport over the evaluation period, with up to 4,200 FTE workers employed at the airport in 2060.

Sub-regional (associated) development and employment

An airport also impacts the economy through flow-on effects from ‘off-site’ businesses in the region that supply the airport and its users or form part of a growing airport ‘city’ or sub-regional economic centre with close links to the airport.

Employment in the industrial/commercial developments near the airport is projected to grow to approximately 4,060 employees[42] by 2060. The general business sector will have the highest employment levels in any industrial/commercial developments, with warehousing/logistics and light industrial activities also being key employment sectors.

Other indirect employment

Employment and economic activity derived from the development of the airport is expected to support[43] an additional 2,000 to 3,000 jobs[44] within the wider region[45] by 2060.

Sources of employment

The analysis assumes that the majority of people employed at the airport and associated industrial/commercial developments will reside in areas within 30 minutes travel time.[46]

Our analysis found that currently there are potentially up to 22,700 underemployed residents within the region. These workers could be redirected to potential employment opportunities associated with the airport. This level of regional underutilised labour supply is anticipated to fall to 5,000 by 2060 without the airport development.

Economic impacts

The development of an airport at Richmond is forecast to increase NSW GSP by $292 million in 2025 in real terms, increasing to $563 million in 2060. From a national perspective, the development of the airport is forecast to increase GDP by $423 million in 2025 in real terms, increasing to $1,005 million in 2060.[47]

[40] Note that the number of allotments does not equate to the number of households. For the purpose of this exercise, we have tallied the number of allotments in which housing is permissible.
[41] Furthermore this legislation states that that no new housing is to be developed within the Australian Noise Exposure Forecast (ANEF) ranges 25-30, and that all houses developed within the ANEF ranges 20-25 must be constructed with insulation.
[42] In the medium case scenario – the high and low case scenarios forecast 3,100 and 5,000 FTE employees respectively by 2060
[43] These do not reflect additional employment opportunities created, but jobs that are somewhat supported by the activities of the airport.
[44] These reflect jobs outside of the airport and the associated business park
[45] This analysis is unable to determine whether these jobs will be within the region as defined within this study or elsewhere within the Sydney basin.
[46] This assumption is broadly consistent with the geographic distribution of where employees of KSA reside, with approximately 70% of the airport’s workforce residing within 30 minutes travel time[46] and approximately 90% residing within 45 minutes travel time.

Social impacts

An operational airport within the Richmond region and the associated activity will result in a range of social impacts, including improved living standards, by strengthening communities and by supporting development within the region and beyond.

Living standards

- *Social and cultural benefits resulting from accessibility of aviation services* – an airport at the Richmond site will increase accessibility to and affordability of flights to residents of North West Sydney. However, as the airport is likely to cater for domestic flights for 5 million passengers per year, the increased social and cultural benefits from additional aviation connectivity are likely to be relatively small.

- *Jobs closer to home and a positive impact on work/life balance* - the employment opportunities generated in the region as a consequence of the airport development[48] have the potential to save up to 0.72 million hours as a result of people working closer to home by 2030, increasing to up to 1.23 million hours by 2060.[49] Other benefits include reduced energy use, increased productivity and more active lifestyles.

- *Land prices* – Residential properties surrounding the Richmond site that are affected by noise are likely to experience a decrease in value, whereas those that are not directly under airplane flight paths are likely to experience a small increase in value.

[47] Centre of Policy Studies general equilibrium modelling was used to determine the flow on economic and employment impacts
[48] Either at the airport or the landside development
[49] Ernst & Young calculation based on Bureau of Transport Statistics (BTS) trip distribution matrix, assumed (current and future) travel speeds

Strengthening communities and supporting development

The development of an airport at Richmond could generate a small range of positive social impacts on the local region through the strengthening of a regional 'economic identity'. Building such an identity can contribute to a region's competitiveness, as well as being a driver for regional strategies and new investment. It can also help to sustain the resilience of communities when a region faces challenges.

More broadly, the airport could play a part in supporting regional NSW growth and improving access from regional communities to services and facilities in Sydney, as well as improving national connectivity.

A civil aviation airport operating at the Richmond site will assist in supporting the growth of Western Sydney, through the development of an industrial and employment hub. The relatively small passenger throughput and possible agglomeration opportunities associated with business park industries will attract a small amount of capital and labour resources away from the Sydney CBD and toward the North West Growth Centre. A Richmond airport will provide some support for future population growth and the development of a new major centre.

Furthermore, the additional economic activity that will be generated from the development of a Richmond airport is expected to result in an increase in government tax revenue of $208 million in 2040, rising to $288 million in additional tax revenue in 2060.[50]

[50] Average tax revenue collected as a result of a general increase in GDP by all levels of government. The values presented above are the mid-point between the range that was calculated within this analysis

Assessment of Wilton – summary results

The site at Wilton is located approximately 63 kilometres south-west of the Sydney CBD and 28 kilometres north-west of Wollongong in the Wollondilly Local Government Area (LGA). The site covers an area of approximately 2,000 hectares.

Regional context

The Wilton study region is defined as the area bounded by Wollondilly, Camden, Campbelltown and Wollongong Local Government Areas (LGAs).

Socio-economic composition

In total, 413,922 people reside within the region within 148,699 households. The levels of unemployment within the region are higher than the Sydney average. The region that supports Wilton currently has a 7% unemployment rate, while 36% of the working age population (18 to 64) are not in the labour force. [51] This compares to a Sydney wide unemployment rate of 5.3%, with an estimated 31.8% of the working age population not in the labour force. [52]

The Wilton site is located in proximity to a number of employment centres in Sydney's south-west. Of the major employment centres within the region that supports Wilton, Wollongong is an established and major 'regional city', while Warrawong and Campbelltown are established 'major centres'. Dapto and Leppington are 'planned major centres'. Manufacturing (15%) and retail trade (13%) are the region's largest employing industries. [53]

Current infrastructure provision

The Wilton sub-region is well-served by a number of major road and public transport links.

Motorways in the region include the M5 (to the north) as well as the Hume Highway (National Route 31, M5 route), which is located approximately nine kilometres to the north-west. Access to the potential Wilton Airport could be from Picton Road (to the south-east) and Route 88 (off the Hume Highway), which intersects with Macarthur Drive. Access to Wilton is also via Wilton Road and Appin Road from Campbelltown in southern Sydney, but with a steep narrow river crossing not suitable for trucks or large vehicles.

Public transport provides support for the region's development by providing access for residents to major centres within the region and elsewhere. The area is also accessible via the Bankstown and Inner West lines to Liverpool and the Cumberland line from Bankstown to Campbelltown.

Any future extension of the rail network to Wilton will likely be from the existing Main Southern Railway south of Campbelltown/Macarthur.

Future growth

The number of persons living within the Sydney basin within the medium to long-term is anticipated to increase substantially in line with national population growth. The Australian Bureau of Statistics has forecast 9.2 million persons living in Sydney by 2056 – 46% more people than live in the city today and an average annual growth rate of 1.27%. [54]

The South West Growth Centre, regional cities such as Liverpool and Penrith, and planned major centres such as Leppington are all part of the region that surrounds Wilton. These areas are expected to grow strongly over the coming decades.

The population in the Wilton region is forecast to increase by 65% to 786,000 residents by 2036, compared to a 38% projected population growth in the wider Sydney region over the same period. [55] The LGAs with the greatest level of population growth in the region are anticipated to be Camden and then Liverpool. A number of government plans are in place to support this growth and develop the region.

Proposed development

[51] Department of Planning and Infrastructure, Population Forecasts
[52] .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data
[53] .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data
[54] ABS forecasts (3222.0) – Population growth Scenario B
[55] Department of Planning and Infrastructure population forecasts

The demand analysis undertaken by Booz & Co found that 7.3 million passengers will use aviation services at an airport developed at Wilton when it opens in 2030, [56] increasing to 19.5 million passengers by 2040 and ultimately 44.2 million passengers in 2060. [57]

Around 150,000 tonnes of freight will pass through the airport by 2040, increasing to 773,000 tonnes of freight in 2060. Approximately 85% of freight through a second airport at Wilton will have international origins or destinations.

By 2060, the number of daily passenger aircraft movements is projected to increase to 10 regional flights servicing 5 locations, 156 domestic flights servicing 11 locations, and 88 international flights servicing 18 locations. [58]

Supporting infrastructure

The development of an airport at Wilton will require a range of infrastructure to help support its operations.

Picton Road will need to be upgraded to be able to accommodate the additional traffic movements that will result from the movement of traffic to and from Wollongong and the Wilton airport, while an additional 9 km of road will have to be constructed to link the site to the existing road infrastructure. The estimated cost of these works is approximately $456 million.[59] While planned upgrades to the existing motorways should cater for the increased traffic levels associated with the airport, further operational impacts analysis by WorleyParsons suggests that the Hume Highway and the M5 will need long-term modifications to handle the predicted volumes. [60]

The analysis found that providing rail access to an airport at Wilton will require completion of the Maldon- Dombarton Railway. The analysis also found that the Main Southern Railway/East Hills line does not have sufficient capacity to serve the increased demand that will result from the development of a new airport at Wilton and that there will be a need for the Southern Sydney Freight Line quadruplication between Revesby and Glenfield, and sextuplication between Erskineville and Tempe.

Servicing an operational airport at Wilton will also require a range of utility infrastructure in the area to be developed and/or upgraded. Costing for this utility infrastructure has not been undertaken at this stage of the study.

Key operational impacts

This study has analysed a range of operational factors, including important environmental, social and land use impacts.

Air quality

Emissions of five of the six National Environmental Protection Measures (NEPM) (Ambient Air) pollutants were assessed for airport operations by WorleyParsons.

WorleyParsons' analysis has found that the additional air emissions that result from a second airport will make a small contribution to four of the NEPM pollutants and total hydrocarbons in the Sydney region. The largest impact is expected from the 8% increase in NOx emissions.

Drainage and water quality

WorleyParsons assessed the impacts that a proposed Wilton airport could have on existing surface water and ground water systems. The analysis found that the proposed Wilton site has a medium level of water catchment contamination risk.

In terms of the discharge of untreated stormwater during extreme storm events, the possibility of discharging excess flow into the Drinking Water Catchment (that is, the flow above a peak 20 or 100 year ARI[61] flow threshold) was raised with the Sydney Catchment Authority (SCA). Any discharge will only occur once the threshold event has been exceeded and only following the diversion of initial flows to suitable first-flush systems and Allens Creek as part of the stormwater treatment system.

Flora and fauna species within footprint

[56] As indicated by the department
[57] As indicated by the demand analysis of Booz & Co
[58] As indicated by the demand analysis by Booz & Co
[59] This value excludes design, project management and contingency
[60] Operational analysis undertaken by WorleyParsons
[61] Average recurrence interval event

A WorleyParsons EPBC search revealed the likely presence of multiple Endangered Ecological Communities (EEC's) in the Wilton study area. The EPBC search found that there could be 50 different threatened species; 24 bird, 2 fish, 6 frog, 16 mammal and 2 reptile that may exist within the footprint of the site.[62]

WorleyParsons analysis found that up to four Koala colonies reside in close proximity of the proposed airport site. Furthermore this analysis found that to enhance the chances of survival of these colonies gene-flow is required which could be prohibited by major impacts upon the vegetation that connects these colonies.

Noise

The noise impact of an airport is one of the major negative aspects associated with the asset. Residents living in the vicinity of airports or under busy flight paths are exposed to the ongoing impacts of aircraft noise.

WorleyParsons' analysis has found a total 181 persons will experience 50 additional N70[63] events every day; 264 persons will experience 20 additional N70 events per day; and 817 persons will experience 10 additional N70 events each day. These N70 events will primarily be directed toward the north and south of the proposed airport site due to the orientation of the aircraft runways.[64]

Displacement

The construction of an airport at Wilton will require a number of properties to be compulsorily acquired under the powers governed by the *Land Acquisition Act 1989*. In particular, the proposed footprint of the site will require some property (90 lots) to be compulsorily acquired at the southern end of the site.

In line with Australian health and safety standards for noise pollution, properties located within ANEC contours 40, 35 and 30 should be acquired by the Commonwealth Government. Our analysis found that there could be up to 27 allotments[65] that should be considered for compulsory acquisition for noise reasons.[66]

Commercial and industrial development

Should the site be selected for use as an airport, there is the potential for some of the land adjoining the site to be assessed and, if found suitable, rezoned to permit business parks and industrial land uses. The areas of land to the north-west of the site could be investigated for these uses as they are less fragmented than the land to the north, are outside the drinking water catchment boundary and are located close to the airport site with good connections to existing road infrastructure. This area of land is approximately 444 hectares.

This analysis found that by 2035 the level of demand for industrial land will be in the order of 101 to 233 hectares. With the anticipated increases in airport activity, this land use demand is forecast to grow to 122 to 288 hectares by 2060.

Employment impacts

Development of an airport and associated industrial/commercial development will result in new direct and indirect employment opportunities during construction and operational phases.

Direct employment

Ernst & Young estimate that approximately 2,400 to 3,400 FTE persons will be employed during the construction period. A further 1,300 to 1,800 FTE persons will be employed to construct supporting infrastructure (such as road and rail connections).

Ongoing operations at the airport will create a range of direct employment opportunities at the airport that will otherwise not be realised within the region. Between 13,350 and 25,500 FTE workers are anticipated to be employed at Wilton airport over the evaluation period, with up to 34,850 FTE workers employed in 2060.

Sub-regional (associated) development and employment

[62] A full flora and fauna impact assessment and species impact statement (SIS) would be required as part of a potential Environmental Impact Statement conducted to address Commonwealth and NSW legislation. This would assess the significance of potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance.
[63] 70 decibel events – this noise level is equivalent to between a conversation at 2 metres and a truck at 7 metres.
[64] Maximum impacts based on current population and maximum capacity of the airport over and above those impacts that would be realised as a result of Richmond RAAF operations
[65] Please note that the number of allotments does not equate to the number of households. For the purpose of this exercise we have tallied the number of allotments in which housing is permissible.
[66] Furthermore this legislation states that that no new housing is developed within the ANEF ranges 25-30, and that all houses developed within the ANEF ranges 20-25 must be constructed with insulation.

An airport also impacts the economy through flow-on effects from 'off-site' businesses in the region that supply the airport and its users or form part of a growing airport 'city' or sub-regional economic centre with close links to the airport.

Employment in the industrial/commercial developments near the airport is projected to grow to approximately 12,700 employees[67] by 2060. The general business sector will have the highest employment levels in these industrial/commercial developments, with warehousing/logistics and light industrial activities also being key employment sectors.

Other indirect employment

Employment and economic activity derived from the development of the airport is expected to support[68] an additional 16,000 to 27,000 jobs by 2060.[69]

Sources of employment

To be conservative, the analysis assumes that the majority of people employed at the airport and associated industrial/ commercial developments will reside in areas within 30 minutes travel time.[70]

Our analysis found that 325 persons within the region are currently looking for employment opportunities and a further 15,000 are underemployed. These workers could be redirected to potential employment opportunities associated with the airport. This level of regional underutilised labour supply is anticipated to rise to 68,000[71] by 2030 and 124,000 by 2060.

[67] In the medium case scenario – the high and low case scenarios forecast 9,500 and 16,000 FTE employees respectively by 2060
[68] These do not reflect additional employment opportunities created, but jobs that are somewhat supported by the activities of the airport.
[69] The number of additional jobs that are supported as a result of the development of the airport reduces over time as the business park and its associated businesses develop to support the operations of the airport.
[70] This assumption is broadly consistent with the geographic distribution of KSA employees, with approximately 70% of the airport's workforce residing within 30 minutes travel time[70] and approximately 90% residing reside within 45 minutes travel time.
[71] Taking into account the relative difference between population and jobs growth within the region

Economic impacts

The development of an airport at Wilton is forecast to increase NSW GSP by $1,284 million in 2030 in real terms, increasing to $16,853 million in 2060. From a national perspective, the development of the airport is forecast to increase GDP by $1,442 million in 2030 in real terms, increasing to $20,017 million in 2060.

Social impacts

An operational airport within the Wilton region and the associated activity will result in a range of social impacts, including improved living standards, by strengthening communities and by supporting development within the region and beyond.

Living standards and quality of life factors

Living standards refer to the level of comfort, wealth and material goods that an individual or group experiences. A range of factors that affect living standards will be impacted through the development of an airport at Wilton, including:

- *Social and cultural benefits resulting from accessibility of aviation services* - the development of an airport at Wilton is forecast to increase accessibility to aviation services for residents in the South Western Sydney region. The number of flights taken by these residents is projected to increase by approximately 2.9 million flights per annum by 2030 and 8.1 million flights by 2060. The benefits associated with increased travel include broader perspectives, new experiences that stimulate fresh ideas and innovation, and reduced personal stress.
- *Jobs closer to home and a positive impact on work/life balance* - the employment opportunities generated in the region through the airport development[72] have the potential to save up to 0.57 million hours as a result of people working closer to home by 2030, increasing to up to 3.6 million hours by 2060.[73] Other benefits include reduced energy use, increased productivity and more active lifestyles.
- *Land prices* – Residential properties surrounding the Wilton site that are affected by noise are likely to experience a decrease in value, whereas those that are not directly under airplane flight paths are likely to experience a small increase in value.

Strengthening communities and supporting development

The development of an airport at Wilton could generate a range of positive social impacts on the local region. As well as generating connectivity, employment and investment opportunities, an airport can improve social cohesion through the development of a strong regional 'economic identity'. Building such an identity can contribute to a region's competitiveness, as well as being a driver for regional strategies and new investment. It can also help to sustain the resilience of communities when a region faces challenges.

More broadly, the airport could play a vital part in supporting regional NSW growth and improving access from regional communities to services and facilities in Sydney, as well as improving national connectivity.

A 'City of Cities' approach to the management of future growth attempts to develop a network of economic centres across the city and to direct future growth in and around those centres

A second airport at the proposed Wilton site will introduce significant pieces of infrastructure to a growing South Western Sydney, developing over time into a thriving industrial and employment hub. This development will support the State Government's plans to realise future population and economic growth within Sydney through a 'City of Cities' approach.

Furthermore, the additional economic activity that will be generated from the development of a Wilton airport is expected to result in an increase in government tax revenue by $1,682 million in 2040, rising to $5,747 million in additional tax revenue in 2060.[74]

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[72] Either at the airport or the landside development
[73] Ernst & Young calculation based on Bureau of Transport Statistics (BTS) trip distribution matrix, assumed (current and future travel speeds
[74] Average tax revenue collected as a result of a general increase in GDP by all levels of government. The values presented above are the mid-point between the range that was calculated within this analysis

How do the options compare?

Each of the options for the development of a secondary airport within the Sydney basin has the same positive and negative impacts; however, the relative size of those impacts for each of the alternative sites varies. The table below presents a brief comparison of the major impacts of the development of an operational airport at the Badgerys Creek and Wilton sites.

Table 1: Summary of relative indicators

Indicator	Metrics	Badgerys Creek	Wilton
Operational			
PAX capacity	Per annum (million)	70	70
Commencement of operations	Date	2025	2030
Passengers and Freight			
PAX in 2060	Million PAX	54.0	44.2
Cumulative PAX throughput	Total throughput over analysis period (million PAX)	1,139.1	769.5
Dedicated freight throughput	Over analysis period (million tonnes)	9.5	9.5
Employment			
Direct	2060 employment ('000)	30.5	28
Landside associated impacts	2060 employment ('000)	30	13
Net Additional jobs[75]	2060 employment ('000)	33	28
Environmental			
Noise impacts	Potential maximum number of persons who experience 50 N70 events per day (2060)	2,664	181
Air quality/ environmental emissions	Potential change in nitrogen oxides levels in Sydney basin (2060)	8.6%	8%
Potential threatened species that could be affected	Number	24	50
Water catchment contamination	Level of risk	Low	Medium
Social			
Displacement	Number of property lots acquired	92	96
Jobs closer to home	2060 time saved in commuting time (million hours)	3.92	3.60
Additional flights by local residents	2060 movements ('000)	6,500	8,100[76]
Economic			
Additional economic activity	2060 GSP ($m)	20,296	16,853
Sub regional commercial/industrial developments	2060 - hectares	260	205
Additional tax revenue at all levels of Government	2060 ($m)	$6,871	$5,747

Source: Ernst & Young analysis
Notes: all factors are only analysed on a regional basis

[75] Total induced employment in NSW as a result of the development of an airport
[76] As a result of additional demand that would be realised due to population growth within the southern portion of the South West Growth Centre

While the two proposed greenfield sites (Badgerys Creek and Wilton) have the capacity to cater for the same number of passengers, Badgerys Creek – which has the potential to commence operations 5 years earlier and is located closer to a relatively larger economic and population base of Western Sydney – is expected to attract 9.8 million more passengers by 2060 than an airport located at Wilton. These factors are also expected to attract more business investment and consequently generate an additional 5,000 induced jobs in NSW. Overall, an airport at Badgerys Creek is projected to have a relatively larger state-wide economic impact – adding an extra $3,443 million to NSW GSP by 2060.

However, locating an airport closer to population centres has a range of social and environmental impacts. Most notably, approximately 2,500 more persons will experience 50 additional N70 events per day as a result of the development of an airport at Badgerys Creek compared to Wilton.

At this stage, it is anticipated that the proposed site at Richmond will be able to accommodate 5 million passengers per annum and will not be used to service freight. Therefore, for the most part, the scale of impacts is considerably smaller than for the two 'full size" options above.

Part B – Introduction and background

1. Introduction

1.1 Background

The Australian and NSW Governments were recently presented with the report of the *Joint Study on aviation capacity for the Sydney region*, which was established to inform future infrastructure planning and investment by government and industry, and to enable the proper integration of future airport operations with surrounding land use planning and surface transport networks.

The Joint Study was overseen by an independent Steering Committee of government and industry experts. The Study considered the short, medium and long-term needs for aviation infrastructure and supporting surface transport in the Sydney region, and identified strategies and locations to meet future needs. It also considered options for the use of Commonwealth-owned land at Badgerys Creek.

The Australian and NSW Governments are currently deliberating on the Joint Study's analysis and recommended strategies to increase the supply of aviation services to the Sydney basin into the future.

To assist government with its deliberations, Ernst & Young were commissioned by the Commonwealth Department of Infrastructure and Transport (the Department) to undertake a detailed analysis of the social and economic impacts that a second airport will have on the Sydney region, focussing on potential sites at Richmond and Wilton. The range of impacts of an airport were also considered for the region around Badgerys Creek to provide an objective scale against which to interpret the Wilton findings and as a basis for the Government to consider them. All references in this report ton an airport development at Badgerys Creek are for these analytical purposes only.

1.2 Scope of this study

This report presents an analysis of the net operational, employment, economic and social impacts of the development of an airport. Specifically this report presents:

- A detailed qualitative analysis of the operational impacts of an airport in each of the proposed sites, which includes consideration of:
    - Those who demand the services of an airport
    - Strategic, social and environmental impacts (that were considered during the first phase of the analysis) as a result of the development of the airport, supporting infrastructure and associated developments
    - Positive impacts on the local community as a result of improved services (e.g. improved road and public transport access) and increased economic activity (e.g. induced impacts from the creation and relocation of businesses). Negative outputs such as noise impacts are also analysed.
- A quantitative analysis of the level of direct, induced and indirect employment and income as a result of the development (both construction and operations) of an airport. This includes:
    - The type of employment
    - The distribution of employment and source of employees among geographical regions and industries.
- A quantitative and qualitative assessment of the economic and social impacts that will result from the development of an airport within the region. This includes:
    - An analysis of the potential change in land use and prices
    - Detailed analysis of the potential induced development and business relocation
    - Analysis of the impact of developing an airport on a range of economic and social indicators (e.g. unemployment rate, social inclusion index, average wage).

The above outputs have been analysed and presented graphically on a spatial and temporal basis. The spatial presentation of results highlights the foreseeable geographical distribution of impacts of an airport: for example, the likely source of labour used to support an operational airport. The temporal presentation of results highlights how an airport will impact the region over a prolonged period of time.

Further information regarding the scope of the report and the methodology undertaken for the study can be found in Chapter 4.

1.3 Data sources

The main sources of information to support the economic analysis were:

- Booz & Co – undertook the demand analysis for each of the airports analysed and, in addition to the traffic projections, have provided other operational assumptions that underpin various elements of the analysis within this report.
- WorleyParsons – collation, analysis and presentation of publicly available socioeconomic and environmental data from sources including the Australian Bureau of Statistics (Census 2006 data, Roads and Maritime Services (RMS) and Bureau of Transport Statistics). Projections and forecasts are based on ABS, Booz &Co, Bureau of Transport Statistics (BTS) and RMS data.
- Centre of Policy Studies, Monash University – undertook general equilibrium modelling to determine the indirect economic and employment that will result from the development of an airport within each of the sites analysed.

Ernst & Young has also sourced a vast and varied amount of information from publicly available sources (e.g. government statistics, planning documents, aviation-specific information and industry publications), as well as internal knowledge resources, to complete this analysis.

Sources for all assumptions within the analysis are clearly stated throughout this report.

1.4 Assumptions and limitations

This section of the report sets out the key assumptions underlying the analysis and the limitations of their use.

1.4.1 Key assumptions

Ernst & Young were tasked to analyse the social and economic impacts of the development of an airport on the local communities surrounding the proposed sites. A number of limitations were identified to the scope of this analysis. Furthermore, a number of simplifying assumptions were made to undertake this analysis. The key assumptions that have been applied to this analysis include:

- All value terms throughout this report are presented in real 2012 dollar terms unless clearly expressed otherwise.
- There is no capacity or opportunity at other existing airports to meet the increase in demand for movements to and from Sydney (beyond the base case assumptions regarding KSA).
- All of the airport designs and alignments have been developed for this stage of the analysis to identify the potential and impact of developing an airport on the site. Each of the design elements of the airport, including its size and alignment, may change.
- The development of each of the airports are mutually exclusive – all of the data and calculations that is presented in the analysis is based on the assumption that only that airport in question is being developed (that is, the analysis does not present or take into account how the development of more than one airport will impact each of the regions).
- All of the data and calculations presented in this analysis are based on how each airport will be developed in a manner to meet all future demand (that is, there is no staging of the development that may constrain future demand at some point in time).
- The impact on the wider national economy, and the potential distribution of employment and economic benefits that will transfer as a result of a constrained aviation network in Sydney (such as the benefit that other states will receive from a transfer of tourists), was deemed to be outside of the scope of this analysis.
- Costs and benefits, as well as positive and negative impacts, were developed throughout the Study's process as best estimates of the values in current terms. The real values of costs and benefits may vary between now and the time that an airport may be constructed and operational as a result of real inflation and other factors.
- The inputs into this analysis have been developed to a confidence level that is suitable for the purposes of this stage of the analysis. Further analysis may be required to increase the confidence of inputs for the latter stages of the project (for example, the costings included within this report should not be used for budgeting purposes).

Other assumptions that have been made within specific phases of the project are set out alongside the explanation of inputs. Ernst & Young's approach to this analysis has been to adopt conservative assumptions in all cases where direct data cannot be sourced.

1.4.2 Limitations and disclaimer

The forecasts presented in this report were prepared using the information and assumptions acknowledged in this document, supported by the judgement and experience of those providing the assumptions. Some of the assumptions used to develop the forecasts may not be realised and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and the actual results, and these differences may be material.

Limitations on the accuracy of the results due to the variability in the inputs used, and the preliminary nature of the assessment, mean that the results should not be used for budgeting purposes or project cost forecasting.

While every care has been taken in preparing this report, Ernst & Young, and those whose inputs have been used with the analysis, will not accept any responsibility or liability to any person or corporation seeking to rely on information, advice or opinion provided in this publication for any loss or damage, whatever nature suffered by such person or corporation.

Unit rates and cost estimates are provided. It should be noted that these preliminary cost estimates have been developed from a desktop analysis using typical unit costs for construction and benchmarks against past projects. These preliminary estimates should be reviewed by a Quantity Surveyor when site-specific information becomes available. They are not intended for tendering or contract purposes, and may exclude some contingency allowances, services connections costs, land acquisition and negotiation, site remediation for contamination, site access and security, environmental studies and impact mitigation measures, cost inflation or taxes such as the GST. Given the unusual nature of this project, tender prices may vary significantly from these preliminary estimates.

1.5 Report

As noted above, the analysis assumes that each of the airports is mutually exclusive and only the particular airport being assessed will be developed. As such, all of the findings of the analysis undertaken are presented for each of the potential airport sites in this report. While this involves some repetition, it allows each airport – and its impacts – be considered separately and on its own merits. This report is structured as follows:

- Part A – Executive Summary: this section of the report provides both the narrative as well as a summary of the analysis undertaken
- Part B - Introduction and Background: highlights the basis for the analysis including the scope, limitations and methodology of the report
- Part C - Literature review: presents a range of academic literature as well as real life examples of the impacts that airports have had on their surrounding communities
- Part D – Analysis of Badgerys Creek: presents an underlying analysis of the Badgerys Creek region and the likely social, environmental, employment and economic impacts of an airport development
- Part E – Analysis of Richmond: presents an underlying analysis of the Richmond region and the likely social, environmental, employment and economic impacts of an airport development
- Part F – Analysis of Wilton: presents an underlying analysis of the Wilton region and the likely social, environmental, employment and economic impacts of an airport development
- Part G – Comparison and conclusions: presents a high level analysis of the key impacts of each of the proposed mutually exclusive airport developments on their surrounding regions
- Part H - Appendices: provides all of the relevant background material and analysis undertaken as part of this report.

All underlying information, including methodology and data is presented in the supporting appendices.

2. The current Sydney aviation situation

2.1 Context

In December 2009, the Commonwealth and NSW Governments agreed to undertake a Joint Study on aviation capacity for the Sydney region with a view to developing an Aviation Strategic Plan (the Strategic Plan) for the Sydney region. This will determine the region's long-term aviation infrastructure requirements and inform the NSW government's planning and investment strategy for the region.

The Joint Study was overseen by an independent Steering Committee comprised of several government agencies (including Transport for NSW, the NSW Department of Planning and Infrastructure and the Commonwealth Department of Infrastructure and Transport) and industry leaders.

The Joint Steering Committee report was submitted to the Commonwealth and NSW Governments on 2nd March 2012. The report found that demand for aviation services within the Sydney basin is anticipated to be greater than supply by 2030 and that if no solutions are developed this will have a severe impact on the NSW and national economies. The main findings of the report are outlined below.[77]

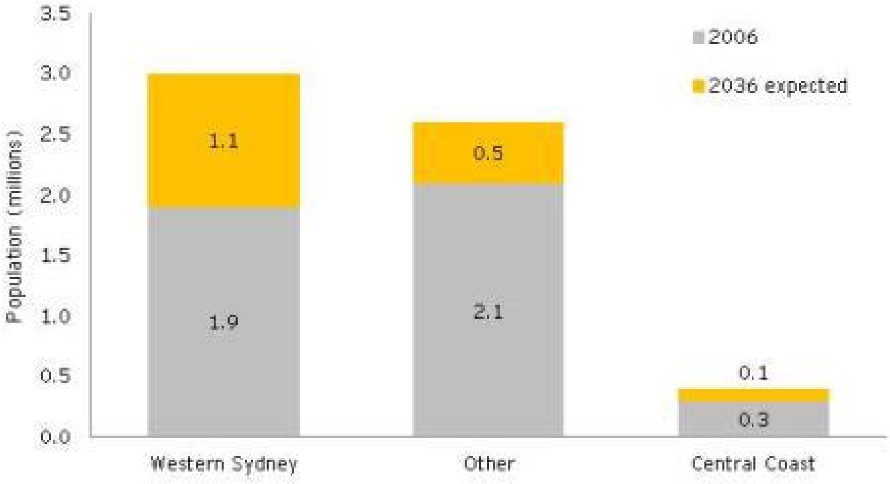
2.1.1 Drivers of aviation demand in Sydney

The Joint Study found that the principal driver for aviation demand in the Sydney basin over the forward period will be anticipated population and economic growth across the Sydney Metropolitan Area. The continued economic development of the Global Economic Corridor and the anticipated increase in tourism as international living standards rise are also viewed as key drivers of a significantly expanded aviation sector.

There are currently around 4.6 million people living in the Sydney region. This is predicted to grow to 6 million by 2036 and 7.5 million by 2056, reflecting an average annual growth rate of 1.2% until 2036.

The majority of this growth is expected to occur in Western Sydney, particularly in the North West and South West Growth Centres and the Western Sydney Employment Area. Figure 4 illustrates the growth expected at 2036 by region.

Figure 4: Population projections (2006 – 2036)



Source: NSW Metropolitan Plan

The Sydney basin is also anticipated to experience strong economic growth over the forward period. For example, in its 2012 Business Outlook, Access Economics has forecast the NSW economy to grow by 27% to 2021 in real terms, which represents an average annual growth rate of 2.6%.

Furthermore, a large proportion of this anticipated economic activity and business operations is forecast in the Global Economic Corridor, which features Kingsford-Smith Airport and Port Botany. It is widely acknowledged that the economic growth and increased requirement for services in this area will place great pressure on the current infrastructure network: if this network cannot keep pace with economic growth and demand, this will significantly constrain the nation's productivity over the longer term.

[77] Further information regarding the Joint Steering Committee analysis can be found at http://www.infrastructure.gov.au/aviation/sydney_av_cap/index.aspx

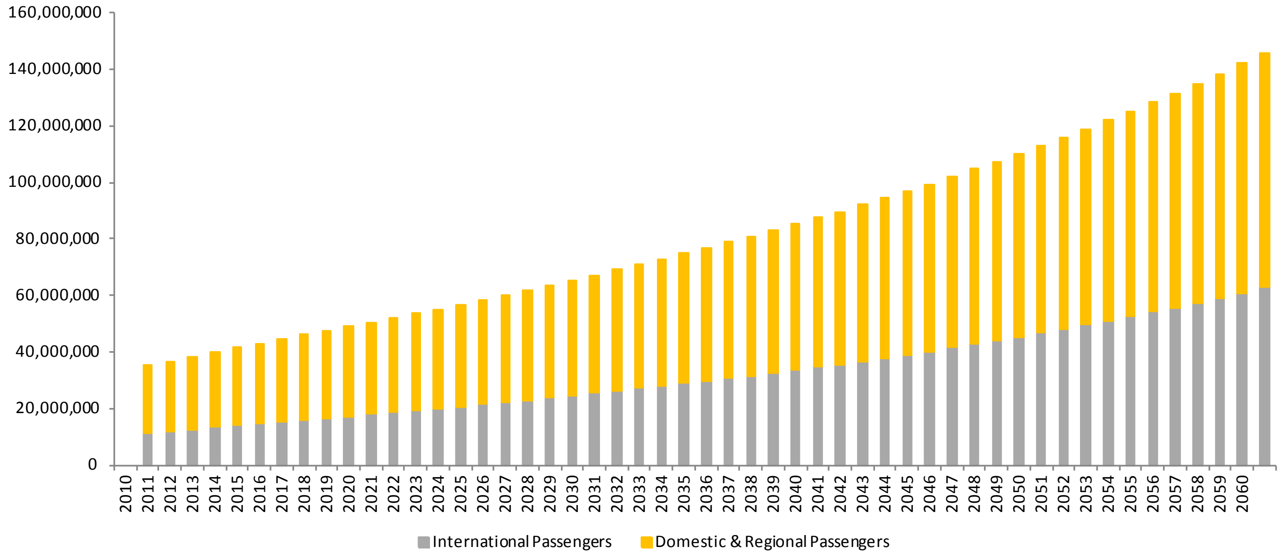
Finally, international tourism demand is also anticipated to increase in the medium to long- term as living standards in developing countries continue to improve. This phenomenon is particularly prevalent in relation to tourism from China, where it is anticipated that by 2020 there will be approximately 958,000 Chinese tourists entering Sydney/Australia each year. This represents an average annual growth rate of 7.8% from current levels of Chinese tourists visiting Australia.[78]

2.1.2 Demand for aviation services

The Joint Study analysed the current and future demand of aviation services within the Sydney basin.

This analysis found that 35 million passengers currently use aviation services within the Sydney basin. This is forecast to increase to 69 million passengers per annum by 2030 and 145 million passengers per annum by 2060 (based on unconstrained demand projections). Project aviation demand within the Sydney basin is shown in Figure 5 below.

Figure 5: Demand forecasts in an unconstrained market



Source: Booz & Co – Joint Study

Furthermore, the analysis found that 490,000 tonnes of air freight currently move through airports within the Sydney basin, and that this is forecast to increase to 960,000 tonnes of freight per annum by 2030 and around 2.3 million tonnes of freight per annum by 2060.

2.1.3 Supply of aviation services

The Joint Study analysed the current and future constraints on the supply of aviation services within the Sydney basin.

Kingsford-Smith Airport (KSA) is the principal provider of aviation services in the Sydney region. Using the assumed staging of capacity upgrades planned for the airport (e.g. terminals and gates) outlined in the *Sydney Airport Master Plan 2009,* as well as assumptions regarding aircraft sizes within the market over time, KSA is expected to support up to 67 million passengers per annum by 2030 and 91 million passengers per annum by 2060. This implies that there will be unmet demand after 2029 that will not be fully supported by planned capacity upgrades to KSA.

[78] Tourism Forecasting Committee (2011), "Forecast 2011 Issue 2", Tourism Research Australia

It is also anticipated that forecast demand of aviation services within the region will place considerable capacity pressure on KSA well before 2029:

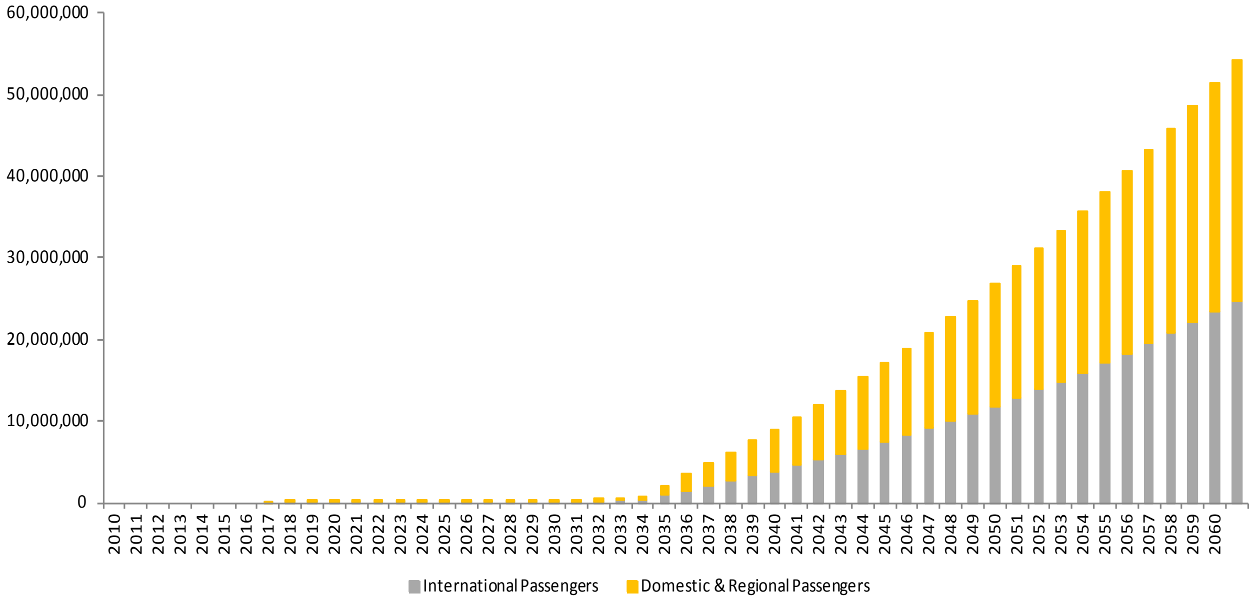
- At current demand levels, it is already necessary to tow aircraft to remote stands (particularly in the International Terminal) in peak periods. Another issue is taxiway capacity, where queues develop from the congestion and delays that result from a shortage of gates and stands.[79]

- During peak periods, the average delay on taxiways and apron areas is estimated to be 6 minutes for an arriving flight and 12 minutes for departing flights.

- These delays and capacity constraints will be exacerbated over time as demand increases. This will result in unmet demand at some point in the future, which will become significant over a number of decades.

Post 2029, a proportion of the demand of aviation services that is unable to be met by services at KSA will be redistributed to other time slots (off-peak) and a portion will be suppressed. Figure 6 outlines the amount of anticipated unmet international domestic demand between 2010 and 2060.

Figure 6: International and domestic passenger movements expected to be unmet (2010 – 2060)



Source: Booz & Co – Joint Study on Aviation Capacity for the Sydney Region

This analysis concluded that if no additional capacity was made available, over and above that which is planned for KSA, then excess demand will be approximately 54 million passenger movements and more than 760,000 tonnes of air freight per annum by 2060.

2.1.4 Economic cost of not meeting future demand

The effect of this excess demand and congestion on the economy was estimated in the Joint Study as including:

- Direct impacts – all impacts on GDP from direct aviation-related activity by passengers, freight operator, and airline/airports

- Aviation-facilitated impacts – all impacts on GDP from industries that are facilitated by aviation including tourism and freight expenditure

- Indirect and induced impacts – the impact on GDP from all business activity and wellbeing that is affected by the presence of efficient aviation services.[80]

[79] Existing gates, stands and aprons are already heavily utilised during peak times at current demand levels. Gates in the International Terminal (Terminal 1) are fully utilised during the morning peak period (7:30am-10:00am), the Domestic Terminal 2 are utilised heavily at various points during the day, and Domestic Terminal 3 are consistently used throughout the day.

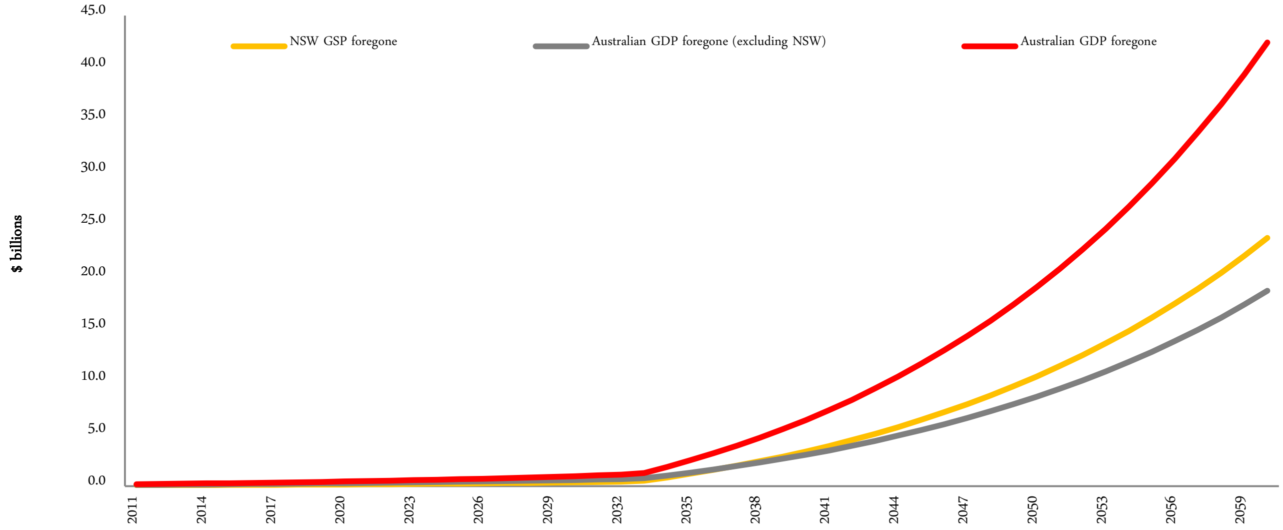
[80] An estimate of the cost of these impacts is likely to be understated due to the difficulty of monetising certain impacts or every aspect of certain impacts (e.g. time lost due to flight delays).

The study found that there will be a significant impact on the Sydney and national economies as a result of not increasing the supply of aviation services, notably: [81]

- The cumulative impact this may have on expenditure in the Australian economy is $59.5 billion and $34 billion in foregone GDP.
- NSW is likely to be the most significantly affected, with an estimated cumulative impact by 2060 of $17.5 billion foregone GSP.

Figure 7 illustrates foregone GSP of NSW and the foregone GDP of Australia from excess demand for aviation services in Sydney as calculated by the Joint Study.

Figure 7: NSW GSP and national GDP foregone (medium scenario, 2010 dollars $ billions)



Source: Ernst & Young analysis of CoPS and TERM, medium scenario – Joint Study

[81] All figures presented are results under the medium scenario (and when expressed in dollar terms are done so in 2010 discounted dollar terms).

3. Options being analysed

Ernst & Young have been directed to analyse the economic, operational and social impacts of the development of a secondary airport within the Sydney region. The three sites included in this analysis are Badgerys Creek, Wilton and Richmond.

As highlighted in section 1.4.1, this analysis of each of the potential airport development options has been undertaken based on the assumption that their developments are mutually exclusive. Furthermore, this analysis has only identified the social, environmental and economic impacts of each of the proposed developments based on the assumption that they are developed to their maximum design, including supporting infrastructure, within the initial construction period.

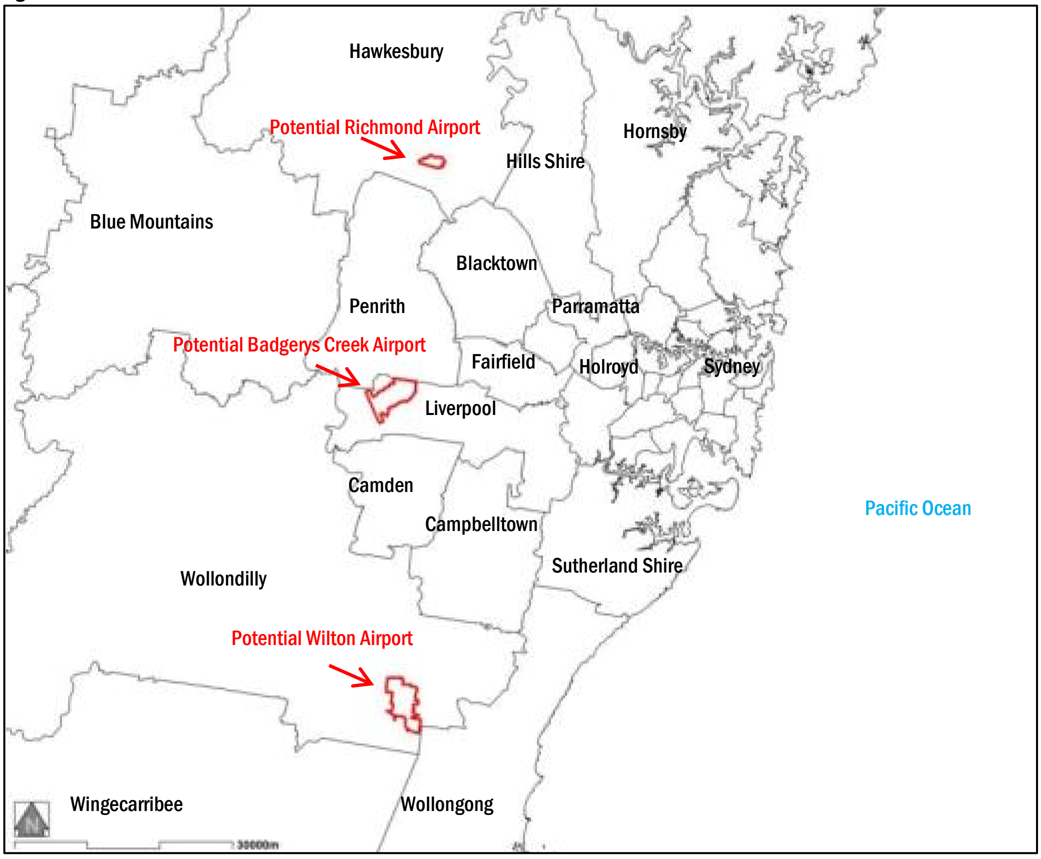
In addition, this analysis has only looked at the positive and negative impacts of developing one specified type of airport within each of the locations. Therefore, this analysis has not looked at other forms of developments on these sites (whether related to alignment or size).

This section of the report presents the proposed locations and developments that are analysed within this study.

3.1 Proposed secondary airport developments

This study has analysed three possible locations: Badgerys Creek, Richmond and Wilton. The location of the three sites, relative to the main geographical centres of the Sydney basin is illustrated in Figure 8.

Figure 8: Potential Sites



Source: WorleyParsons

This section of the report provides a brief explanation of the proposed airport developments at each of these sites. Further information regarding the proposed developments for airports at Badgerys Creek, Richmond and Wilton are provided in Chapters 8, 15 and 22 respectively.

3.1.1 Badgerys Creek

The site at Badgerys Creek is located approximately 50 kilometres west of the Sydney CBD and 33 kilometres south-west of Parramatta in the Liverpool Local Government Area (LGA). The site covers an area of approximately 1,700 hectares.

Most of the site was originally acquired by the Commonwealth between 1986 and 1991[82] as the site for a major airport. This involved the acquisition of land at the site under the *Commonwealth Lands Acquisition Act 1989*. Many of the properties were acquired as voluntary purchases at fair value. The remaining land within the site boundaries is in private ownership.

The Joint Study found this site to be the most suitable site for the development of a greenfield airport within the Sydney basin due to the following factors:

- The region has 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.
- The majority of direct 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.
- The establishment of an airport at the site will provide employment, directly and through flow-on impacts, that will be required in the west, and particularly the south-west, of Sydney as the population grows. [83]

However, the Steering Committee acknowledged the development that has occurred in the locality since the acquisition of the site and community concerns regarding the adverse effects of aircraft operations. The Committee also recognised that in the *National Aviation Policy White Paper – Flight Path to the Future* released in December 2009, the Australian Government set out the position that 'Badgerys Creek is no longer an option, it has been overtaken by years of urban growth in the area and is inconsistent with future NSW spatial planning and land use development for the south-west region of Sydney'.[84]

This report analyses the potential to develop a commercial airport on the Badgerys Creek site that is capable of catering up to 70 million passenger movements per annum. This level of passengers represents approximately 450,000 aircraft movements annually.

To cater for this level of demand, an airport at this location will need two 4,000 metre runways.

The development of an airport at Badgerys Creek capable of handling 70 million passengers per annum will require upgrades and the development of other assets within the region, including:

- The existing roadways of The Northern Road and Elizabeth Drive will need to be upgraded with a further 8km of road connecting Elizabeth Drive to the airport requiring development.
- An 11 km extension of the Southwest Rail Link (now under construction) will be required. To meet the expected level of demand, there will also be a requirement for providing additional capacity for 4 trains per hour on the East Hills line. This will result in the quadruplication of the line between Revesby and Glenfield and sextuplication between Erskineville and Tempe[85]. It is estimated that construction of this infrastructure will cost approximately $1.13 billion.[86]

The services provided at an airport on the site will generally cater for a wide variety of aircraft types and provide services to domestic and international locations such as Melbourne, Brisbane, China and India. As such, this airport will be in direct competition with Kingsford-Smith Airport.

An initial assessment of the development of such an option has found that an airport could commence operations by 2025. The development of an airport on this site, compared to that developed on another greenfield location, could be realised marginally quicker as a large amount of analysis and preliminary work, including the purchase of land, was completed subsequent to the 1985 aviation capacity analysis.

Booz & Co undertook an analysis of the probable uptake of services provided at a Badgerys Creek airport. This analysis found that:

- 9.2 million passengers will use aviation services at a Badgerys Creek when it is originally opens in 2025, which will increase to 28.5 million PAX by 2040 and ultimately 54.0 million in 2060.
- 150,000 tonnes of freight will pass through the airport by 2040, increasing to 773,000 tonnes in 2060.

Further information regarding the proposed airport development at Badgerys Creek can be found in Chapter 8.

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[82] Note that the Commonwealth Government commenced the acquisition of the site prior to the completion of the report
[83] Steering Committee, Joint Study on Aviation Capacity in the Sydney region, Australian and NSW Governments, March 2012, accessed 20 August 2012, http://www.infrastructure.gov.au/aviation/sydney_av_cap/files/sac_part_nine_future_use_badgery_creek.pdf
[84] National Aviation Policy White Paper, *Flight Path to the Future,* Australian Government, Page 193, December 2009, accessed 28 August 2012
[85] Potential staging of the airport development is outside of the scope of this analysis.
[86] This value excludes design, project management and contingencies.

3.1.2 Richmond

RAAF Base Richmond is located approximately 48 km north-west of the Sydney CBD and is accessed from Percival Street off Richmond Road. The towns of Windsor and Richmond lie to the immediate east and west of the airport respectively. According to the Australian Bureau of Statistics, the Richmond-Windsor area had a population in 2006 of approximately 26,000 residents.

The site is currently used by the Royal Australian Air Force as its only operational air base in the Sydney basin. The air base supports a number of Defence units and has a number of operational roles, including:

- The base for 37SQN flying squadron, which operates the C-130H/J Hercules – these aircraft provide a vital air mobility capability for the Australian Defence Force (ADF)
- Headquarters for the Air Lift Group, which is responsible for the ADF air mobility aircraft
- Accommodating a number of support units including the Air Mobility Control Centre, which is the central tasking agency for airlift operations across the ADF
- Other transport assets of the RAAF such as the C-17, BBJ, Challenger and forthcoming KC-30A multi role tanker transport (MRTT) use the base as required, as do other ADF elements including fast jets
- Support for air drop and parachute training, as well as itinerant foreign military aircraft operations and the USAF.

Furthermore, the base is commonly used to:

- Transit explosive ordnance from the Defence Establishment Orchard Hills
- Provide a point of exit for air medical evacuation (AME), disaster relief and combat forces
- Provide a point of delivery for repatriation for wounded or deceased personnel
- Divert fighter aircraft from Williamtown.

Statistics provided by the Department of Defence show that in 2006,[87] 2,930 people were directly employed on the site. Of this number, 2,143 were military personnel. These statistics show there were 5,318 military aircraft movements and 7,513 civil transits of Richmond airspace.

This report analyses the potential to develop a commercial general aviation airport on the site that is capable of catering up to 5 million passenger movements per annum while maintaining the current level of Defence force operations. This level of passengers represents an average of 37 aircraft movements per day. [88]

This proposed development means that both functions will share some common infrastructure, including the runway. The development of a civil airport on the site will require the development and upgrading of on-site infrastructure, which is likely to include:

- 409,960 m^2 of aprons and taxiways
- 26,050 m^2 of terminal buildings
- 8 gates
- Security/division – there will be a clear differentiation between the public and RAAF areas at the airport. Civilian access will be restricted to the western portion of the airport, with RAAF operations to the east.

The services provided at an airport on the site will generally cater for smaller aircraft and provide short to medium haul east coast services. As such, this airport will complement services at Kingsford-Smith Airport.

[87] Econtech Pty Ltd, *Modelling the Economic and Social impacts of various scenarios for the RAAF Base Richmond, The* Department of Defence, 20 December 2006
[88] This is one of a range of alternative development options that could be undertaken on the Richmond site that could either cost more or less depending on the complexity of design.

An initial assessment of the development of this option found that a general civil aviation airport could commence operations at Richmond by 2017. This increase in aviation capacity could be developed considerably quicker than through the development of larger greenfield airport.

Booz & Co undertook an analysis of the probable uptake of services provided at a Richmond airport. This analysis found that:

- 3 million passengers could use aviation services at a Richmond when it opens in 2017 and the airport will reach its capacity of 5 million passengers per annum by 2036.
- As of yet, no freight is forecast to be serviced at an airport based at Richmond.

Further information regarding the proposed airport development at Richmond can be found within Chapter 15.

3.1.3 Wilton

The site at Wilton is located approximately 63 kilometres south west of the Sydney CBD and 28 kilometres north-west of Wollongong in the Wollondilly Local Government Area (LGA). The site covers an area of approximately 2,000 hectares.

The Joint Study found that this site is the next best site if Badgerys Creek is ruled out. The reasons for such a conclusion included:[89]

- The site was best located with regards to noise impacts.
- A smaller number of people will be impacted by land acquisition.
- The site is one of the least constrained in terms of airspace interactions.

The Steering Committee recognised that the Wilton site ranks relatively low in terms of proximity to market, including the Sydney area growth centres, but will be well located if the south-west corridor becomes the key focus for long-term development beyond the consideration of existing planning instruments. The South-West Growth Area is approximately 37km from Wilton.[90]

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 an airport at Badgerys Creek in the initial years.[91] This report analyses the potential to develop a commercial airport on the site that is capable of catering up to 70 million passenger movements per annum. This level of passengers represents approximately 450,000 aircraft movements annually.

To cater for this level of demand, an airport at this location will need two 4,000 metre long and 60 metre wide runways. Supplementary infrastructure required at the airport to support this level of aviation demand will involve an investment in water and wastewater, power, communications, gas and fuel. Costings for these infrastructure requirements have not yet been undertaken.

To develop an airport at Wilton capable of handling 70 million passengers per annum, a number of other assets within the region will also have to be developed / upgraded, including:

- Picton Road will need upgrading to accommodate the additional traffic movements to and from the airport and Wollongong. Furthermore, an additional 9 km of road will have to be constructed to link the site to the existing road infrastructure. The estimated cost of upgrading this road is approximately $456 million.[92]
- Construction of an airport at Wilton will require completion of the Maldon Dombarton Railway in order to provide a rail link between the proposed airport site and the Illawarra and South Coast. The use of this line for passenger rail services will require a spur line to gain access to the site and an additional 4 freight trains per hour on the main South line to free up access. It is noted that this line will only enable diesel hauled rail services to access the site, requiring passengers to change trains at Dombarton to reach the site.
- Additionally, to ensure that the Main Southern Railway/East Hills line has sufficient capacity to serve increased demand, there needs to be re-signalling and electrification, new refuges south of Macarthur, quadruplication between Revesby and Glenfield, sextuplication between Erskineville and Tempe, and the completion of the Southern Sydney Freight Line. Costings for these rail infrastructure requirements have not yet been undertaken.

The services provided at an airport on the site will generally cater for a wide variety of aircraft types and provide a range of services to both domestic and international destinations. As such, this airport will be in direct competition with Kingsford-Smith Airport.

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[89] Joint Study, Aviation Capacity study, http://www.infrastructure.gov.au/aviation/sydney_av_cap/files/sac_part_nine_future_use_badgery_creek.pdf
[90] Google Maps
[91] Steering Committee, *Joint Study on aviation capacity in the Sydney region*, NSW Government and Australian Government, page 34, March 2012
[92] This value excludes design, project management and contingency

An initial assessment of the development of such an option has found that an airport could commence operations by 2030. The Steering Committee indicated that as the Wilton site has not yet been acquired by government, and demand for services at the airport will be lower than that at Badgerys Creek, the commencement of operations may not be viable before 2030 for Wilton.

Booz & Co undertook an analysis of the probable uptake of services provided at a Wilton airport. This analysis found that:

- 7.3 million passengers will acquire aviation services at an airport developed at Wilton when it opens in 2030, which will increase to 19.5 million PAX by 2040 and ultimately 44.2 million in 2060.
- 150,000 tonnes of freight will pass through the airport by 2040, rising to 773,000 tonnes of freight in 2060.

Further information regarding the proposed airport development at Wilton can be found within Chapter 22.

4. Methodology and process

The scope of this report is to identify the scale and nature of the socio-economic impacts of a second Sydney airport, particularly as it relates to surrounding communities, the employment/income structure of Sydney and broader impacts on industries and the economy. Specifically, the scope of this report is to provide detailed advice in three areas (for each airport site):

- Operational impacts
- Employment impacts
- Economic and social impacts.

Before assessing each of the airport sites in detail, Ernst & Young undertook extensive research and analysis of airport systems around Australia and internationally. In doing this, we have also sourced a vast amount and variety of information from publicly available sources (such as government statistics and planning documents, aviation-specific information and industry publications), as well as from a range of internal knowledge resources. We also developed statistical models to understand the relationships between the use of airports and the impacts on their surrounding areas in terms of economic development and employment.

Additional sources of information to support the economic analysis include the demand analysis undertaken by Booz & Company; the technical, socioeconomic and environmental data provided by WorleyParsons; and the outputs of general equilibrium modelling undertaken by the Centre of Policy Studies at Monash University, which was used to determine the flow-on economic and employment that will result from development of an airport.

In assessing the operational and socio-economic impacts for each airport site, we have adopted a five-phase process as shown in Figure 9.

Figure 9: Analysis process

Regional Context	Airside & Landside Development	A Operational Impacts	B Employment Impacts
Socio-Economic Indicators Business & Industry Transport & Utilities LGA & State Government Plans	Airport Runway Footprint Terminals & Airside Infrastructure Utilities & Transport Connections Landside Commercial Development	Strategic (land use, population, demographics, spatial distribution) Environmental (air, water, meteorological) Social (displacement, noise, amenity)	Construction Direct Indirect Types Sources (of employees)

Source: Ernst & Young

4.1 Regional context

The starting point for the analysis was to define the study areas or sub-regions for each of the airport sites. In doing this, we sought to define practical airport catchments that reflect the position of each airport within its own or nearby local government areas, and the propensity for the resident population to experience the more significant impacts of the airport.

Once the sub-regions for each airport were defined, their current and projected characteristics were investigated. All information within this phase of the analysis was from publically available sources. This analysis established the baseline situation for the study and included:

- **Socio-economic composition** – looking at demographics of each study area including population size and densities, household size, age profiles, employment rates and job types, education levels, and incomes. This information is used to identify labour supply and population impacts.
- **Current businesses and employment** – drivers looking at major employment industries and the location of major employment centres. This information is used to quantify the effective developable land for each airport site.
- **Current infrastructure provision** – looking at existing transport links, freight and restricted access vehicle (RAV) networks, public transport services, and utility infrastructure. This information is used to identify the gaps in supporting infrastructure for each airport site.
- **Future growth** – looking at population growth projections and government planning strategies. This information is used to identify labour supply and population impacts

4.2 Airside and landside development

The second phase covers the airside and landside development proposed for each airport site, including:

- **The site** – including a description of the area and relevant planning legislation. This information is used to provide context around each airport site in terms of land use planning.
- **The surrounding region** – including land use zoning and commercial/industrial land development. This information is used to identify developable land for each airport site.
- **The airport** – including terminal sizing, runway orientation and overall footprints assumed for this report.[93] This information is used to identify operational impacts including environmental and social impacts.
- **Supporting infrastructure** required for the development of each airport site – including missing transport links, public transport services, and utility infrastructure. This information is used to identify the infrastructure upgrades that will be needed to service each airport site.
- **Other notable issues** – including geology, mine subsidence, airspace conflicts, flight path obstructions, and meteorological conditions that affect site viability. This information is used to identify key challenges for each airport site in terms of airport construction and operation.
- **Demand for aviation services** – including feasible catchment areas, likely airline routes, passenger demand, freight demand, and passenger origins/destinations within Sydney.[94] This information is used to project both employment impacts and commercial/industrial land development.

[93] Information sourced from Joint Study report (for Badgerys Creek and Richmond) and from WorleyParsons (for Wilton)
[94] Passenger demand forecasts for each airport developed by Booz & Co

4.3 Operational impacts

The third phase covers the operational impacts for each airport site, including:

- **Environmental impacts** – including landscape and visual impacts, air and water quality, and flora and fauna. These were identified by desktop research and will need to be 'ground proofed' during latter stages to confirm the likelihood and consequence of potential impacts. These impacts will be addressed as part of an Environmental Impact Statement under Commonwealth and NSW government legislation, in particular the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)* or the NSW Environmental *Planning and Assessment Act, 1979 (EP&A Act).*[95]

- **Direct social impacts** – looking at local heritage, noise, residential displacement, and amenity. Again, these were identified by desktop research and will need to be 'ground proofed' during latter stages to confirm the likelihood and consequence of potential impacts. The noise modelling in particular is based on conceptual runway orientations and therefore provides an indication of social impacts.

- **Commercial/industrial business development** – looking at land supply (proximity, fragmentation, accessibility, and zoning) and land demand (based on projections over time using econometric modelling of passenger demand, freight volumes, and location specific factors).[96] This analysis was used to quantify the effective developable land for each airport site for businesses linked directly to airport operations and for businesses wanting to take advantage of new business park infrastructure. The economic benefits will include business agglomeration, industry competitiveness and savings in land development costs by clustering industrial and commercial activities together.

4.4 Employment impacts

Major airports provide substantial employment opportunities, whether directly at the airport during construction and operation, or indirectly through those businesses that support the airports operations or take advantage of new land development opportunities by relocating from other regions. The fourth phase covers employment impacts, including:

- **Direct employment** – looking at construction and operational employment (based on projections over time using econometric modelling of passenger demand and freight volumes) and the composition of job types over time. See Appendix D for further detail on the methodology applied to this econometric analysis.
- **Sub-regional (induced) employment** – based on projections of industrial/commercial land development over time (from the operational impacts section) and the composition of job types employed by these industrial/commercial developments (such as research & development, light industrial, logistics, business, retail and hospitality).
- **Net increase in Employment** – a number of the jobs that are included within the direct and sub-regional employment forecasts will effectively be a transfer of employment that will have otherwise occurred. The total net increase in employment that will result from the development of each of the airports was calculated using a general equilibrium model. This calculation was undertaken by the Centre of Policy Studies at Monash University and the outputs were used to determine the flow-on economic impacts and employment that will result from development of an airport.
- **Sources of employment** – linking these employment projections back to the regional context analysis to identify the number of residents (current and future) who will benefit from these additional employment opportunities. The analysis assumes that the majority of people employed at the airport and associated industrial/commercial developments will reside in areas within 30 minutes travel time. The three main sources of labour are unemployed residents seeking employment, underemployed residents seeking full-time employment, and the future resident labour force not employed by new jobs planned for the region. Labour sources are further broken into higher skilled labour (managers, professionals, technical experts) and lower skilled labour (labourers, machine operators, retail).

4.5 Economic impacts

As a part of this report, a methodology was developed to ascertain the potential economic impact of the construction and operations of an international airport at Badgerys Creek, from a NSW and national perspective.

The direct economic impacts of the airport on the immediate area estimate the impact of a range of factors including the construction of the airport, the ongoing renewal and maintenance of the airport, airline and retail activity, tourism and hospitality activity, freight and logistics, and other business activities. The impact is expressed for each industry between 2012 and 2060. For further information on the methodology used to estimate each direct impact, see Appendix B.

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[95] Information underlying environmental impacts has been developed by WorleyParsons and AMPC.
[96] See Appendix B for further detail on the methodology applied to this econometric analysis.

The overall economic impact on the NSW and Australian economies was undertaken using a general equilibrium modelling approach. Under a general equilibrium approach, the direct expenditure associated with the development and operations of the airport on the wider NSW and Australian economies forms the foundation of the wider economic analysis. The economic impact assessment was undertaken using the MMRF model, developed at the Centre of Policy Studies (CoPS). Further details on the assumptions and approach used by the model can be found in Appendix B.

4.6 Social impacts

The social impacts of an airport at each site are also discussed in the report. Unfortunately, most social benefits are unable to be quantified, as they constitute non-market activities that provide intangible welfare gains to airport users and also non-users. However, they are closely associated with the economic impacts of employment and productivity. Accordingly, analysis of the social benefits of each airport site relies on the estimated economic impacts of the airport, which informs the type and extent of social impacts that may result.

The table below outlines the various social benefits that have been considered for each airport site. As can be seen, airports are potentially significant in improving regional accessibility, better locating workers with their workplaces, providing employment opportunities to regional areas and improving national connectivity. They also generate increased tax revenue.

Table 2: Range of social and cultural impacts of airports

Social and cultural impact	Result of impact
Living standards	► Social and cultural benefits resulting from the ability to fly ► Social benefits of employment opportunities ► Jobs closer to home and impact on work/life balance ► Land prices
Strengthening communities and supporting development	► National and regional benefits of aviation ► Supporting the growth of Sydney (Benefit of city of cities approach) ► Increased tax revenue as a result of additional economic activity (e.g., tax spend per GSP)

Part C –
Literature review

Summary

- This section of the report provides context for the analysis undertaken throughout this study with by highlighting the potential role of the secondary airport within the Sydney basin and literature regarding the potential wider impacts of airports. The environmental impacts of airports are well established and outlined in detail within Appendix D.
- Airports provide essential infrastructure to support social and economic growth in the surrounding region as they ultimately increase the productive capacity and productivity of those businesses that require aviation-related services to operate in global markets.
- Airports and aviation-related industries are economic drivers that generate a wide range of benefits primarily through the creation direct and indirect employment opportunities.
- The role and function of a new airport operating within the Sydney basin will have a significant impact on the type of services provided and ultimately on the financial and economic success of the development.
- A number of factors are impacting the development of secondary airports globally, including the increasing demand for aviation services, the constrained level of supply of these services, mitigation/redistribution of the impacts of aviation services and the emergence of the low cost carrier segment of the industry.
- A number of challenges face the development of secondary airports in western society, including aircraft noise, environmental constraints, regulatory and political factors, and difficulties in financing and staging the development.

5. Role of a secondary airport

The role and function of a new airport operating within the Sydney basin will have a significant impact on the type of services provided and ultimately upon the financial and economic success of the development.

This section of the report analyses the factors that are specific to the development and operations of secondary airports, including the types of services they provide as identified within the Joint Study.[97]

5.1 Drivers of secondary airport systems

The construction of secondary airports to support growing community needs has been an issue facing developed and developing cities alike for a number of years. A number of factors are impacting the development of secondary airports globally, including:

- Increasing demand – Growing population, living standards and mobility have all increased the demand for aviation services. In Australia, the number of aviation passenger movements has increased from 38.7 million in 1988/89 to over 120 million passenger movements in 2008/09[98].

- Constrained level of supply – The constrained footprints of airports and the inherent additional costs of redeveloping have resulted in the inability to upscale operations to meet the increased demand for services.

- Mitigation/redistribution of the impacts of aviation services – There are examples internationally where aviation services have been relocated and/or redistributed to mitigate the impacts of the aviation industry, most notably noise and environmental impacts, on built and established urban areas. These issues have also impeded the expansion of airports in densely populated areas.

- Emergence of the low cost carrier industry – In recent times low cost airlines and innovative cargo carriers such as DHL, FedEx and UPS have, been significant in the development of secondary airports.

5.2 Types of secondary airports

There are generally three forms of interaction between the primary and secondary airports in a city: competitive, complementary and hybrid models. The Booz & Co passenger demand modelling for Sydney assumes a competitive airport model for Sydney, which has implications for the way traffic is assumed to develop at KSA and the proposed airport sites.

Table 3 presents a brief analysis of the alternative service factors that are associated with each of these secondary airport operating models.

Table 3: Types of secondary airports

	Purely Competitive	Hybrid	Highly Complementary
Services	There is a full duplication of services across both competing airports. Each services all market segments.	Duplication of some specific services and some crossover in market segments serviced by both airports	Mutually exclusive service offerings and market segments are serviced by each airport.
Airline Exclusivity	Multiple airlines are based out of both airport sites and there are mutually exclusive competing airport owners.	Multiple airlines could be based out of both airports, but a very limited degree of airport exclusivity is possible. Normally, there are mutually exclusive competing airport owners.	Multiple airlines may potentially be based out of both airport sites, although some degree of airline exclusivity is likely. There is one individual owner of the complementary airports.
Secondary impact on surrounding airports	High impact where the competitive environment is not necessarily geographically constrained and diversion from non-KSA possible	Limited impact on surrounding airports	Limited impact due to non-competitive market dynamics
Market	High degree of stimulation of market growth, particularly for second airport localities where generalised costs will fall markedly. Strong competition will cut airport fees and airfares.	Some degree of stimulation of market growth and impact on airlines and airfares. The impact depends on where segment competition exists.	Limited stimulation of market growth. There is some impact on airlines and airfares as the alleviation of supply constraints should see some level of airfare decrease.

Source: Joint Study on Aviation Capacity for the Sydney Region

[97] Joint Study on Aviation Capacity for the Sydney Region
[98] BITRE

5.3 Services provided at secondary airports

The Joint Study identified four different types of scheduled[99] airline models:

- Full service (predominantly long service or legacy) carriers
- Low cost carriers (LCCs)
- 'Hybrid' LCCs – these are LCC's with some full service/legacy characteristics
- Dedicated freight airlines.

Each of these models considers a number of operational factors to determine the service level they will provide at a secondary airport relative to a primary airport.

Table 4 was developed by Booz & Co and presents the 'high level' key criteria for each airline model in considering secondary airport usage relative to primary airport usage.

Table 4: High level airline model criteria in considering secondary airport relative to primary airport usage

Criteria	New entrants 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 hr turnaround/utilisation opportunities)	L	H	M	H	H	H	H	H
Operational constraints/congestion at primary airport	L	H	H	H	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	H	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

Source: Joint Study on Aviation Capacity for the Sydney Region
Note: (High = most important, Medium = reasonably important, and Low = less important)

The table highlights that, across all airline types, proximity to market and the size of the market are important in determining the location of services at non-primary airports. Furthermore, the analysis found that there are variations in relative priorities between an airline already established in a market and a new market entrant, and that congestion at the primary airport, or strategic and/or competitive issues, may influence an established airline to move from a primary to secondary airport or to co-locate operations.

[99] Scheduled excludes general aviation

Overall, the Joint Study found that:

- ► Short-haul LCC airlines typically gravitate to secondary airports.
- ► Legacy airlines generally remain at primary airports.
- ► Hybrid LCCs are more likely to use primary airports that 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.

The criteria that impact an airline's decision to use a non-primary airport is set out in more detail in Table 5.

Table 5: Decision factors to locate at a non primary airport

Criteria	*Explanation*
Network connectivity and alliance requirements	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. Regional airlines are less likely to use secondary 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. Interlining and alliance will put greater pressure on appropriate transport links between airports. Although the cost incurred through using primary airports is higher than at secondary 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	The higher attractiveness of secondary airports is derived from their relative accessibility and pricing, compared with the primary airport. Secondary 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.
Cost and duplication issues	There are numerous benefits for an airline to concentrate operations at one airport, as airlines face high establishment costs at each airport. The use of multiple airports is likely to lead to a duplication of assets and supporting resources.
Proximity to market and size/viability of catchment	Airlines require proximity to markets with development potential to absorb the capacity created by commencing or expanding operations. In regards to outbound routes, airlines require a sizeable population base in close proximity to the airport and promising GDP growth, as propensity to travel broadly tracks GDP growth. In regards to inbound routes, there should be key reasons for passengers to travel to the airport such as tourism, easy access to a major city or greater employment opportunities than their origin market.
Market segments served	Depending on geographical location, segmented market characteristics and underlying commercial arrangements, airport operations will make a decision to service certain market segments. The operators' decisions will be aligned with their overarching corporate strategies.
Airline bases	Under a two airport model, airlines have the choice of basing themselves exclusively out of one airport or a combination of both airports with commercial factors and underlying infrastructure availability dictating their decision. In addition, in order to attract LCCs, the LCC business model must be complemented with low operational costs and quick turnaround of aircraft. This requires airport design considerations to be tailored to attract a target market.
Airline network and schedule	The type of frequency of scheduled services at airports will correlate directly with an airport's target markets. In a competing airport environment, significant duplication of services across competing airports is expected whereas under a hybrid model, duplication will not be as widespread but rather targeted based on the chosen business operating models and, hence, target market segments of the two airports. Under a truly complementary airport model, each airport will have mutually exclusive target markets with services scheduled accordingly.

Source: Joint Study on Aviation Capacity for the Sydney Region

5.4 Parallel networks

Over and above the development of secondary airports, there is a growing phenomenon where carriers (normally LCCs) are developing parallel networks of airline services in major markets worldwide out of low cost, uncongested secondary airports. These parallel networks compete alongside the traditional range of full-service airline operations that connect the major airports of the world. In particular, innovative airlines are deliberately developing systems of services based on smaller airports. These parallel networks have critical features that distinguish them from traditional airline services such as:

- Distinct products including low cost passenger or integrated cargo services
- Lack of connectivity with traditional full-service airlines
- Operations generally focused on uncongested, low cost airports
- Distinct geographical networks with links that traditional full-service airlines do not duplicate.

If parallel networks for aviation services are developed by innovative carriers that compete with full-service airlines, there could be a complete realignment of the trends in airport use and expectations for the future of airport development and services. This prospect has already been realised partially on the east coast of Australia with the growth in aviation movements from Avalon and Gold Coast airports.

It is possible that secondary, low cost airports will become home to financially powerful, low cost airlines that will induce traffic away from established primary airports. This could result in established airports being left with relatively high cost services that have diminishing markets, leading to increases in the average cost of services with a flow-on impact on demand.

5.5 International examples of multi airport networks

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) reviewed a number of international examples where multiple airports operate. A brief introduction of these airports can be seen in Table 6.

Table 6: International examples of multi airport systems

	Chicago	London South East	San Francisco	Tokyo
General Information				
Country	United States of America	England	United States of America	Japan
Resident / Basin Population	► Chicago City - 2.8m	► London City - 7.1m ► London SE Region - 56m	► San Francisco - 2.27m	► Tokyo - 12.6m ► Greater Tokyo - 27m
Number of primary / secondary airports	3	5	3	2
Primary airport(s)	► Chicago O'Hare International (ORD)	► London Heathrow (LHR) ► London Gatwick (LGW)	► San Francisco International (SFO) ► Oakland (OAK)	► Tokyo Narita (NRT) ► Haneda (HND)
Secondary airport(s)	► Chicago Midway (MDW) ► Chicago Rockford (Cargo Only)	► London Stansted (STN) ► London Luton ► London City	► San Jose (SJC)	► Ibaraki (IBR)

	Chicago	London South East	San Francisco	Tokyo
Market characteristics				
Passenger movements	81 million [2009 CY]	136.9 million [2006]	56 million [2009 CY]	94 million (2009CY)
Primary / Secondary shares	► ORD 79% ► MDW 21%	► LHR 49% ► LGW 25% ► STN 17% ► Luton 7% ► City 2%	► SFO 68% ► OAK 17% ► SJC 15%	► NRT 34% ► HND 66%
Primary passenger market split	► ORD Domestic 83.7% (Int 16.3%)	► LHR Domestic 8% (Int 92%) ► LGW Domestic 11% (Int 89%)	► SFO Domestic 77.6% (Int 22.4%) ► OAK Domestic 98.4% (Int 1.6%)	► NRT Domestic 7% (Int 93%) ► HND Domestic 99.5% (Int 0.5%)
Secondary airport market splits	► MDW Domestic 99% (Int 1%)		► SJC Domestic 98.6% (Int 1.4%)	► IBR (not yet available)
Freight (tonnes/year)	1.2 million tonnes	1.4 million tonnes (LHR and LGW only)	1.006 million tonnes	2.3 million tonnes

Source: BITRE

Table 6 provides some interesting insights regarding Sydney's aviation capacity relative to other major cities.

While Sydney currently has a population of 4.6 million people, making it larger in population than both Chicago and San Francisco, it is the smallest of the five cities in terms of passenger movements and freight throughput per annum, with 33 million passengers and 595,000 tonnes of freight. However, apart from Tokyo, Sydney has the highest passenger movement and freight throughput per primary / secondary airport in the city.

In Sydney, passenger movements are expected to increase in an unconstrained market to 145 million in 2060, while freight movements will increase to 2.3 million tonnes per annum. This means that by 2060, the Sydney basin will service more passengers and freight than any of the cities in Table 6 currently service (for example, 137 million passengers passed through London in 2006 and these were spread over five airports, with Heathrow Airport accounting for 49% of passengers). Yet Sydney is only serviced by one airport, while the other cities have invested in multiple airports to service their increased level of activity. Given the above analysis and the supply constraints being faced by Kingsford-Smith Airport, it is clear that Sydney will need to invest in an additional airport in the near future.

5.6 Issues facing the development of secondary airports

As part of the Joint Study, BITRE reviewed various international multi-airport case studies and relevant literature to determine if there were any common themes in the development of secondary airports. This analysis found:

- Western countries have found it very difficult to expand capacity. In the Asia-Pacific region, the lack of existing airports within metropolitan regions has meant multi-airport systems have involved mainly the construction of new high capacity airports.
- Noise has been the major constraint on expanding system capacity in Western countries.
- Expanding capacity at existing airports can lead to governments imposing increasingly stringent environmental constraints. Where capacity expansions have been allowed, they have often been accompanied by tighter environmental requirements.
- Successful secondary airports are driven by LCC entry at existing, under-utilised airports. Entry of LCCs changes the market dynamic and typically lowers fees, opening up new market opportunities and stimulating traffic, potentially congesting primary airports.
- Regulatory and political factors play a significant role in the construction of a new airport, particularly with regard to the way traffic is distributed. This can limit the development of multi-airport systems.
- Secondary airports are difficult to fund commercially as they are risky investments due to high capital costs, uncertain demand, low industry interest and the need for co-operation with state and local governments in providing surface transport infrastructure and services. Secondary airports with one major low cost airline serving price sensitive markets are likely to be particularly risky investments.

5.7 Sydney aviation context

The role that a secondary airport will play in the aviation network will depend on which option is developed, in terms of site, and also over the life of the asset. These issues are discussed in more detail below.

- Either of the greenfield development options, Badgerys Creek or Wilton, will most likely be developed on a competitive basis. The level of competition and markets the airport captures will change significantly over time, from when it first becomes operational to when it is an established alternative within the market. The services provided at each of these airports will be for a range of domestic and international locations.

- The airport that is currently being proposed at the Richmond site will most likely be a complementary airport given the size and nature of services being provided (i.e. most likely servicing low cost carriers and general aviation). This airport is likely to become a key link in a parallel aviation network on the east coast of Australia (Melbourne – Avalon, Sydney – Richmond and Brisbane – Coolangatta).

6. Airports supporting economic and social development

Airports have long served as a popular and important mode of transportation, particularly for long distance and international travel.

The aviation industry within Australia is particularly important within the national economy, as air transport is the only viable passenger transport mode for travel between major destinations for most purposes, given the vast distances between major population centres within Australia and abroad. Without access to these services, our businesses would not be able to compete in the global economy.

Reflecting the importance of aviation connectivity, constrained aviation supply in Sydney is a national issue given that Sydney is Australia's international gateway. The interdependent nature of aviation services means that foregone economic activity, growth and jobs from these constraints will exert an influence well beyond Sydney. In particular, the impacts will be felt in reduced mobility to and from regional areas and in an associated reduction in tax revenue.

While their primary role in the economy is as a transport node, airports also play a significant role in the regional economy and its development.[100] Airports are widely recognised as having a considerable economic and social impact on their surrounding regions. These impacts go beyond the direct effect of an airport's operation on its neighbours to the wider benefits that air service accessibility brings to regional businesses and consumers.

Airports provide essential infrastructure to support social and economic growth in the region, as well as being commercial entities in their own right capable of generating returns on investment to the benefit of their shareholders, other stakeholders and society as a whole.

This chapter provides a general review of the impacts of airports on the economy, in terms of their role as an international gateway and their impact on businesses competitiveness/productivity, employment and social development.

The findings from this review have informed our assessment of the potential impacts on the local community from the development of a secondary airport at each of the proposed three sites within the Sydney basin.

6.1 The economic impacts of an airport

Airports internationally have provided benefits to their surrounding communities as well as supporting economic growth and productivity at the wider regional and national levels. There are various analytical frameworks available for considering the economic impacts of an airport. These typically split the economic impacts into four broad categories: the direct, induced, indirect and catalytic impacts of an airport.[101] For the direct, induced and indirect impacts, these frameworks are primarily focused on the employment and income/expenditures that can be linked to aviation activity through an airport. The catalytic impacts represent the benefits to the wider economy, which benefits from international trade and inward investment.

For this study, we have tailored these frameworks to focus on the impacts that are most relevant for comparing the specific airport sites of Badgerys Creek, Richmond and Wilton. In line with this approach, the categories of impacts include:

- Direct impacts – employment and income that is wholly or largely related to the construction and operation of an airport
- Sub-regional (induced) impacts – employment and income generated in the economy of the defined sub-region or 'study area' of an airport, which reflects the development of the surrounding area that can be linked to the airport
- Indirect impacts – employment and income generated in the economy by the spending of incomes by the direct and induced employees of the airport
- Catalytic impacts – employment and income generated in the wider economy by the role of the airport in improving the productivity of businesses and in attracting economic activities such as inward investment and inbound tourism.

It is important to recognise that this is a socioeconomic impact study and that we have not been asked to consider the economic benefits associated with the use of airports. These economic benefits are typically considered in economic cost-benefit analyses (CBAs) and are representations of changes in welfare linked to the investment in infrastructure, such as a new airport. In many cases,

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[100] Kramer, J. H. T. (1988), "The airport of Schiphol: economic and spatial impact, *TESG*, 79(4), p.297-303.
[101] Stevens, N. Baker, D. & Freestone, R. *Understanding the Australian Airport Metropolis*, School of Urban Development, Queensland University of Technology, Brisbane, accessed 28 August 2012, http://www.airportmetropolis.qut.edu.au/documents/SOAC07FinalCopyNSUnderstandingtheAustralianAirportMetropolis.pdf; and Air Transport Action Group (ATAG), The economic and social benefits of air transport, 2008

there is overlap of economic benefits and socioeconomic impacts, although only in cases where there are aggregate changes in income and productivity that can be attributed to the investment.

6.1.1 Direct employment and expenditure

One channel through which an airport impacts the economy is via the direct employment and expenditure that is realised on and/or at the airport during both the construction and operation phases.

During construction of the airport, this direct impact arises from the demand of materials by construction companies to construct the asset, as well as labour, consultancy and engineering design fees.

During the operational phase of the airport, the direct impact includes the economic activity created by airlines, airport management, fixed based operators and other tenants with a direct involvement in aviation. These are also known as airside and terminal operations.

6.1.2 Sub-regional (induced) economic development and employment

An airport also impacts the economy through a flow-on effect from 'off-site' companies in the region that supply the airport users or form part of a growing airport 'city' or sub-regional economic centre with close links to the airport. For this study, this is referred to as the induced impact of the airport.

6.1.3 Indirect impacts

For this study, the indirect impacts are driven by the direct and induced spending at and around the airport, which is transmitted through the economy via a multiplier effect.

Examples of indirect impacts include the manufacturing firm that supplies machinery to the airlines and the office supply store that provides office furnishings and stationary to the airport's managers. The indirect impacts also involve employees of the airport, or suppliers of the airport, spending their additional income on goods and services in the wider economy, such as food, education services and holidays.

A number of studies have attempted to quantify these three impacts of public infrastructure investment on economic development. These studies have shown that these investments can make a substantial contribution to the overall economy of the areas they serve. Specifically:

- The combined effect of the direct, induced and indirect impacts of the aviation industry is responsible for between 1.4-2.5% of GDP, excluding tourism impacts, within established countries such as the Netherlands, Austria, France and Italy.[102]
- The presence of airports has been found to be significant in determining the level of economic output on a per capita basis in a particular country.[103]
- In this same study, airports were found to be an even stronger determinant of economic development than the level of human capital.

6.1.4 Catalytic impacts

The fourth category of economic impacts, the 'catalytic' impacts, acknowledges that airports are infrastructure that not only contributes to the economy through aggregate demand, but also facilitates business interactions that would not occur under other transportation modes.

In other words, the provision of aviation services and the subsequent ability to travel and access different locations and markets that would otherwise not be accessible impacts both the level of economic activity as well as the productivity and competitiveness of local businesses.

The factors that create catalytic impacts on regional businesses and the wider economy through the provision of aviation services (access, price and the resulting increase in aggregate economic activity) are illustrated in Figure 10.

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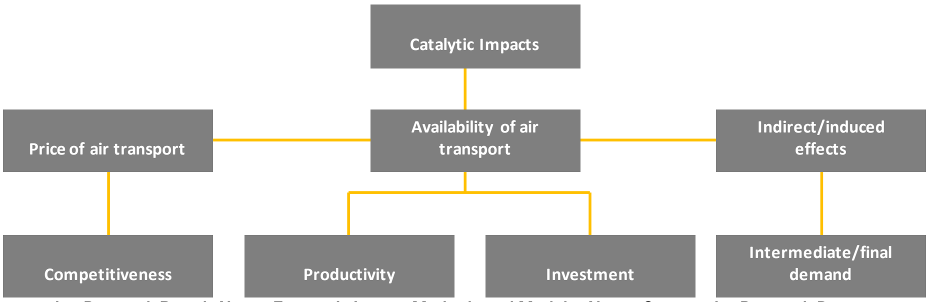
[102] Surveyed by York Aviation (2004) For examples see:
Oxford Economic Forecasting (1999), 'The Contribution of the Aviation Industry to the UK Economy';
'The Economic Impact of Vienna International Airport', Presentation by Clement, Schrock, Kastelic, and Kotrba; and 'The Economic Impact of the Airports of Rome' (1999), CERTeT, Gruppo CLAS, LIUC
[103] Florida, R., Mellander, C., and Holgersson, T. (2012), "Up in the Air: The Role of Airports for Regional Economic Development", *Working Paper Series: Martin Prosperity Research*, Martin Prosperity Institute

Figure 10: Catalytic Impacts



Source: Transportation Research Board, Airport Economic Impact Methods and Models, Airport Cooperative Research Program

Airports can provide a strong regional economic anchor and are often magnets for economic activity. By locating near each other in airport precincts, firms can benefit from significant economies of scale and network effects.

Formal literature research has found that the benefits of catalytic impacts on local businesses are significant for both large and smaller airports. Florida et al. (2012) showed that secondary airports located in regions that are near a major city exhibit the catalytic benefits associated with airports.[104] Furthermore, Warren (2007) found that small airports have a statistically significant effect on the economic development of individual counties (i.e. the geographical subdivisions of States) in the United States. [105]

Research has also found that the development of the Seoul, Atlanta and Memphis Airports has been cited as the catalyst for nearby clusters of development.[106] The development of Seoul's Incheon Airport was determined to have resulted in the £15 billion mixed-use development proposed upon reclaimed land near the airport, which will house 65,000 residents and 300,000 office workers.

The following sections analyse the rationale underpinning the catalytic benefits of an airport.

6.1.4.1 Availability of air transport

Air transport connects people and businesses to the global economy, thereby playing an increasingly important role in global economic activity. Indeed, global connectivity is regularly cited by international businesses as a reason for choosing a location.

A high degree of connectivity is critical to maintain both Australia's and Sydney's reputation as world-class destinations for business and leisure (i.e. 'Brand Australia' and 'Brand Sydney'), particularly given the geographical distance between Australia and many other world-class cities. Furthermore, in a county of Australia's size, frequent and affordable air transport links are important for ensuring access to and from other cities and regional/remote communities.

There is a risk that constrained aviation in the Sydney region will diminish Australia's ability to consistently attract business and leisure visitors to the region. While flights may continue to be available, operating the system at maximum capacity increases the risk that unexpected events, such as weather, safety or security issues, have a particularly detrimental impact on the quality and consistency of service. Capacity constraints are also likely to lead to higher airfares and constrain the number of destinations that are directly served from Sydney.

Connectivity generates wider economic benefits for businesses, both through the efficiency of direct linkages and 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, dependent on mobile workforces and face-to-face relations. These include high-tech sectors, pharmaceuticals and financial and business services.[107]

Airports facilitate productivity improvements through providing better connections to global flows of labour, goods, money and information. Productivity is a key determinant of economic growth, both now and in the future, and the link between the provision of infrastructure and productivity within an economy is well established. [108]

Furthermore, improved accessibility can have a more significant impact on productivity in labour-intensive industries (such has the services sector), where interpersonal interaction and knowledge intensity in the production process is integral.[109] This impact is particularly important to the Sydney economy as it continues to act both as the main driver of the services sector within Australia

[104] O'Connor K. (2003), "Global air travel: toward concentration or dispersal?", *Journal of Transport Geography*, 11(2), 83-92
[105] Warren, D. (2007), "The Regional Economic Effects of Airport Infrastructure and Commercial Air Service: Quasi-Experimental Evaluation of the Economic Effects of Commercial Air Service Near Smaller Airports", Presented at the 54th Annual North American Meetings of the Regional Science Council, Georgia
[106] '*A new airport for London*', Mayor of London (2011)
[107] *'Economic Impacts of Hub Airports'*, British Chambers of Commerce (2009)
[108] Australian Government, *National Aviation Policy White Paper*, December 2009, section 1, p. 40-52
[109] Button, K., Lall, S., Stough, R. and Trice, M. (1999), "High-technology employment and hub airports", *Journal of Air Transport Management*, 5, p.53–59

(Sydney possesses 24% of all services sector employees and 30% of professional services sector employees)[110] and the international gateway to Australia.

Being part of a nationally and globally integrated transport network plays a particularly important role in enabling firms to access larger markets. For example, the UK Eddington Transport Study cited the widespread use of aviation and its falling costs as a key driver in the transformation of the connectivity of both the manufacturing and services sectors globally.[111]

In a detailed review undertaken by Oxford Economic Forecasting (OEF) for the International Air Transport Association (IATA), nearly 85% of firms reported that air services were important for their sales and over half of the businesses surveyed believed that their ability to compete internationally would be very badly or moderately affected by constraints on the availability of air transport.[112]

[110] ABS, 2006 Census data
[111] *'The Eddington Transport Study, Main report: Transport's role in sustaining the UK's productivity and competitiveness'*, Eddington (2006)
[112] *'Airline Network Benefits'*, International Air Transport Association (2007)

In particular, the ability to hold face-to-face meetings with overseas contacts is perceived as crucial to doing business effectively.[113] While it has been argued that 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 that this is not the case due to the importance of building strong personal relationships.[114]

6.1.4.2 Prices of air transport

Constraining the supply of aviation services will negatively impact the competitiveness of businesses by increasing the costs to provide their goods and/or services (inputs and/or the provision of their goods/services to the final customer) relative to their international competitors.

Examples of business inputs that will be negatively impacted by the constrained supply of aviation services include any good that is suitable for air freight such as high end electronics, retail merchandise and perishable foods. As before this will also have major consequences for the services sector, which is increasingly reliant on aviation to support its flexible and mobile labour force.

The international competitiveness of Australian businesses will continue to be a significant issue influencing the nation's development as the impacts of globalisation increase. The rapid increase in international trade in recent decades has been fuelled not only by lower trade barriers, but also by the ability to efficiently and cheaply transport people and goods (due in part to the development of aviation services).[115]

6.1.4.3 Indirect/induced demand

The presence of an airport and the associated positive impacts, as described above, can be critical factors in attracting new inward investment from firms operating in other cities and countries, retaining existing companies in the area and encouraging the expansion of existing companies. All of these business impacts will lead to local and regional investment that will spur economic growth and employment.

The size/level of this investment and economic impact will depend on a number of factors relating to the airport and the surrounding location. Specifically, these factors will include the provision of land for businesses in close proximity to the airport, as well as the type of services provided at the airport.

Furthermore, the increase in economic activity realised through greater productivity, competitiveness and/or inward capital investment will generate ongoing flow-on benefits for the wider community through the provision of goods and services to these businesses and to those persons who are employed within these businesses.

Access to emerging markets

International trade is widely recognised as a key driver of economic growth, increasing prosperity and rising living standards, with world trade persistently growing more rapidly than global GDP.[1] The availability of both air freight and passenger services plays a vital role in facilitating trade and enabling businesses to serve a bigger market.

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. Oxford Economics' econometric research across 24 EU countries implies that, other things being equal, a 10% increase in output of air services will raise productivity and potential output by 0.56% in the longer term.

6.1.5 International examples of economic impact calculations

The following section provides a summary of calculated economic impacts that have been collated as part of this analysis.

6.1.5.1 Economic impacts of airports

Using publically available annual reports and economic impact statements, the analysis presents an accumulation of data regarding the total economic impact (direct, indirect and induced) of different airports around the world. This data can be found in Table 147 and in Appendix C.

[113] *'Connecting for growth: the role of Britain's hub airports in economic recovery'*, Frontier Economics (September 2011)
[114] '*A new airport for London'*, Mayor of London (2011)
[115] Australian Government, *National Aviation Policy White Paper*, December 2009, p. 40-84

Analysing this data, it can be concluded that there is a positive relationship between airport activity (freight throughput and passenger movements) and its total economic impact.

Our analysis indicates that, on average, the US has a relatively higher total economic impact per unit of freight and passenger throughput. In contrast, European airports typically have a relatively lower total economic impact per unit of activity. This may be somewhat explained by the fact that most US airports are adjacent to Mass Development Business Parks (see section 6.2.3 below), while European airports tend to be relatively older and lack the surrounding land space required to expand activities.[116]

6.1.5.2 *Direct, indirect and induced economic impacts*

As part of this analysis, Ernst & Young also analysed publically available data of the multiplier effects of the direct economic impacts of some airports, both international and domestic.

Table 7 indicates the extent of the direct impacts of each airport and how the airport also contributes to the economy through indirect and induced impacts, adding to the total impact that an airport has on the economy.

Table 7: The multiplier effects of airports

Airport	PAX (millions)	Freight (tonnes)	Direct Economic Impact per annum ($ billions)	Total Economic Impact per annum ($ billions)	Indirect Multiplier Effect
North America					
Phoenix AZ, US (PHX)	40.6	302,146	8.2	33.0	4.0
Houston TX, US (IAH)	40.2	423,777	7.4	22.4	3.0
Kansas, US (MCI)	10.2	83,686	1.1	5.5	5.0
Houston, US (HOU)	9.8	53,681	1.7	4.5	2.6
Sacramento, US (SMF)	8.7	64,302	0.5	3.2	6.2
John Wayne, US (SNA)	8.6	15,569	1.1	5.6	5.1
Florida, US (RSW)	7.5	14,760	2.3	3.8	1.7
Weighted Average					**3.5**
Europe					
BRUSSELS, BE (BRU)	18.8	475,124	0.6	1.9	3.0
Budapest (BUD)	8.9	106,595	0.4	1.7	4.5
Weighted Average					**3.6**
Asia & Middle East					
Dubai, AE (DXB)	51.0	2,190,000	6.2	22.0	3.5
NEW DELHI, IN (DEL)	35.0	600,000	3.7	9.1	2.5
Weighted Average					**3.1**
Australia					
SYDNEY, AU (SYD)	32.2	634,000	8.0	16.5	2.1
BRISBANE, AU (BNE)	20.4	81,678	3.2	5.4	1.7
PERTH, AU (PIA)	9.4	49,542	1.4	2.9	2.1
Weighted Average					**2.0**

Source: Compiled by Ernst & Young from York Aviation Study (2004) and publicly available documents

Table 7 indicates again that there is a positive relationship between passenger and freight throughput at an airport and that airports directly and indirectly contribute to the economy. An average airport will have a total economic impact of approximately three to four times the size of its direct economic impact due to indirect and induced effects.

Based on the above information, it is difficult to draw any detailed conclusions regarding the induced and indirect economic impacts of airports. There seems to be a large degree of variability in terms of the size of the indirect/induced effects between different airports, with some indirect and induced impacts not even doubling the direct impact of the airport, while other airports have an impact that is greater than 5. Australian experience suggests slightly lower indirect effects of around double the direct economic benefits.

Additionally, there seems to be little consistency between the multipliers for airports:

- Within the same region – Airports within the same region seem to vary as much from each other as they do with airports in the rest of the world, although it should be noted that Australian airports tend to have lower economic multipliers relative to other airports around the world.

- With the same amount of PAX – Airports that have relatively lower PAX seem to have high variability in their multiplier levels, as do airports with relatively larger PAX (over 30 million).

However, despite these inconsistencies and variables, it is clear that airports can have significant economic impacts on both their surrounding areas and broader regional, state and national economies.

[116] Consideration must also be given to the potential for methodological differences between different airport calculations

6.2 Business development

Much of the wider economic impacts of an airport are delivered through regional business development. As highlighted above, the presence of an airport and its impact on productivity and competition can be a critical factor in the growth of businesses. Furthermore, airports can significantly influence the location decisions of firms, leading to a clustering of firms near airports (including within an airport business park precinct) and associated agglomeration and efficiency benefits.

This section reviews the evidence that this occurs on a microeconomic level and also considers the potential for business parks and multimodal transport hubs.

6.2.1 Business location

A number of factors affect the decision of where a company should locate, including cost and proximity to clients, suppliers and transport nodes.

As highlighted above, a business that locates in close proximity to an airport has access to a number of benefits, including:

- Potential reduction in cost of air freight movements
- Domestic and international movement of labour
- Access to the global labour pool
- Access to a good level of infrastructure
- Increased demand for the goods and services
- Agglomeration improvements from the clustering of firms.

A number of studies have been undertaken that analyse airport firms' location decisions:

- Research undertaken by Hoare (1975) found that the level of accessibility to Heathrow Airport was a key factor in attracting overseas firms to a regional location in South East England,[117] which found a 'clustering' of firms within one hour's travel of the airport.
- Later research in the same region, undertaken by Andrew and Bailey (1994), concluded that being within two hours travel time of a major airport in South East England was essential for major firms.[118]
- Surveys undertaken in regional areas around airports display evidence that global accessibility can be an important and deciding factor in location decisions. For example, one study reported that 31% of companies in the region around Munich Airport cited the proximity of the airport as a primary factor in their location decisions.[119]
- A survey of manufacturing businesses in the Hamburg region found that 80% of these firms relied on airport proximity to enable customers to examine their products.[120]

As highlighted above, a number of factors will impact on the relative success of an alternative site to locate additional aviation services within the Sydney basin. At a high level, businesses will prefer to locate near to an airport that provides a greater range of services to a larger number of persons compared to one that does not. An airport site that is relatively close to a good source of labour, with an appropriate level of transport and utility services, is also preferable.

6.2.2 Types of airport business developments

The demand for businesses to locate close to airports has resulted in the development of industrial hubs at or near airport sites. Most international scale airports globally have a form of business park near the airport.[121]

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[117] Hoare, A.G. (1975), "Foreign firms and air transport: the geographical effect of Heathrow Airport", *Regional Studies*, 9, p.349-366
[118] Andrew, R. and Bailey, R. (1994), *Flightpath to Prosperity: The Economic impact of airports in the South East on their local economies*, South East Economic Development Strategy (SEEDS), Harlow, Essex, p.1-183
[119] Munich Institute Bulwein and Partner (1997), 'Munich Airport as an Economic Factor'
[120] York Aviation (2004), *The social and economic impact of airports in Europe*, Report for the Airports Council International (ACI Europe), p.6, available online: http://www.ryanair.com/doc/news/2012/ACI-Report.pdf

Activities immediately adjacent to commercial airports typically include:

- ► Services directly supporting operation of the airport (flight kitchens and aircraft maintenance services)
- ► Services for airline employees and passengers (hotels, restaurants, car rental and parking facilities)
- ► Airport-related freight services (shipping, freight forwarding, customs and sometimes a foreign trade zone).[122]

The probability of such sites being developed – and their ultimate success – depends on a number of factors, particularly land availability, transport links to existing business parks and airport capacity.

There are two generally accepted forms of business parks that have been established as a result of airport developments: the multimodal transport hub and the airport oriented business park. These two forms of business parks are analysed below.

6.2.2.1 Airport oriented business parks

A business park is a heavily concentrated collection of buildings grouped together in a particular area of land. Typically, they are located in areas that are low cost and have sufficient space to build wide-floored facilities. Business parks located near airports can be used by a variety of firms, including: [123]

- ► Firms that are in some way connected to the airport or aerospace industries
- ► Firms that require a significant amount of air transport in their business operations
- ► Firms relying on the high volume of passengers travelling to and from the airport
- ► Firms that are attracted to the availability of land in the area.[124]

There are a number of international examples where business parks have flourished adjacent to airports with large land holdings. Examples include:

- ► Auckland Airport - Located within proximity are a number of logistic businesses, recreational facilities, fast food restaurants, car parking providers and retail facilities.
- ► Indianapolis Airport - Located within proximity are a large number of logistic and warehouse facilities, in addition to fast food restaurants and retail facilities.
- ► Dallas Love Field Airport - Located within proximity are a large number of logistic and warehouse facilities, in addition to fast food restaurants, commercial businesses and retail facilities.

Such has been the success of airport business parks that there has been a move towards the development of 'Airport Cities' – where there has been such a strong movement of economic activity towards the airport that non-aviation related industries have moved there as well, creating a mass of activity equivalent to a city development. The Dusseldorf International Airport is one example of an 'airport city' development that has received interest from investors in projects including a hotel, office complexes and a Porsche dealership.

6.2.2.2 Multimodal transport hubs

A multimodal transport hub is a centre of transport logistics that usually features an airport and major freight and passenger rail/high speed rail/bus connections.

Converting an airport into a multimodal transport hub is viewed as one potential long-term solution to the growing aviation congestion generated by ever increasing demand for aviation services. As road and rail connections to airports improve, those airports with large areas of available land adjacent to them are able to capitalise on this and develop as national or regional centres of logistics.

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[121] This study is interested in only those business parks/zones that are developed as a result of the construction of an airport. Furthermore the ownership of the land where the business development occurs is inconsequential to this analysis as we are looking at the issue from a wider economic view.
[122] Weisbrod, G. *Airport Area Economic Development Model,* PTRC International Transport Conference, Manchester, England, 1993, accessed 20 July 2012, http://www.edrgroup.com/pdf/airport-econ-ptrc.pdf
[123] Deloitte Access Economics, *Connecting Australia: The Economic and social contribution of Australian airports*, Australian Airports Association, May 2012, p. 8
[124] The Times 100, *Business Location,* 12 edition, accessed 3 September 2012, http://www.thetimes100.co.uk/downloads/theory/business_location.pdf

One study has found that the creation of multimodal transport hubs has resulted in numerous benefits, including agglomeration and a substitution effect to support the more efficient allocation of resources and the provision of complementary services.[125]

International examples of multimodal transport hub developments include:

- Perth Airport – The location of the airport estate relative to the city has meant that it offers the best land available to be the area's transport, logistics and services hub. The primary function of the airport's primary freight hub at Kewdale (68 hectares) is to provide rail and road intermodal freight services for the receipt of interstate and intrastate containerised and bulk freight, and international and interstate containerised sea freight, connecting to the port of Fremantle.[126]
- Rome's Fiumicino Airport - An intermodal centre has been developed adjacent to the airport, with strong links to shipping lanes and the road network, and future intentions of being connected to the Rome-Genoa rail line.
- Charlotte-Douglas International Airport – A regional intermodal facility is being built by Norfolk Southern, adjacent to the airport. By building a $90 million freight rail facility linking to regional areas and making use of the existing links from the airport to Interstates 77 and 85 and multiple seaports, the location offers an attractive freight base.[127]

6.2.3 Types of business park developments

To capitalise on the need for air service accessibility, there has been an increasing trend to develop commercial business precincts on or near airport grounds. Often these business parks are occupied largely by firms in airport operations and related industries, or by companies that rely on air transport to meet clients, connect staff and management or visit suppliers.[128]

Ernst & Young undertook an analysis of the area of land that is generally put aside for the development of business parks with respect to the passenger and freight throughput of the adjacent airport, as well as an analysis of the composition of each business park.

To undertake this analysis, we used multiple sources of information including academic literature, publicly available annual reports of specific airports and economic impact statements for both individual airports and the aviation industry in particular regions/countries. The detailed outputs of this analysis can be found in Appendix B.

This high level analysis of different airport business parks found that they can be broadly divided into three categories based on their size, as well as their purpose and composition:

- Small scale business parks
- Medium scale business parks
- Mass development business parks.[129]

6.2.3.1 Small scale business parks

Small scale business parks are constructed solely to serve the interests of the airport. This includes services assisting the airport's operation (flight kitchens) and services for airline employees and passengers (hotels and restaurants), as well as airport freight-related services.

It is more likely that such business parks are part of an airport with relatively low levels of passenger and freight throughput per annum. This is because with low airport activity, industries may be less inclined to locate within the business park as they may expect limited demand. Additionally and perhaps more importantly, an airport with low activity levels implies smaller airport-related industries. This means that there are fewer clustering opportunities, making other industries less inclined to locate to the business park.

Our research has indicated that small scale business parks are also more commonly found in developed countries and especially at airports that have been in existence for a long time. It is likely that these airports were constructed without anticipating the potential growth of the city around them and, as such, the business parks cannot be expanded now due to lack of available land.

Given the above observations, these parks tend to be small in geographical area. An example of a small scale business park is the International Airport in Rome (Fiumicino Airport). This airport is adjacent to a small scale business park of 63 hectares, which only contains industries that serve the needs of the airport's operations (for example, car rental services, restaurants and accommodation). While this airport has a relatively large degree of passenger throughput (38 million), its small scale may be explained partially by its limited freight throughput (approximately 160,000 tonnes per annum) and its long history.

[125] Milan Janic, "Assessing some social and environmental effects of transforming an airport into a real multimodal transport node", *Transportation Research Part D*, 16, p.137-149
[126] Western Australia Department of Transport, *Perth Airport Master Plan*, Government of Western Australia, page 11, March 2010
[127] Crumbo, C. *Norfolk Southern to build intermodal terminal at Charlotte Airport*, Charleston Regional Business Journal, 25 April 2012
[128] Deloitte Economics, *Connecting Australia: The Economic and Social Contribution of Australia's Airports*, Australian Airports Association, page 24, May 2012
[129] This classification was developed by Ernst & Young for the purpose of analysing alternative international business park developments.

6.2.3.2 Medium scale business parks

Generally, these business parks were initially created to serve the purposes of the airport, but have grown over time as they attract greater industry involvement and customer demand.

In these cases, the associated airport is likely to have a higher amount of freight and passenger throughput on an annual basis relative to airports adjacent to small scale business parks. This is because with greater airport activity there are larger potential agglomeration benefits from locating close to the airport for certain industries.

It is reasonable that when a business park begins to grow beyond solely supplying the airport's operations, the largest agglomeration benefits will go to the industries that are most closely related to the airport's operations. For example, manufacturing industries can use their location adjacent to the airport to acquire less costly access to freight movements inward and outward. As such, we have observed that industries such as manufacturing, petrol stations and financial and business services can gain from being located in the business park when its activity levels grow. Firms in these industries are commonly found in business parks when they grow beyond small scale to medium scale.

Examples of medium scale business parks are:

- The International Airport located in Madrid (Madrid-Barajas Airport) – This airport has a business park of 1,039 hectares. The park contains airport-related industries such as car rental, restaurants and accommodation, but it has also attracted other industries such as manufacturing. Madrid-Barajas Airport has passenger throughput of approximately 50 million a year and freight throughput of 370,000 tonnes.
- The Charlotte International Airport – This airport has 722 hectares of land plus throughput of 38 million passengers and 137,000 tonnes of freight per year. This has attracted other businesses to the location, including manufacturing, petrol stations and call centres.

6.2.3.3 Mass development business park

These business parks are large scale and do not solely contain industries servicing the airport's operation. Instead, such industries are simply a single facet of the services available and there is a large range of other businesses that serve other needs.

The close relationship between landside business activity and airport operations means that certain types of businesses gain advantages from being adjacent to an airport. As the size of airport operations and the number/types of businesses within a business park grow, potential agglomeration benefits also grow, attracting other diverse industry types. Clustering of 'hi-tech' equipment manufacturers and suppliers can be encouraged, as it is an industry with a need for air travel. Businesses such as tertiary schools and large retailers have located to these mass development business parks to enjoy the larger agglomeration benefits possible.

We have observed that mass development business parks are more common in developing countries and at airports that have been constructed more recently in developing non-democratic countries. These airports were constructed with a greater understanding of the current scale of the aviation industry and the potential agglomeration and clustering impacts of airport business parks. As such, these airports may have been constructed adjacent to a large amount of land.

Examples of mass development business parks are:

- Dubai International Airport Business Park – This business park has almost 2,000 hectares of land. While some of this is explained by the large amount of passengers (51 million per annum) and a large freight throughput (approximately 2.2 million tonnes per annum), indicating larger airport servicing industries, the business park also contains manufacturing industries, retail services, recreation facilities, a call centre, a school and a church, as well as a post office.
- The Miami International Airport – This business park covers 6,250 hectares of land. Due to the of land available, there are large agglomeration benefits associated with locating to the business park that have attracted many industries beyond airport servicing operations including manufacturing, call centres and recreation services.

Our research and observations have found that many US airports are adjacent to mass development business parks that are large in geographical size (although some airports, such as JFK International in New York, have built up instead of spreading out, making their land use relatively small). These parks contain industries that do not simply service the airports operations, but rather take advantage of clustering possibilities. However, it is difficult to determine whether US airports were designed to be surrounded by large vacant areas, anticipating future business park growth, or if the availability of land is mainly an accident of US cities' economic geography.

There are multiple examples of Australian and international airports adjacent to mass development business parks (based on our classifications). The following pages provide some notable examples.

Canberra Airport ACT

Since the privatisation of Canberra Airport in 1999, there have been plans in place to obtain approval for a wide range of land uses in a variety of different precincts to develop a diverse and vibrant airport. These plans indicated that the development of a vibrant, flexible and supportive commercial environment is seen as essential to the long-term growth of Canberra Airport as a commercial entity. Canberra Airport can be divided into the following three business precincts:

- Brindabella Business Park –- Around 7,000 people are employed in the 46 businesses operating within this precinct. The 19 office buildings within the park are tenanted by a range of firms including high-tech aerospace, defence and technology businesses, early learning centres, sports and recreational fields services, financial and retail services, cafes and restaurants
- Fairbairn – This is the largest commercial district in the airport, encompassing 90 hectares of land. Around 2,000 workers are employed in the businesses within this area, supplying a diverse range of facilities and services.
- Majura Park – Large retailers such as Big W and Cost Co are located within Majura Park, as well as a variety of facilities and services such as childcare, cafes, and recreation.

Pictures (from top to bottom): Brindabella Business Park, Majura Park, Fairbairn

All information above is sourced from: http://www.canberraairport.com.au/air_property/fairbairn.cfm

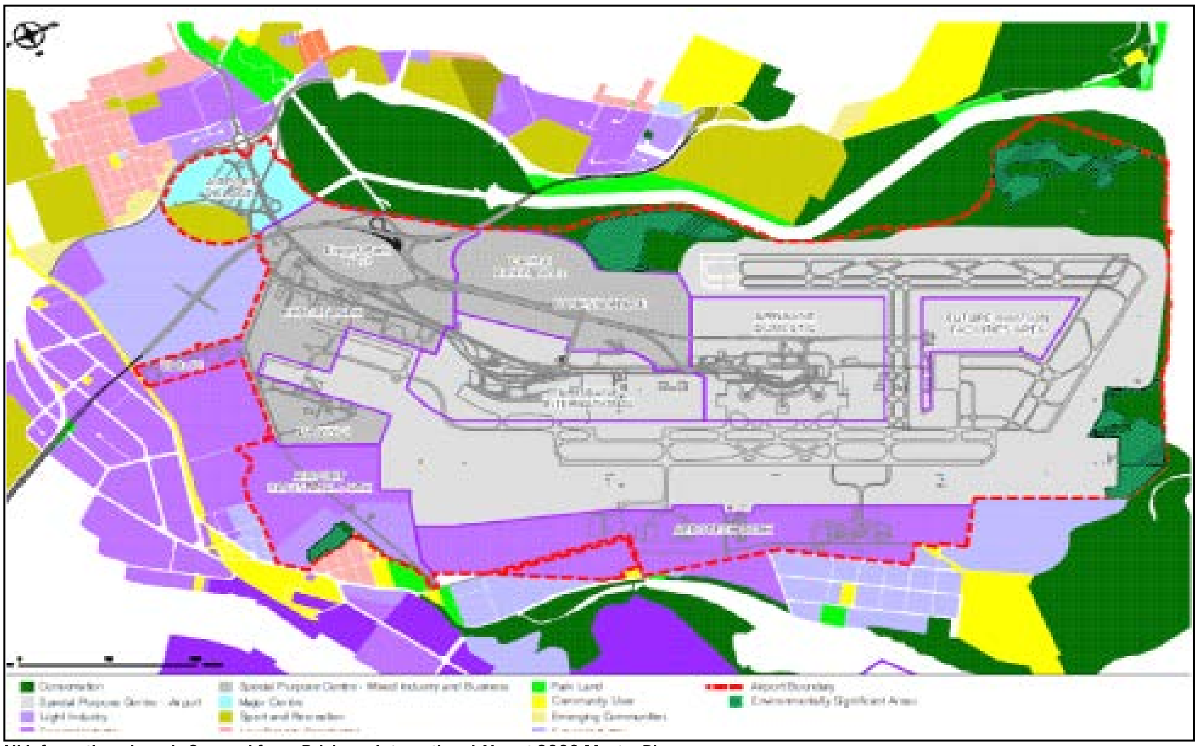
Brisbane Airport, Queensland

While primarily recognised as infrastructure to facilitate aviation, Brisbane Airport also plays an important role as a community hub, bringing together a network of stakeholders with an interest in its operations and services.

One of the largest commercial landholders in Queensland, BAC's vision for land use and precinct development is to create integrated development clusters that capitalise on airport assets and operations. The Brisbane Airport Business Park precinct can be divided into multiple smaller zones, which have been created in order to enhance clustering benefits:

- Export Park – A Special Purpose Centre for mixed industry and business, and located to facilitate air cargo operations and designed as a corporate office park catering for the individual functions associated with cargo terminal operators, freight forwarders and warehouse distribution networks.
- Da Vinci – Dedicated to air service related logistics and aviation/aeronautical education uses.
- Banksia Place – Combines a considerable area of car parking with associated service buildings and small offices. Mixed industry and business in Banksia Place precinct includes commercial offices, car rental depots, car parking and logistic operations.
- Airport Village – Considered the town centre of Brisbane Airport, once developed the Airport Village will be a fully integrated commercial, business, retail and leisure community. It will include hotels, childcare, tourist outlets, health facilities, a direct factory outlet, tavern and a golf course.
- Aerotech Park – A hub for aircraft maintenance, manufacture and related aviation services.
- Airport Industrial Park – An industrial precinct designated to assist aviation operations with warehousing, light industrial and logistics.

Figure 11: Brisbane Airport Business Park



All information above is Sourced from: Brisbane International Airport 2009 Master Plan

Frankfurt Airport

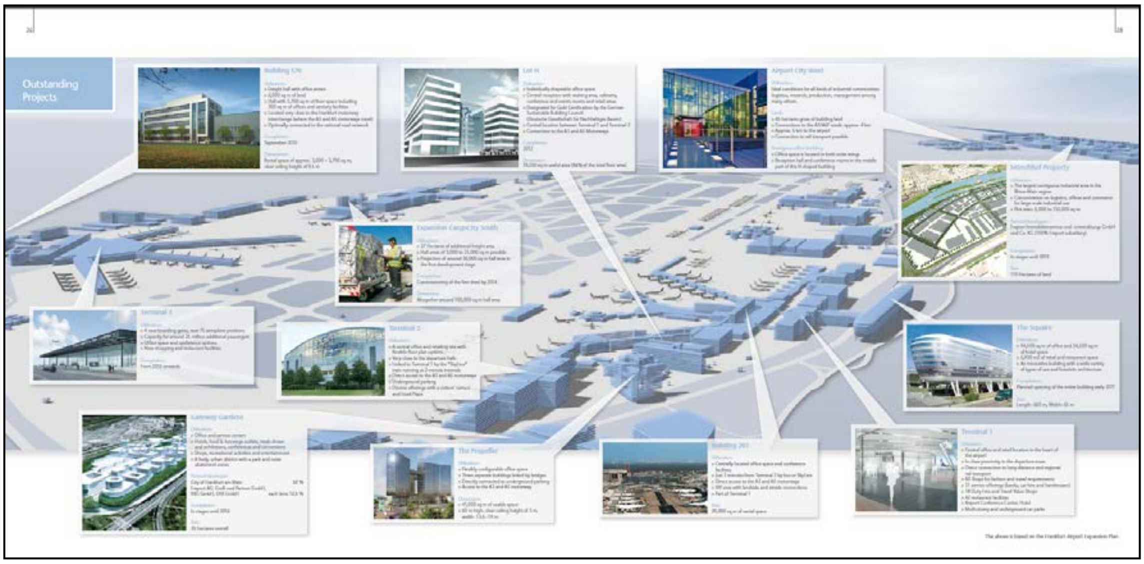
Frankfurt Airport services over 51 million passengers on an annual basis and is Germany's largest place of employment with 73,000 employees. The area around the airport is developing into a vibrant base for doing business, attracting fast growing international companies from a wide spectrum of industries.

Companies that locate at the airport benefit from being very close to prospective collaborators and a high concentration of capabilities of all kinds. For example, innovative high-tech companies have clustered with product suppliers, service companies, creative idea tanks, logistics operations, financial service providers and banks. Currently, over 500 companies have located in the Frankfurt Airport business parks.

To capitalise on this demand, several billion Euros have been earmarked to systematically expand and upgrade the site into an 'Airport City'. The following investments will add to the Business Park of Frankfurt Airport:[1]

- Building 570 and Lot H – These buildings will be established to provide more office space for companies that locate to the business park, while also providing space for restaurants, conference rooms and retail outlets.
- Monchhof Property – The largest contiguous industrial area in Frankfurt is set to be complete by 2019. It will be dedicated to logistics, offices and large scale industrial use.
- The Square – This building will provide improved facilities for passengers, including hotels, restaurants and some retail outlets.
- Cargo City – This area is dedicated to freight and will be extended by 27 hectares.
- Gateway Gardens – An additional 35 hectares will be added to the business park with this investment. This will be dedicated to providing space for hotels, food and beverage outlets, trade shows and exhibitions, conferences and conventions, as well as shops, recreation areas and entertainment facilities.

Figure 12: Frankfurt Airport Business Park



All information above is sourced from: *Frankfurt Airport about Us*

In Sydney, while no formal business park developments were created around KSA, a number of industrial and commercial businesses have located in close proximity to the airport, predominantly on the northern (city) side where the main arterial road and rail access to the airport is located in the suburbs of Mascot and Beaconsfield.

A range of businesses are located in this area including aviation-related businesses (QANTAS training flight centre and catering services), freight service companies (TNT), hotels (IBIS) and other general businesses (Bunnings warehouse, Harvey Norman and others).

6.2.4 Types of companies that locate in close proximity to airports

A wide variety of industries reside in business park developments internationally, including those that are goods and services based. The types of businesses that reside in business parks are analysed below based on the services they provide.

High Technology: Airports are sometimes able to encourage nearby clusters of 'high-tech' firms. These firms are frequent users of air transport due to constant travel by employees and their requirement to interact with customers in person, as well as the transport of products and components by air freight.

Examples of this phenomenon include the Sophia-Antipolis Science Park (located close to Nice Airport) and the Kista development (in Stockholm near the two city airports).

Manufacturing: Access to freight services is of ever increasing importance for the manufacturing sector in a progressively globalised world. The aviation industry plays an important role in this market through the provision of international and express freight services.

These services are regularly used at night for next day delivery to customers, and integrated services have helped improve efficiency and productivity by decreasing the organisational burden of long distance transport. The importance of productivity and efficiency in the manufacturing sector of the developed world will continue to be tested as firms face increasing competition from developing countries.

Financial and business services: These sectors potentially make the greatest use of air transport due to the integral nature of personal relationships with clients who are often located in other cities. Greater accessibility to air services is likely to have a strong influence on location decisions for these types of firms. For instance, the land around Brussels Airport contains a large number of foreign owned companies (many of which operate in air intensive sectors).[130]

Tourism: Airports have always been very important entry points for tourists entering the country, encouraging the tourism industry to locate in close proximity to airports in order to adequately serve their clients. Companies located further away from the airport will, on average, be less convenient for customers. This is especially true for remote locations and island airports (both of which define Australia's geography), as there are fewer alternative modes of transport for arrival and departure.

Global access

Global access and connectivity is vital to the success of a 'global city' such as Sydney. As the key gateway into Australia, as well as being home to a number of the nation's premier attractions, Sydney is a key tourism destination.

Aviation is a major contributor to Australia's tourism industry. As an island continent with no land borders, Australia relies almost exclusively on air services to bring international visitors to the country, with over 99 per cent of inbound tourists arriving in Australia by air. Domestic tourism also relies heavily on air transport (Australian Government, National Aviation Policy White Paper).

According to ABS statistics, when analysing short term international visitor departures in the year to October 2012, 35.7% of visitors had stayed in NSW for the longest period of time (Australian Bureau of Statistics, Book 3401.0 Overseas Arrivals and Departures).

Australia's international reputation, as well as the economic and social benefits it generates, could be at risk if Sydney cannot meet the growing demand for aviation. At best, visitors may relocate their travel plans to other Australian cities, such as Melbourne and Brisbane. At worst, Australia will lose significant tourism and business activity to other parts of the globe.

Beyond the direct financial benefits of tourism, the industry also brings more intangible benefits to society as a whole. For example, it has been argued that tourism plays a key role in cultural exchange and education.

International events are key drivers of increasing tourism and Australia has long been a prime destination for major sporting and cultural events (such as the 2000 Olympics and the 2003 Rugby World Cup). Particularly in light of Australia's distance from the rest of the world, maintaining strong network links and efficient and affordable air transport services are critical to ensuring Australia continues to be successful in attracting events of this nature.

[130] York Aviation (2004), The social and economic impact of airports in Europe

6.3 Employment

This section of the report analyses the impact of employment at airports, in terms of direct and indirect employment and type of employment, as well as examining where those employed at an airport generally reside.

6.3.1 Total direct employment

Direct employment includes those persons that are employed at the airport to assist in the provision of its services. Direct employment at an airport typically includes administration and airport management staff, baggage handlers, airline staff, freight processing, retail operators, government operators, security and other services provided to customers.

As part of this project, Ernst & Young undertook research on the number of employees at airports globally. This analysis provided insights regarding how, and to what extent, employment is affected by the number of passengers at a particular airport and whether this relationship between PAX and employment is consistent in different locations.

The data collated from this analysis can be found in Appendix C. Table 8 presents the summary of the employment per PAX for airports of different PAX throughput ranges in different continents.[131]

[131] This was done by calculating the weighted average (based on PAX of each airport) of this ratio in each region.

Table 8: PAX per direct employee in different world regions

PAX/Regions around the world	Australia	Asia & Middle East	USA	Europe
0-15 million	1,156	815	1,463	1,308
15-30 million	1,923	-	2,297	1,028
30-50 million	423	1,114	1,143	1,351
50+ million	-	852	1,409	942

Source: Collated by Ernst & Young from publicly available information and the York Aviation Study (2004)

To conduct this high level analysis, we referred to The York Aviation Study (2004), publicly available economic impact statements and the annual reports of respective airports, as well as economic impact studies of the airport industry in specific regions/countries.

Given the data we were able to access, our analysis indicates that the amount of PAX at airports and the jurisdiction in which the airport is located has a limited impact - the number of PAX per direct employee tends to be consistent, fluctuating around 1,000 across different regions and levels of PAX. Furthermore, at a high level, this analysis found that positive economies of scale are realised with regards to airports with greater passenger throughput.[132]

However, our analysis did identify some outliers, including:

► KSA was calculated to have 423 PAX per direct employee. This can be explained somewhat by the relatively high level of direct employees at the airport (75,580).[133]

► LaGuardia International Airport in New York only has 8,000 direct employees serving its annual PAX of 24 million (or 3,015 PAX per direct employee).[134] If this airport were removed from the analysis of airports within the 15 million to 30 million PAX range, the weighted average for airports in the USA with between 15 and 30 million passengers would fall to 1,421.

6.3.2 Type of direct employment

The composition of an airport's workforce will be closely related to the volume of air traffic, the design of the airport and its main customer base. Factors that affect the type of employment at airports include:

► A major area for distinction is the extent of on-airport retailing, which is important for local employment and also as a source of income.

► Different sizes of airport will encourage different forms of consumer behaviour.

► Airports that are significant enough to generate tourists (as opposed to being 'tourist receivers') will benefit from not being as significantly impacted by seasonal fluctuations or long-term trends in the popularity of tourist routes.[135]

In relation to direct employment, the three broad categories of employees in airports are: airline operation/service (such as ground handling, airline staff, fuel staff, freight operations staff and all maintenance staff), administration (such as airport company, police, immigration and customs employees) and commercial (such as duty free retail, restaurants and car hire companies).[136]

A sample breakdown of employment at an airport presented by York Aviation (2004) shows two thirds being sourced from airline staff, handling agents and aircraft maintenance. The remainder was split between in-flight catering, restaurants and bars and retailing (12%), air traffic control and control agencies (6%), freight (1%) and other activities such as fuel companies and ground transport operators (3%).

As part of this analysis, Ernst & Young reviewed the breakdown of types of employment at a selection of Australian and international airports. Table 143 and Table 144 can be found in Appendix C.

Based on the data we were able to compile, we observed the following:

► The analysis shows that the composition of the workforce at an airport can vary significantly depending on the size, location, and specialisation of the airport. For example, the percentage of employment accruing to retail or freight can be very small or

[132] Our analysis was unable to decipher any other observations regarding PAX per direct employee across different world regions. There is a risk that this information may include inconsistent classifications and overstate the true level of employment due to the nature of the reports. To minimise the risks inherent in using this information Ernst & Young have also taken into consideration the analysis undertaken within the Joint Study.
[133] Sydney Airport Corporation Limited, *The Economic Impact of Growth at Sydney Airport*, URS, January 2008
[134] The Port Authority of New York and New Jersey, *Facts & information*, LaGuardia Airport, http://www.panynj.gov/airports/lga-facts-info.html, accessed 24 July 2012
[135] Andrew, R. (2006), "The contribution of Airports to Regional Economic Development", University of Luton, United Kingdom
[136] York Aviation (2004), The social and economic impact of airports in Europe

large depending on the competitive advantage and level of development of the airport. The average breakdown by airport in the sample is 43% for air services, 26% for other services, 12% for freight and 22% for supportive operations;

- Between all the international airports for which we accumulated workforce composition data, there exists broad variability. However, there are employment categories where many of the airports are somewhat consistent and there are only a few outliers.
- For many airports, broadly 30% of direct employees are employed specifically for airlines servicing the airport.
- Freight and government operations tend to take up the second and third largest proportions of the workforce located at each airport
- Employment categories such as construction, ground transportation/car rental and administration normally explain the majority of the workforce that remains.
- Employment dedicated to freight varies largely between airports, as some airports are more dedicated to passenger services (Washington has less than 0.5% of its workforce dedicated to freight as its annual throughput is only 6,261 tonnes) than others (Anchorage International Airport has 39% of its workforce dedicated to freight as its annual throughput is 2.6 million tonnes)
- From a high level analysis, there seems to be no clear relationship between the percentage of an airport's workforce that is hired specifically for airline services and the number of PAX. Rather, as previously stated, the figure is broadly consistent at 30% and outliers to this phenomenon also cannot be explained by the number of PAX.

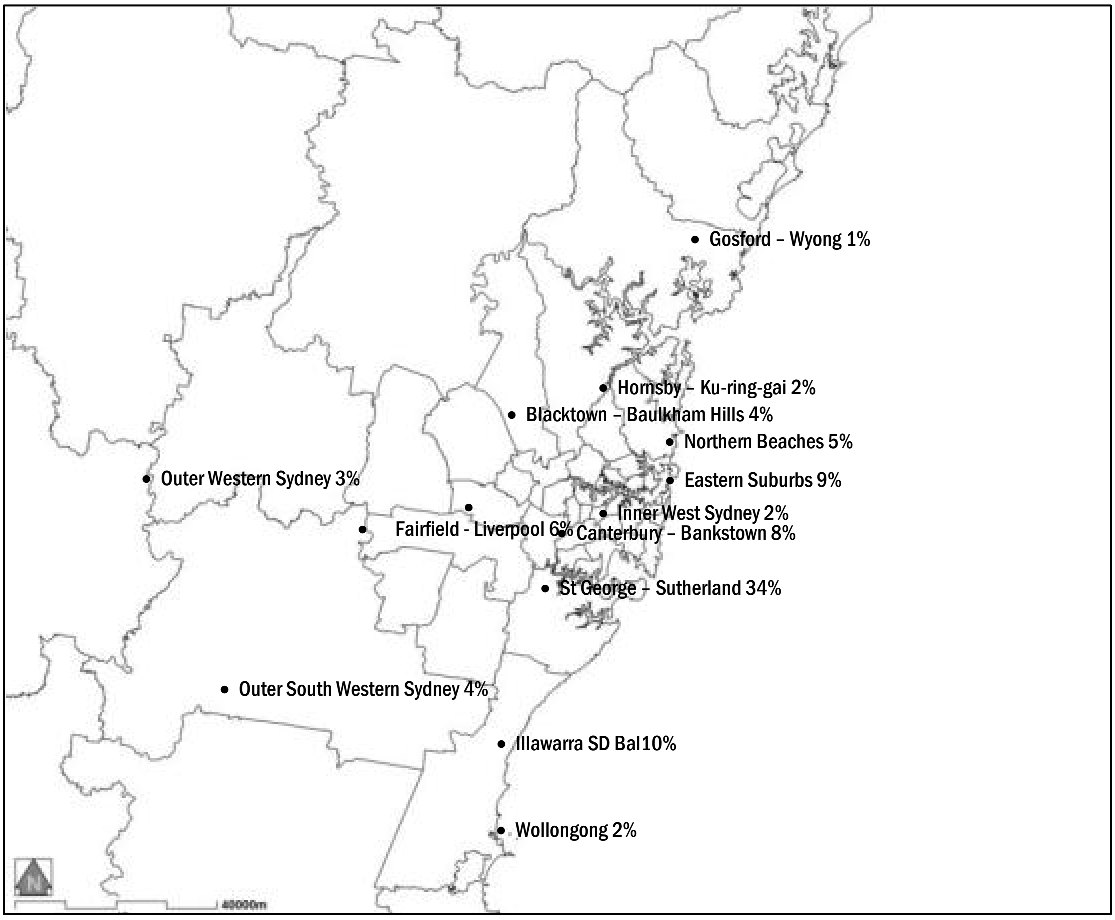
6.3.3 Airport related employment catchments

The sections above provide background as to the total direct, indirect, and induced employment that is generally realised from the development of an airport of a certain size and activity level. This section analyses the general geographic distribution of where people who take up these employment opportunities reside. This is important as it will determine the population growth – and thus growth in indirect economic activity and employment – that will be realised within the airport's surrounding region.

6.3.3.1 Sydney and Australia

As seen in the figure and table below, the Sydney Airport Ground Travel Plan (2006) showed that almost 60% of KSA employees reside in areas adjacent to the airport (St. George – Sutherland, Canterbury – Bankstown, the eastern suburbs and inner Sydney).

Figure 13: KSA employee's distribution



Source: Sydney Airport Ground Travel Plan (2006)

This can be seen in Table 9.

Table 9: KSA's employee distribution

Area	Percentage of employees from KSA
St George – Sutherland	34%
Illawarra SD Balance	10%
Eastern Suburbs	9%
Canterbury - Bankstown	8%
Fairfield - Liverpool	6%
Northern Beaches	5%
Blacktown – Baulkham Hills	4%
Outer South Western Sydney	4%
Outer Western Sydney	3%
Inner West Sydney	2%
Hornsby – Ku-ring-gai	2%
Wollongong	2%
Gosford - Wyong	1%

Source: Sydney Airport Ground Travel Plan (2006)

As part of this study, we also undertook an analysis of Australian Bureau of Statistics data to determine where employees at other major airports within Australia reside.

6.3.3.2 International examples

An international example of the geographic distribution of where employees reside is provided by Heathrow Airport. The results of the Heathrow Airport Employment Survey (2008/9) [137] reveal that 45.5% of direct airport/airline employment was sourced from the local labour area. The report also estimates that 25% of the indirect employment resulting from the airport is sourced locally and 51% from the greater London area.

Studies have been undertaken to determine the distribution of indirect employment within the local region around an airport as a result of its development. Using survey evidence of economic evaluations of 25 European airports, York Aviation (2005) applied the weighted average to construct multipliers that determine the distribution of these jobs. The survey evidence suggested that, on average, for every 1,000 direct FTE persons employed at an airport, there are around 2,100 indirect/induced jobs supported nationally: 1,100 of these indirect/induced jobs are supported regionally and 500 are situated locally.

6.3.4 Other employment opportunities (indirect/induced/catalytic)

The development of an airport will result in people being employed elsewhere in the economy to provide goods and services to the airport, as well as to meet the increased demand of goods and services required generally as a result of higher aggregate wages and expenditure within the economy. [138]

Estimating the amount of indirect/induced/catalytic employment generated by an airport relies on the use of multipliers that estimate the effect of direct employment on less direct employment. It allows the subsequent employment effects to be summarised and then compared with other airport projects. These are often derived from input-output or general equilibrium models.

By analysing publicly available annual reports, master plans and economic impact statements, Ernst & Young were able to acquire data on the employment figures of domestic and international airports to analyse for this report.

Table 10 presents the PAX, freight throughput per annum and the direct, indirect and total employment that arises due to the existence of those airports where information is publicly available.

Table 10: Employment figures of Australian Airports

Airport Details	Size		Employment		
City of Airport	Current passenger throughput per annum (millions)	Current freight throughput per annum ('000 tonnes)	Direct	Indirect	Total
Australia					
SYDNEY	32	634	75,580	130,553	206,133
MELBOURNE	25	350	12,542	-	-
PERTH	9	50	8,700	10,000	18,700
ADELAIDE	7	21	6,800	9,751	16,551
BANKSTOWN	N/A	N/A	2,479	3,513	5,992
CAIRNS	4	N/A	2,400	27,600	30,000
International					
DALLAS/FORT WORTH TX, US (DFW)	58	653	61,775	-	305,000
DUBAI, AE (DXB)	51	2190	58,000	43,000	101,000
MADRID, ES (MAD)	50	370	11,688	1,597	13,285
PHOENIX AZ, US (PHX)	41	302	33,639	103,793	137,432
MINNEAPOLIS MN, US (MSP)	38	355	28,545	11,264	39,809
SEATTLE WA, US (SEA)	33	280	18,773	4,723	23,496
COPENHAGEN, DK (CPH)	23	312	22,000	-	-
VIENNA, AT (VIE)	21	278	18,000	52,500	70,500
MANCHESTER, GB (MAN)	19	107	19,000	42,500	-
BRUSSELS, BE (BRU)	19	475	21,000	40,000	-
WASHINGTON, DC, US (DCA)	19	6	7,006	12,583	-
CAIRO, EGYPT (CAI)	13	40	4,000	16,000	-
PORTLAND, US (PDX)	14	206	10,574	2,147	17,499
HOUSTON, US (HOU)	10	54	7,172	14,629	52,069
MILWAUKEE, US (MKE)	10	77	6,340	13,299	38,595
JOHN WAYNE, US (SNA)	9	16	3,305	24,858	42,162

Source: Compiled by Ernst & Young from York Aviation Study (2004) and publicly available documents

Table 10 also presents the employment density of airports based on PAX per number of direct employees. A traditional 'rule of thumb' used for direct employment from airports is 1,000 jobs per 1 million passengers. The above figures indicate that there is some broad consistency with this rule, even though there is a large degree of variation between the employment densities of different international airports.

[137] Optimal Economics (2011), *Heathrow Related Employment*, September 2011
[138] This classification includes that employment that would be realised by those businesses operating near the airport in a business park development

6.3.5 Wider impacts on employment

Increasing aviation capacity can have significant employment impacts, both at airports that are large employers in their own right and in a range of activities supplying the airport. Beyond these direct and indirect employment benefits, aviation capacity can have potential implications for the wider labour market.

For example, in the context of London, it has been argued that the number of destinations accessible will widen the pool of talent from which businesses are able to recruit, thereby increasing London's productivity by allowing the city to attract more highly skilled workers.[139] Furthermore, research carried out by Oxera suggests that aviation sector workers are more productive than the average worker by approximately £17,100 (AU$27,500) per annum.[140]

The international labour force is particularly significant to Australia's economy in certain skilled sectors. As highlighted by the Productivity Commission, migration contributes to the economy in many ways, including the up-skilling of the workforce, economies of scale and the development of new export markets. Indeed, the Productivity Commission concluded that increasing skilled migration will 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 in and out of Australia.[141]

6.4 Social

Airports have multiple impacts on the social fabric of both the region and the nation that goes beyond general employment benefits.

Based on global and local experience, the planning, development and operation of large scale airports can have a range of social impacts – both positive and negative – on various communities. The nature and spatial spread of such impacts depend to a large extent on either the proximity of residential areas to the airport or the functional relationship that people have to the airport as either airport users or airport workers.

This section outlines the major social benefits that airports create.

6.4.1 Living standards and quality of life factors

Living standards refer to the level of comfort, wealth and material goods that an individual or group possesses. Living standards and quality of life are driven by a number of factors including income and purchasing power, accessibility to employment and goods and services, infrastructure and national economic growth, the quality and affordability of housing, the number of vacation days per year, and access to health and education.

[139] '*A new airport for London*', Mayor of London (2011)
[140] *'What is the Contribution of Aviation to the UK Economy?'* Final Report Prepared for the Airport Operators Association, Oxera (2008)
[141] '*Economic impacts of Migration and Population Growth*', Productivity Commission (2006)

Enhancing national infrastructure with the development of an airport can increase living standards for both the surrounding region as well as the wider nation. Through its ability to connect regions and act as a major employment / industrial hub, an airport can provide a number of benefits including additional connectivity and employment opportunities to local residents, an increase in tourism and business opportunities, and improved accessibility for the wider economy (through both increased aviation capacity and the introduction of supporting transport infrastructure).

6.4.1.1 Social and cultural benefits resulting from enhanced connectivity

Australia is a big and isolated country with a widely dispersed population, and the aviation sector provides an essential service by physically connecting people and business to one another and the rest of the world. Introducing a second airport to the Sydney basin can enhance connectivity and increase the country's ability to attract tourism through service frequency and affordability. In turn, this may lead to an increase in the number of flights for leisure purposes and deliver a range of social and cultural benefits associated with increased travel.

Relative access to aviation services is a key determinant in the likelihood of a person choosing that mode to travel. An example of this is the increase in the number of aeronautical trips undertaken by Geelong and Gold Coast residents once they were provided greater access to civil aviation services from the Avalon and Coolangatta airports (respectively).

As of November 2010, there were 200 passenger aircraft and 25,000 passenger movements per week at Avalon airport. It has been estimated that 70% of these passengers were Victorian residents who were new flyers only attracted to flying due to the location and low-cost nature of services provided through Avalon airport.[142]

Holiday makers will benefit from greater choice when planning their travel, due to the potential introduction of more affordable flights[143] coupled with increased connectivity to a wider range of domestic and international destinations. Increased travel to a wider range of destinations around the world will broaden people's leisure and cultural experiences. There are numerous benefits associated with increased travel, some of which are listed below:

- ► Increased knowledge, broader perspectives, exposure to different cultures and ways of life, and increased awareness of national and international issues;
- ► New experiences that stimulate ideas, greater resourcefulness and innovation; and
- ► Relaxation and reduced stress from being away from the day-to-day home and work environment and the opportunity to spend time with family and friends.

6.4.1.2 Social benefits of employment opportunities

Employment, and the associated income, provides benefits to communities beyond personal subsistence and consumption. The fabric of a community relies on a group of individuals pursuing their respective interests and ambitions in life. Adequate economic opportunities within a community not only offer the psychological benefits associated with a stable and satisfying workplace, but also provides additional career choices without relocation.

More remote communities do not have access to the same standard of infrastructure as urban communities; in areas such as education, transport, and communications. Should this be combined with insufficient economic opportunities, strong economic incentives to relocate will exist (particularly for young adults). This phenomenon impacts on the diversity of the demographics in the community and the utility of being near family.

With more employment opportunities and career choices, there are likely to be higher levels of social cohesion and a greater sense of community in the region. This feeds into other social benefits including increased social inclusion, good mental health and greater life satisfaction.

6.4.1.3 Jobs closer to home and impact on work/life balance

The opportunity to work closer to home provides a number of social benefits to individuals, employers and society as a whole.

Working close to home has the potential to reduce commuter times for individuals and thereby reduce energy use, cut carbon emissions, raise the overall productivity of the workforce, and increase people's leisure time. It will also promote an active and healthy lifestyle and lower the incidence of inaccessibility and isolation experienced by many residents in new, outer suburban areas.

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[142] Avalon Airport: Economic Benefit Study, Avalon Airport Australia Pty Ltd, July 2010, http://www.avalonairport.com.au/cms/wp-content/uploads/2012/02/10066-Avalon-Airport-EIA-Final-Report-22-July-2010.pdf
[143] Than would otherwise be the case within a supply constrained market

More people working close to home will also improve overall congestion on roads and public transport by reducing the number and length of commuter trips required for people in high growth areas.

6.4.1.4 Land prices

A change in the price of land can have varied impacts on those using that land. For example, those owning the land are likely to benefit through increased wealth (potential resale value) which they can leverage or through higher aggregate returns (for example, charging higher rents), whereas a renter of property that has increased in value can experience a negative impact on their wellbeing through the charging of higher rents. On the other hand, Governments can receive higher revenues (through local government rates and State Government land taxes).

As with the development of any large piece of infrastructure, the construction of an airport will impact on the dynamics of the area, which will ultimately impact the land's value. The change in dynamics will vary due to a number of factors, including:

- Service capacity (passengers and freight)
- Location
- Accessibility (employment and services)
- Noise
- Development restrictions.

Due to their size, airports are generally developed in greenfield locations and for this reason, there is often a large change in the value of the land surrounding the new airport. Residential properties within close proximity to the airport and under a flight path often experience a fall in value. This is more significant in high value areas. Rural land around larger airports that can be developed for other uses generally experiences significant uplift in value (even before rezoning) as developers and land bankers anticipate strong demand from commercial, industrial, retail and accommodation businesses.

Airport freight and passenger capacity is likely to have a significant impact on the types of surrounding land uses. Airports with large freight capacities often attract more logistic and manufacturing uses, whereas airports with large passenger capacity may attract more accommodation and retail uses.

6.4.2 Strengthening communities and supporting development

Transport infrastructure, employment opportunities, community inclusion and identity, as well as proximity to family, services and work, are all factors that can determine the living standards experienced by a community.

While their primary role in an economy is as a transport node, airports also play a significant role in the regional economy and the development of their surrounding communities. For communities, airports are able to increase accessibility to business and leisure flights, employment and vital infrastructure such as health and education, with positive impacts on community living standards, stability and identity.

Furthermore, an increase in economic activity associated with the development of the airport will result in a range of social benefits to local residents through increased employment opportunities and services provided.

6.4.2.1 Benefits of greater connectivity

More accessible and affordable flights will lead to an increased number of flights for business and leisure purposes and greater national connectivity. Greater national connectivity has the potential to deliver a range of benefits including increased national cohesion, reduced business costs, improved knowledge and awareness, and a stronger national identity.

Outside of the Sydney basin, the provision of additional regional aviation services will increase the connectivity of regions and support regional development.

As highlighted by the NSW Department of Planning and Infrastructure, regional and remote communities within NSW are anticipated to grow by approximately 550,000 between 2006 and 2036, equivalent to a 22% increase over 30 years. Aviation services provide a necessary link between remote areas and key commercial centres, which enables regional communities to access a wider range of labour and commercial services. Furthermore, increased connectivity will provide regional communities with access to vital public services including health, education and government services.

6.4.2.2 Benefit to the local community

Airports are significant pieces of infrastructure that can transform local communities through a number of social and cultural impacts. Such significant projects can reduce residents' isolation from family and vital infrastructure and be a catalyst for improved community stability and identity, enhancing their quality of life.

WSROC's *Future Directions Western Sydney 2030* paper indicates the importance of strengthening the identity of the communities of Western Sydney. The paper indicates that communities in Western Sydney need to improve their brand; create distinct identities; enhance community pride and invest in iconic projects and signature events in order to maintain and attract resources (labour and capital and promote economic investment and community development.[144]

The development of an airport can increase stability, social cohesion and sense of community identity, as airports and their adjacent regions can over time develop into a hub for transport, industry and employment. Such development increases:

- Employment opportunities without the need for relocation of local residents;
- Incentives for resources (labour and capital) to be pulled toward and invested in the community; and
- Accessibility to other valuable infrastructure such as education, health and communications.

[144] *Future Directions Western Sydney 2030*, WSROC

6.4.2.3 Supporting the growth of Sydney

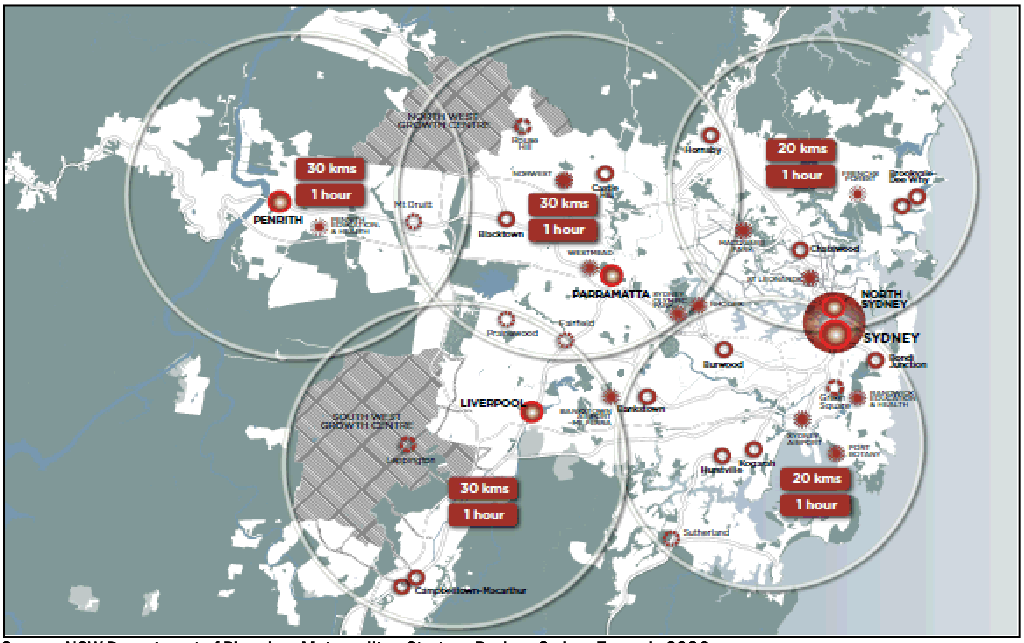
The sustainable distribution of population and economic growth of Sydney over the medium to long-term is a major issue facing the city. Sydney will require more than one major centre to support the wider region, due to the limitations imposed by land use planning (geographic and population growth implications), the supply and demand impacts on land and property prices, and the importance of maintaining and improving the quality of life for residents of the Sydney basin.

Securing the sustainable growth and continued global success of Sydney as a 'City of Cities' is a key factor of the NSW Government's urban policy. The 'City of Cities' concept describes a compact, multi-centred and connected city structure. Each 'city' within this structure offers services, employment, retail and entertainment and cultural facilities at a regional scale, acting as 'capitals' for their regions.

A 'City of Cities' approach to the management of future growth attempts to develop a network of economic centres across the city and to direct future growth in and around those centres. This will decentralise economic activity away from the CBD, but develop agglomeration economies at other points in the city that are closer to where people live.[145]

The NSW 2021 State Plan seeks to plan for towns and cities that are accessible and viable, easing travel between work and home and allowing residents to spend more time with their families. The State Plan aims to use strategic and land use planning to increase the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney.[146]

Figure 14: Sydney basin economic centres



Source: NSW Department of Planning, Metropolitan Strategy Review: Sydney Towards 2036.

A second airport in the Sydney basin will introduce a significant piece of infrastructure that can act as a hub for transport, industry and employment. The location of this infrastructure could work with existing price signals to encourage the movement of economic activity to the airport's surrounding area, assisting in the development of a new major centre to support the future growth of the Sydney basin.

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[145] Brown & Peterson 2010, *"The Macquarie Commission": A proposal to examine, manage and govern sustainable population growth in greater Western Sydney"*
[146] NSW Government, NSW 2021: A Plan to Make NSW Number One, 2011, http://www.2021.nsw.gov.au/

6.4.2.4 Increase in tax revenue

The increase in economic activity, both aeronautical and non-aeronautical, that is generated from the development of an airport will ultimately result in additional tax revenue at all levels of government. It is possible that this additional government revenue can then be re-distributed in the form of increased social welfare transfers or lower income and corporate taxes. Additionally, it can be spent by different levels of government on other projects that are significant to their respective communities. Therefore, an increase in tax revenue can potentially further add to the living standards of the Australian population and the social benefits indirectly created by the introduction of a second airport.

An increase in 1% in GDP generally relates to an increase of 0.2% in national tax revenues.[147] This increase in tax revenue will impact on the level of services that can be provided by governments.

6.5 Sydney aviation context

The development of another airport within the Sydney basin that will effectively increase the supply of aviation services will provide many economic and social benefits to the region, through direct and indirect employment and increased economic and related activities.

Ultimately, the impacts that any of the proposed airports will have on their respective regions will be directly related to their overall size and throughput, which will be determined by a number of factors including the potential catchment area, ease of access and people's willingness to travel further and/or longer to access these services. These factors are discussed in further detail throughout the report.

[147] Ernst & Young analysis

Part D – Analysis of Badgerys Creek

Badgerys Creek airport summary

The region

- The region surrounding the Badgerys Creek site is well supported by an established and growing population base with 685,240 people residing within the region.
- The Badgerys Creek site is located in close proximity to a number of employment centres in Sydney's west, including Penrith, Parramatta and Liverpool.
- The Badgerys Creek sub-region is well-served by a number of major road and public transport links, including the M4, M5 and M7.

The development

- A Badgerys Creek airport, with supporting infrastructure, would be capable of catering for up to 70 million passenger movements per annum.
- The demand analysis undertaken by Booz & Co found that 9.2 million passengers would use aviation services at a Badgerys Creek airport when it first opens in 2025. This would increase to 28.5 million passengers by 2040 and ultimately 54.0 million in 2060.

Operational impact of the airport

- An operational airport at Badgerys Creek would increase carbon emissions within the Sydney basin, in addition there would be an estimated 8% - 9% increase in NOx emissions.
- A total 1,536 persons would experience 100 additional N70 events every day (equivalent to a truck driving past 10 metres away), while 69,660 persons would experience 10 additional N70 events per day.

Employment impacts of the airport

- Approximately 2,300 to 3,300 FTE persons would be employed to build the airport over the construction period.
- Approximately 30,500 FTE jobs would be created at the airport by 2060.
- Industrial/commercial developments near the airport would support approximately 30,000 employees by 2060.

Economic impacts of the airport

- A second airport at Badgerys Creek would introduce significant pieces of infrastructure that would support the growth of western Sydney.
- The development of an airport at Badgerys Creek is forecast to increase GDP by $1,636 million in 2025, increasing to $23,942 million in 2060.
- The airport has the potential to save up to 3.92 million of commuting hours per annum by 2060 as a result of people working closer to home.

7. Badgerys Creek regional context

This chapter introduces the background context for the Badgerys Creek study region and provides a baseline for comparison against potential impacts that an airport may have on the region.

7.1 The study region

The following sections present the relevant background information regarding the region, both currently and what is planned for the future, to determine the impact of an airport.

The Badgerys Creek study region is defined as the area bounded by Liverpool, Penrith, Fairfield and Bankstown Local Government Areas (LGAs). This study region was defined by Ernst & Young in consultation with government stakeholders, other consultants and the Bureau of Infrastructure, Transport and Regional Economics.

Figure 15 highlights the Badgerys Creek airport site relative to the study region and the wider Sydney basin.

Figure 15: Badgerys Creek airport site and region

Source: Department of Planning and Infrastructure

The following analysis of the region includes the relevant socio-economic composition, current business and employment drivers, and the current provision of infrastructure that supports the region. This section also provides a snapshot of other planned development in the region.

7.1.1 Socio-economic composition

A socio-economic analysis was undertaken of residents within the study region. This analysis was undertaken to establish the current socio-economic composition of residents within the region to determine how an airport will impact their lives.

Table 11 presents the socio-economic composition of the Badgerys Creek region.

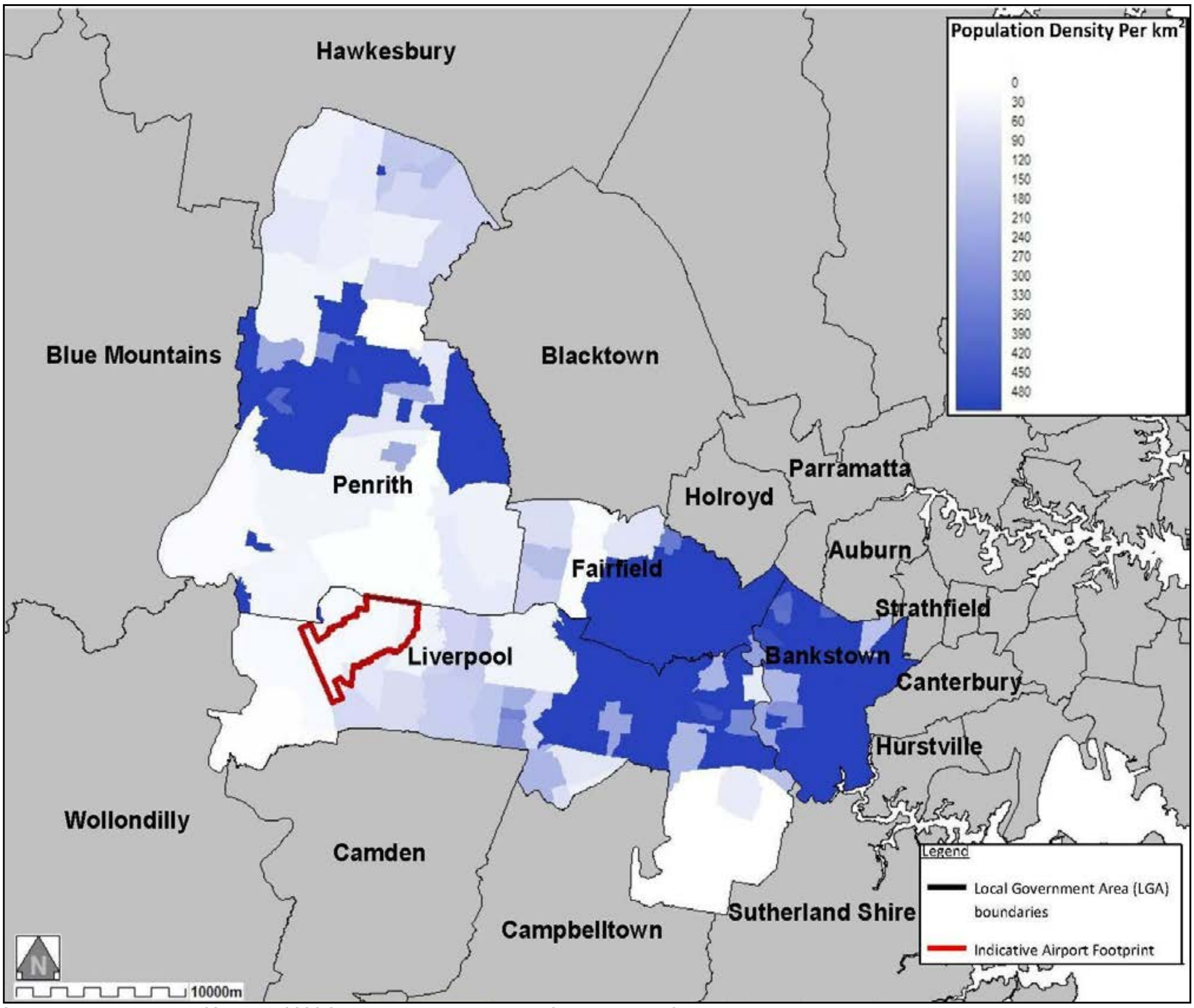
Table 11: Socio-economic statistics for Badgerys Creek

Statistical Indicator	Value
Population	685,240
Households	224,636
Person Per Dwelling Ratio	3.1
Age Profile	
Infants 0 to 4 years	51,219
Children 5 to 17 years	136,527
Adults 18 to 64 years	426,258
Mature adults 65 to 84 years	64,091
Senior citizens 85 years and over	7,139
Average Age	35.7
Employment	
Full Time	190,209
Part Time	79,666
Unemployed	22,864
Not in Labour Force	190,395
Type of employment	
Managers	12%
Professionals	17%
Technicians and Trades Workers	15%
Community and Personal Service Workers	8%
Clerical and Administrative Workers	16%
Sales Workers	11%
Machinery Operators And Drivers	11%
Labourers	11%
Not stated/inadequately described	1%
Qualification Attainment	
Postgraduate Degree Level	3%
Graduate Diploma and Graduate Certificate Level	1%
Bachelor Degree Level	14%
Advanced Diploma and Diploma Level	9%
Certificate Level	19%
No post-school qualification	47%
Not stated/inadequately described	7%
Household Income Profile (pa)	
Negative income	0%
$1-$149	5%
$150-$249	5%
$250-$399	10%
$400-$599	20%
$600-$799	18%
$800-$999	14%
$1,000-$1,299	13%
$1,300-$1,599	8%
$1,600-$1,999	4%
$2,000 or more	4%
Not Stated	2%
Home Ownership	
Residents Own/Mortgage	70%
Rent	30%

Source: .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data

Figure 16 presents the geographical distribution of where people reside within the region.

Figure 16: Geographical distribution of population



Source: Australian Bureau of Statistics 2006 Census data and Department of Planning and Infrastructure

Figure 16 highlights that the areas with the greatest population densities are to the north and to the east of the site. Areas to the immediate north and west of the site are sparsely populated, with population density increasing further away from the site. While the areas immediately to the south and east of the site are inhabited, this area has relatively lower population density.

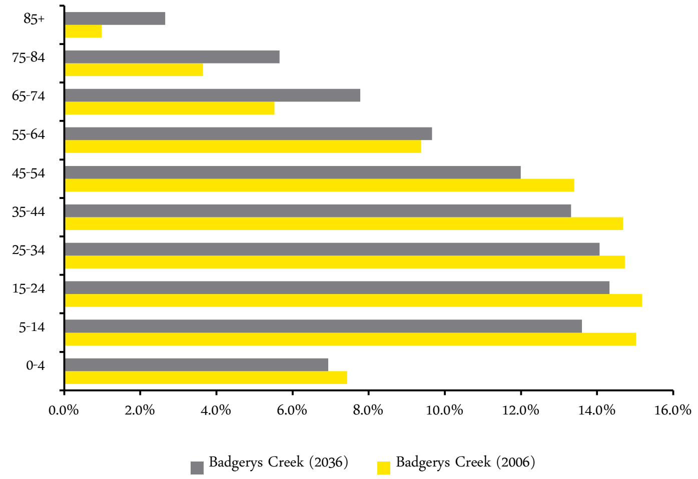
The region that supports Badgerys Creek currently has 7.8% unemployment, with 39% of the working age population (18 to 64) not in the labour force. Within the Sydney Statistical Division, the unemployment figure is 5.3%, with 31.8% of the working age population not in the labour force. Within Australia, the unemployment figure is 5.2%, with 26.5% of the working age population not in the labour force.

The average age of residents within the region is 35.7[148]; this is 1.9 years younger than the average age of people residing in the Sydney Statistical Division.

The average age in the region is expected to grow over time, as shown in Figure 17.

[148] Average Age was calculated by averaging the median values of each age bracket from .id – the population experts (http://home.id.com.au/), with the median value of the '85 and over' age bracket set as 92.5. The average for Sydney Statistical Division was obtained from ABS website.

Figure 17: Age distribution for Badgerys Creek



Source: Department of Planning and Infrastructure, Population Forecasts

This figure demonstrates that between 2006 and 2036, the proportion of the region's population over 65 will grow from 10.2% to 16.1%.[149] At the same time, the population over 65 in the Sydney Statistical Division will grow from approximately 12.0% to 18.0%.[150]

The average income of residents within the region is $817 per week,[151] compared to $1,254 per week in the Sydney Statistical Division. Badgerys Creek residents currently earn approximately $22,800 per annum less income (on average) than the wider Sydney region.[152] Furthermore:

- 20% of households within the region earn less than $399 per week, compared to 8% in the Sydney Statistical Division.
- 65% of households within the region earn between $400 and $1,299 per week, compared to 52% in the Sydney Statistical Division.
- 15% of households within the region earn over $1,300 per week, compared to 38% in the Sydney Statistical Division.

The region has a greater percentage of residents with only high school education (47%) than the Sydney Statistical Division (30%), and the percentage of residents with a Bachelor Degree or higher (18%) is lower than that in Sydney (48%). This may indicate that the skills mix in the region is different and more orientated toward lower skilled jobs relative to the wider Sydney region.

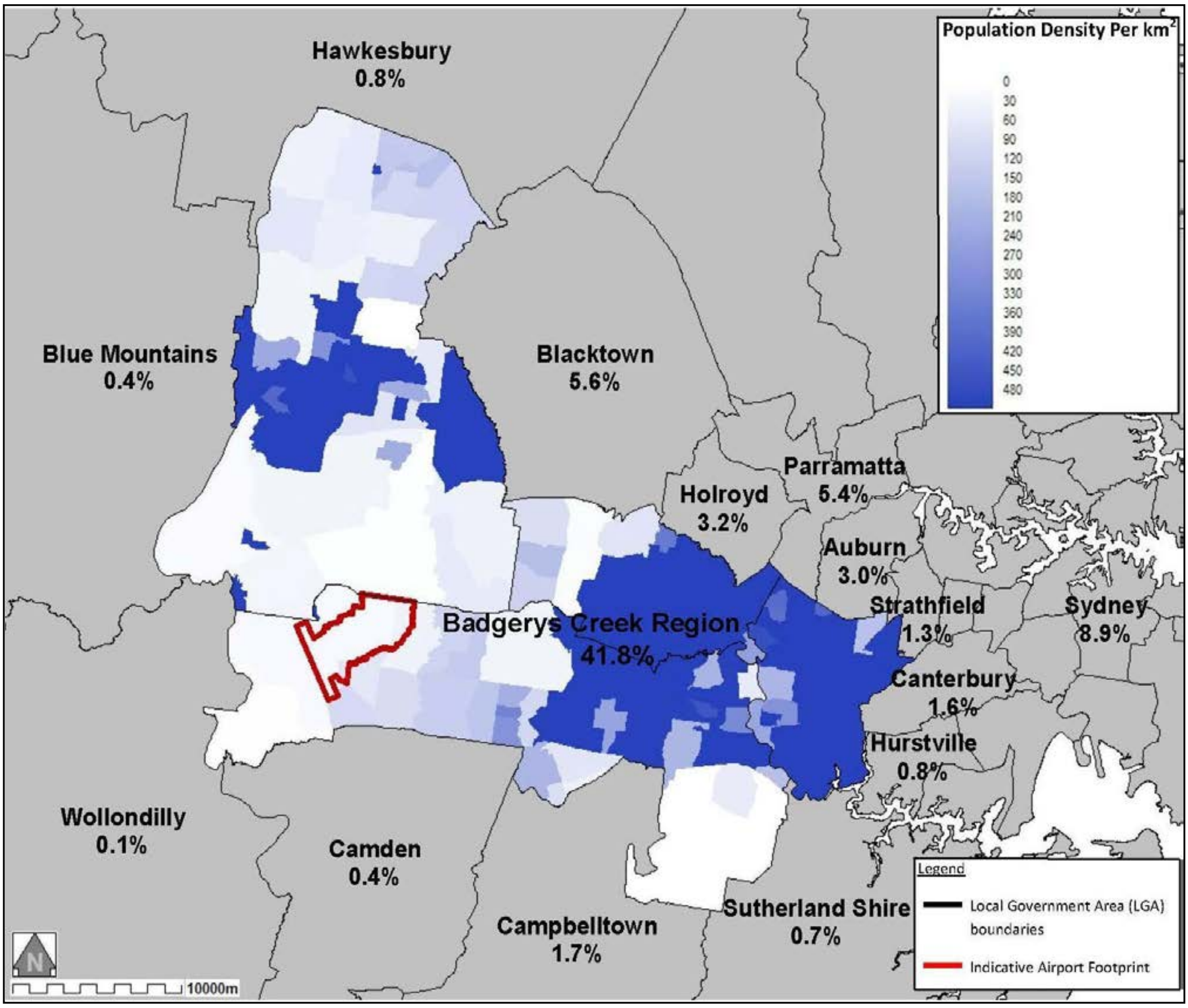
'Skilled'[153] employment makes up 52% of employment in Badgerys Creek, relative to 66% within the wider Sydney region. Of those workers that reside within the region, the greatest industry participation is in the manufacturing sector (20%), followed by retail trade (12%).

Of those persons who reside within the region, 42% are employed within the region; 25% are employed in the adjoining regions of Hawkesbury, Blacktown, Holroyd, Parramatta, Auburn, Strathfield, Canterbury, Hurstville, Sutherland, Campbelltown, Camden, Wollondilly and the Blue Mountains; and 9% work within the Sydney area.[154]

Figure 18 illustrates the region's employment distribution based on 2006 Census data.

Figure 18: Employment distribution of residents within the Badgerys Creek region (each sub-region as a percentage of total)

[149] Department of Planning and Infrastructure population projections for NSW
[150] Department of Planning and Infrastructure population projections for NSW
[151] Average Individual Weekly Income was calculated by averaging the median values of each income bracket from .id – the population experts (http://home.id.com.au/), with the median value of the '$2,000 or more' bracket set as $2,500.
[152] Sydney Statistic Division as described by the Australian Bureau of Statistics
[153] We have defined skilled employment as including; managers, professionals, technicians and trade workers, as well as community and personal service workers.
[154] Population representation based on Australian Bureau of Statistics 2006 Census Data



Source: WorleyParsons analysis – Bureau of Transport Statistics, Journey to Work summary table by Workplace LGA, Department of Planning and Infrastructure and Australian Bureau of Statistics 2006 Census data

7.1.1.1 Socio-economic Indexes for Areas

The Socio-economic Indexes for Areas (SEIFA) is a suite of four Australian community welfare measures provided by the Australian Bureau of Statistics (ABS).

For each index, every geographic area in Australia is given a SEIFA score that shows how disadvantaged that area is compared with other areas in Australia. This allows for ranking of regions and areas, providing a method of determining the level of social and economic wellbeing in each region.

The Index of Relative Socio-Economic Disadvantage (IRSD) focuses on disadvantage and is derived from 2006 Census variables such as low income, low educational attainment, unemployment and dwellings without motor vehicles. The IRSD for each of the LGAs surrounding the Badgerys Creek site is provided in the table below. Note that a lower score/rank indicates that an area is relatively disadvantaged compared to an area with a higher score/rank.

Table 12: SEIFA score and rank for each LGA surrounding Badgerys Creek

LGA	Population	Score	Ranking within Australia	Ranking within NSW	Minimum score for CDs in area	Maximum score for CDs in area
Bankstown	170,488	945	203	39	551	1113
Fairfield	179,893	876	86	4	553	1101
Liverpool	164,603	966	295	67	559	1135
Penrith	172,141	1006	494	114	707	1137

Source: ABS
Note: CDs are Census Collection Districts

As highlighted in the table above:

- Fairfield is the fourth worst LGA in NSW with respect to social disadvantage and 86th in Australia, indicating its relatively low levels of socio-economic wellbeing.
- Bankstown, Fairfield and Liverpool (3 of the 4 surrounding LGAs) are within the 50 percentile of NSW LGAs with the highest level of socio-economic disadvantage.
- Penrith is within the 25% of LGAs within NSW with the lowest levels of socio-economic disadvantage.

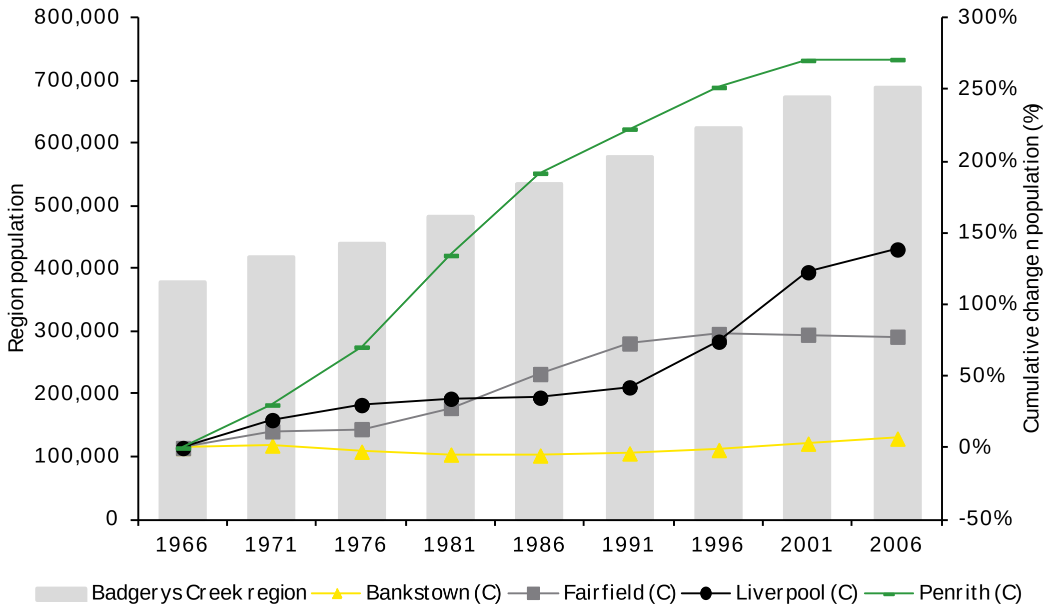
Overall, with an average score of 948, the LGAs surrounding Badgerys Creek currently provide a relatively low level of socio-economic wellbeing.

7.1.2 Historic growth of the region

The Badgerys Creek region as a whole has experienced substantial growth over the past 40 years. In 1966, the region as a whole had a population of 377,000, which has grown to 687,000 in 2006, representing a growth rate of 2% per annum.

The number of people residing within the region over this period and the cumulative change in population within the relevant LGAs is shown in the figure below.

Figure 19: Population growth of the region



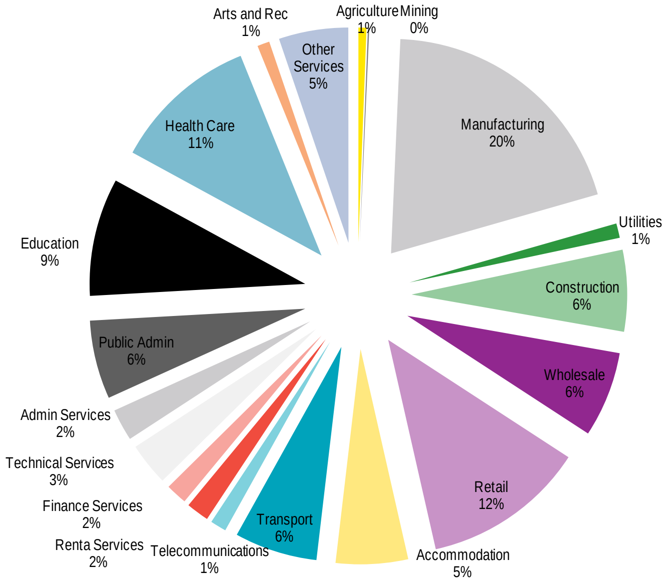
Source: ABS Census

As can be seen in the figure above, Penrith experienced the greatest growth within the region with an increase of 125,000, representing a 270% increase in persons residing within the region over the analysis period. Bankstown, with a population increase of 10,000 or 7%, experienced the least growth within the region.

7.1.3 Current business and employment

An analysis was also undertaken of the industries that are located within the region. This analysis was undertaken to determine the current composition of these businesses to examine how an airport will be beneficial to the region, as well as to analyse the potential for aviation-related industry sectors to develop within the region. Figure 20 presents a breakdown of employment by industry within the region.

Figure 20: Employment industry breakdown



Source: .id – the population experts (http://home.id.com.au/) analysis of ABS, 2006 Census data

As can be seen in Figure 20, the highest employing industries within the region are manufacturing (19.8%) followed by retail trade (12.2%).

Major businesses that operate within the region include:

- Liverpool Hospital
- Westfield Liverpool
- Bankstown Airport
- Westfield Penrith
- Boral Concrete & Quarries Ltd[155]

Figure 21 highlights the location of the major employment centres within the region. Penrith and Liverpool are already established 'regional cities' and Bankstown is an established 'major centre'. Leppington is a 'planned major centre', while Prairiewood, Fairfield and Cabramatta are seen as a 'potential major centres'. [156]

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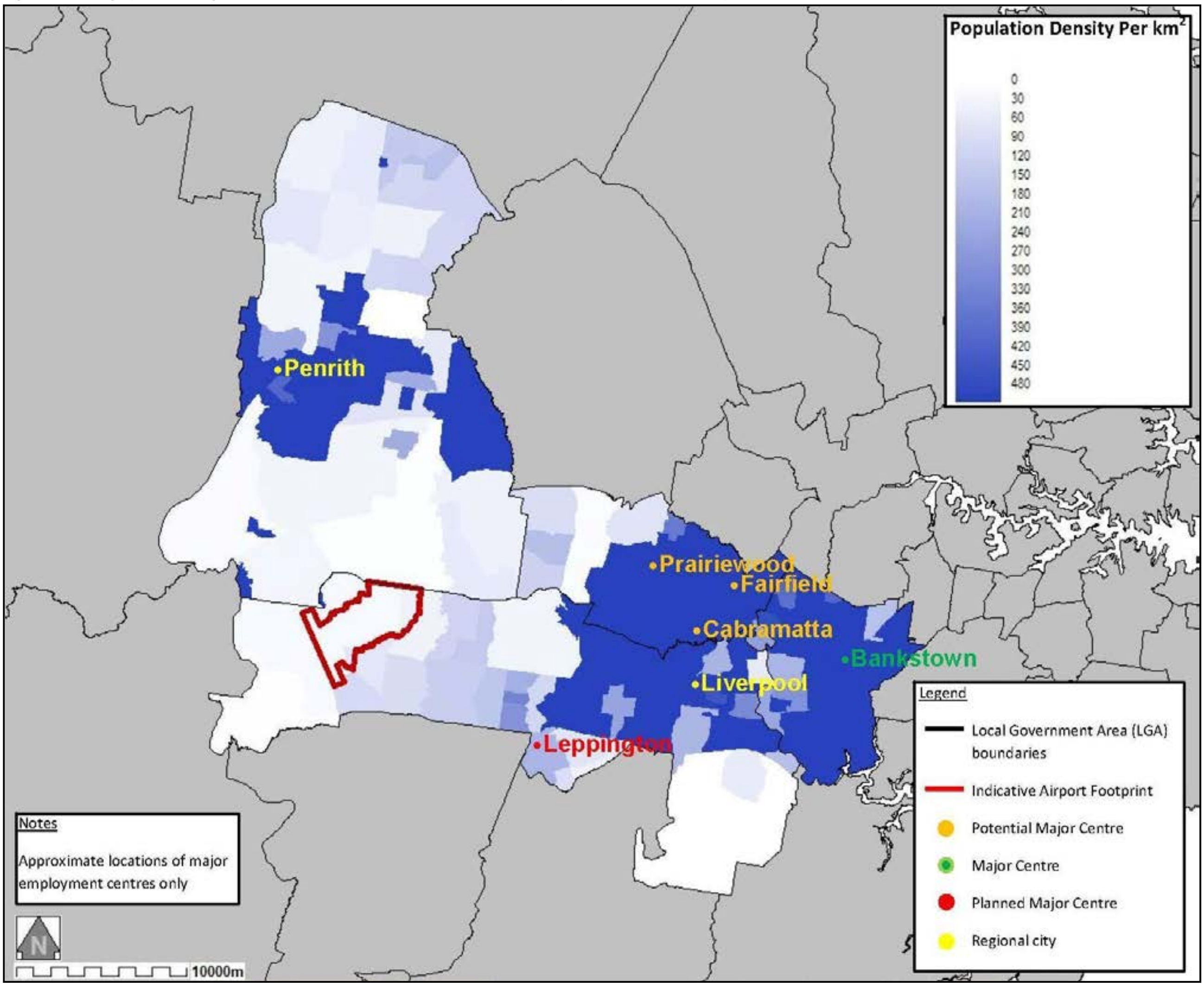
[155] A more complete list of employment centres within the region can be found in Appendix E
[156] Population representation based on Australian Bureau of Statistics 2006 Census Data

Figure 21: Badgerys Creek region's population distribution and location of major and planned employment centres



Source: Australian Bureau of Statistics 2006 Census data and Department of Planning and Infrastructure

Figure 132 and Figure 133 (which can be found in Appendix E) provide maps of the existing and proposed South West Employment and Western Central Employment Lands respectively that could affect the region and the airport development.

7.1.4 Current infrastructure provision

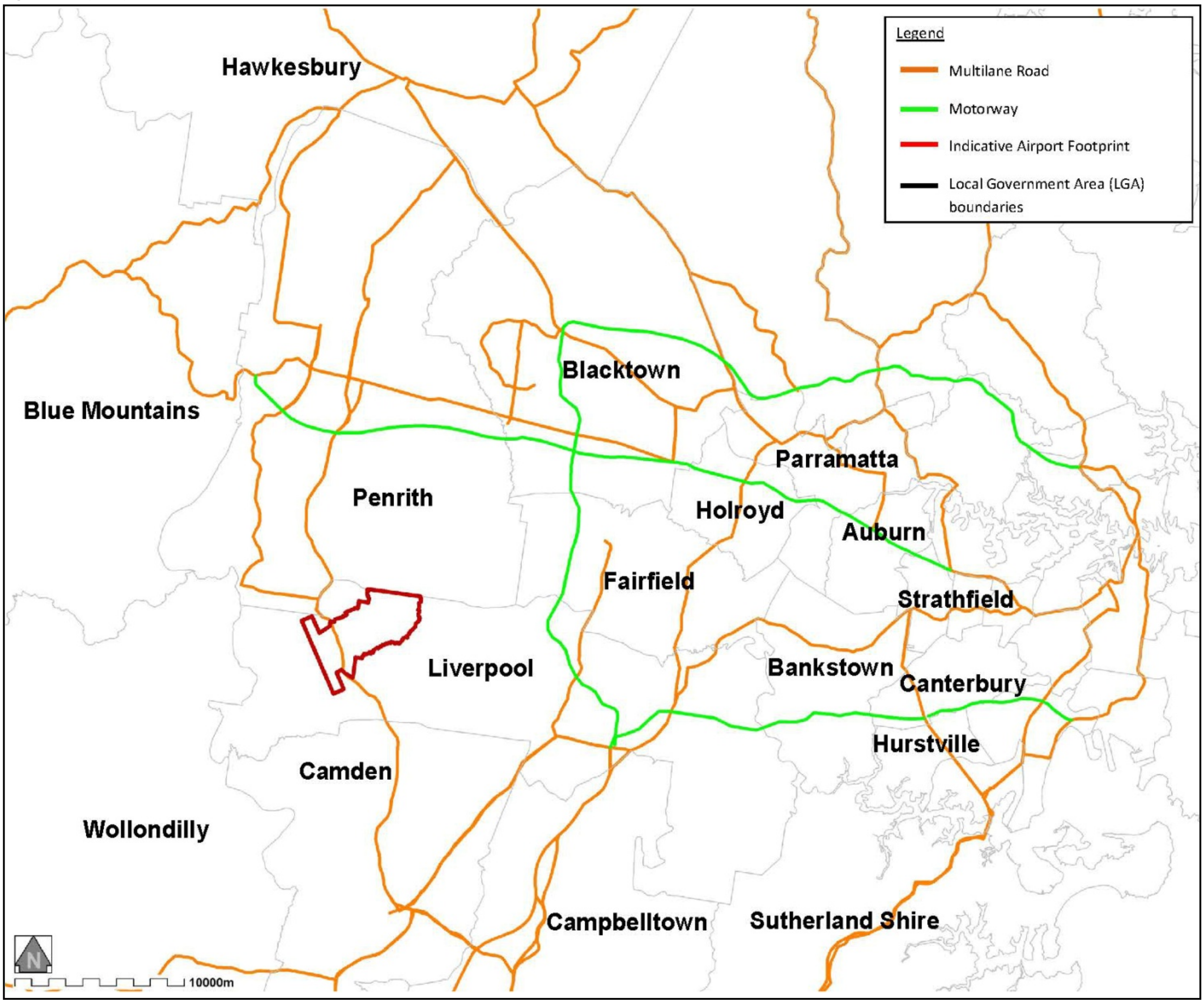
To determine the incremental impact on the study region following development of an airport an analysis of infrastructure that currently serves the region was undertaken. This section presents a high level analysis of the main transport, public transport and utility infrastructure that currently serves the region.

7.1.4.1 Roads

Motorways in the study region are the M4 (to the north of Badgerys Creek) and the M5 and M7 (to the east of Badgerys Creek). The two state roads that connect with the site are Elizabeth Drive (linking with the M7) and The Northern Road (linking with the M4 and Hume Highway). These two state roads are progressively being upgraded to four-lane divided carriageways.

Figure 22 highlights existing multi lane roads and motorways with respect to the relative location of the Badgerys Creek site and major population centres.

Figure 22: Sydney road network



Source: Department of Planning and Infrastructure and Google Maps

As the main west-east links from Western Sydney to Sydney CBD, the M4 and M5 currently carry very high levels of traffic. The current peak hour volume to capacity ratio and AADT (annual average daily traffic) of these main motorways and the projected increase in traffic volumes are shown in Table 13.

Table 13: Current and projected use of major motorways within the Badgerys Creek region

Motorways	V/C ratio	AADT	Projected growth (pa)
M4	0.45	87,273	1.1%
M5	0.80	98,194	1.1%
M7	NA	NA	1.1%
M2	0.31	38,634	1.1%
The Northern Road	0.34	17,290	1.1%
Elizabeth Drive	0.34	17,311	1.1%
Bringelly Road	0.19	9,449	1.1%

Source: NSW Roads and Maritime Services – Traffic Volume Data and Bureau of Transport Statistics – Travel forecasts 2006 - 2036
NA – data not available

As seen in Table 13, the existing motorways around the Badgerys Creek site on an annualised basis have capacity to take further traffic. There are a range of issues regarding peak hour congestion within these motorways that proposed projects are planned to correct (i.e. WestConnex).

The planned upgrades are as follows:

- ► Widening of the M5 from 2 lanes to 3 lanes running in each direction. This project has begun and is scheduled for completion by 2014. The widening will extend from the beginning of the M5 at Prestons through to King Georges Road at Beverly Hills.
- ► Construction of WestConnex over 10 years, which will include widening and extension of the M4 along Parramatta Road and duplication of the M5 east linking up with the M4 extension
- ► Planning for the upgrade of Bringelly Road from the intersection with Cowpasture Road to the intersection with The Northern Road. This would provide a connection between The Northern Road and the M5.
- ► Consideration of the upgrade to The Northern Road from Narellan to Mersey Road, Bringelly. This would provide a link from the airport site to Bringelly Road, then onto the M5.

7.1.4.2 Freight and restricted access vehicles

The Badgerys Creek site is strategically located close to significant freight industry clusters and the South West Growth Centre. This means it is within the catchments of planned intermodal freight terminals (IMT) including the Western Sydney Employment Area (approximately 20km by road) and Moorebank (approximately 25km by road).[157]

The Restricted Access Vehicle (RAV) network is managed by NSW Roads and Maritime Services. The RAV network identifies roads that are approved for B-double trucks, over-dimension vehicles (high and wide loads), higher mass limits (HML) and mobile cranes.

The Badgerys Creek site already has approved B-double (26m long and 4.6m high) access via The Northern Road and Elizabeth Drive. Both of these roads are also specified as HML and mobile crane routes. Access for over-dimension vehicles, higher mass limits and mobile cranes will be important during airport construction activities. Access for B-double trucks will be important for on-going freight operations and broader network connections to the M4 and M7 motorways and the Hume Highway.[158]

7.1.4.3 Public transport

Public transport provides critical infrastructure that supports a region's development by providing access for residents to major centres within the region and elsewhere. The major rail links that support the region include:

- ► The East Hills line to Macarthur
- ► The Bankstown and Inner West lines to Liverpool
- ► The Cumberland line from Bankstown to Campbelltown.

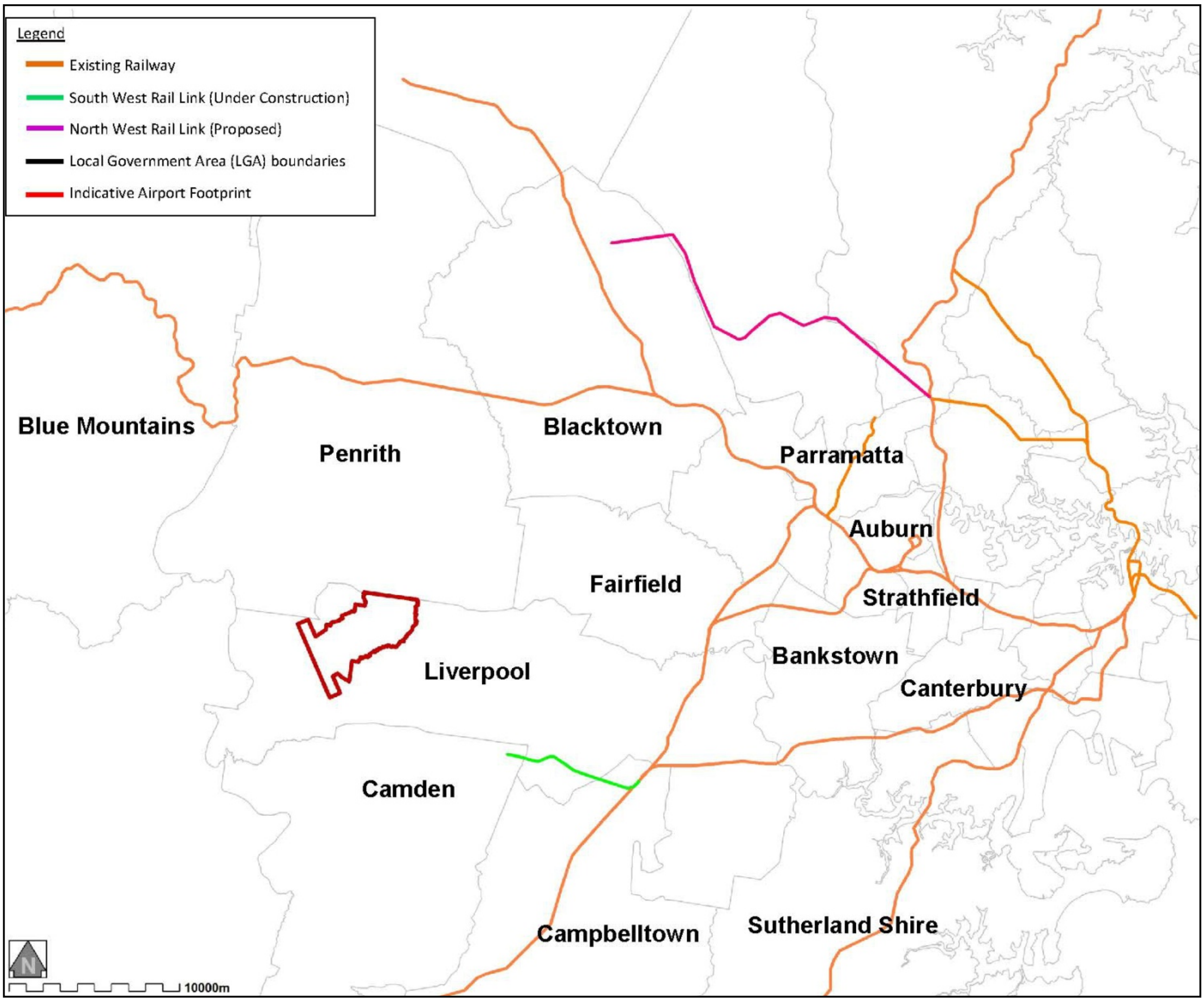
The South West Rail Link (also within the region) is currently under construction. This line will provide train services for residents of Leppington and Edmondson Park to Glenfield where they will be able to access the rest of the network through the lines listed above. This line is expected to commence operations in 2016.[159]

The Kingsgrove to Revesby quadruplication is also currently under construction. This upgrade will allow physical separation of local and express services on the East Hills line.[160]

Figure 23 portrays the existing rail network with respect to the relative location of the Badgerys Creek site and major LGAs.

Figure 23: Sydney rail network

[157] NSW Government, Metropolitan Plan for Sydney 2036, p. 144
[158] NSW Roads and Maritime Services, Higher Mass Limits, accessed 28 August 2012
[159] Transport for NSW, *Track laid for the South West Rail Project,* accessed 20 August 2012, http://www.transport.nsw.gov.au/media-releases/track-laid-south-west-rail-project
[160] Transport for NSW, *Kingsgrove to Revesby Quadruplication,* 16 May 2011, accessed 20 August 2012 http://www.transport.nsw.gov.au/Projects-Rail-Clearways-Program/Kingsgrove-to-Revesby-Quadruplication



Source: Department of Planning and Infrastructure and Google Maps

There are two main train routes available for the region's residents. The primary route is the Airport/East Hills line, boarding/alighting approximately 124,980 passengers per day. The secondary route is the South line, which boards/alights approximately 207,570 passengers on a daily basis.

The table below presents the 2006 boardings at stations along these routes.

Table 14: CityRail Station Barrier Counts

Station	Entry	Exits
Primary Route		
Central	76,660	76,660
Redfern	16,130	16,130
Turrella	510	510
Sydenham	4,660	4,660
Bardwell Park	880	880
Bexley North	910	910
Kingsgrove	2,490	2,490
Beverly Hills	1,610	1,610
Narwee	1,310	1,310
Riverwood	3,080	3,080
Padstow	3,500	3,500
Revesby	2,010	2,010
Panania	1,470	1,470
East Hills	1,450	1,450
Holsworthy	3,090	3,090
Glenfield	5,220	5,220
Secondary Route		
Central	76,660	76,660
Redfern	16,130	16,130
Newtown	4,290	4,290
Ashfield	9,930	9,930
Croydon	2,140	2,140
Burwood	10,640	10,640
Strathfield	18,600	18,600
Homebush	1,430	1,430
Flemington	2,750	2,750
Lidcombe	8,750	8,750
Auburn	7,640	7,640
Granville	5,640	5,640
Merrylands	5,000	5,000
Guildford	2,590	2,590
Yennora	690	690
Fairfield	8,050	8,050
Canley Vale	1,640	1,640
Cabramatta	9,510	9,510
Warwick Farm	1,940	1,940
Liverpool	8,150	8,150
Casula	180	180
Glenfield	5,220	5,220

Source: 2006 CityRail Station Barrier Counts dataset

The Airport/East Hills line will be the primary route for passengers from the Sydney CBD and also for passengers who will need to switch trains at Central station and KSA to get to the airport. A secondary route is the South line, with passengers boarding at Granville (from Penrith and Blacktown) and Strathfield (from Epping and Hornsby). Glenfield is expected to continue being a transportation hub with the introduction of the South West Rail Link.

Information from the Bureau of Transport Statistics (BTS)[161] indicates that between 2006 and 2036, there is a predicted increase of 47.8% in the number of trips being made across the rail network for the Sydney Statistical Division. The information, however, does not include a breakdown by train line or by region of where these increases may occur.

Currently, there are no major planned upgrades to the public transport network within the region that supports Badgerys Creek in the short term.

[161] Bureau of Transport Statistics, Transport for NSW - Electronic Publication No E2012-01-STM

7.1.4.4 Utility infrastructure

The region has well established utility infrastructure, able to service the current population and businesses.

Given the area[162] around the Badgerys Creek site is rural and/or large lot residential rural land, increases in population density and industries will require augmentation of utility infrastructure to improve service levels over time. The infrastructure that is likely to be upgraded as a result of natural growth within this area over the medium to long-term includes:

- Water and wastewater – Sydney Water has established a plan to ensure water and wastewater services are provided for the South West Growth Centre region, which includes the areas around the Badgerys Creek site.
- Electricity – Endeavour Energy has established a plan to ensure the reliability and expansion of the electricity network and has incorporated the South West Growth Centre in major substations being planned for the region.
- Telecommunications – Telstra has an obligation to connect any future developments to the telephone network. The area is covered currently and expansion is planned for the South West Growth Centre region.

The upgrades, as well as timing of those upgrades that will be required as a result of the development of an airport within the region, are described further in section 8.4.3.

7.1.5 Future growth

This section of the report highlights publicly available government strategies, plans and forecasts that describe how the region is likely to look like in the short, medium and longer term.

7.1.5.1 Population growth projections

The number of persons that are projected to live within the Sydney basin within the medium to long-term is anticipated to increase substantially in line with national population growth. The Australian Bureau of Statistics has forecast 9.2 million persons living in Sydney by 2056, 46% more people than live in the city today and a compounded annual growth rate of 1.27%.[163]

The NSW Department of Planning and Infrastructure has provided forecasts for the foreseeable distribution of where people are likely to reside in the short to medium term. With regards to the Badgerys Creek region, the population is forecast to increase by 31% to 1.01 million residents by 2036, compared to a 38% projected population growth rate in the broader Sydney region. A breakdown of this projected level of population growth by LGA is shown in Table 15.

Table 15: Projected level of population growth by LGA

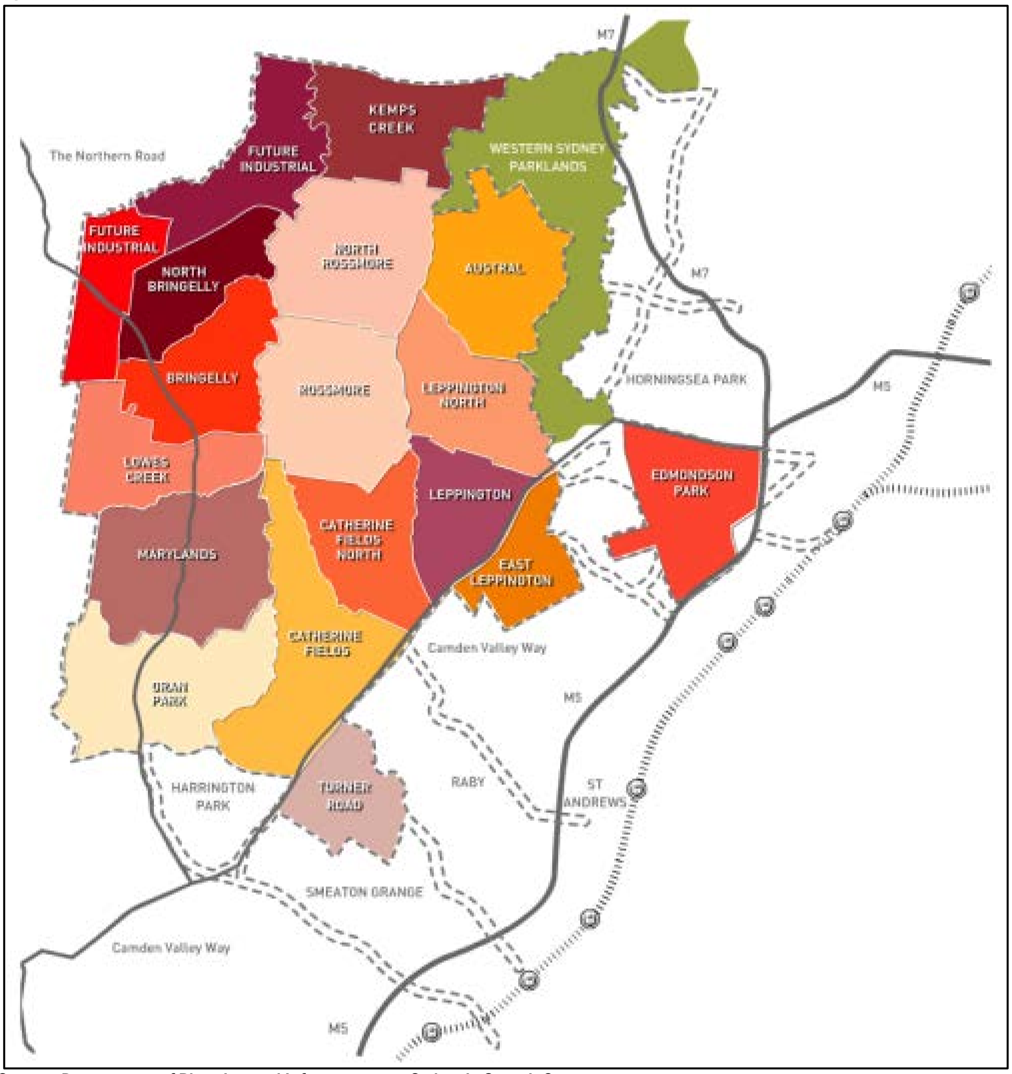
LGA	2006 population	Projected growth (2006- 2036)	Forecast population 2036
Penrith	177,152	25.6%	234,308
Liverpool	170,915	63.9%	324,438
Bankstown	176,857	21.0%	225,100
Fairfield	187,263	15.1%	226,931

Source: Department of Planning and Infrastructure population forecasts

Table 15 shows that the greatest level of population growth in the region is anticipated to occur within the Liverpool LGA, followed by Penrith. This is illustrated in Figure 24, which highlights Sydney's South West Growth Centre.

[162] West of the M7, mainly between St Clair, Kemps Creek, Catherine Field and Luddenham
[163] ABS forecasts (3222.0) – Population growth Scenario B

Figure 24: Sydney's South West Growth Centre



Source: Department of Planning and Infrastructure – Sydney's Growth Centres

7.1.5.2 Regional government planning

The South West Growth Centre, regional cities such as Liverpool and Penrith, and planned major centres such as Leppington are all part of the region that surrounds Badgerys Creek. Governments have developed a number of plans to support and manage growth and development in the region. A brief overview of local and State Government plans and objectives that will impact the region in the longer term is set out in more detail below.

State

The NSW Government has stated that one of its key objectives is to assist in the development of the Western Sydney Employment Area in order to create more jobs closer to where people live.

To do this, the State Government has identified Liverpool, the major regional centre serving the South West Growth Centre, as a major focal point for regional transport and jobs, with a target of 30,000 jobs set for 2031. To support this employment growth, the Government has plans to increase residential development in and around the Liverpool Regional City with 45,000 additional homes in 25 years. Campbelltown will be developed as a major centre and a planned major centre will be developed at Leppington. Also on the Government's agenda is a renewal of the Airds Bradbury social housing area, near Campbelltown, over the next 15-20 years.[164]

Moorebank is a significant and growing industrial area that is well connected to Sydney and the wider region by the M5 Motorway and Sydney Orbital roads.

The State Government's Metropolitan and State Plans also identify that transport networks will be extended to connect the South West Growth Centre to the existing rail network at Glenfield through the development of the South West Rail Link, which will provide

[164] http://www.housing.nsw.gov.au/Changes+to+Social+Housing/Redevelopment/Airds+Bradbury+Renewal+Project.htm

direct and frequent rail services to Liverpool. In addition, there are plans to extend Strategic Bus Corridors and to extend and upgrade the road network (widening the M5) in the South West Growth Centre. Also planned are a long-term increase in capacity on the Bankstown rail line and a widening of the F5 Freeway between Liverpool and Campbelltown. The Government has noted that Badgerys Creek will continue to be dominated by road transport, but that there are plans for increased modal share for public transport.

To support this growth and investment in infrastructure, the NSW Government aims to accelerate the process required to release employment lands. The Employment Lands Task Force (as part of the Government's Employment Lands Development Program) has identified that the South West Sub-region has the greatest amount of potential future employment lands identified across the Sydney region. Around 2,600 hectares of potential unzoned Employment Lands have been identified in the South West, approximately 74% of all potential future Employment Lands supply in the Sydney region.[165]

Local

The Future Directions Western Sydney 2030 report by the Western Sydney Regional Organisation of Councils (WSROC) advocates the promotion of business investment, accessible employment opportunities and – most importantly – the establishment of a number of employment hubs within Western Sydney. In this way, Western Sydney will aim to reduce its disparity with Sydney in terms of job options, unemployment and residential population, which has lead to 50% of Western Sydney's potential workforce not being engaged in effective work.[166]

Projects are being promoted to ensure that the cities of Penrith, Fairfield City and Bankstown become focal points for future regional transport, employment and housing:

- Liverpool and Penrith councils are planning the construction of intermodal freight terminals throughout Western Sydney, to improve the freight rail network and reduce pressure on public roads.
- With the State Government's plans to accommodate a greater number of residents and employees, roads, public transport, services and infrastructure will be required.[167]
- The development of existing urban areas within the Penrith City Council LGA will be intensified. Penrith City Centre and St Marys Town Centre will both experience significant intensification with infill development.[168] Infrastructure investment will be required to support this urban growth and development.
- Development of the Fairfield interchange, a new state park, a southern link road in Wetherill Park (carrying around 4,800 vehicles per hour) and commuter parking, as well as the redevelopment of social and private housing will deliver benefits in the Fairfield City LGA.[169]
- The Bankstown LGA will use its strategic location and connections to key transport links to increase its market share of freight logistic services. This could possibly be supported by a future transport corridor from Parramatta to Hurstville via Bankstown, as well as the creation of light rail links to key regions in the future.[170]

[165] Employment Lands Task Force (2010), *Employment Lands Development Program; Report 1 – South West Subregion*
[166] Western Sydney Regional Organisation of Councils (October 2011), *Future Directions Western Sydney 2030*
[167] http://www.liverpool.nsw.gov.au/formspublicationspolicies/deliveryprogramandoperationalplan.html
[168] SGS Economics and Planning (December 2008), *Penrith Regional City Infrastructure Planning Strategy*, Penrith City Council, p. 19, http://www.penrithcity.nsw.gov.au/uploadedFiles/Website/Planning_&_Development/Planning_Studies_&_Strategies/Penrith%20Regional%20City%20Infrastructure%20Strategy%20(Reduced%20File%20Size).pdf
[169] http://www.fairfieldcity.nsw.gov.au/upload/pcfoe43964/DeliveryProgram20112013.pdf
[170] Bankstown City Council (September 2011), *Bankstown CBD Local Area Plan*

8. The Badgerys Creek airport development

This section of the report introduces the site currently owned by the Australian Government and surrounding area. This section also presents what could be developed at the site, including airside and landside infrastructure to cater for the forecasted level of aviation demand. This was done to inform analysis of economic, employment and other impacts analysed within this report and to provide an objective scales against which to interpret the Wilton findings. It is noted that the Australian Government has ruled out Badgerys Creek for an airport site. All references in this report to an airport development at Badgerys Creek are for these analytical purposes only.

8.1 The site

The Badgerys Creek site is located approximately 50 kilometres west of the Sydney CBD and 33 kilometres south-west of Parramatta in the Liverpool LGA. The site covers an area of approximately 1,700 hectares.

Most of the site where the airport will sit was originally acquired by the Commonwealth between 1986 and1991 as the site for a major airport. This involved the acquisition of land at the site under the *Commonwealth Lands Acquisition Act 1989*. Many of the lands were acquired as voluntary purchases at fair value. The remaining lands within the site boundaries are in private ownership.[171]

Most of the site has 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*. The remaining lands are zoned RU1 (Primary Production) and RU4 (Rural Small Holdings) under the *Liverpool LEP*.

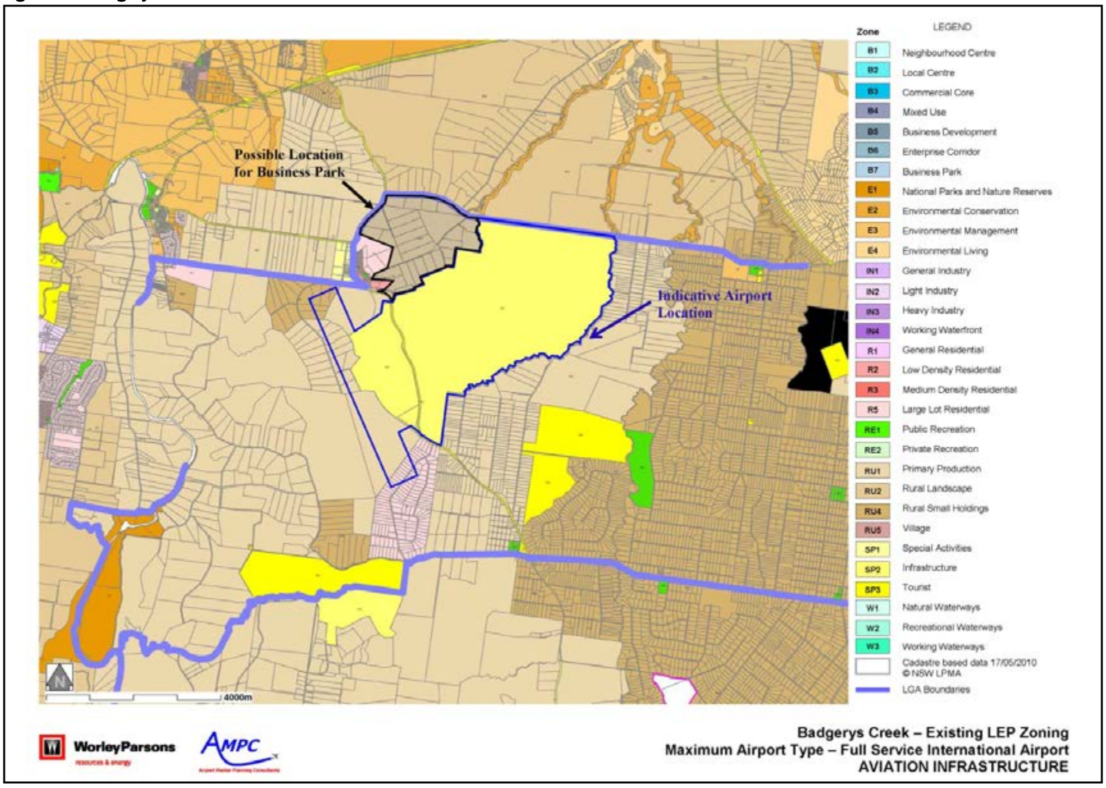
Since the acquisition of most of the site, the Commonwealth has negotiated approximately 250 short-term commercial leases (including grazing, a winery, shop, a piggery, a duck farm and market gardens) and residential rural leases over the site. The bulk of the properties on the site are rural residential, 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).

As part of the Joint Study, the Commonwealth Government asked the Steering Committee to analyse the potential use of the Badgerys Creek site if it was not to be used for the development of an airport. The Study found that 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 (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). The Study also stated that release of the land in the short-term (next 10 years) could have a significant impact on the current NSW Government land supply and infrastructure investment strategy. Furthermore, the report noted that 'land banking' using a managed and staged land release will provide the greatest financial benefit for the Commonwealth Government.

A visual representation of what an airport could look like on the site is shown in Figure 26.

[171] Note that there may be some people who will be required to move as a result of noise and health exposure. This is explained in more detail in section 10.2.2

Figure 25: Badgerys Creek site



Source: WorleyParsons

8.2 Airport design

The development of an airport at the Badgerys Creek site is based on a north-east / south-west alignment that is capable of catering up to 70 million passenger movements per annum. This level of passengers represents approximately 450,000 aircraft movements annually.

A visual representation of what an airport could look like on the site is shown in Figure 26.

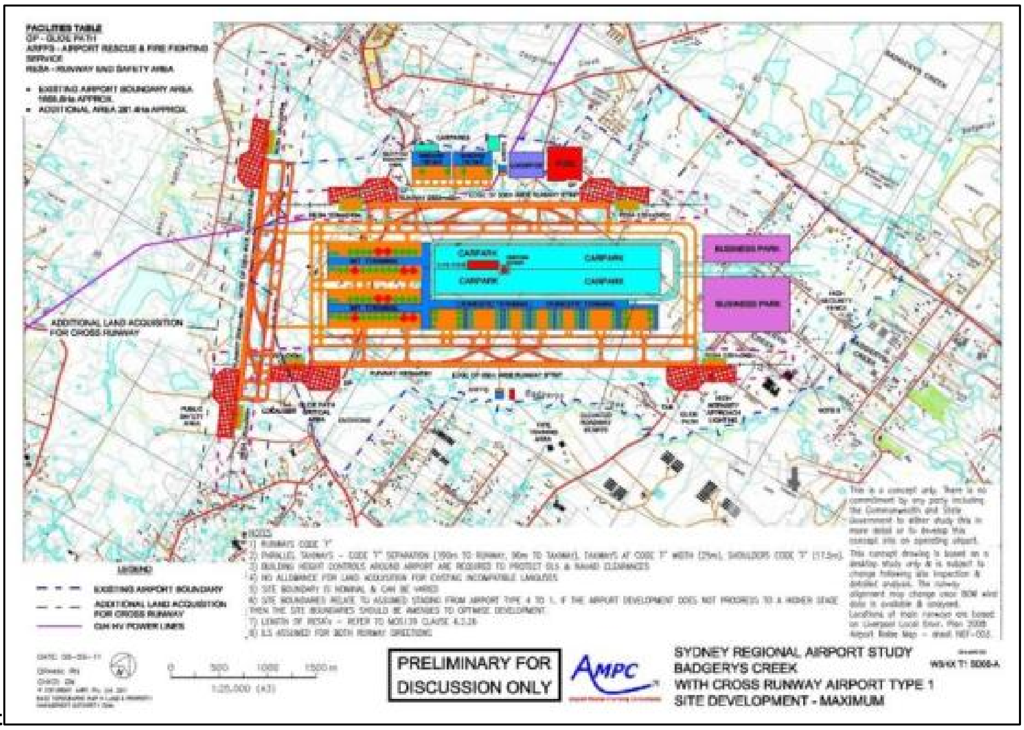


Figure 26: Indicative airport layout
Source: AMPC

The development of an airport that is capable of catering to this level of aircraft and passenger throughput will require the construction of infrastructure on the site that is likely to include:

- Two 4,000 metres long, 60 metres wide runways
- One 2,500 metres long, 60 metres wide cross runway
- 1,108,520m^2 of taxiways
- 1,086,620m^2 of aprons to support the general aviation and air cargo areas, while also providing sufficient area for aircraft maintenance facilities
- 558,270 m^2 of terminal buildings
- 114 gates
- 760,000 m^2 for the development of an on-site business park
- Air navigation aids including, instrument landing systems, visual guidance systems and landing aids
- Air traffic control facilities including, control tower, service centres, route surveillance and surface movement radars and radio transmitter and receiver sites.

Planning provision has been approved for the development of the following supporting facilities at the site, which are commonly found at major airports:

- Government agencies – Federal Police, Customs and agencies with responsibility for overseeing aviation maintenance and safety, and aviation administration
- Access services including car parking, taxi ranks and hire car facilities
- General services such as hotel/motels, postal, catering, banking and so on.

8.3 The surrounding region

The analysis reviewed the potential of the land immediately surrounding the site with regard to its suitability to readily supply developed land for business parks and employment and industrial land uses.[172]

An area enclosed by a radius of approximately 4km from the site centre was investigated to determine potential locations for industrial zones and business parks.

This review recognised that 'Employment Land' is generally zoned under the NSW Department of Planning and Infrastructure's Standard Instrument in three ways:

1. Industrial Zones (IN1, IN2 and IN3)
2. Centre Zones (B2, B3 and B4)
3. Business Park Zones (B7 and in some cases B6 and B5).

Industrial zones and business parks can be defined as:

- Industrial Zones – comprising a range of large scale but low employment density land uses. Ideally separated from residential development by appropriate buffering, but close to major transport corridors
- Business Park Zones – combining stand-alone commercial offices with larger scale industrial buildings.

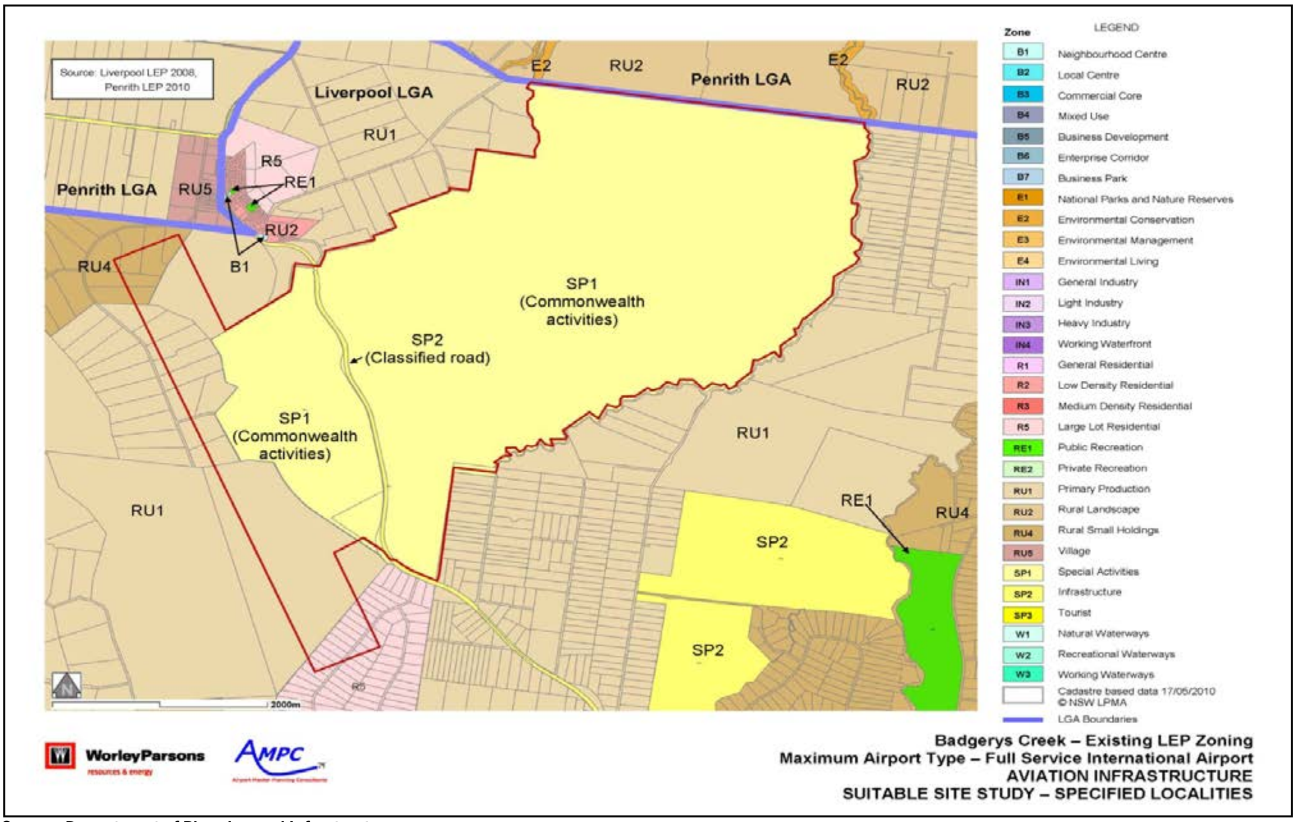
The existing zoning surrounding the airport footprint is predominately zoned RU1 (Primary Production) with some land zoned R1 (General Residential) to the south and RU2 (Low Density Residential), RU5 (Village) and R5 (Large Lot Residential) to the north-west.

[172] The assumptions and methodology used in undertaking this analysis are presented in chapter 4

The current zoning of the land surrounding the Badgerys Creek site does not permit development for the purpose of business parks or industrial land uses.

Figure 27 shows the zoning of the Badgerys Creek site and the land surrounding the site.

Figure 27: Badgerys Creek site – industrial zones



Source: Department of Planning and Infrastructure

Currently, there are no significant natural barriers that will affect the airport footprint at the Badgerys Creek site. There are minor flooding issues on the eastern boundary of the site, but this area can be re-contoured to reduce the risk of flooding on the airport. However, there are HV power lines located on the western footprint of the site that will need to be relocated or placed underground.

There are completed and planned residential developments in the area that will also affect the site. The following planned industrial and business park lands were identified by the Department of Planning and Infrastructure in 2010 as proposed for the South West Growth Centre:

- Turner Road (96ha)
- Austral (162ha)
- Lowes Creek (79ha)
- Catherine Fields (82ha)
- Catherine Fields North (12ha)
- Future Industrial 1 (644ha)
- Future Industrial 3 (520ha)
- Kemps Creek (489ha)
- Maryland (46ha)
- Rossmore (52ha)
- Oran Park (18ha).

The above list indicates that there are around 2,200ha of industrial and business park land planned for the South West Growth Centre. This planned development could be aligned with the development of the airport to optimise its use.

8.4 Supporting infrastructure

A number of upgrades and redevelopments to existing infrastructure were identified as being required with the development of an airport at Badgerys Creek, including transport, public transport and utility infrastructure.

This section of the report presents the findings of this analysis, as well as presenting some high level conclusions that result from the development of an airport within the region.

8.4.1 Roads

WorleyParsons has calculated that the development of an airport at Badgerys Creek catering for approximately 54 million passenger movements per annum by 2060 will result in an increase in land transport movements of 44 million vehicle trips per annum,[173] based on 2060 movement projections for the area. These trips represent people accessing the airport for aviation services only. [174]

The Joint Study found that the development of an airport at Badgerys Creek[175] will require an 8km upgrade of Elizabeth Drive and a connection to the airport. It was determined that this road will need to be upgraded from 2 lanes to 4 lanes, enabling it to become the main access to the site and catering for 123,200 movements in an average day. The cost of upgrading this road is estimated to be approximately $190 million.[176]

The Joint Study found that there will be an increase in traffic volume to capacity of major arterial roads as a result of developing the airport, namely the M4, M5 or M2. It was assumed that the upgrades to the M5, namely the widening from Prestons up to King Georges Road, will be realised independently of the development of the airport and before it commences operations in 2060. No data was available for the M7. As a result of these increased vehicle movements, there may be a need for further upgrades to the M4 and M5 (see Table 16).

The projected change in the volume to capacity of those motorways – with and without the airport development – is set out in the table below.

Table 16: Projected change in daily road usage as a result of an airport development

Motorways	Road Type	2006	2035		2050	
		V/C	V/C without airport	V/C with airport	V/C without airport	V/C with airport
M4	Motorway, 6 lanes	0.45	0.64	0.74	0.84	1.07
M5	Motorway, 4 lanes	0.80	0.72[177]	0.77	0.95	1.07
M7	Motorway, 4 lanes	NA	NA	NA	NA	NA
M2	Motorway, 4 lanes	0.31	0.44	0.51	0.59	0.73
Elizabeth Drive	Part 2 lanes, and part 4 lanes	0.34	0.48	1.15	0.64	2.06
The Northern Road	Local Road, 2 lanes	0.34	0.20[178]	0.25	0.26	0.37
Bringelly Road	Local Road, 2 lanes	0.19	0.11[179]	0.24	0.14	0.42

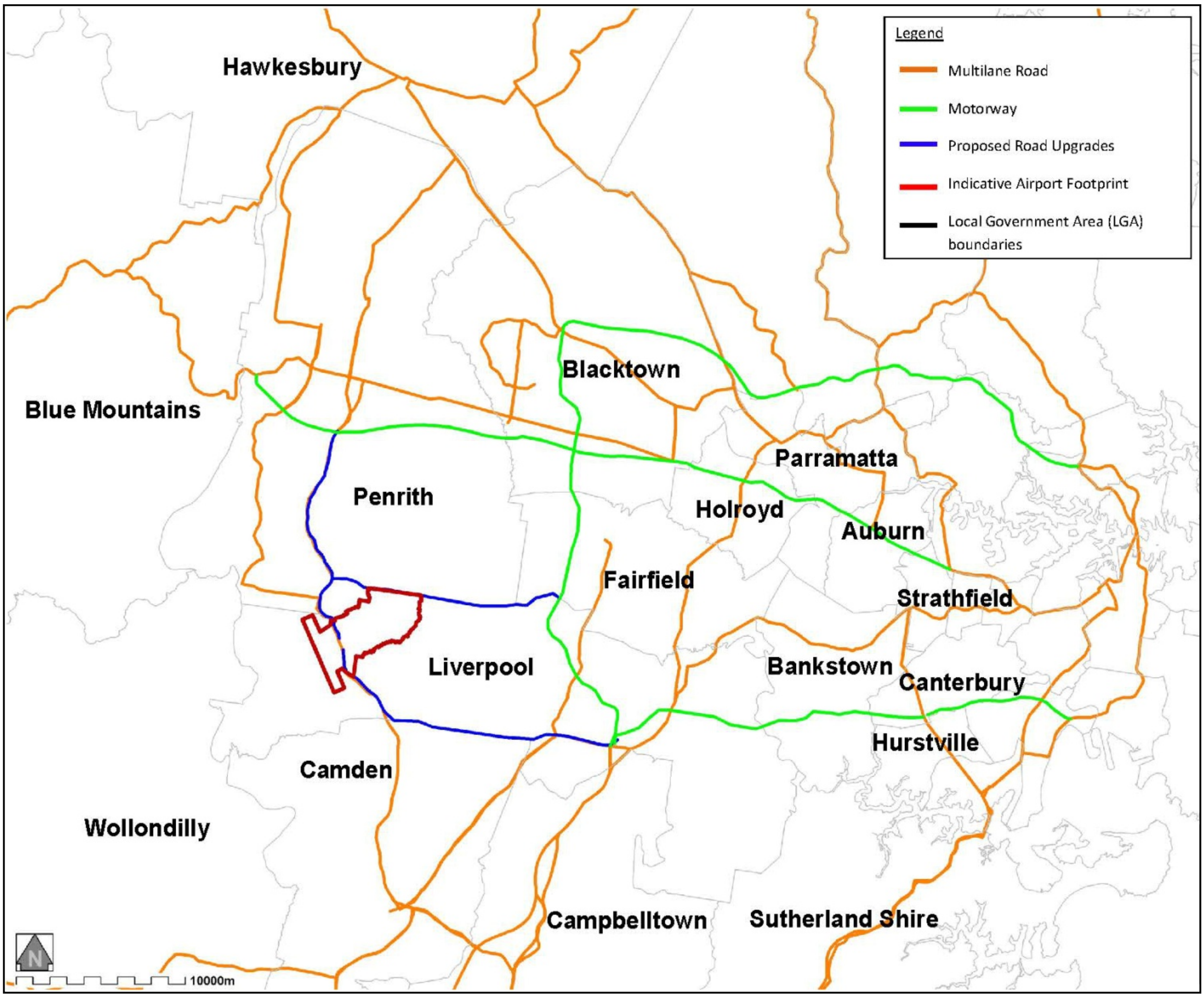
NA = data not available
Source: WorleyParsons calculation based on NSW Roads and Maritime Services – Traffic Volume Data, Bureau of Transport Statistics – Travel forecasts 2006 – 2036 and Booz & Co projections
Note: these estimates only take into account the additional passenger movements on the local road network as a result of passenger movements

It can be seen that the volume to capacity ratios for the motorways increase substantially with the development of the airport. The largest effect will be on Elizabeth Drive, which will require upgrades from the current two-lane single carriageway configuration. Furthermore with the development of an airport the M5 and M4 will be at capacity by 2060.

The figure below shows the existing multi-lane roads and motorways and the potential road upgrades.

Figure 28: Existing major roads and potential road upgrades associated with the airport

[173] Note, there is not a one-for-one relationship between passengers and vehicle trips as more than one person can use each vehicle
[174] WorleyParsons assumption based on annualised passenger throughput projections. Note that it is assumed that more than one PAX can be travelling within one car
[175] Analysis only takes into account passenger demands, does not include travel for employed personnel and does not include freight.
[176] This value excludes design, project management and contingencies.
[177] M5 widening to King Georges Road is currently being undertaken and scheduled for completion by 2014. M5 duplication between King Georges Road and Sydney Airport was not taken into account given no firm date has been provided for project completion.
[178] Studies into upgrading The Northern Road are being undertaken. This would lead to an upgrade of The Northern Road from a one- lane two-way road to a two- lane two-way road. It is assumed these works will be completed by 2036.
[179] Studies into upgrading Bringelly Road are being undertaken. This would lead to an upgrade of Bringelly from a one-lane two-way road to a two-lane two-way road. It is assumed these works will be completed by 2036.



Source: WorleyParsons, Department of Planning and Infrastructure and Google Maps

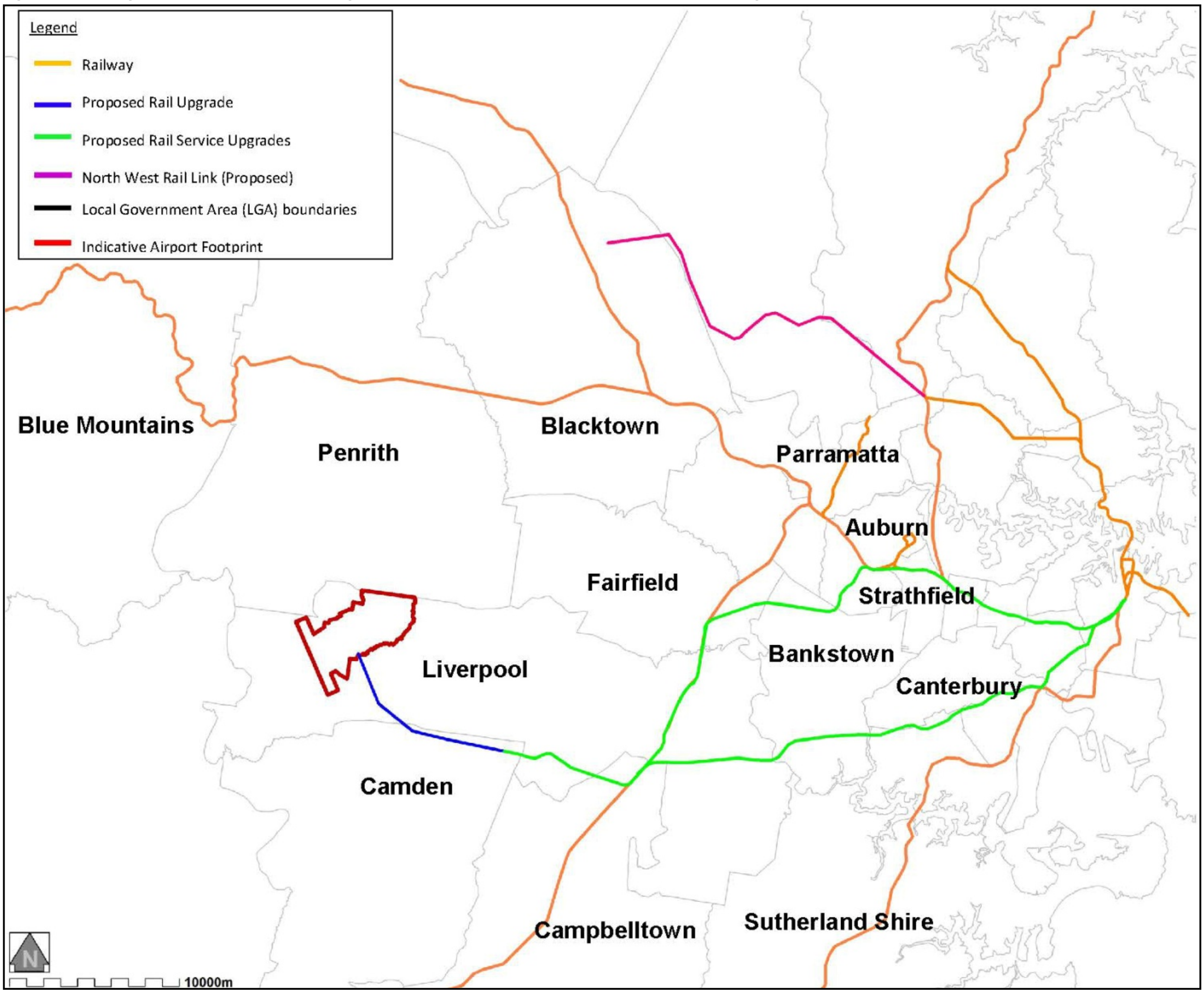
8.4.2 Public transport

WorleyParsons has calculated that the development of an airport at Badgerys Creek catering for approximately 54 million passenger movements per annum by 2060[180] will result in a 6 million increase in public transport trips per annum.[181] These trips represent people accessing the airport for aviation services only.[182]

The Joint Study analysis found that providing rail access to an airport at Badgerys Creek[183] will require an 11 km extension of the South West Rail Link that is currently under construction. Furthermore, it was found that providing access to the airport will require an additional 4 trains per hour on the East Hills Line, which will require quadruplication between Revesby and Glenfield and sextuplication between Erskineville and Tempe. Construction of this infrastructure is expected to cost approximately $1.13 billion.[184] In relation to the previously identified secondary route (the South line), required upgrade investigations have not been undertaken. However, service upgrades are envisaged at a minimum.

Figure 29 shows the existing rail network, potential rail upgrades, North West Rail Link and proposed rail service upgrades.

Figure 29: Existing rail network, potential rail upgrades, North West Rail Link and potential rail service upgrades:



Source: WorleyParsons, Department of Planning and Infrastructure, Transport for NSW & Google Maps

This improvement in rail service levels will benefit other Eastern Hills line users – those using the line to gain access to other areas of the network – once the airport and the rail line are operational. Those persons using the East Hills line to gain access to Campbelltown will have the benefit of increased frequency, up from an average of approximately 3.6 trains per hour to 7.6 trains per

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180 The expected passenger demand is discussed further in section 9.
181 Note that there is not a one-for-one relationship between passengers and vehicle trips as more than one person can use each vehicle
182 WorleyParsons assumption based on annualised passenger throughput projections
183 Analysis only takes into account passenger demands, does not include travel for employed personnel and does not include freight.
184 This value excludes design, project management and contingencies

hour.[185] The stopping pattern of trains providing access to Campbelltown will determine which stations benefit from the increased frequency of service.

A number of underlying assumptions were made by WorleyParsons in undertaking the analysis, including:

- It is assumed that the trains used in the new system will be new rolling stock specific to the airport project.
- The new line will connect into the new South West Rail Link. It will connect the airport, then head towards Leppington station (under construction) through Glenfield and along the Airport and East Hills lines towards Central station. It is likely that the line will run alternating services directly to Central and through the Airport line to connect both Airports.
- It is envisioned that most airport users will access the airport services from Central station if they are coming from the North Shore or the Central Coast and Hunter regions. Passengers and commuters travelling from the South Coast or Hurstville and Sutherland can catch the train from Wolli Creek and then onto the airport. All users from the western suburbs will travel to Glenfield and catch a connecting airport train.

Table 17 provides an indication of travel times (based on current service levels and patterns) and the potential make-up of the journey (such as the need to transfer between trains) for a number of sample suburbs to access the airport site.

Table 17: Approximate rail travel times

	Route	Approximate Travel Time[186]
Parramatta	North Shore and Western Line (Parramatta to Granville)	3 min
	South Line (Granville to Glenfield)	30 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Hornsby	Newcastle and Central Coast Line (Hornsby to Strathfield)	23 min
	South Line (Strathfield to Glenfield)	44 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Hurstville	Eastern Suburbs and Illawarra Line (Hurstville to Wolli Creek)	10 min
	East Hills Line (Wolli Creek to Glenfield)	31 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Penrith	North Shore and Western Line (Penrith to Granville)	42 min
	South Line (Granville to Glenfield)	30 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Blacktown	North Shore and Western Line (Blacktown to Granville)	17 min
	South Line (Granville to Glenfield)	30 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Liverpool	South Line (Liverpool to Glenfield)	6 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Sutherland	Eastern Suburbs and Illawarra Line (Sutherland to Wolli Creek)	21min
	East Hills Line (Wolli Creek to Glenfield)	31 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Campbelltown	South Line (Campbelltown to Glenfield)	15 min
	Southwest Rail Link (Glenfield to Airport)	23 min
Central	Airport and East Hills Line (Central to Glenfield)	44 min
	Southwest Rail Link (Glenfield to Airport)	23 min

Source: WorleyParsons analysis of Google Maps
Note: these estimates do not take into account average wait or transfer times

As can be seen in Table 17, a person accessing the airport from the central city or Parramatta via the existing public transport network (with likely changes) will take approximately 67 minutes and 56 minutes respectively.

8.4.3 Utility infrastructure

To service an operational airport at Badgerys Creek, a range of utility infrastructure in the area will have to be developed and/or upgraded. WorleyParsons has found that the following pieces of local infrastructure will have to be developed/upgraded to support this airport development:[187]

- Water ($77 million) – to connect the airport to the existing water network
- Wastewater ($34 million) – to connect the airport to the existing wastewater network

[185] Calculated by WorleyParsons
[186] Source: Google Maps. Travel time does not include wait time. Travel times are based on expected travel times in August 2012. Travel time from Glenfield to Airport obtained by using travel times for similar distances on other parts of the CityRail network.
[187] Note that all of the values below exclude design, project management and contingencies.

- Power ($199 million) – to relocate the existing power lines within the airport footprint, as well as moving the power lines that are within the OLS
- Communications ($19 million) – to connect the airport to the existing telecommunications network
- Gas ($22 million) – to connect the airport to the existing gas network
- Fuel ($423 million) – two separate underground pipelines will need to be constructed linking the airport to the current supply locations at Clyde and Port Botany. The length of these pipelines is approximately 35km and 60km respectively.

These infrastructure upgrades will benefit existing and future residents and businesses in the area. The resulting infrastructure capacity will ensure that residents in the airport's surrounding region have uninterrupted services and meet the growing needs of the community. These upgrades will also attract industry to the region, given that the infrastructure is available and of a high capacity.

8.5 Other notable issues

A number of other issues can potentially have a significant impact on the cost and/or the effective operations of an airport in a particular location. Costs that are significantly dependent on the location of the airport include earthworks required to develop the airport platform and potential works to mitigate possible mine subsidence.

Other impacts that could significantly impact the operations of an airport in a particular location include meteorological conditions and airspace conflicts. These impacts will have a significant effect on the economic viability of the development of an airport. Each of these impacts is briefly discussed below.

8.5.1 Geology

The topology and the composition of the soil at the site will play a significant role in the total cost associated with the development of an airport given its potential alignment.

WorleyParsons undertook an analysis of the geology and topology of each of the sites analysed as part of the Joint Study. This section of the report provides a brief overview of the current nature and composition of the land within the site to determine the ability to construct an airport, as well as the likely cost incurred in shaping the landscape in its current form to develop a platform that is suitable for an operational airport.

The terrain of the Badgerys Creek site ranges from flat to gently undulating. Construction of an airport on this site will require a major portion of the site to be reshaped. The type of dirt/rock/soil that can be found on the site includes sandstone and shale. While shale is not generally considered difficult to excavate, sandstone is considered to be exceedingly difficult.

It was estimated that approximately 225,030,000 m^3 of earth[188] will have to be excavated (cut and fill) to develop a suitably flat platform for the construction of an airport. Given the total amount of earth that will have to be moved and the type of soil/rock that sits within the site, the cost to excavate and prepare the site is estimated to be approximately $360 million.[189]

The additional excavated earth will need to be stockpiled for use elsewhere on the site or disposed of off-site.

The topology of the land after earthworks is expected to remain similar to the pre-development state. The purpose of the earthworks is to level the land, as well as to allow foundations to be built.[190]

8.5.2 Mine subsidence

Mine subsidence present on a site will impact the viability of an airport due to the requirement to stabilise the material and the potential to be required to compensate title holders to forgo the right to that material.

The previous EIS study found that coal resources underlie the site at Badgerys Creek, which were roughly calculated to total 40Mt and to occur at a depth of 830 metres. However, there is no precise information obtainable from drilling data to confirm the exact depth and amount of coal involved. Because of the depth and size of this resource in relation to other coal resources and known reserves, there is unlikely to be any demand to mine the site in the foreseeable future. Furthermore, given the depth of this resource and the fact that no extraction has ever taken place, it is unlikely that any works will be required to stabilise the land.

[188] Steering Committee (March 2012), Joint Study on the Aviation Capacity in the Sydney region, NSW Government and Australian Government
[189] Steering Committee (March 2012), Joint Study on the Aviation Capacity in the Sydney region, NSW Government and Australian Government
[190] Steering Committee (March 2012), Joint Study on the Aviation Capacity in the Sydney region, NSW Government and Australian Government

8.5.3 Airspace conflicts and flight path obstructions

The development of an airport will have to fit and be able to operate within the Sydney aeronautical network as a whole. Furthermore the development of any airport within the Sydney basin may require a change in use and/or acquisition of a number of assets within close proximity of the airport site.

8.5.3.1 Air space conflicts

At present, there are four types of designated airspace in the Sydney basin:

- Control zones - established around busy airports to ensure the safe and orderly flow of traffic
- A control area - a volume of airspace centred on KSA and is determined by the climb and descent performance of the variety of aircraft using that airport
- Restricted areas - volumes of airspace around military facilities or civil installations such as Orchard Hills and Holsworthy Army Facilities
- Danger areas - designated volumes of airspace to identify potentially hazardous areas (such as flying training or parachuting areas).

This analysis undertaken by ASA found that a north-east / south-west runway alignment at the Badgerys Creek site will impact current and projected alignment of airspace movements. Air Services Australia has advised that modifications to the existing KSA flight regime will be required to ensure there are no conflicts with the Badgerys Creek site. ASA also advised that Camden airfield will need to be shut down.

Changes to the airspace movements and designations within the Sydney basin to allow an operational airport at Badgerys Creek have not been clarified as there has been no formal negotiation with ASA. It is noted that the above issues have not been resolved with ASA.

8.5.3.2 Flight path obstructions

WorleyParsons also undertook a preliminary analysis of existing assets that may have their operations affected as a result of the development of an airport at Badgerys Creek. This analysis found that the development of a north-east / south-west runway alignment at the Badgerys Creek site will result in the potential requirement for a number of assets to be compulsory acquired or will potentially impact on their current operational patterns. The main assets affected are:

- Holsworthy and Orchard Hills Military Installations
- 300kV and 500kV power lines relatively close to the site.

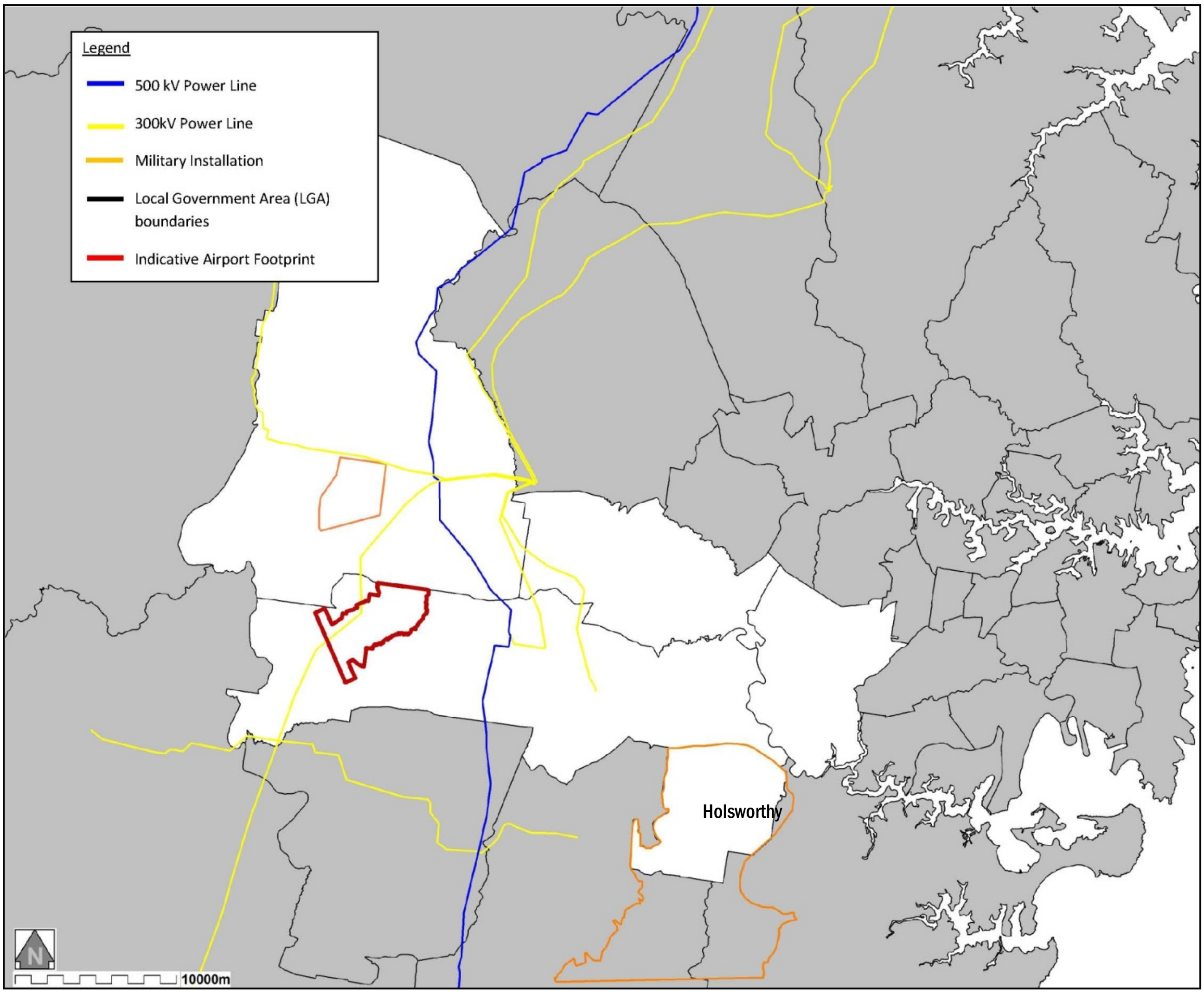
Figure 30 shows the relative location of these assets to a Badgerys Creek airport. As noted earlier, the power lines within the area can be relocated or placed underground to avoid any conflict.

Figure 30: Flight path obstructions

Orchard Hills

Orchard Hills

Holsworthy



Source: Department of Planning and Infrastructure and Google Maps

8.5.4 Meteorological conditions affecting the site

The meteorological conditions of the region can restrict the ability for an airport within a particular area to operate efficiently in accordance with air safety control regulations.

This section of the report addresses the impacts of wind direction, wind speed and visibility at the Badgerys Creek site to determine whether current conditions will impact a full international airport operating on the site.

8.5.4.1 Applicable legislation/regulation

The International Civil Aviation Organization (ICAO) determines the safe level of wind speeds to operate an airport (Annex 14 of ICAO Edition 5). This criteria requires that runways at an airport should be oriented such that aircraft may be landed at least 95% of the time with the following crosswind components:

- ► 20 knots for aircraft reference field length 1,500 metres or over
- ► 13 knots for aircraft reference field length greater than 1,200 metres and less than 1500 metres.[191]

The Badgerys Creek airport has a field length of 4,000 metres and therefore a maximum crosswind of 20 knots applies (according to ICAO runway design criteria).

In the event that crosswind conditions are more than 20 knots, an alternative cross runway must be used (if one exists) or operations must be suspended until adverse weather passes.

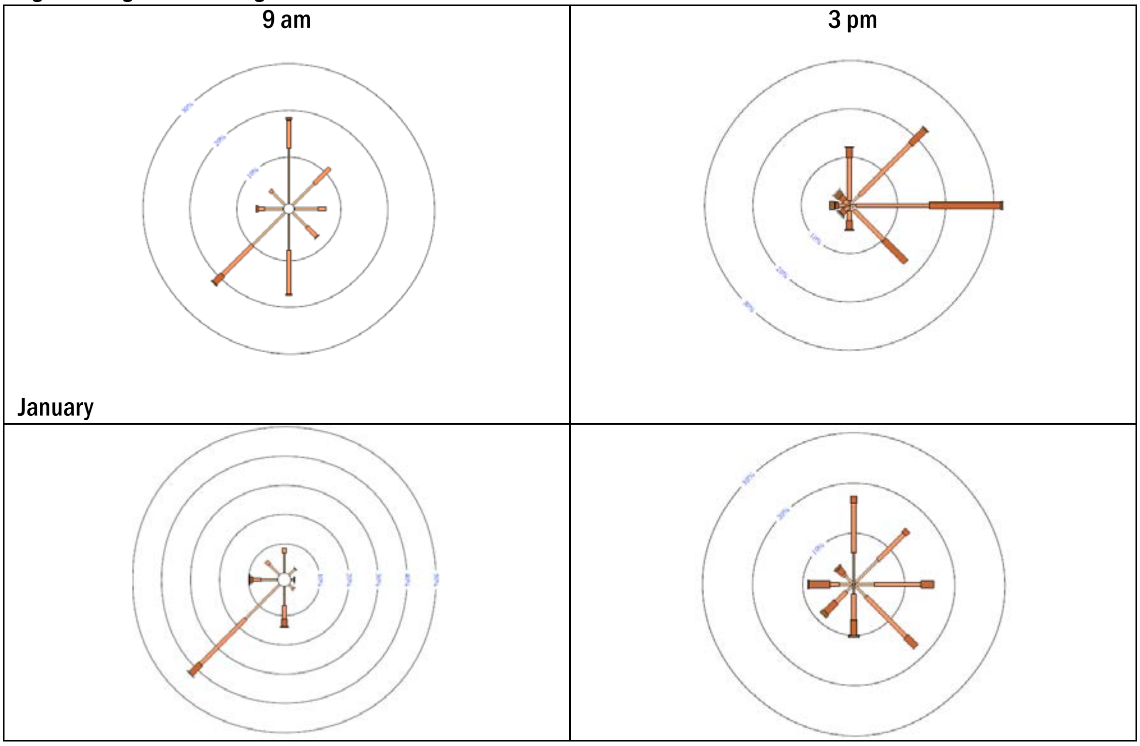
The instrument landing system operating limits (ILS minima) requires a cloud base of 100 metres above ground level and visibility of 800 metres. It was assumed that there will need to be more than scattered cloud below the ILS minima to render the airport unusable.

8.5.4.2 Meteorological conditions at Badgerys Creek site

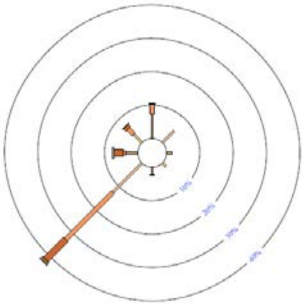
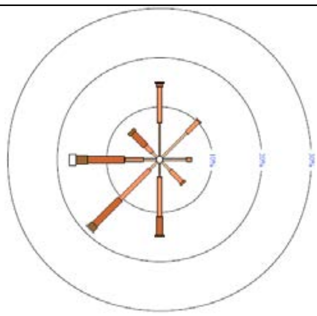
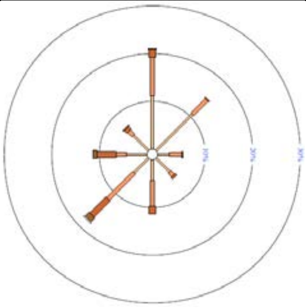
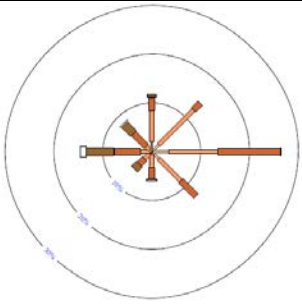
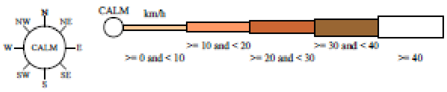
WorleyParsons obtained meteorological data from the Automatic Weather Station AWS at Badgerys Creek, located 7 km from the site. This should provide a reasonably accurate representation of conditions at the airport site.

The seasonal variations in wind direction and strength are indicated in Figure 31.

Figure 31: Regional meteorological conditions



[191] This criteria is applicable in all weather conditions.

9 am	3 pm
April	
	
July	
	
October	
	

Source: WorleyParsons - BoM Monthly Climate Statistics

On average over the year, calm conditions prevailed 10.4% of the time. In the morning, the prevailing wind direction is south and south-westerly with a small to moderate northerly component. In the afternoon the wind favours an east to north easterly direction, suggesting the influence of summer sea breezes. There are small south easterly and south-westerly components. The predominant wind patterns are therefore south-westerly. Table 18 indicates the number of exceedences of the crosswind limit based on observations of average wind speeds at Badgerys Creek.

Table 18: Badgerys Creek average wind speed

Average wind speed exceedence	Gust wind speed exceedence
0.19% or 17 hours pa	1.08% or 95 hours pa

Source: WorleyParsons analysis of BoM data

As can be seen in the table above, there is potential for the Badgerys Creek airport's main parallel runways to be temporarily closed for up to 95 hours per annum as a result of gusts in exceedence of the regulated safety levels.

The impact of visibility and fogs at Badgerys Creek in relation to potential airport closure to landings was not assessed as no data is available.[192]

[192] Cloud base and visibility data from the Bureau of Meteorology were compared with average Instrument Landing System (ILS) minima to determine whether the airport will be closed due to weather conditions.

9. Demand for Badgerys Creek aviation services

Airports play a significant role in the integration and connectivity of otherwise isolated cities and countries through the facilitation of international and domestic trade and tourism.

This section of the report presents the forecast demand for passenger and freight services at an airport developed within Badgerys Creek. Further information regarding the assumptions that underlie this analysis can be found within Appendix B.

9.1 Demand forecast methodology

The forecast demand for aviation services, with regards to passenger and freight throughput at an airport at the Badgerys Creek site, has been undertaken by Booz & Co.[193]

Patronage at the Badgerys Creek site was estimated through a generalised cost model accounting for the impact of ground access on aviation demand for each specific site. The model replicates passenger decision-making based on the relative generalised cost of the end-to-end journey for alternative airport sites. Where the generalised cost of travel using one airport is cheaper than the alternative airport, a portion of the passengers (as determined by the magnitude of the difference in generalised cost and inherent customer bias factors) will be assigned to that airport. In addition to this component of the market, the forecasts also include a portion of the demand that KSA cannot accommodate due to capacity constraints.

As highlighted in chapter 6, the location of an airport relative to the origin/destination of users within the wider region will ultimately impact on the demand as well as the type of services that it provides. This is because the generalised cost (that is, time and vehicle costs) of accessing the services of the airport will impact on a person's willingness to use the services relative to alternative services (such as using KSA, driving or taking a bus) or taking up the services at all (not undertaking the trip).

Furthermore, the proximity of the airport site to existing and forecast population and employment centres will also increase the probability of or, conversely, reduce the risks associated with potential demand for the services provided by the airport. This factor is an underlying assumption within the estimated forecast of travel demand from the airport as undertaken by Booz & Co.[194]

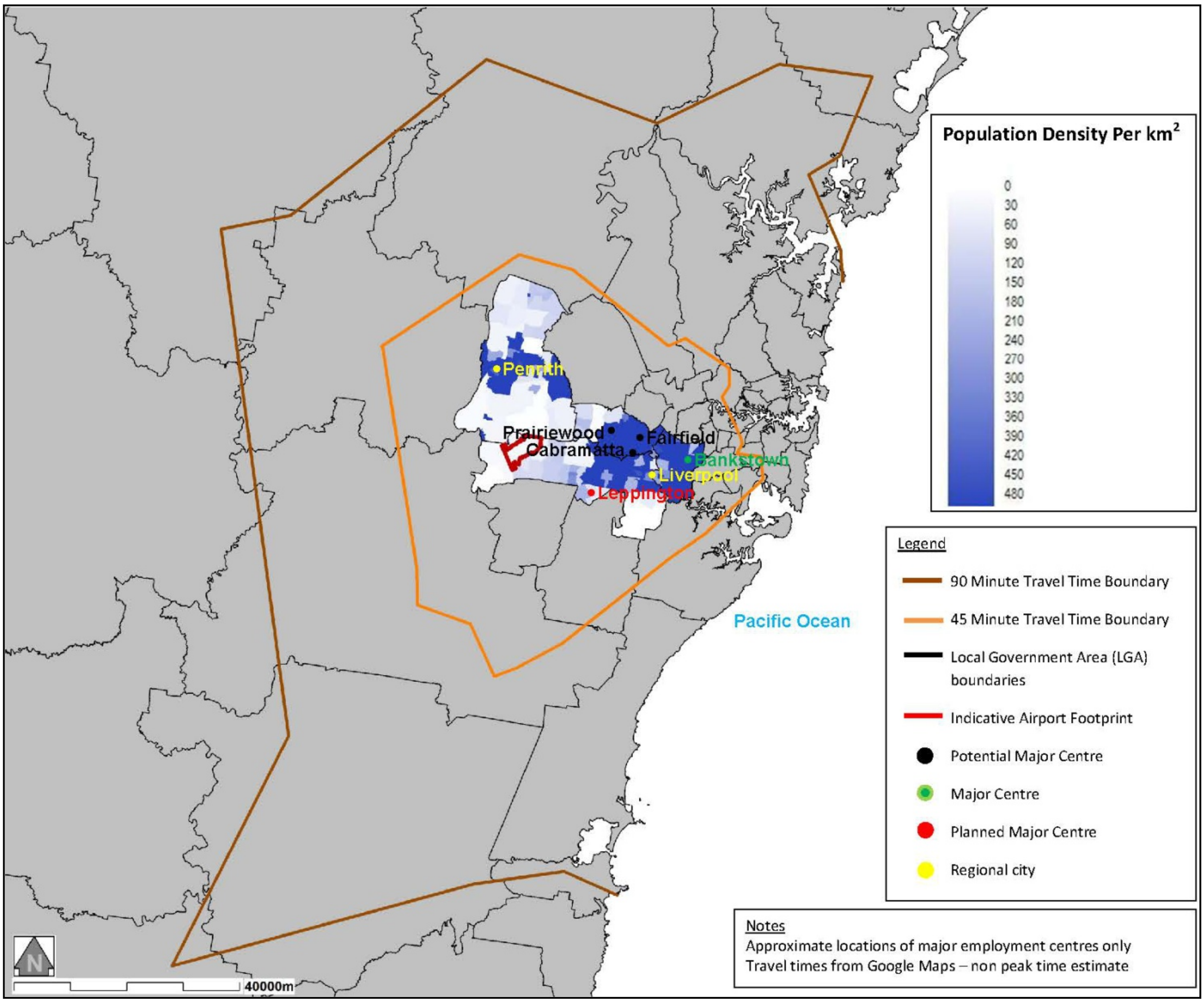
9.2 Demand catchment area

Analysis previously undertaken by WorleyParsons found that the average aviation passenger is willing to travel up to 90 minutes to access an airport.

Figure 32 provides an illustration of the breadth of the Sydney basin that can access the Badgerys Creek site within 90 minutes of private vehicle travel time.

[193] These forecasts have not distinguished between Regular Public Transport (RPT) services and General Aviation (GA) services.
[194] Further information regarding the assumptions underlying the Booz & Co analysis can be found in Appendix B

Figure 32: Travel time distance to Badgerys Creek Airport



Source: WorleyParsons and Google Maps

Figure 32 shows that the residents of each of the planned, potential and existing major centres, as well as the regional cities that surround the Badgerys Creek site, are able to access the site within 45 minutes. Additionally, residents of inner Sydney and the South West Growth Centre are able to access the site within 90 minutes.

As found within the previous phase of the analysis and presented in section 2.1, 65% of the population growth that is anticipated to occur between 2006 and 2036 in Greater Sydney as a whole is expected to be realised in Western Sydney.[195] This growth is anticipated to occur in brownfield areas such as Parramatta and Liverpool, as well as greenfield areas that have been designated for population growth by the State Government.

Taking into account this expected pattern of growth, Ernst & Young undertook a study of the potential travel times that will be required to access the airport at Badgerys Creek from a number of key centres within Western Sydney given current and projected travel speeds (by road) over the operational period of the airport. The findings of this analysis are set out in Table 19.

[195] NSW Government, NSW Metropolitan Plan for Sydney 2036, p. 5, accessed 31 August 2012

Table 19: Projected private vehicle travel times from Western Sydney (minutes)

Region	Current	2030	2050
South West Growth Centre	17	19	21
North West Growth Centre	38	45	51
South West	24	31	37
West	34	40	46
North West	29	37	44
Outer west	24	31	38

Source: Ernst & Young analysis – BTS and Google maps

As highlighted in Table 19 , the general travel speed over the next 40 years is anticipated to decrease by approximately 42.9%.[196] The resulting increase in travel time will reduce the effective radial distance of the airport's potential passenger catchment.

9.3 Services provided by an international airport at Badgerys Creek

The airport at the Badgerys Creek as defined within this study will be developed to cater for international and domestic services.

In 2028, a Badgerys Creek airport that is servicing approximately 20 million passengers per annum is forecast to be catering for 139 domestic and short to medium-haul international flights per day. The majority of services will be domestic, with the airport catering for 13 domestic locations and 6 international locations including New Zealand, South East Asia and India.[197]

Melbourne (48 flights per day) and Brisbane (20 flights per day) will be the most frequently serviced domestic locations, while Auckland (6 flights per day) and Christchurch (4 per day) are expected to be the most frequently serviced international locations.

Table 20 shows the services that a competitive airport at Badgerys Creek is forecast to provide in 2060.

Table 20: Indicative daily services provided at a competitive Badgerys Creek airport

Destination	2060	
	No. Airlines	Frequency
Domestic		
Brisbane	3	36
Gold Coast	3	16
Sunshine Coast	2	6
Cairns	2	8
Townsville	1	2
Melbourne	Multiple	66
Adelaide	3	14
Canberra	2	4
Hobart	2	8
Darwin	3	4
Perth	3	12
International		
China	Multiple	15
Japan	2	6
Korea	2	3
Taiwan	2	3
Malaysia	2	3
Indonesia	2	2
Thailand	2	2
Vietnam	1	1
Philippines	1	1
India	Multiple	12
Sri Lanka	2	4
Europe	Multiple	8
Other (e.g. South America)	Multiple	6
North America	Multiple	7
Auckland	2	9
Christchurch	2	9
Wellington	2	5
Queenstown	2	3
Regional		
Albury Wodonga	2	3
Dubbo	2	3

[196] This is an average of the percentage increase in travel time to each of the areas listed in the table.
[197] Booz & Co

Destination	2060	
	No. Airlines	Frequency
Orange	1	2
Wagga Wagga	1	1
Lismore	1	1

Source: Booz & Co

As seen in the table above, by 2060 the number of daily passenger aircraft movements is expected to increase to:

- ► 10 regional flights servicing 5 locations
- ► 176 domestic flights servicing 11 locations
- ► 99 international flights servicing 18 locations.

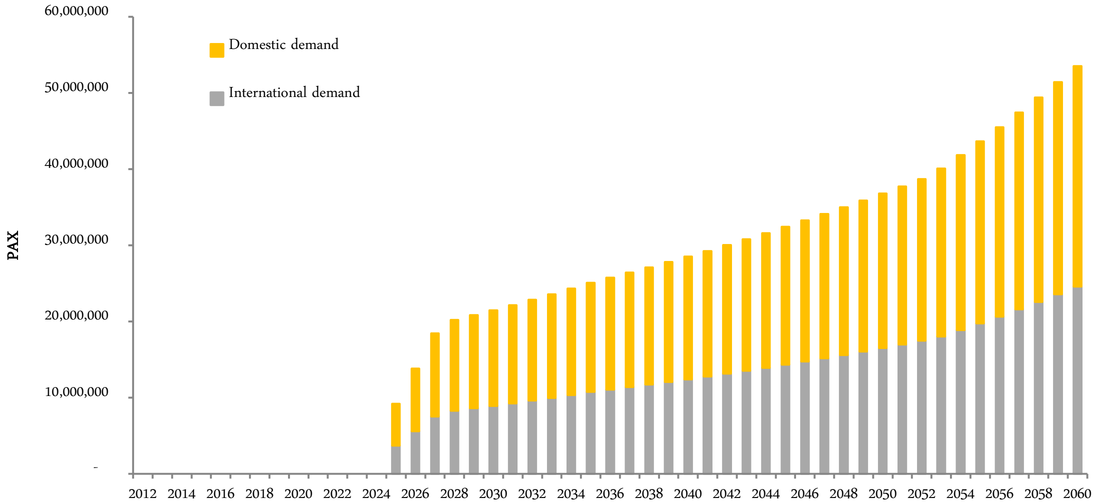
By 2060, the Booz & Co forecasts assume that flights to/from Melbourne will be the most frequent service domestically, with 66 daily passenger flights being accommodated by multiple airlines. China will be the most frequent international passenger service, with 15 daily flights being accommodated by multiple airlines.

Additionally, by 2060 Badgerys Creek will service 12 international freighters, 12 domestic freighters and 11 general aviation flights on a daily basis.

9.4 Passenger demand

The demand analysis undertaken by Booz & Co found that 9.2 million passengers will use aviation services at a Badgerys Creek airport when it opens in 2025, increasing to 28.5 million PAX by 2040 and ultimately 54.0 million in 2060. Figure 33 presents the annual demand for aviation services at an airport at Badgerys Creek with respect to total annual PAX, domestic/regional PAX, and international PAX. As can be seen, domestic and regional transport constitutes the majority of the airport's business, with international travel still remaining a significant source of demand, particularly later in the evaluation period.

Figure 33: Badgerys Creek demand forecasts (domestic and international)



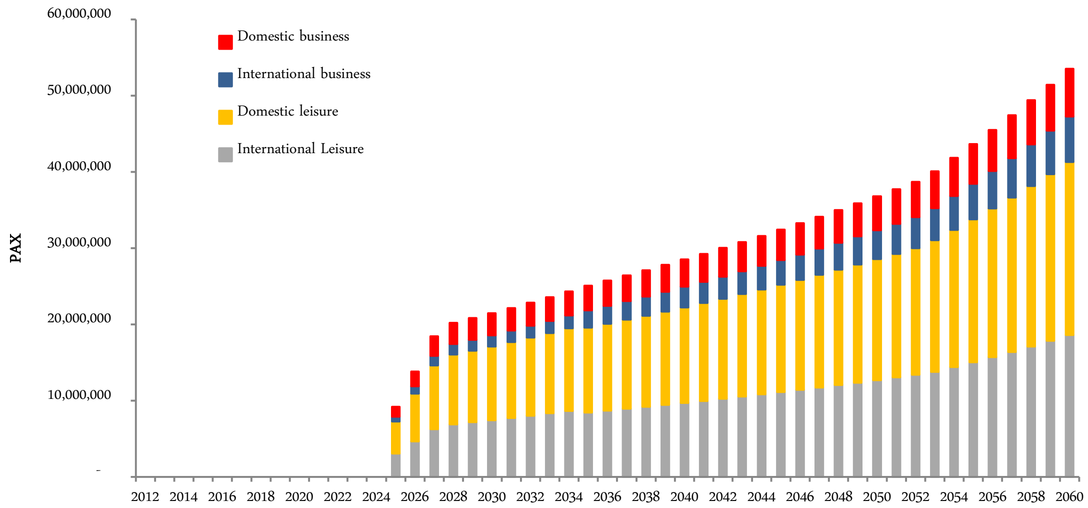
Source: Booz & Co

This analysis forecasts that approximately 40 % of passengers who acquire aviation services at an airport developed at Badgerys Creek when it is first opened will be accessing international locations, increasing to 43% by 2040 and ultimately 46 % in 2060.

This analysis has found that approximately 76% to 80% of passengers will require aviation services for leisure purposes, and 20% to 24% for business purposes at an airport developed at Badgerys Creek. Furthermore, between 76% and 84% of international passengers and between 76% and 78% of domestic passengers that use the airport will be travelling for leisure purposes.

Figure 34 presents annual demand for aviation services at Badgerys Creek, characterised by trip purpose between leisure and business.

Figure 34: Badgerys Creek demand forecasts (domestic and international, business and leisure)



Source: Booz & Co.

9.4.1 Origins/destinations of passengers within Sydney

A breakdown of the origin/destination of passenger aviation demand both within the Sydney basin and outside Sydney can be seen in Table 21.

Table 21: Origin/destination of aviation passengers (within Sydney basin)

	2030 demand				2060 demand			
	KSA		Badgerys Creek		KSA		Badgerys Creek	
	International	Domestic	International	Domestic	International	Domestic	International	Domestic
North East	14%	14%	11%	11%	13%	14%	11%	11%
Metro Sydney	55%	59%	28%	27%	58%	59%	31%	27%
South and South West	10%	7%	15%	15%	9%	7%	14%	15%
West Central	10%	8%	25%	25%	9%	8%	24%	25%
North and North West	10%	9%	15%	15%	9%	9%	14%	15%
Newcastle	2%	2%	3%	4%	2%	2%	3%	4%
Wollongong	0%	0%	0%	0%	0%	0%	0%	0%
Canberra	0%	0%	0%	0%	0%	0%	0%	0%
West	0%	0%	2%	3%	0%	0%	2%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Booz & Co.

As the table above shows, the greatest number of passengers that will use a Badgerys Creek airport for both domestic and international flights will come from Metropolitan and West Central Sydney. This demand distribution can be explained by the relatively high levels of demand for aviation services from Metropolitan Sydney and the convenient location of an airport located at Badgerys Creek for West Central Sydney residents. On the other hand, the greatest number of passengers that will use KSA will come from Metropolitan Sydney and North East Sydney.

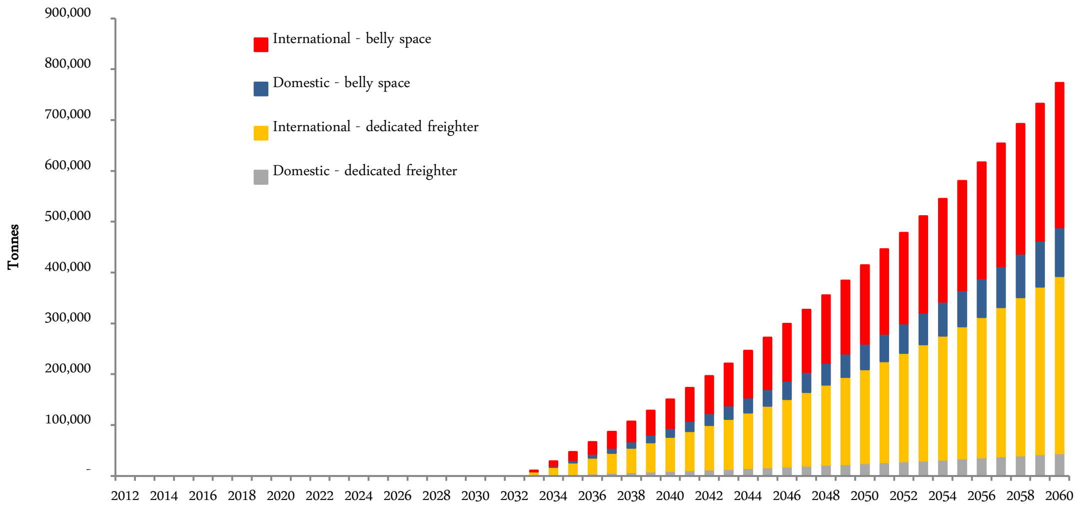
Table 21 indicates that the mix of passengers that will use an airport at Badgerys Creek will come from a more diverse mix of locations relative to KSA with over half of all domestic and international passengers of KSA originating from or destined for Metropolitan Sydney. This high level of demand from this area represents the large tourist and business travel market that will prefer to use the services of KSA over an alternative airport at Badgerys Creek because of KSA's close proximity to the central city.

9.5 Freight demand

It is estimated that 150,000 tonnes of freight will pass through the airport by 2040, increasing to 773,000 tonnes of freight in 2060.[198]

The type of freight that will use the services of this airport includes both passenger freight and dedicated aviation freight. The figure below provides a breakdown of the freight throughput, in tonnes per annum, by type of freight.

Figure 35: Badgerys Creek freight demand forecasts (domestic and international, dedicated and non-dedicated)



Source: Booz & Co

As can be seen in the figure above, between 82% and 85% of freight that is forecast to go through a secondary airport at Badgerys Creek will either originate from or be destined for international locations. Furthermore, it has been estimated that approximately 51% of all freight movements to the airport will be through dedicated freight providers, with 49% of freight movements through passenger service belly space.

[198] Booz & Co – it is assumed within analysis that there will be no transfer of dedicated freight from KSA to an alternative airport site

10. Operational impacts of a Badgerys Creek airport

This chapter of the report identifies and analyses the environmental and social issues regarding the development and operation of an airport at Badgerys Creek.

This report builds on the analysis that was undertaken by the Joint Study, taking into account some additional impacts as well as looking at the time series implications of these factors when applicable. The results in this section draw upon analysis undertaken by WorleyParsons and set out in detail at Appendix B.

It should be noted that the environmental and social issues identified and analysed are directly related to the airport footprint and runway orientation and that the impacts assessed in this section are based on the airport footprint and runway orientation shown in chapter 8.

10.1 Environmental

A number of environmental issues will impact on the ultimate success of an airport developed in the region. These environmental issues have a range of impacts on the acceptance of an airport operating within the region. The environmental factors analysed for this report include:

- Landscape and visual effects
- Air quality
- Drainage and water quality
- Flora and fauna species within the airport footprint.[199]

10.1.1 Landscape and visual effects

The Badgerys Creek site is currently farmland and open fields with scattered rural residential development. The area is relatively flat with small areas of undulating terrain. There are several small ponds and dams as well as creeks running through the site. The eastern boundary of the site runs along Badgerys Creek, which extends from South Creek to the north of Elizabeth Drive down to The Northern Road. In summary, there are no constraints to an airport development at Badgerys Creek in terms of landscape and visual effects given the low levels of surrounding development. [200]

10.1.2 Air quality

Air pollution is one of the main negative impacts associated with the construction and operation of an airport. Despite modern aircraft becoming increasingly fuel efficient, the rapid growth of air travel in recent years has contributed to an increase in total aviation emissions, accounting for 3% of total European Union greenhouse gas emissions.[201] For example, a seven-hour return flight generates approximately the same level of emissions as the average household in a developed country emits through heating for an entire year. [202]

Due to this, and the increasing social concern for the environment, a range of government legislation applies to air quality for the construction and operation of an airport.

This section provides a high-level quantitative analysis of the additional air pollutants that will be released through the operational phases of an airport development. Construction related emissions (for example, from land clearing and earthworks) were not considered in detail as these emissions are likely to be relatively low.

Emissions of five of the six National Environmental Protection Measures (NEPM) (Ambient Air) pollutants were assessed for airport operations.

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[199] This analysis looked at the overall environmental impacts of an airport and did not look to quantify these impacts in order to provide a level of subjective assessment within the decision making process
[200] WorleyParsons
[201] European Union Press Release, *Climate Change: Commission proposes bringing air transport into EU Emissions Trading Scheme*, 20 December 2006
[202] European Union Press Release, *Climate Change: Commission proposes bringing air transport into EU Emissions Trading Scheme*, 20 December 2006

The pollutants assessed in this analysis included nitrogen oxides, particulate matter PM_{10}[203], sulphur dioxide, carbon monoxide and hydrocarbons. The air emissions were divided into three categories: aircraft emissions, ground-based aircraft handling emissions and increased road traffic emissions.[204]

The air emissions from all sources in relation to an airport developed at Badgerys Creek are summarised in the table below.

Table 22: Badgerys Creek air quality impacts[205]

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Total Sydney Basin emissions (tonnes/year)	555,357	94,353	13,833	24,004	164,822
All Badgerys Creek airport related emissions (tonnes/year)	25,507	8,830	381	194	1,994
Percentage increase due to airport development	4.4%	8.6%	2.7%	0.8%	1.2%

Source: WorleyParsons Calculations

This analysis has found that the additional air emissions that result from a second airport will make a small contribution to four of the NEPM pollutants and total hydrocarbons in the Sydney region. The analysis presented here is conservative and uses the maximum number of passenger and aircraft movements forecast for 2060. One of the key uncertainties is the volume of additional vehicle traffic that will be generated by the various airport developments near the airport.

The largest impact from the Badgerys Creek option is expected to be the 8% to 9% increase in NOx emissions due to the rise in motor vehicle trips by passengers and employees. As NOx is a precursor for the formation of photochemical smog, such an increase will likely lead to a reduction in air quality. However, the precise nature of the impacts on local and regional air quality cannot be accurately quantified.

One of the complexities is the movement of clean and polluted air parcels over the site and the potential for these to produce additional air pollution. The flow of pollution out of the airport site into the Sydney and Hawkesbury basins is governed by a number of drainage flows. The present frequencies at which these drainage flows operate are not known. The present frequency of temperature inversions in Badgerys Creek is also not precisely known (inversions tend to isolate air emissions near their point of origin). The air quality issue is of concern as relatively high ozone levels are currently measured in semi-rural areas near Badgerys Creek, such as Bringelly.[206]

Note that the above figures are based on the existence of a fully operational airport with a capacity of 70 million passengers. As such, these air pollution levels will not occur at the opening of the airport in 2025. Instead it will grow over time. There is not a one-to-one relationship between passenger throughput and air emissions, as air emissions are impacted by the following factors:

- Congestion and ease of movement on the supporting transport network
- Efficiency of the aviation services at the airport

10.1.3 Drainage and water quality

This section provides a brief summary of how an operational airport will impact existing surface water and ground water systems and the potential for flooding, and the measures required to protect water quality within the surrounding areas.

- The site is located downstream of the Warragamba Catchment. Therefore, runoff generated from the site will not drain into the catchment.
- Runoff amounts up to and including the 20-year ARI events[207] are expected to be treated prior to discharge from the site. Events above and including the 100-year ARI event will be discharged from the site untreated; however, as the site is not within the Warragamba Catchment it is not expected to impact on the drinking water catchment.

The potential contaminants in run-off and effluent as a result of the construction and operation of an airport are set out in Table 23.

Table 23: Source and type of potential water contaminant

Contaminant	Source

[203] Particulate matter of 10 micrometers or less in diameter
[204] Assessment of ozone levels as a result of the operation of a second airport is beyond the scope of this study. Ozone is a secondary pollutant with its concentrations at a particular site being governed by a combination of complex photochemical processes and prevailing meteorological conditions. Lead levels were not assessed as they are presently well below the NEPM standards and are currently not monitored in NSW.
[205] WorleyParsons work only analysed the impact on local air quality and not national/global air quality as a result of an airport development
[206] Further information regarding the impacts of air quality as a result of the Badgerys Creek airport development can be found in Appendix D
[207] Average recurrence interval event

Sediment	Erosion, Earthworks
Nutrients	Sediment, Fertilisers, Sewage
Contaminated food/water	Kitchen waste from international flight
Sulphuric Acid	Wet oil batteries used for standby power supplied
Emulsified oil, Grease, Solvent Cleaners	Workshops and aircraft maintenance
Detergents	Aircraft washdown, service and maintenance areas
Paint Strippers	Maintenance
Acid, fluorocarbon and Hydrocarbon Solvents	Fire-fighting
Trade Wastes	Food preparation
Aircraft Fuel	Fuel storage, refuelling
Rubber Detritus	Tyre wear and tear
Pesticides/herbicides	Ground maintenance
Heavy Metals	Aircraft/vehicle wear and tear

Source: WorleyParsons analysis

Measures to minimise the potential impacts of contaminants in stormwater runoff will be taken via a treatment train prior to discharge. A typical treatment train involves stormwater being diverted to a first flush system, such as a retention pond, where initial runoff (which is considered to be most polluted) is retained. Additional runoff will be directed to stormwater retarding basins, which will be designed to contain the peak flow of a storm and ensure that the discharge from the site does not exceed the present peak flows from such an event.[208]

Other additional water quality treatment measures will include rainwater tanks, swales, gross pollutant traps and hydrocarbon separators.[209]

[208] Based on industry standard and DECCW water quality requirements
[209] Further information regarding the impacts of water quality as a result of the Badgerys Creek airport development can be found within Appendix D

10.1.4 Flora and fauna species within footprint

An Environment Protection and Biodiversity Conservation (EPBC) search revealed the likely presence of one Endangered Ecological Community (EEC) in the Badgerys Creek study area. The Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, which are partially located in the site, are classified as critically endangered under the Commonwealth EPBC Act.

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest was formerly extensive across the Cumberland Plain, but now occurs as mostly small patches. The Federal Environment Minister listed the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest as a critically endangered ecological community in December 2009. The advice by the Threatened Species Scientific Committee indicated that this ecological community is critically endangered because it has a very restricted distribution.

The preservation of woodland remnants, such as this particular ecological community, contributes to native vegetation corridors that will contribute to improved quality of life as the area becomes increasingly urbanised. It will also help to maintain valuable connectivity among native vegetation remnants that are essential to retain the fauna that live in or migrate through the region. For example, birds and bats, including some threatened species, use the ecological community to move from north to south through western Sydney and beyond, and from east to west across the Great Dividing Range to the coast, as seasons change.

The EPBC search found that there could be 5 bird, 2 fish, 2 frog, 7 mammal, 7 plant and 1 reptile threatened species that may exist within the footprint of the site.[210]

A complete list of threatened species found by the EPBC search is contained in Appendix D.

10.2 Direct social impact

The development of an airport will have a direct social impact on the local region, notably through:[211]

- Impacts to local heritage
- Noise
- Displacement of local residents
- Amenity
- Development and spatial distribution of the region's commercial/industrial businesses.

10.2.1 Heritage

This report has built on the Aboriginal and European heritage section of the Joint Study.

The Joint Study reported that only one Aboriginal archaeological site was located during a field survey performed during the previous EIS study. Five silcrete flakes and flaked pieces were found in a devegetated area beside Badgerys Creek. However, it is probable that there are other artefact scatters obscured by vegetation along the banks of other creeks.

The study also found that the clearing of native vegetation resulted in the removal of almost all trees of sufficient age that would have been alive at a time when Aboriginal communities used traditional subsistence practices in the area.[212]

Other heritage sites identified in the region are listed in Table 171 as seen in Appendix D.

10.2.2 Noise

The noise impact of an airport is one of the major negative aspects associated with the asset.

The noise created as a result of airplanes taking off and landing is one of the major impacts of an airport on the surrounding community.

[210] A full flora and fauna impact assessment and species impact statement (SIS) would be required as part of a potential Environmental Impact Statement conducted to address Commonwealth and NSW legislation. This would assess the significance of potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance.
[211] This section of the report only presents the social impacts that are directly associated with the development of the airport. A number of wider social impacts that indirectly result from the development of an airport within the region have been analysed and are presented in section 12.
[212] Note that only a small portion of the proposed site was examined in the study.

Residents living in the vicinity of airports or under busy flight routes are exposed to the ongoing impacts of aircraft noise. These effects vary from levels of annoyance to real effects on amenity and health, reducing residents' quality of life and lowering property values.

Elevated sound levels can have various health consequences such as hearing impairment, hypertension, cardiovascular effects, rising blood pressure, annoyance and sleep disturbance. These consequences can then result in stress, increased workplace accidents, reduced performance in school and work and even anti-social behaviour.

These effects have caused multiple examples of community pressures to reduce airport activity or to not build an airport in the first place. Such pressures have been effective in Australia, with the introduction of the *Sydney Curfew Act* in 1995 being just one example.[213]

At existing airports, although individual aircraft have become quieter, the number of aircraft movements has increased substantially over time. This, along with the increase in population density, has meant that the number of complaints has grown and that community pressure for operational constraints at airports is coming increasingly from residents living outside the typical high noise impact areas. The source of complaint is now more often about the higher number of over-flights rather than individual noise impacts.[214]

To measure the impact of an operational airport on the local community, WorleyParsons undertook an analysis of the noise impact of an operational airport at Badgerys Creek on the surrounding region. This analysis looked at the noise impact on households, as well as the likely number of events that will be experienced by local residents.

This section of the report builds on the findings of the previous analysis and highlights alternative measures for determining the noise impact of the airport as well as the extent of the impact. To determine the likely noise impact of the development of an airport at Badgerys Creek, the following measures were analysed:

- *The Australian Noise Exposure Forecast* (ANEF) is used to regulate aircraft operations and to report on the effects of those activities. This system takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location. Staged noise analysis has not been undertaken for this study.

- *N70 events* refer to the minimum number of events above 70 decibels one can expect to experience in an average day. A 70 decibel noise impact is equivalent to an operating machine or the noise of a car while driving.

Further information regarding the definition and measurement of these noise impact assessments, as well as examples of relative noise level impacts, can be found in Appendix D.

The analysis to date has only been undertaken on the noise impact of the airport at its maximum capacity on the current structure and composition of the population. Therefore, the actual noise impact on the local community will be smaller during the period when the airport is scaling up its operations to reach capacity.

The following sections highlight the forecast noise impact of an airport at Badgerys Creek on the local community.

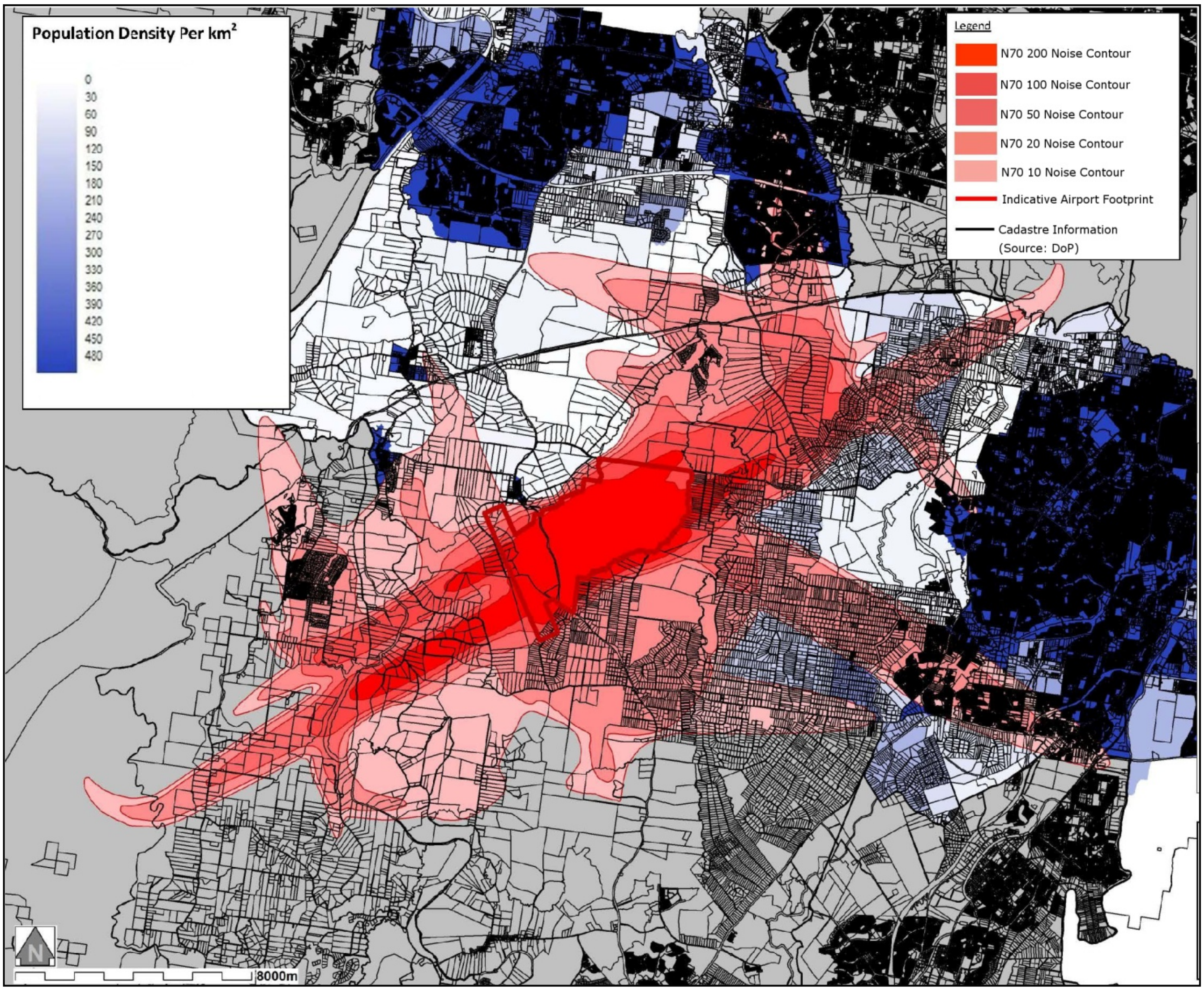
10.2.2.1 N70 noise impact

As described above the measurement of N70 events refer to the minimum number of events above 70 decibels individuals can expect to experience in an average day.

Figure 36 displays a range of N70 noise contours for a fully operational airport (70 million passengers) at Badgerys Creek.

Figure 36: N70 event distribution

[213] National Aviation Policy White Paper, p 214
[214] National Aviation Policy White Paper, p 214



Source: AMPC & Department of Planning and Infrastructure and the Australian Bureau of Statistics 2006 Census data

As can be seen in the figure above, the N70 events will primarily be directed toward the north-east and south-west of the site due to the direction of the aircraft runways. Immediately, in either direction, the population levels that will be affected by the most severe aircraft noise are relatively low.

However, the figure also indicates that there are some residents to the north and south-east of the site who will be affected by the N70 events caused by the development of an airport. Importantly, a large part of these areas, particularly to the north, have a relatively high population density, meaning that the adverse noise impacts could be relatively substantial.

This analysis has found that by 2060 a total of 1,536 persons will experience 100 additional N70 events every day, while 2,664 persons will experience 50 additional N70 events per day and 69,660 persons will experience 10 additional N70 events per day.[215] Table 168 lists all N70 events and is included in Appendix D.

10.2.2.2 *Australian Noise Exposure Forecast impact of Badgerys Creek*

As described above the Australian Noise Exposure Forecast (ANEF) is the Australian Standard AS2021 used to regulate aircraft operations and to report on the effects of those activities. This system takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location.

Impact of noise over time

As described above the noise generated at the airport is predominantly as a result of aircrafts takeoff and landing. Therefore the noise impact of the airport will grow over time in line with the number of services provided (number of plane movements).

[215] WorleyParsons analysis of ABS data, Census 2006

All of the above noise estimates have been based on an airport operating on the site that would cater the maximum level of services (the aircraft movements that is required to support 70 million passenger movements per annum).

The Department of Infrastructure and Transport with the assistance of WorleyParsons has undertaken an analysis of the likely number of persons[216] who will be affected by noise of the airport over the operational period on an ANEF 20 basis.

The findings of this analysis can be seen in the table below:

Figure 37: Sound levels of familiar sources

Passenger movements (million PAX)	Aircraft movements (per day)	Population under ANEF 20
5	74	215
20	280	605
70	824	3,200

Source: Commonwealth Department of Infrastructure and Transport and WorleyParsons

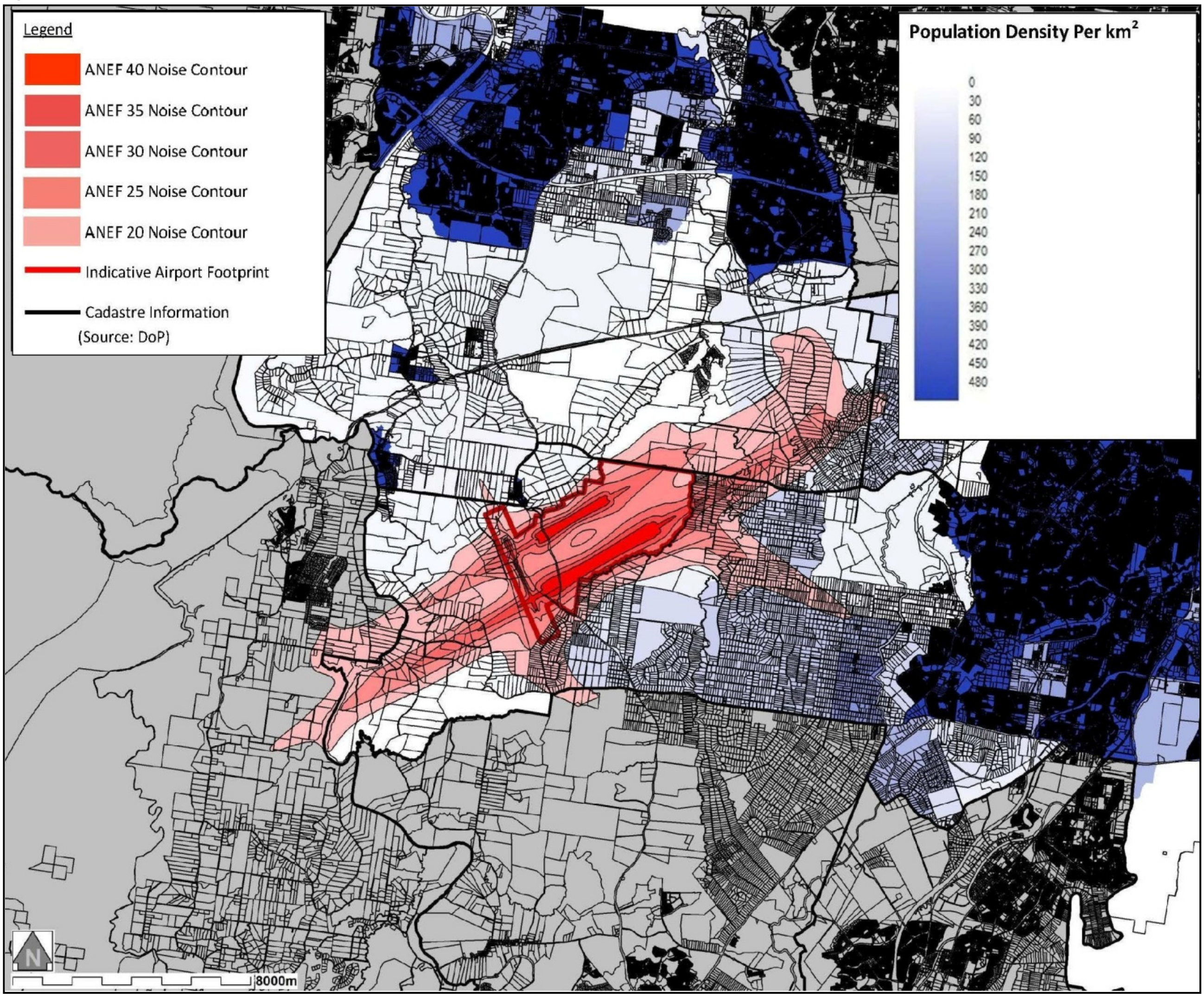
This analysis found that when the airport first commences operations, up to 215 people will be affected.[217] By 2030, when the airport is servicing up to 20 million passengers per year with up to 280 services per day, up to 605 people will be adversely affected by the additional noise. Finally, between 2031 and 2060 when the airport is servicing between 20 million and 70 million passenger movements per annum, up to 3,200 persons will be adversely affected by the additional noise created from the operational airport.[218]

Maximum noise impact

Figure 38 displays a range of ANEF noise contours for the fully operational airport (70 million passengers per annum) at Badgerys Creek.

[216] Based on current population
[217] Reside within the ANEF 20 contour
[218] This analysis is based on the Department's classification of different airport sizes. Note that the actual services provided at each airport may differ from these classification

Figure 38: ANEF noise impact



Source: AMPC & Department of Planning & Australian Bureau of Statistics 2006 Census data

This figure shows that based on the fully operational airport of 70 million passengers per annum (ultimate practical capacity of the airport), approximately 324 hectares will be within the ANEF 40 noise contour. Furthermore a total of 62 allotments or 1,624 hectares are within the ANEF 30 noise contour and 226 allotments or 3,837 hectares are within the ANEF 25 noise contour.

10.2.2.3 Noise mitigation measures

A range of measures can be undertaken to minimise the impact of noise that will result from an operational airport:

- ► The most effective, but most costly, mitigation measure is to purchase all lands within a specified ANEF noise contour.
- ► Residential properties within a specified ANEF noise contour can be 'noise proofed'.
- ► Advancements in aircraft engine technology may also provide a reduction in ANEF noise contours.

10.2.3 Displacement

The construction of an airport at Badgerys Creek will require a number of properties to be compulsorily acquired through the *Land Acquisition Act 1989,* which provides specific powers to the Commonwealth Government to acquire interests in land.[219]

Properties that will have to be acquired as a result of the Badgerys Creek civil airport development includes those properties within the airport site and those properties that will fall within specified boundaries around the airport (such as properties within specified ANEF noise contours).

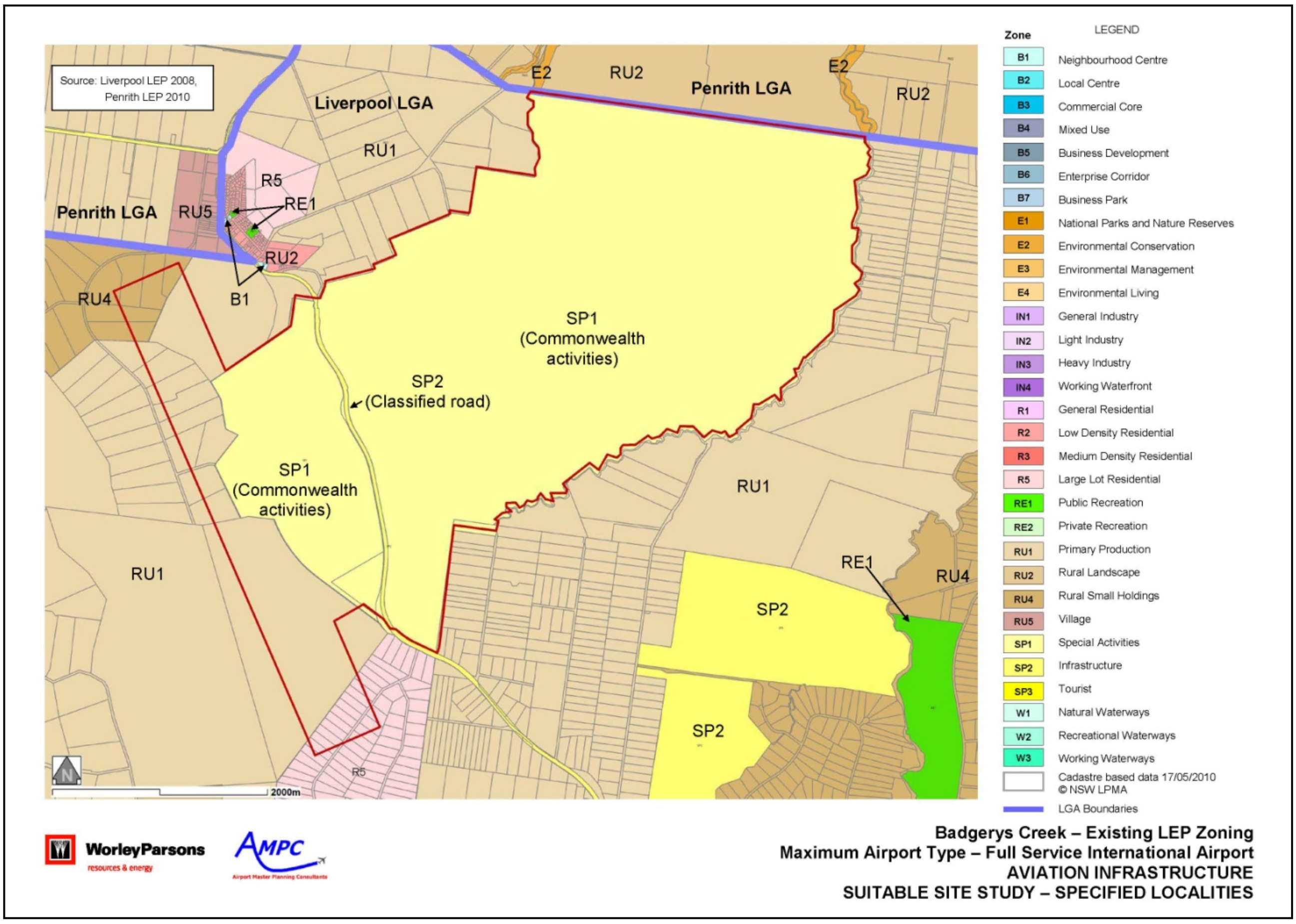
[219] Further information regarding the legislative process for the Government to acquire land through these means can be found within Appendix D

WorleyParsons has undertaken an analysis of the total number of properties that will have to be compulsorily acquired as a result of the development of an airport at Badgerys Creek.

10.2.3.1 Houses within the site

As described in section 8.1, the majority of the land within the Badgerys Creek site was originally acquired by the Commonwealth as the site for a major airport. As shown in Figure 39, the footprint of the site will require further properties – approximately 30 lots – to be compulsorily acquired at the southern end of the site as they are located within the airport footprint.[220]

Figure 39: Badgerys Creek site



Source: Department of Planning and Infrastructure

10.2.3.2 Houses acquired due to noise impact

The Department of Infrastructure and Transport has prepared a Discussion Paper[221] that provides a comparison of the planning controls for aircraft noise between a number of countries. In relation to Australia, the paper indicates the following:

- 40 ANEC or greater – no housing
- 30 -40 ANEC – no new housing
- 25-30 ANEC – insulation of existing housing and no new housing
- 20 – 25 ANEC – new housing with insulation
- Less than 20 ANEC – no restrictions.

As shown in Table 24, there are approximately 62 allotments[222] above the 30 ANEF noise contour. In line with the Australian Standard AS2021-2000, properties located within ANEC contours 40, 35 and 30 should be acquired by the Commonwealth

[220] This estimate of compulsorily acquired lots only applies to this 'reference case' airport configuration as defined by the Department. The land purchased would differ under alternative configurations

[221] http://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/index.aspx

Government. No new housing should be developed within the ANEF ranges 25-30, and that all new houses developed within the ANEF ranges 20-25 must be constructed with insulation.

Table 24: Compulsory acquisition as a result of noise impacts

ANEF	Allotments[223] within noise footprint[224]
20	940
25	226
30	62
35	5
40	0

Source: AMPC, WorleyParsons
Note: Those properties within the higher ANEF contours are already counted within the lower contours

Even though an airport developed within the region will not reach this level of operational output and present this level of noise for over 50 years, it is anticipated that the Government will acquire these houses at the earliest opportunity and put in place relevant procedures to ensure that any residential development within the area will conform with the changing nature of the airport's noise footprint.

10.2.4 Amenity impacts

Throughout an airports lifecycle, the local community will experience a range of amenity impacts. These impacts will differ greatly throughout the various phases of the airports development and operation. As the airport development at the Badgerys Creek site is a greenfield development, the development will have significant amenity impact on the local community. Potential impacts that would arise as a result of the development of an airport at Badgerys Creek at each phase include:

- Planning phase - The development would see a dramatic shift in the development planning for not only for the site but also the wider region. At a local level a number of occupied dwellings and other assets would have to be relocated as a result of land acquisitions for the airport development and surrounding infrastructure. Similarly at a regional level, planning changes would be made to transport infrastructure to facilitate the increased traffic flows caused by the airport.

- Construction phase - Like with the construction of any large piece of infrastructure, the construction phase will result in a range of amenity impacts to local and regional residents. These impacts include, noise, dust and traffic disruptions.

- Operational phase - Once the airport at the Badgerys Creek site transitions from the construction phase to the operational phase, the nature of the land use would change dramatically, with the introduction aircraft traffic potentially causing noise pollution beyond the immediate airport site location. Similarly, the introduction of aircraft traffic would change the visual amenity of the site and the character of the landscape at Badgerys Creek.

10.2.5 Associated development and spatial distribution of region's commercial / industrial businesses

As a core element in a range of supply chains, airports and the infrastructure supporting them, can significantly affect the location decisions of firms, leading to a clustering of firms near airports (including within an airport business park precinct) and associated agglomeration and efficiency benefits. This section outlines projected demand and supply for land adjacent to an airport at the Badgerys Creek site.

As described in section 6.2, the more businesses that choose to locate near and use the services provided by the airport the more viable the airport is likely to be. Furthermore, the more land that is available to be developed around the site, the relative proximity and access of this area to the airport and the availability and quality of other infrastructure will have an impact on the number of businesses that will relocate their operations to this area.

10.2.5.1 Supply of land

WorleyParsons has undertaken a preliminary analysis of the land surrounding the site to comment on its potential to meet industrial and business park purposes. This analysis looked at:

[222] Note that the number of allotments does not equate to the number of households. For the purpose of this exercise we have tallied the number of allotments in which housing is permissible.
[223] Note that the number of allotments does not represent the number of existing households. For the purpose of this exercise we have considered the number of allotments on which housing is permissible.
[224] WorleyParsons analysis on noise impact on residents (Airport Suitable Sites – Specified Localities, matrix) and person per dwelling ratio from ABS Census data-2006

- Proximity to airport footprint
- Least fragmented land
- Ability to connect with airport footprint and access existing transport infrastructure
- Current zoning may not permit 'commercial' and 'industrial' land uses and may require a change in land zoning.

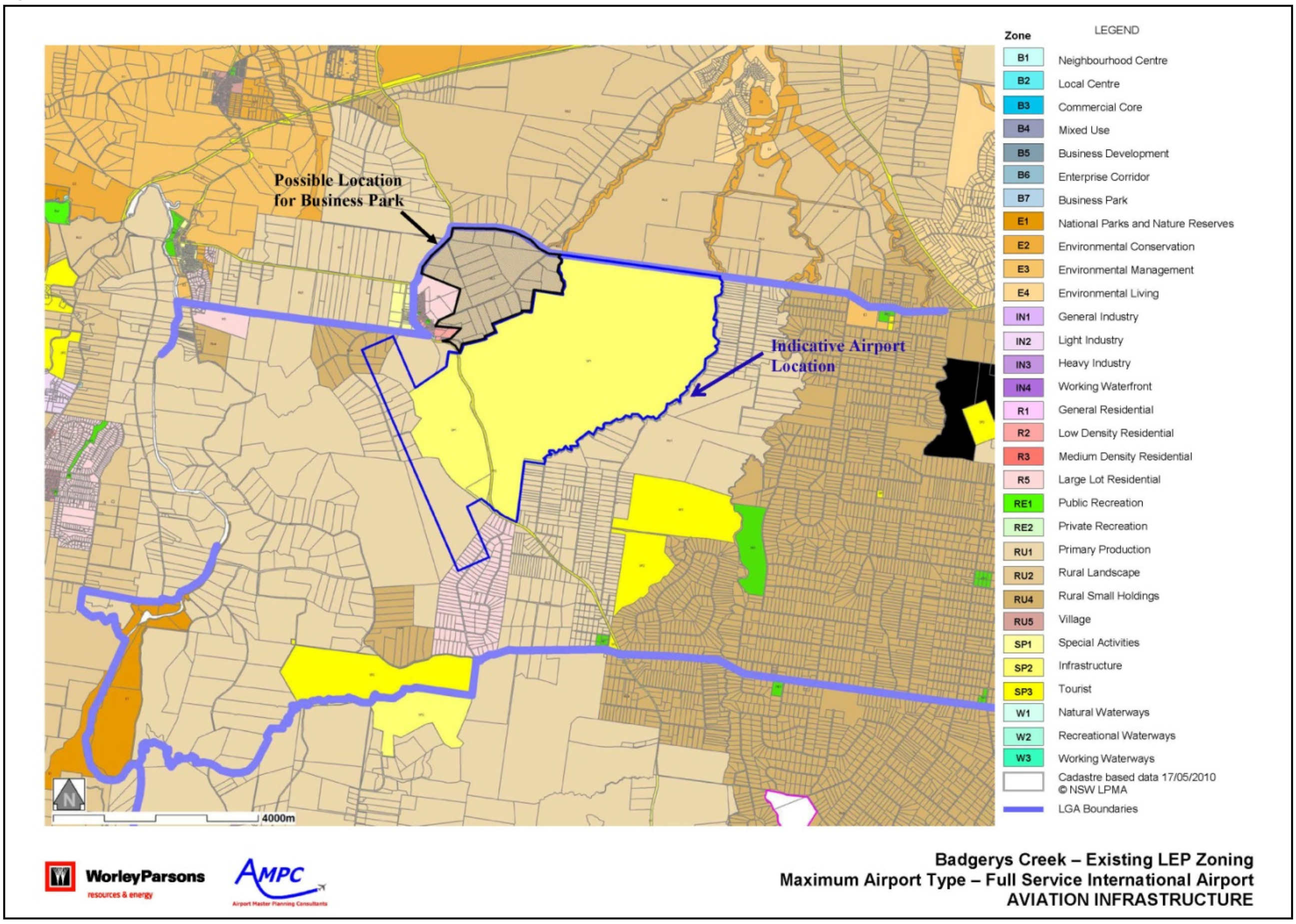
An area enclosed by a radius of approximately 4km from the site centre was investigated to determine potential industrial land and business parks.

Currently the land surrounding the airport site is predominately zoned RU1 (Primary Production) with some land zoned R1 (General Residential) to the south and RU2 (Low Density Residential), RU5 (Village) and R5 (Large Lot Residential) to the north-west. As noted in section 8.3, the current zoning of the land surrounding the Badgerys Creek site will not permit development for the purpose of business parks or industrial land uses.

Should the site be selected for use as an airport, there is the potential that some of the land adjoining the site could be assessed and, if suitable, rezoned for the purpose of permitting business parks and industrial land uses. The areas of land to the north–west of the site could be investigated for employment land uses as they are less fragmented than the land to the east and south; their location is on the southern side of Elizabeth Drive proximate to the airport site and they able to connect well with the existing road infrastructure. This area of land equates to approximately 378 hectares of land.

Figure 40 shows the current zoning of land surrounding the Badgerys Creek site.

Figure 40: Area around airport site



Source: WorleyParsons and NSW Department of Planning and Infrastructure

The majority of the site itself is zoned SP1 (Commonwealth activities) and is owned by the Commonwealth Government. The western part of the site is zoned RU1, RU4 and R5, is fragmented and is in several private land ownerships.

10.2.5.2 Demand for land

To determine the potential uptake of industrial/commercial development around an airport, an analysis of the demand of such businesses to locate in the region was undertaken. This analysis was undertaken through a search of like airports internationally and a qualitative analysis of the factors that may entice a business to locate in a specific location within Sydney. See Appendix B for more details on our methodology.

The results of this analysis are shown in Table 25:

Table 25: Forecast industrial land uptake for Badgerys Creek

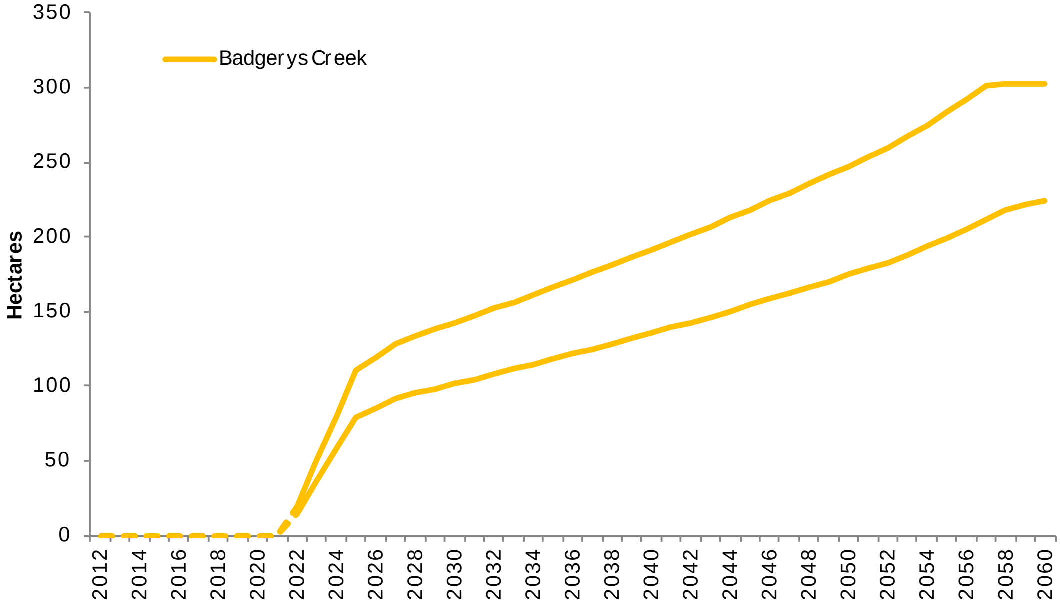
	2035 (ha)	2050 (ha)	2060 (ha)
Low	118	174	225
High	166	247	302

Source: Booz & Co data, analysis by Ernst & Young

The results show that by 2035 the level of demand for industrial land will be in the order of 118 and 166 hectares. With the anticipated increases in airport activity as well as urban growth in surrounding areas, this land use demand is forecast to grow to between 225 and 302 hectares by 2060. Furthermore, demand for this land is expected to be relatively high due to the site's relative closeness to the Sydney CBD and other business districts in Sydney.

Figure 41 presents the results of applying the methodology for determining the demand for land around an airport at Badgerys Creek over the analysis period.

Figure 41: Forecast demand for land use at Badgerys Creek



Source: Booz & Co data, analysis by Ernst & Young (high and low case)

Figure 41 shows the range and expected levels of demand for industrial land at the site. Analysing the strengths and weaknesses of the site can help to determine where demand could be greatest. The strengths of the region are:

- Good transport arterial links
- Cheaper industrial land
- Earmarked as a growth centre.

The comparative weaknesses of the region include the future management of the effective mix of residential and business population growth within the region

Accordingly, it is likely that the uptake of this potential range of demand will be on the higher side of this range.

As can be seen above, the potential supply of land for the development of industrial and commercial businesses in close proximity to the airport over the medium to long-term may reach capacity. Government, local businesses and the airport stakeholders may find it beneficial to also zone additional areas around the site for future business development to protect the long-term strategic benefit of the area and its infrastructure.

10.2.5.3 Induced sub-regional business development

Those businesses that choose to locate in close proximity to the airport could either be induced (will not be realised without the airport) or enticed to move to the area (will have located either within the local or wider region, but choose to locate or relocate close to the airport).

Those businesses that will be developed purely as a result of the operational airport will produce a substantial impact on the economy, with the turnover they generate resulting in a near ‘one for one’ benefit to the economy as a whole.

A number of benefits are associated with a business centre such as that which is likely to develop around an international airport at Badgerys Creek, including:

- ► Clustering and agglomeration of like minded' businesses – The close location of simular businesses can result in a variety of economic benefits including sharing resources and reducing the cost of inputs (for example, lower transportation costs)
- ► Increased competitiveness of other centres – Competition between major centres can increase competition that will increase choice for consumers and reduce the effective price of goods and/or services
- ► Improvement in the use of land – The development of such a centre can encourage businesses and industries with high land use needs but low value output to locate in a less developed area, allowing higher value operations to move into more appropriate locations. An example of this is the movement of industrial businesses away from a town centre to allow higher value residential and commercial development.

Those businesses that will locate in close proximity to the airport (and that are likely not to base themselves within the wider region if the airport is not developed) are most likely to be aviation-oriented (such as airport maintenance, aviation engineers and catering services). Businesses that are likely to move to the area that otherwise would have been located somewhere else within the wider region include those engaged in R&D and light industry activities. Finally, those businesses that are likely to locate in close proximity to the airport that would otherwise have been located within the region in any case are likely to include retail and hospitality services.

11. Employment impacts of a Badgerys Creek airport

The development of an airport and associated industrial/commercial development will result in new employment opportunities during construction and operational phases. These employment opportunities will be realised through direct employment at the airport, as well as indirect employment as a result of increased business activity within the surrounding region.

This section of the report looks at the aggregate level of direct and indirect employment that is likely as a result of the construction and operation of a Badgerys Creek airport. It also analyses the types of employment opportunities likely to be generated and the sources of workers that will be needed.

11.1 Direct employment

The development of an airport will result in a number of additional employment opportunities, throughout both the construction and operation phases.

11.1.1 Construction employment

The construction of an airport and supporting infrastructure at Badgerys Creek will be one of the largest single capital investments in Australia's history. Such a large investment will result in a large number of people being employed to build the underlying infrastructure.

Ernst & Young have undertaken a calculation to determine the potential number of persons that will be employed on the construction of an airport and supporting infrastructure over the initial construction period. This calculation is based on the capital expenditure on infrastructure and the number of construction workers typically required to build these types of assets[225] (this information has been sourced from Treasury NSW).[226] The results from this analysis have been compared to a number of domestic and international case studies.[227]

We have calculated that, on average, approximately 2,300 to 3,300 FTE persons will be employed to build an airport over the construction period. We estimate that a further 1,300 to 1,800 FTE persons will be employed to construct the infrastructure necessary to support an operational airport (such as road and rail infrastructure), as described in section 8.3.

11.1.2 Operational employment

The ongoing operations at the airport will create a range of direct employment opportunities at the airport that will otherwise not be generated within the region.

The number and type of employees that will be directly employed in the operation of an airport was determined based on forecast airport activity (passenger and freight throughput) and the relationship between employment and airport activity identified from a sample of other domestic and international airports.[228] The number of persons forecast to be directly employed at the airport is shown in Figure 42.

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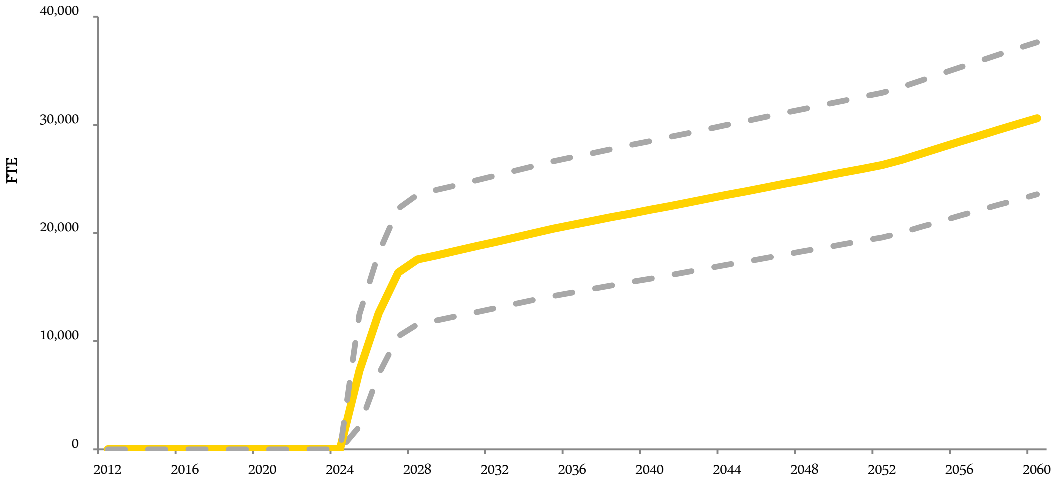
[225] This analysis only looks at the employment and impacts of the initial construction phase and does not analyse the potential for further employment as a result of periodic renewal of the asset.
[226] http://www.treasury.nsw.gov.au/__data/assets/pdf_file/0020/17309/trp09-3_dnd.pdf
[227] Case studies that were analysed include Brisbane airport second runway, the new Indianapolis Airport development and Tom Bradley International Airport.
[228] Further information regarding the methodology and assumptions utilised in undertaking the evaluation of direct employment at the airport can be found in Appendix B

Figure 42: Forecasts of direct employment for Badgerys Creek



Source: Booz & Co data, Analysis by Ernst & Young

Table 26 breaks down the number of full time equivalent positions that are forecast to be realised at an airport at Badgerys Creek.

Table 26: Forecasts PAX, Freight and Employment

Year	PAX	Freight (tonnes)	Direct Employment
2035	25,055,436	47,219	20,391
2050	36,925,565	414,642	25,583
2060	53,978,777	772,921	30,587

Source: Booz & Co data, Analysis by Ernst & Young

The number of direct full-time employees at Badgerys Creek airport is expected to increase from 20,391in 2035 to 30,587 in 2060. This represents a 50% increase over 25 years or an average annual growth rate of 2%.

As airport activity increases, the airport will benefit from economies of scale whereby direct employment increases at a slower rate than growth in aviation activity. As such, the number of passengers per full time employee is anticipated to grow from 1,228 in 2035 to 1,764 in 2060, representing a 44% increase in efficiency.

11.1.2.1 *Composition of employment*

Based on our analysis of other airports, we have been able to disaggregate our forecasts of direct employment into four broad employment categories:

- Passenger employment: airlines, air services and general aviation
- Freight: this includes employment related to the movement of freight at the airport
- Support services: this includes ground transport, administration, retail, car parking and security at the airport
- Other services: this includes government services, maintenance and construction at the airport.

Using international observations, we analysed the relationships between airport activity and the proportion of direct employees in each category at the airport. [229] These relationships were then applied to forecast activity levels for Badgerys Creek. The results of this analysis are provided in the table below.

Table 27: Number and proportion of direct employees for each employment category

Year	Passenger facing employment		Freight		Supporting services		Other services	
	No.	%	No.	%	No.	%	No.	%
2035	8,747	43%	108	1%	5,166	25%	6,369	31%
2050	12,462	49%	1,191	5%	5,343	21%	6,587	26%
2060	17,456	57%	2,655	9%	4,692	15%	5,784	19%

Source: Booz & Co data, analysis by Ernst & Young

[229] Further information regarding the methodology and assumptions utilised in undertaking the evaluation of direct employment at the airport can be found in Appendix B.

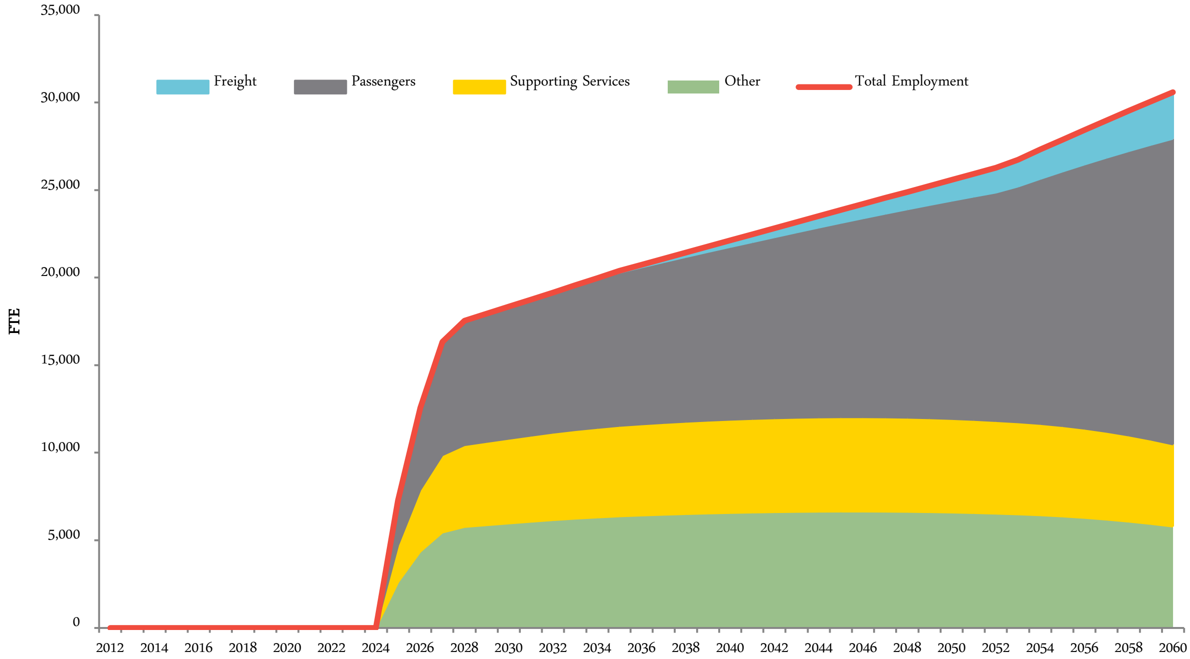
As indicated in the table above, as the airport activity increases, the number and proportion of employees related to passenger and freight services increases. For example, employment in passenger services at Badgerys Creek is forecast to increase from 43% of direct employees in 2035 to 57% in 2060.

According to the traffic forecasts, Badgerys Creek is not expected to cater for dedicated freight activity until 2033, and our forecasts for dedicated freight related employment are consistent with this timing. However, as freight activity increases, so does the proportion of freight-related employment, accounting for approximately 9% of direct employment by 2060.

The support services and other services categories represent a significant proportion of employment throughout the period. However, these employment categories are also more likely to experience economies of scale as aviation activity increases. Our forecasts for these categories show a slowing rate of growth until 2055 when it peaks.

The results of this analysis and the evolution of forecast employment at Badgerys Creek are presented in Figure 43.

Figure 43: Absolute levels of different types of direct employment



Source: Booz & Co data, Analysis by Ernst & Young

An analysis of the skill level composition of each of these types of jobs has found that approximately 53% to 59% are lower skilled employment opportunities, while 41% to 47% are higher skilled employment opportunities over the operational life of the airport.

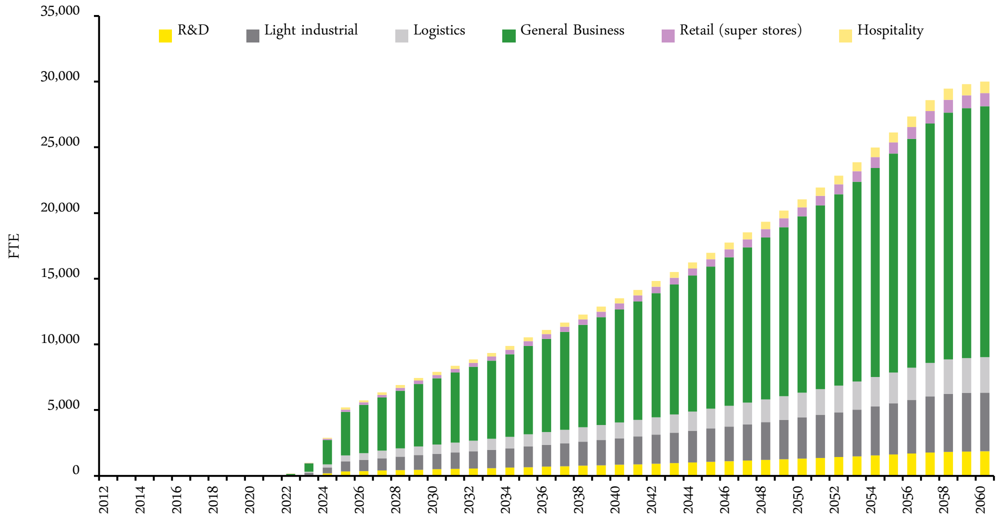
11.2 Sub-regional (associated) development and employment

An airport also impacts the economy through flow-on effects from 'off-site' businesses in the region that supply the airport and its users or form part of a growing airport 'city' or sub-regional economic centre with close links to the airport. For this study, this is referred to as the associated impact of the airport.

As identified in section 6.2, there is a growing trend of businesses locating in close proximity to airports. The level of industrial/commercial land development around the site at Badgerys Creek was estimated based on the 'unconstrained' demand for land in close proximity to the airport and the 'constrained' supply of suitable land parcels. Further information regarding the methodology used in undertaking this analysis can be found in Appendix B.

Using this estimated level of industrial/commercial land development around the airport site, the number of employees, by type of industry, was calculated using employment density industry benchmarks.[230] The estimated level of employment, by type of industry, is shown in Figure 44.

Figure 44: Medium landside commercial/industrial employment projections (FTE)



Source: Ernst & Young analysis[231]

We project that employment in the industrial/commercial developments near the airport is likely to grow to approximately 30,000 employees[232] by 2060.

The general business sector will have the highest employment levels in these industrial/commercial developments, with warehousing/logistics and light industrial also being key employment sectors.

Furthermore, we estimate that the industrial/commercial developments will require 20% higher skilled employees and 80% lower skilled employees.

A number of business activities (and associated employment) will occur within the region and/or the wider Sydney basin irrespective of the development of an airport.[233] However, there are businesses that establish operations around airport sites as a direct result of increased aviation activity, such as logistics and hospitality services. In both instances, the concentration of businesses around airport sites provides benefits to the wider community.[234] As noted in section 9.2, one key benefit is the potential for land releases in other areas to be used for alternative productive uses, including housing, high end retail or other commercial/industrial uses, as a result of businesses relocating their operations to the airport.

[230] Further information regarding the methodology and values utilised within this calculation can be found within Appendix B
[231] Note that this is a forecast based on a number of variables, in reality the development of industrial and commercial businesses as a result of the airport will likely occur in a staggered step change fashion.
[232] In the medium case scenario – the high and low case scenarios forecast 24,600 and 34,400 FTE employees respectively by 2060
[233] Note as previously described these are not necessarily all new jobs realised within the wider community
[234] See chapter 12

11.3 Total employment

As identified in the sections above, employment within the region that will occur in conjunction with the development of an airport includes direct employment in constructing or operating the airport, sub-regional (associated) development and indirect economic activity.

Table 28 summarises the likely total employment generated within the region at different points across the analysis period.

Table 28: Total employment (medium estimate)

	Construction[235]		2030		2060	
	Higher skilled	Lower skilled	Higher skilled	Lower skilled	Higher skilled	Lower skilled
Direct - construction	858	3,434				
Direct - operational			9,851	8,495	18,219	12,368
Indirect -associated landside			1,612	6,291	6,118	23,880
Total	858	3,434	11,463	14,786	24,337	36,247

Source: Ernst & Young analysis

As outlined in section 6.3, not all of these employment opportunities represent new jobs within the region. In other words, a number of these business and employment opportunities will reflect a transfer of activity that would have otherwise occurred elsewhere. Analysis of the wider economic impact of the airport development, undertaken by Monash University general equilibrium model has found that the development of a Badgerys Creek airport will increase the number of people employed within NSW by 10,600 in 2030, rising to 33,400 in 2060.[236]

Furthermore, additional indirect employment opportunities will be created as a result of the development of an airport. These employment opportunities will result from increased economic activity at the airport and the spending of wages from direct employment that will ultimately result in increased employment elsewhere within the economy.

The employment and economic activity derived from the development of the airport is projected to support[237] 12,000 to 28,000 jobs[238] within the wider region (over and above that employment which is realised in the industrial/business parks)[239] by 2030 and 3,000 to 11,000 jobs within the wider region by 2060.[240] Note that the number of additional jobs that are supported within the wider region as a result of the development of the airport reduces over time as those businesses that reside within the business/industrial park develop and play a greater role in supporting the operations of the airport.

11.4 Sources of employment

This section of the report analyses the number of residents (current and future) who will benefit from additional employment opportunities created by the construction and operation of Badgerys Creek airport.

The analysis assumes that the majority of people employed at the airport and associated industrial/commercial developments will reside in areas within 30 minutes travel time. As noted in section 6.3.3, this assumption is broadly consistent with the distribution of where employees of KSA reside.

A number of current NSW Government policies, including the State Plan and the Metropolitan Plan, indicate a desire to provide more jobs closer to residents and to reduce the amount of time people spend travelling to work. The benefits of achieving these policies include improved productivity, better infrastructure utilisation, reduced car use, reduced energy consumption, emissions reductions and more active living.[241]

For this analysis, we have assumed that there are three potential primary sources of labour in the study region to support the airport and associated industrial/commercial developments:

► Unemployed residents seeking employment (excluding the natural long-term rate of structural unemployment assumed to be 4.5%)

► Underemployed residents seeking full-time employment (excluding the natural long-term rate of part-time employment assumed to be 50%)

[235] It has been assumed that 80% of construction labour will be lower skilled jobs
[236] The CoPS modelling assumes that there is no project that can by itself change the total number of people employed within Australia as a whole.
[237] These do not reflect additional employment opportunities created, but jobs that are somewhat supported by the activities of the airport.
[238] These reflect jobs outside of the airport and the associated business park.
[239] We are unable to determine whether these jobs will be within the region as defined within this study or elsewhere within the Sydney basin
[240] The amount of indirect economic activity and employment that will occur as a result of developing an airport at Badgerys Creek has been analysed using the Monash University, Centre of Policy Studies, general equilibrium model. More detail around this model can be found in Appendix B.
[241] NSW Government, *NSW 2021: A Plan to make NSW Number 1*, 2011

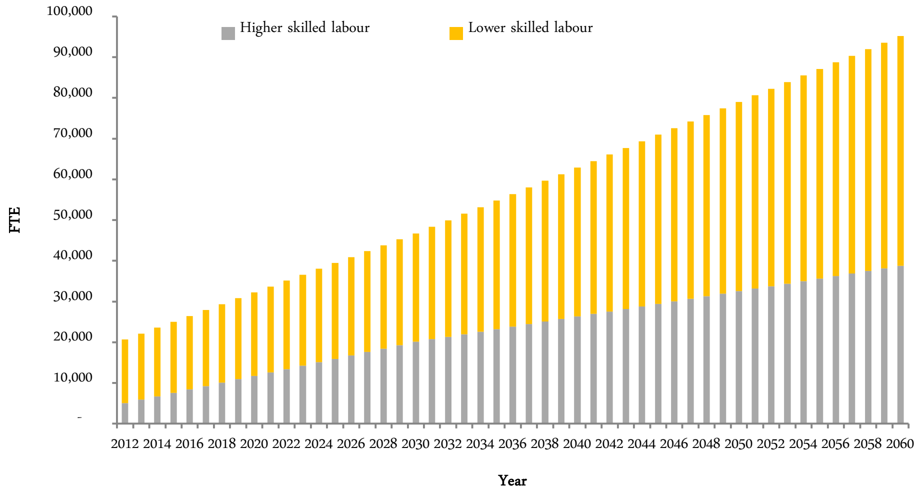
► Future resident labour force not employed by new jobs planned for the region (excluding the natural long-term rate of unemployment/underemployment).[242]

These three sources of labour are divided into higher skilled labour (managers, professionals and technical experts) and lower skilled labour (labourers, machine operators and retail personal).

Identifying sources of labour is complex. In part, labour will be sourced from those who are unemployed/underemployed but also from those who shift from other jobs in the region. This employment redistribution is not taken directly into account by this analysis as the focus is on aggregate employment opportunities. Furthermore, a large proportion of this potential labour pool will be able to obtain gainful employment outside the region, notably in the Sydney CBD, irrespective of the development of an airport within the region.

The potential labour pool within the Badgerys Creek region that could support an operational airport and related industrial/commercial development is illustrated in Figure 45.

Figure 45: Potential labour supply within the Badgerys Creek region



Source: Ernst & Young calculation

There are 757 FTE workers within the region who are currently unemployed and a further 19,900 who are underemployed. These workers could be redirected to potential employment opportunities. This level of underutilised labour supply is anticipated to rise to 46,700 by 2030 and 95,200 by 2060. Of this potential labour force, 41% to 43% will be higher skilled while 57% to 59% will be lower skilled.

This level of potential labour supply is compared to the total demand for labour that will result from the operations of the airport and related businesses operations, shown in Table 29.

Table 29: Forecast labour supply and demand within the Badgerys Creek region

Year	Demand		Supply	
	Higher skilled	Lower skilled	Higher skilled	Lower skilled
current			5,055	15,619
2030	11,463	14,786	20,111	26,593
2060	24,337	36,247	38,737	56,461

Source: Ernst & Young calculation

The airport and associated business activity will create approximately 36,600 jobs by 2030, rising to 58,000 in 2060. As seen in the table above, over the operational period of the airport (2030 to 2060) there will be ample supply of both higher skilled and lower skilled labour that can be sourced from the region.

An airport and industrial/commercial developments at Badgerys Creek will also draw on labour that is within 45 minutes travel time, including from the key suburbs of Parramatta, Bankstown and Strathfield.

[242] As identified with NSW Department of Planning and Infrastructure forecasts

12. Economic impacts of a Badgerys Creek airport

This section of the report analyses the potential economic impact of the construction and operations of an international airport at Badgerys Creek, from both a NSW and national perspective.

The economy wide study was undertaken using a general equilibrium modelling approach. Under this approach, the direct expenditure associated with the development and operations of the airport on the wider NSW and Australian economies forms the foundation of the wider economic analysis. The economic impact assessment was undertaken using the MMRF model, developed at the Monash University Centre of Policy Studies.

It should be noted that this analysis assumes that without the development of an airport, in this case at Badgerys Creek, the majority of aviation movements that would transfer through the airport will be suppressed. Furthermore, a range of high level assumptions were made regarding the proportion of landside business operations that will be developed as a result of the airport development. Our approach regarding the direct impacts assessment and the general equilibrium modelling is summarised in Appendix B.

The result of this analysis is the presentation of a range of state and national economic variables that highlight the aggregate impact of the development of an airport at Badgerys Creek. The measures presented in the analysis include:

- ► Real private consumption – presents the changes in expenditure on goods and services intended for individual consumption or use
- ► Real investment – presents the changes in investment in tangible and productive assets such as plant and machinery, as opposed to investment in securities or other financial instruments
- ► International export volumes – a measure of the change in international trade of products and services from NSW and the national economy
- ► International import volumes – a measure of the change in international trade of products and services into NSW and the national economy
- ► Real Gross State/Domestic Product – a measure of the total market value of all final goods and services produced in NSW and Australia in a given year, which is equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports.

The assessment of aviation capacity economic impacts has been produced at the NSW and national economy levels. The assessment has been produced for the period from 2012 to 2060.

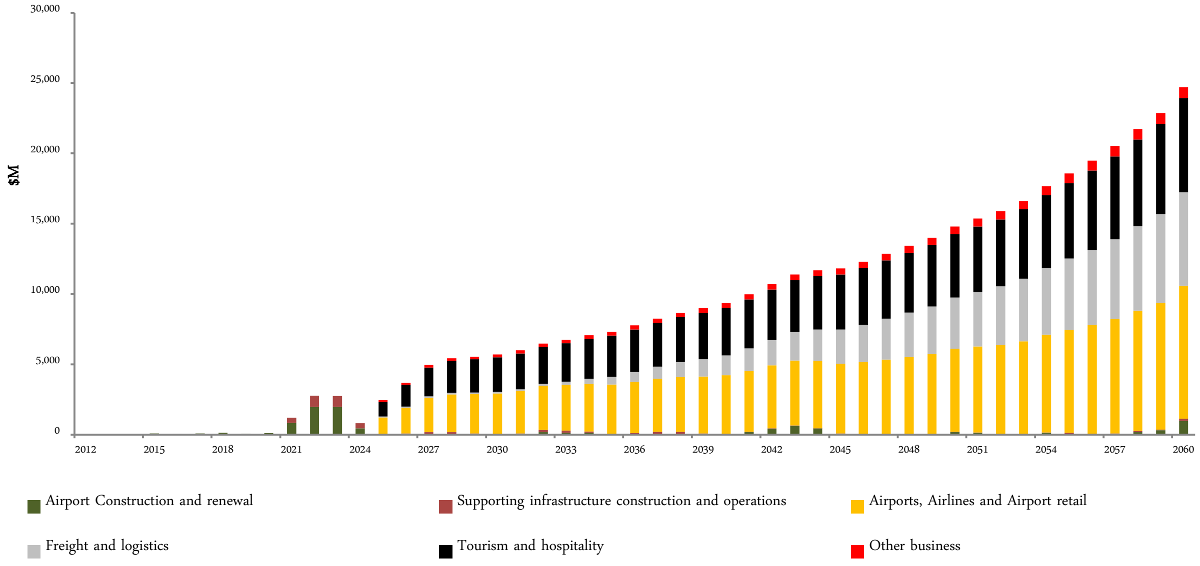
12.1 Direct expenditure impacts

As identified earlier in this report, a number of direct expenditure impacts are associated with the development and operations of an airport at Badgerys Creek. These direct impacts include:

- ► Construction of the airport and supporting infrastructure
- ► Ongoing renewal and maintenance of the airport and supporting infrastructure
- ► Airlines, airports and airport retail
- ► Tourism and hospitality
- ► Freight and logistics
- ► Other business activities – including R&D, retail and general businesses that will be developed and operate as a direct result of the additional economic activity that an airport will generate.

The direct expenditure outcomes between 2012 and 2060, divided by industries, are presented in the figure below.

Figure 46: Direct economic impact (2012 – 2060)



Source: Ernst & Young analysis

This figure indicates that after the construction and commencement of operations of an airport at Badgerys Creek, the direct economic impact will grow each year much in line with projected demand forecasts. When airport operations commence in 2025, direct expenditure impacts are forecast to be approximately $2.4 billion. This will grow to $9.4 billion in 2040 and $24.7 billion in 2060, a compound annual growth rate of 6.9%.

Airports, airlines and airport retail are expected to contribute the largest direct economic impact from an airport at Badgerys Creek, averaging 44% of total direct expenditure impacts over the evaluation period.

Importantly, the direct impact from freight and logistics will grow over time as freight throughput is introduced to the airport post 2033.[243] The impact of freight and logistics is expected to grow from 3% of total direct impacts in 2025 to 15% of impacts in 2040 and 27% of total direct impacts in 2060.

12.2 Wider economic impact

The direct expenditure impact that will result from the construction and operation of an airport at Badgerys Creek will have a range of flow-on economic impacts including output, consumption, investment and net exports. The forecast impact on both the state and national economies, as calculated within the CoPS general equilibrium modelling, are presented below.

12.2.1 Impact on NSW economy

The estimated impact of additional aviation capacity on NSW Gross State Product (GSP) is shown in Table 30.

This impact is given as percentage deviations and as absolute deviations ($m) away from simulated values that would be applied if an airport is not constructed at Badgerys Creek.

[243] This assumption is in line with the demand forecasts provided by Booz & Co

Table 30: NSW impact on GSP (real)

NSW ($'m)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real GSP ($m)	13	8	1,566	4,340	5,868	7,646	9,727	12,213	15,553	20,296
Real GSP (% change from Base)	0.0%	0.0%	0.4%	0.9%	1.2%	1.5%	1.8%	2.1%	2.6%	3.2%

Source: CoPS and MMRF

The annual impact to the NSW economy of enhancing aviation capacity is estimated to be $1,566 million in 2025 in real GSP terms. By 2060, the annual effect of increasing aviation capacity is estimated to benefit the NSW economy by $20,296 million in real GSP terms. This is equivalent to a 3.2 per cent increase in the growth of the State's economic output as a result of this investment by 2060.

The benefit of increasing aviation capacity through the development of a Badgerys Creek airport on the regions of NSW is produced in Table 31. The variable reported here is real Gross Regional Product, which is analogous to real GSP at the state level. The largest economic cost impacts are produced in the Sydney metropolitan region, but there are general impacts in economic performance across NSW.

Table 31: NSW regional distribution of GSP

Gross Regional Product ($m, 2010 prices)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Sydney	11	8	1,286	3,561	4,816	6,278	7,988	10,029	12,770	16,659
Hunter	2	-1	138	384	519	674	854	1074	1369	1792
Illawarra	1	1	94	262	355	462	588	739	942	1233
Richmond Tweed	0	1	53	142	186	233	287	351	438	566
Mid North Coast	1	1	59	161	212	265	327	399	497	641
Northern	0	0	32	93	124	156	192	234	290	369
North West	0	0	19	56	76	97	121	149	187	240
Central West	0	-1	32	95	129	167	210	263	333	432
South East	0	1	49	136	180	227	282	347	434	560
Murrumbidgee	0	0	32	94	126	159	197	241	300	384
Murray	0	0	24	70	94	119	147	179	223	287
Far West	0	0	3	9	13	18	23	30	39	51

Source: CoPS and MMRF

The impacts of increasing aviation capacity on the main components of GSP from the expenditure side are reported in Table 32. At a State level, subsequent to the commencement of operations at the airport there is an increase to all components of real expenditure, with the greatest increase realised through real private consumption which is anticipated to increase to $11,120 million in 2060.

Table 32: NSW impact on real expenditure

NSW	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
($m, 2010 prices)										
Real private consumption	6	-36	1,046	3,088	4,002	4,902	5,906	7,091	8,857	11,120
Real investment	36	76	1,306	2,165	2,372	2,779	3,373	4,159	5,160	7,396
International export volumes	-2	-3	435	1,441	2,076	2,829	3,692	4,676	5,939	7,487
International import volumes	9	9	720	1,456	1,672	1,927	2,239	2,613	3,158	4,051
(% deviation, 2010 prices)										
Real private consumption	0.0%	0.0%	0.4%	1.2%	1.4%	1.7%	1.9%	2.2%	2.6%	3.2%
Real investment	0.0%	0.1%	1.1%	1.7%	1.8%	2.1%	2.4%	2.8%	3.4%	4.6%
International export volumes	0.0%	0.0%	0.7%	2.2%	3.1%	4.0%	4.9%	5.9%	7.1%	8.5%
International import volumes	0.0%	0.0%	0.9%	1.7%	1.9%	2.1%	2.4%	2.7%	3.1%	3.8%

Source: CoPS and MMRF

The negative impacts to real expenditure that will be realised within the NSW economy within the evaluation period up to 2024 occur as a result of the initial investment required to construct the airport and the likely change in investment and consumption that will result

12.2.2 Impact on national economy

The total impact to the national economy as a result of increasing aviation capacity in the Sydney basin through the development of an airport at Badgerys Creek has been calculated using the CoPS MMRF model. The difference between the economic impact to the national economy compared to the NSW economy is determined by the impacts on other Australian states (which may be positive or negative depending on the economic transfers experienced through aviation capacity increases) and the impacts caused as a result of constrained aviation capacity, such as depreciation in the exchange rate and the effect on traveller's behavioural decisions (which have been determined in the direct expenditure analysis).

The estimated impacts of increasing aviation capacity on Gross Domestic Product (GDP), including NSW, are shown in Table 33, both in real dollar terms and percentage changes away from the simulated case of where there is no additional capacity created (the Base Case).

Table 33: GDP impact on Australian economy

Australia ($m, 2010 prices)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real GDP	24	2	1,636	4,615	6,329	8,444	10,982	14,081	18,246	23,942
Real GDP (%)	0.0%	0.0%	0.1%	0.3%	0.4%	0.5%	0.6%	0.8%	1.0%	1.2%

Source: CoPS and MMRF

The annual impact of developing a Badgerys Creek airport on real GDP has been estimated to be $24 million in 2015, rising to $8,444 million by 2040 and $23,942 million in 2060. The impact on the Australian economy as a result of the development of the airport is generally higher than the impact on the NSW economy after the commencement of operations in 2025.

There are two possible general influences on real GSP of other Australian states:

- ► Real GSP of the remaining Australian states will increase as a result of the expected increase in NSW GSP. This will occur due to flows of increased expenditure in NSW affecting other states, as well as expected increased tax revenue for the Commonwealth Government being redistributed nation-wide. Additionally, real GSP of the remaining Australian states will increase due to an expected increase in interstate tourism by NSW residents that will occur with the introduction of a new airport.

- ► Real GSP of the remaining Australian states will decrease with a second Sydney airport as it will pull international exports and real investment to NSW. GSP will also decrease relative to the Base Case because under the Base Case when KSA reaches capacity both passengers and freight will continue to make their way to Australia, but through other states. With the introduction of a new airport, other Australian states will lose these benefits.

It is an empirical matter as to which of these two effects dominate. Based on the analysis in this case, it appears that the former will apply.

The impacts of Sydney's aviation capacity network on the main expenditure-side components within the economy are reported in Table 34.

Table 34: Australia (including NSW) impact on real expenditures

Australia ($m)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
($m)										
Real private consumption	4	-49	1,314	3,966	5,341	6,877	8,630	10,721	13,652	17,237
Real investment	32	65	1,108	1,660	1,781	2,127	2,665	3,377	4,278	6,195
International export volumes	2	-9	377	1,309	1,891	2,589	3,413	4,401	5,765	7,437
International import volumes	14	7	1,034	1,986	2,241	2,578	3,007	3,525	4,304	5,482
(% change)										
Real private consumption	0.0%	0.0%	0.2%	0.5%	0.6%	0.8%	0.9%	1.1%	1.4%	1.7%
Real investment	0.0%	0.0%	0.3%	0.4%	0.4%	0.5%	0.6%	0.7%	0.8%	1.1%
International export volumes	0.0%	0.0%	0.1%	0.5%	0.6%	0.8%	1.0%	1.2%	1.5%	1.8%
International import volumes	0.0%	0.0%	0.4%	0.7%	0.8%	0.9%	1.0%	1.1%	1.3%	1.6%

Source: CoPS and MMRF

As can be seen above, it is expected that after the commencement of operations in 2025 the national economic impacts as a result of the airport will be positive and growing on all of the main expenditure-side components. Real private consumption is expected to be the largest source of whole of Australia impact throughout the evaluation period, totalling approximately $17,237 million in 2060, while the expected increase in international export volumes relative to the Base Case is the largest: in 2060, international exports are forecast to be 1.8% higher than they would have been without the increase in aviation capacity.

Importantly, when comparing the above figures to the expected impacts in NSW:

- The Australian increases in private consumption and international import volumes are larger than the increases expected in NSW over the evaluation period. This demonstrates that the effects on national productivity will not be limited to NSW alone; instead, GDP will increase by more than GSP.
- Real investment in NSW is larger than in the whole of Australia, indicating that real investment in other states will contract slightly over the evaluation period relative to the Base Case as the development of an airport at Badgerys Creek will pull investment to NSW.
- The increase in international export volumes is larger in NSW relative to the whole of Australia. This indicates that the development of an airport at Badgerys Creek may pull exports away from other states due to the increase in the freight and logistics capacity that a second airport will introduce to NSW.

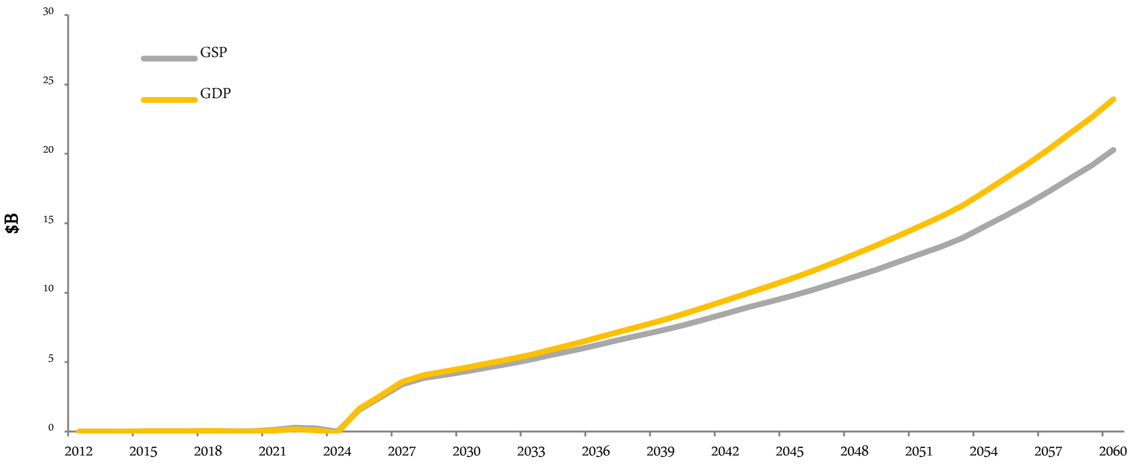
12.2.3 Comparison of NSW and national quantifiable impacts

An assessment of the economy wide impacts of increasing aviation capacity in Sydney through the development of an airport at Badgerys Creek has been undertaken using the direct expenditure impacts.

The economic impact assessment was undertaken using general equilibrium analysis to estimate the historic and future growth in the economy as a result of maintaining the status quo in aviation capacity in the Sydney region.

The GSP/GDP outcomes experienced at the NSW and national levels are presented in the figure below. The changes projected for the NSW economy as a result of additional aviation capacity are less than the changes projected for the Australian economy. This illustrates the extent to which the positive impacts on NSW flow through to the rest of Australia.

Figure 47: Total GSP / GDP outcomes



Source: CoPS data and Ernst & Young analysis

13. Wider social impacts of a Badgerys Creek airport

An airport within the Badgerys Creek region and its associated economic activity will result in a range of social impacts on those who live within the region and those outside the region. The social benefits of airports are typically considered to be substantial and widespread, complementing their economic contributions. However, these social benefits are difficult to quantify as they often represent non-market activities that provide intangible welfare gains to both users and non-users.

The table below presents the social and cultural impacts that are expected to result from the development of an airport at the Badgerys Creek site.

Table 35: Social and cultural impacts of airports

Social and cultural impact	Result of impact
Living standards	► Social and cultural benefits resulting from enhanced connectivity ► Social benefits of employment opportunities ► Jobs closer to home and impact on work/life balance ► Land prices
Strengthening communities and supporting development	► National and regional benefits of aviation ► Supporting the growth of Sydney (benefit of 'City of Cities' approach) ► Increased tax revenue as a result of additional economic activity (eg: tax spend per GSP)

Source: Ernst & Young

13.1 Living standards and quality of life factors

Living standards refer to the level of comfort, wealth and material goods that an individual or group possesses. They are driven by a number of factors including income and purchasing power, accessibility to employment and goods and services, infrastructure and national economic growth, the quality and affordability of housing, the number of vacation days per year, and access to health and education.

A range of factors that affect living standards will be impacted through the development of an airport at Badgerys Creek, including:

- Social and cultural benefits resulting from enhanced connectivity
- Social benefits of employment opportunities
- Jobs closer to home and impact on work/life balance
- Land prices.

These factors have been described in section 6.4. The following sections discuss the specific factors and benefits associated with the development of an airport at Badgerys Creek.

13.1.1 Social and cultural benefits resulting from enhanced connectivity for local residents

The aviation sector provides an essential service by physically connecting people and businesses to one another and the rest of the world. Introducing a second airport to the Sydney basin can enhance connectivity and increase the ability of NSW and Australia to attract tourism through service frequency and affordability. In turn, this may lead to an increase in the number of flights for leisure purposes and deliver to Australians a range of social and cultural benefits associated with increased travel.

An airport development at the Badgerys Creek site, capable of accommodating up to 70 million domestic and international passenger movements, will be able to provide these cultural and social benefits to surrounding regions in the South West Growth Centre. This is particularly important as 65% of the population growth expected to occur between 2006 and 2036 is anticipated to occur in Western Sydney.[244] The patterns of aviation travel with and without the development of the Badgerys Creek airport are shown in the table below.

Table 36: Demand for aviation services with and without the Badgerys Creek development

	Without Badgerys Creek development			With Badgerys Creek development	
	2010	**2030**	**2060**	**2030**	**2060**
North East	4,870,835	9,133,758	12,502,235	11,785,891	18,459,449
Metro Sydney	17,538,860	32,622,502	44,408,239	44,143,066	69,241,016
South and South West	3,490,059	6,633,017	9,160,735	8,687,297	15,093,207
West Central	4,461,350	8,445,707	11,633,950	11,348,240	21,300,812
North and North West	4,038,552	7,609,235	10,448,791	9,355,834	16,011,235
Newcastle	974,692	1,839,944	2,529,750	2,131,999	3,573,221
Western Sydney	277,116	520,712	713,729	820,956	1,697,265
Total	35,651,464	66,804,875	91,397,429	88,273,283	145,376,205

Source: Booz & Co data, Ernst & Young analysis

Currently, residents in outer western Sydney take approximately 277,000 air trips per annum. These trips are anticipated to increase to approximately 714,000 by 2060 without the development of a secondary airport within the Sydney basin. With the development of an airport at Badgerys Creek, approximately 300,000 more flights per annum are forecast by 2030 and 984,000 flights per annum by 2060, over and above that which is forecast to occur without the development of a secondary airport.

A Badgerys Creek airport will also encourage more people in the broader north-west and south-west of Sydney to use aviation services by improving accessibility to these services. The development of the Badgerys Creek airport is forecast to benefit the residents of those regions through an additional 3.8 million flights per annum by 2030 and an additional 11.5 million flights per annum by 2060.

These social consequences of the development of a second airport in the Sydney basin may help to strengthen the identity of the communities of Western Sydney, contributing to the creation of distinct regional brands and identities, enhancing community pride and promoting economic investment and community development.

[244] NSW Metropolitan Plan 2036

13.1.2 Social benefits of employment opportunities

Employment (and its associated income) provides benefits to communities beyond personal subsistence and consumption. These benefits include the psychological benefits associated with a stable and satisfying workplace, the provision of additional career choices without having to relocate, higher levels of social cohesion and inclusion, and a greater sense of community in the region.

The development of an airport at Badgerys Creek is forecast to increase the total number of jobs within NSW by 10,600 in 2030, rising to 33,400 in 2060. [245] Monash University's modelling suggests that this rise in the total number of people employed will result in a decrease in Sydney's unemployment rate by 0.3% in 2030 to 0.74% in 2060.[246]

Communities within the South West Growth Centre will benefit socially from the additional economic opportunities that will result from the development of a Badgerys Creek airport. This is important as the population in these areas is expected to increase significantly in the coming decades, potentially making it more difficult to establish a sense of community and encourage social inclusion in areas that are undergoing rapid population growth.

13.1.3 Jobs closer to home and impact on work/life balance

The opportunity to work closer to home provides a number of social benefits to individuals, employers and society as a whole, including a reduction in energy use and carbon emissions, a rise in workforce productivity, an increase in people's leisure time and the promotion of more active and healthy lifestyles.

More people working close to home will also reduce overall congestion on roads and public transport by reducing the number and length of commuter trips required for people living in high growth areas.

The development of a Badgerys Creek airport and the associated activity around the airport will create more employment opportunities for the current and projected future population within Sydney's high growth areas of the South West Growth Centre, Liverpool and Campbelltown.

Creating jobs closer to home is strongly aligned with the NSW Government's NSW 2021 State Plan, which seeks to use strategic and land use planning to increase the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney.[247] This report assumes that approximately 90% of new jobs stemming from the airport are likely to be taken up by persons who live within 30 minutes private vehicle access time.[248] Between 11,500 and 14,800 employment opportunities by 2030 and 24,300 and 36,200 opportunities by 2060 will be provided closer to the person's home then would have otherwise been the case.

The employment opportunities developed in the region as a result of the airport[249] has the potential to save up to 1.43 million hours travel time as a result of people working closer to home by 2030, increasing to up to 3.92 million hours by 2060.[250] These time savings realised by local residents would furthermore benefit other local commuters by effectively reducing the congestion that would have otherwise been realised on major transport networks from the region to access major employment centres.

13.1.4 Land prices

The construction of an airport at Badgerys Creek will have an impact on the dynamics of the area and the value of land. The table below presents Ernst & Young's Real Estate Advisory team's assessment of the likely impact of the development of an airport on land prices within the surrounding vicinity of the airport. Actual land and property prices are affected by a large number of factors and so only a broad guide to the direction and scale of potential change due to each airport-related factor in turn are given below.

Table 37: Impact on property values in the surrounding area

Assumption	Anticipated impact	Likely impact on value	Main areas affected
Employment	Less than 5% positive	The value uplift on residential property is dependent on the type of employment created (Reed & Pettit 2004): that is, where a number of highly skilled employment opportunities are created, the value uplift to the surrounding residential development may be significant. Airports and their surrounding business parks generally employ low to medium skilled workers for roles such as retail assistants, baggage handlers and cleaners.	Suburbs south of the M4, West of the M7 and East of the Hawkesbury River

[245] The CoPS modelling assumes that no project can by itself change the total number of people employed within Australia as a whole.
[246] Assuming that future unemployment and participation rates are consistent with future population growth
[247] NSW Government (2011), NSW 2021: A Plan to Make NSW Number One, http://www.2021.nsw.gov.au/
[248] Ernst & Young assumption
[249] Either at the airport or the landside development
[250] Ernst & Young calculation based on BTS trip distribution matrix of current origin/destination of trips of residents within the surrounding region, assumed (current and future travel speeds). Further information regarding how this was calculated can be seen in Appendix B

		The airport is likely to provide directly and indirectly a large number of employment opportunities having a positive impact on residential property values. However, due to the anticipated number of lower skilled positions, the positive impact is anticipated to be limited.	
Airport connectivity	Less than 5% positive	Many people require the airport on a regular basis for their employment, business or lifestyles. For this reason, being within an easy drive of the airport may be a consideration for some when seeking to acquire residential property. Areas that are not detrimentally impacted by noise or other negative impacts are likely to experience a slight increase in value due to the additional demand for housing by those with greater purchasing power. As a number of suburbs will benefit from this, the value will be limited.	Properties within 30 minutes drive of the airport site
Accessibility	Less than 5% positive	When governments construct new airports it is common practice to also upgrade the transport network and links to the airport, which can have the effect of improving accessibility and commuter times for journeys not beginning or ending at the airport.	Properties in proximity to new or upgraded transport links.
Noise	More than 5% negative	Airport noise has a negative impact on residential property values, particularly in suburbs directly in line with the runway and in proximity to the airport. Some studies suggest higher value properties are likely to fall more than affordable properties.	Suburbs toward the north and north-east of the site
Traffic	More than 5% negative	Depending on size, airports are likely to create additional road and rail traffic. This is likely to create additional noise and pollution. Without sufficient capacity on transport infrastructure, traffic congestion will occur, creating further pollution. This congestion, or increasing the capacity of existing networks or building new networks is likely to have a negative impact on residential properties on the corridors impacted by the additional noise and pollution.	All properties within proximity to main arterial networks leading to and from the airport
Landscape/views	Less than 5% negative	This will impact properties in proximity to the airport, particularly those with views overlooking the site. As most of the land around each of the sites is near level, this is unlikely to impact on many properties. Properties in proximity to recreation or conservation areas affected by the airport are likely to experience a fall in value.	Properties overlooking the site and within a short distance of the airport and properties adjoining or close to recreational or conservation areas
Public safety risk	Less than 5% negative	This will impact properties within proximity to the airport, in particular those in line with the runway. This is because aircraft accidents generally occur on landing or just after takeoff. Because of the safety record of the commercial airline industry in Australia, this impact is likely to be minor.	Suburbs toward the north and north-east of the site
Pollution	Less than 5% negative	Airport pollution is generally aligned with noise and local air pollution and has a negative impact on residential property values. Those suburbs directly in line with the runway and in proximity to the airport are likely to be impacted the most by pollution.	Suburbs toward the north and north-east of the site

Source: Ernst & Young analysis

Overall, properties surrounding the Badgerys Creek site are likely to experience a small increase or decrease in value depending on their location relative to the site. This includes, but is not limited to:

- Properties severely impacted upon by airport noise are likely to experience a significant fall in value.
- Properties that become more accessible, are in proximity to the airport and not severely impacted upon by noise and are relatively affordable are likely to experience uplift in value due to the airport and surrounding uses becoming an employment centre.
- Moderate and highly priced areas not impacted upon by noise or any other associated detriments are unlikely to experience the same level of value uplift. This is because the airport and the anticipated surrounding uses are likely to create a higher proportion of lower skilled jobs.

Overall, as the Badgerys Creek site is located relatively closer to industrial areas, and therefore the impacts on land prices as a result of an airport development are likely to be smaller than if it was located near a densely urbanised location.

There are a number of ways to manage and mitigate these impacts.[251]

Furthermore, there are several parcels of land around the site that could be re-zoned to change their use, which will most likely have a positive impact on the price of the asset.

13.2 Strengthening communities and supporting development

As described in section 6.4.2, airports play a significant role in the regional economy and the development of their surrounding communities. For these communities, airports are able to increase accessibility to business and leisure flights, employment and vital infrastructure such as health and education, positively impacting community living standards, stability and identity.

13.2.1 Benefits of greater connectivity – across the state and the nation

More accessible and affordable flights will lead to an increased number of flights for business and leisure purposes and greater national connectivity. Greater national connectivity has the potential to deliver a range of benefits including increased national cohesion, reduced business costs, improved knowledge and awareness, and a stronger national identity.

Outside of the Sydney basin, the development of an airport at Badgerys Creek airport will increase the number of aviation services provided to rural and regional NSW. Booz & Co have forecast that by 2060 up to 10 additional flights per day will be provided to regional areas to access the Sydney area. Specifically, the following locations are expected to benefit from additional services:

- Albury Wodonga
- Dubbo
- Orange
- Wagga Wagga
- Lismore.

These additional aviation services will increase the connectivity of regions and support economic development in regional NSW, as well as supporting regional tourism.

New links between regional communities and Western Sydney will give regional communities greater access to Western Sydney's rapidly growing commercial sector, as well as to a wider range of vital public services (such as Westmead Hospital and the University of Western Sydney).

13.2.2 Supporting the growth of Sydney

Section 6.4.2.3 noted the importance – and the challenges – of maintaining a sustainable distribution of population and economic growth across Sydney over the medium to long-term. An airport at Badgerys Creek will provide support for the NSW Government's plans to develop Sydney as a 'City of Cities', with a number of compact, connected major centres offering services, employment, retail and entertainment and cultural facilities at a regional scale and acting as 'capitals' for their regions.

[251] This is outside the scope of this analysis.

An airport at the Badgerys Creek site will introduce a significant piece of infrastructure to a growing Western Sydney and can act as a hub for transport, industry and employment. The location of this infrastructure could work with existing price signals to encourage the movement of economic activity to the area. Freight and passenger throughput, supporting transport and communications infrastructure and possible agglomeration opportunities with business park industries will attract further capital and labour resources away from the Sydney CBD and toward the South West Growth Centre.

The airport will support the population growth that is projected to occur in the South West Growth Centre, Liverpool and Campbelltown, and assist in the development of a new major centre to support the future growth of the Sydney basin, with impacts flowing on to other regional centres through the distribution of employment opportunities and demand for public services, particularly public transport.

13.2.3 Increase in tax revenue

The increase in economic activity, both aeronautical and non-aeronautical, that will result from the development of an airport at Badgerys Creek will ultimately result in additional tax revenue at all levels of government. As noted in section 6.4.2.4, this additional government revenue may then be re-distributed in the form of increased social welfare transfers or lower income and corporate taxes. It may also be spent by different levels of government on other important projects. Accordingly, an increase in tax revenue can potentially further add to the social benefits indirectly generated by the introduction of a second airport in the Sydney basin.

Some of the taxes that are likely to increase as a result of the development of an airport include Commonwealth Government (GST, income tax and corporate tax) and State Government taxes (stamp duties, land taxes, import duties and payroll taxes).

The table below outlines a range of potential outcomes for incremental tax revenue that may accrue to the Commonwealth and NSW State Governments as a result of an airport at Badgerys Creek. These outcomes use the expected increment in GDP and NSW GSP[252] caused by the introduction of a second airport to the Badgerys Creek site and the historic average tax take from economic activity obtained from the Australian Bureau of Statistics. These results should be interpreted with caution and should be read alongside the assumptions and methodology used in their estimation (see Appendix B for more detail).

Table 38: Estimated incremental tax revenues for all levels of government and the NSW government

$m in 2010 dollars	All levels of Government[253]		NSW State Government[254]	
	Low	High	Low	High
2025	$461	$478	$107	$122
2040	$2,381	$2,466	$520	$596
2060	$6,752	$6,991	$1,380	$1,583

Source: CoPS modelling, ABS data and Ernst & Young analysis

Noting the It is estimated that the additional tax revenue that may be collected by all levels of government when the airport opens in 2025 to be in the range of $461 and $478 million. This will increase to between $2,381 million and $2,466 million in 2040 and between $6,752 and $6,991 million in additional tax revenue in 2060.

Furthermore, between $107 million and $122 million could be collected by the NSW State Government in 2025 as incremental tax revenue.[255] This will increase to between $520 million and $596 million in 2040 and between $1,380 million and $1,583 million in 2060.

[252]As sourced from CoPS modelling
[253] This includes NSW Government incremental tax revenue
[254] This includes GST contributions from the Federal Government
[255] This includes GST contributions from the Federal Government.

Part E –
Analysis of Richmond

Richmond airport summary

The region

- The regions surrounding the Richmond site, including the Hawkesbury, Hills, Blacktown and Penrith Local Government Areas, provide the site with a well established population base of 534,986.
- The Richmond site is located in close proximity to a number of major employment centres in Sydney's north-west, including Richmond, Penrith, Castle Hill and Blacktown, as well as the planned employment centre of Rouse Hill.
- The Richmond region is well-served by a number of major road and public transport links, including the M4 and the M7.

The proposed development

- A Richmond airport would utilise the site currently occupied and used by the Royal Australian Air Force and would cater for passenger throughput of 5 million per year.
- The demand analysis undertaken by Booz & Co found that 3 million passengers could use aviation services at a Richmond when it opens in 2017, with the airport reaching its capacity of 5 million passengers per annum by 2036.

Operational impact of the airport

- An operational airport at Badgerys Creek would increase carbon emissions within the Sydney basin; in addition there would be an estimated 0.9% increase in NOx emissions.
- A total 5,086 persons would experience 50 additional N70 events every day, while 12,356 persons would experience 20 additional N70 events per day and 24,131 persons would experience an additional 10 N70 events per day.

Employment impacts of the airport

- Approximately 350 to 500 FTE persons would be employed during the construction period.
- Up to 4,200 FTE jobs would be created at the airport by 2060.
- Industrial/commercial developments near the airport would support approximately 4,060 additional employees by 2060

Economic impacts of the airport

- The development of an airport at Richmond is forecast to increase GDP by $423 million in 2025 in real terms, increasing to $1,005 million in 2060.
- The airport has the potential to save up to 1.23 million commuting hours per annum by 2060 as a result of people working closer to home.
- The economic activity generated from an operational airport would result in an increase in federal, state and local government tax revenue by $208 million in 2040 rising to $288 million in additional tax revenue in 2060.

14. Richmond regional context

This chapter introduces the background context for the Richmond study region and provides a baseline for comparison against potential impacts that an airport may have on the region.

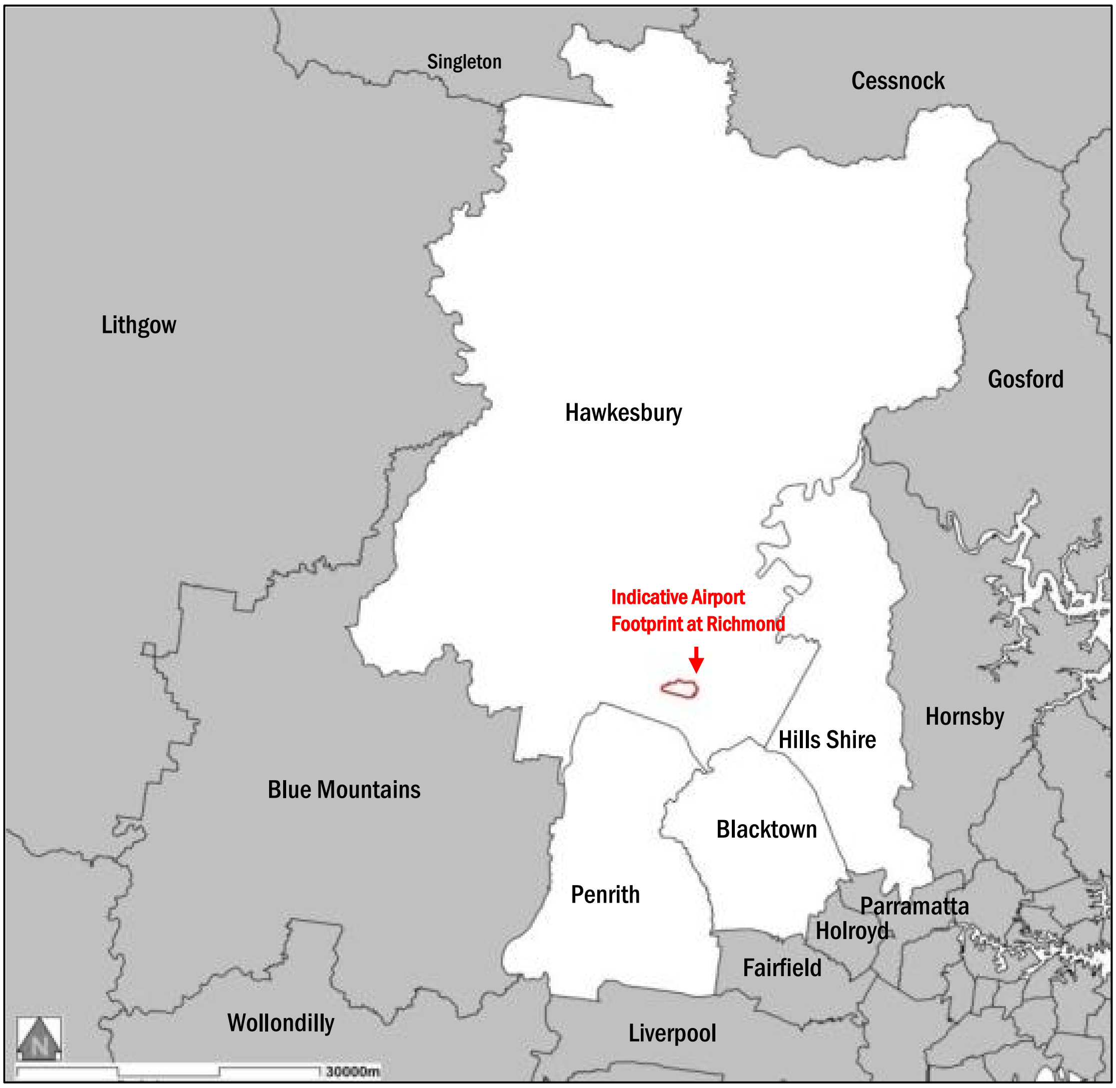
14.1 The study region

The following sections present the relevant background information regarding the region, both currently and what is planned for the future, to determine the impact of an airport.

The Richmond[256] study region is defined as the area bounded by Hawkesbury, The Hills, Blacktown and Penrith Local Government Areas (LGAs). This study region was defined by Ernst & Young in consultation with government stakeholders, other consultants and the Bureau of Infrastructure, Transport and Regional Economics.

Figure 48 highlights the proposed Richmond airport site, relative to the region and the wider Sydney basin.

Figure 48: Proposed Richmond airport site and the region



Source: NSW Department of Planning and Infrastructure

The following analysis of the region includes the relevant socio-economic composition, current business and employment drivers and, the current provision of infrastructure that supports the region. This section also provides a snapshot of other planned development in the region.

[256] For reporting simplicity the region that supports Richmond is defined as the Hawkesbury, The Hills, Blacktown and Penrith Local Government Areas (LGAs) within this report.

14.1.1 Socio-economic composition

A socio-economic analysis was undertaken for residents within the study region. This analysis was undertaken to establish the current socio-economic composition of local residents within the study region to determine how an airport will impact their lives.

Table 39 presents the socio-economic composition of the Richmond region.

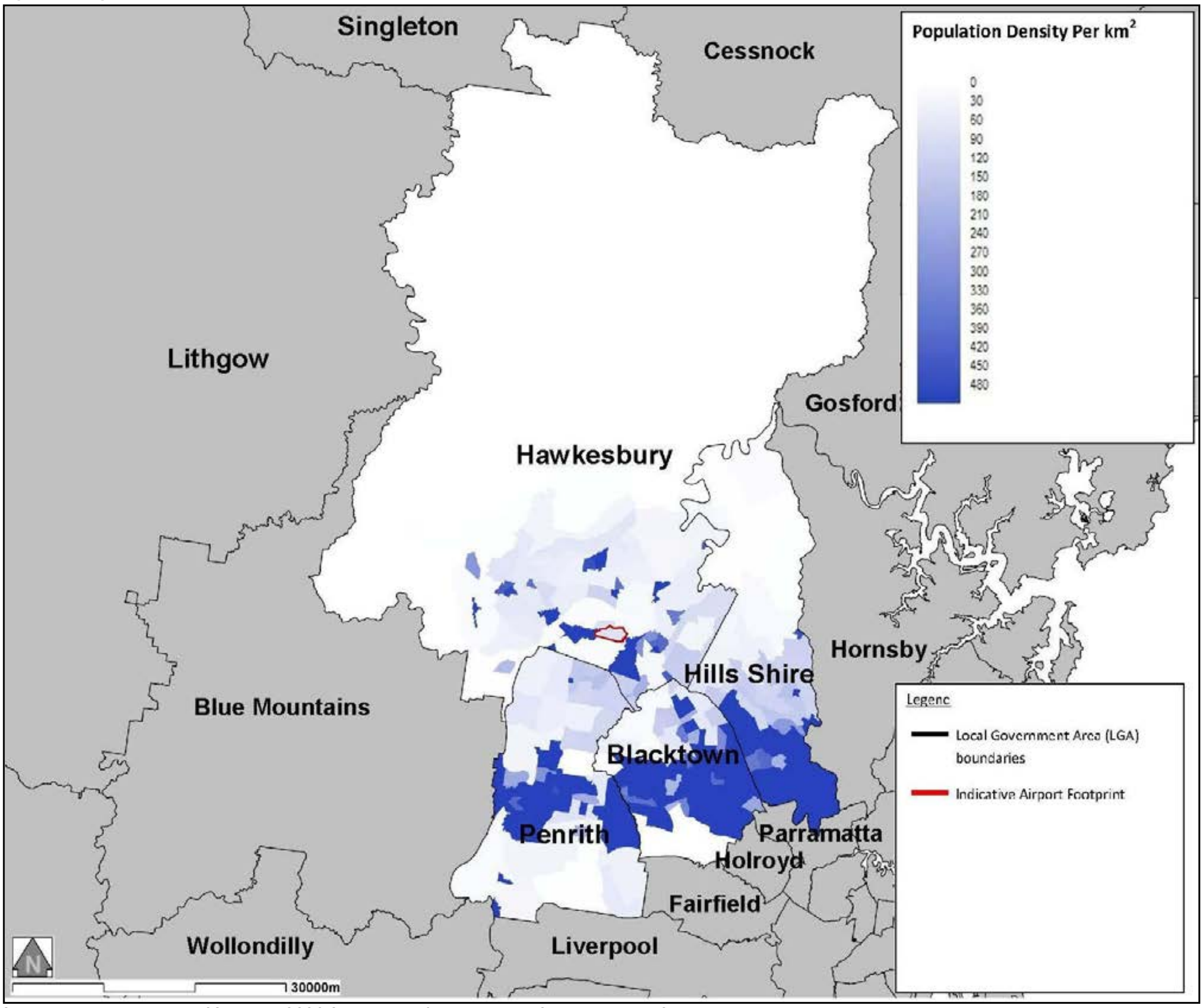
Table 39: Socio-economic statistics of Richmond

Statistical Indicator	
Population	663,803
Households	222,974
Person Per Dwelling Ratio	3
Age Profile	
Infants 0 to 4 years	50,188
Children 5 to 17 years	155,622
Adults 18 to 64 years	401,365
Mature adults 65 to 84 years	51,210
Senior citizens 85 years and over	5,418
Average Age	34
Employment	
Full Time	213,605
Part Time	101,772
Unemployed	17,309
Not in Labour Force	150,781
Type of employment	12%
Managers	18%
Professionals	15%
Technicians and Trades Workers	8%
Community and Personal Service Workers	19%
Clerical and Administrative Workers	10%
Sales Workers	9%
Machinery Operators drivers and labourers	10%
Qualification Attainment	
Postgraduate Degree Level	6%
Graduate Diploma and Graduate Certificate Level	2%
Bachelor Degree Level	26%
Advanced Diploma and Diploma Level	17%
Certificate Level	42%
No post-school qualification	7%
Household Income Profile (pa)	
$1-$149	8%
$150-$249	14%
$250-$399	13%
$400-$599	16%
$600-$799	14%
$800-$999	11%
$1,000-$1,299	11%
$1,300-$1,599	6%
$1,600-$1,999	3%
$2,000 or more	4%
Home Ownership	
Residents Own/Mortgage	74%
Rent	26%

Source: .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data

Figure 49 presents the geographical distribution of where people reside within the region:

Figure 49: Regional population distribution



Source: Australian Bureau of Statistics 2006 Census data & Department of Planning and Infrastructure

Figure 49 highlights that the areas with the greatest population densities are some way south of the existing airport site. Areas to the immediate south of the site are sparsely populated, while the areas immediately to the west and south-east of the proposed site have a relatively higher population density.

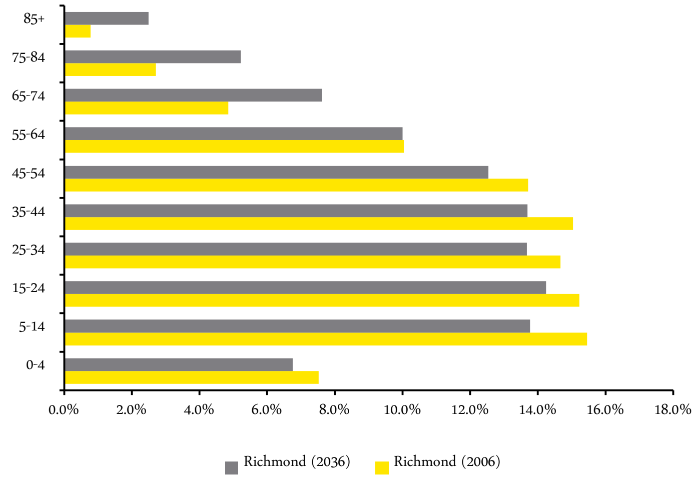
The region currently has 5.4% unemployment, while 32% of the working age population (18 to 64) are not in the labour force. Within the Sydney Statistical Division, the unemployment figure is 5.3%, with 31.8% of the working age population not in the labour force. Within Australia, the unemployment figure is 5.2%, with 26.5% of the working age population not in the labour force.

The average age of residents within the region is 34.7[257]; this is 2.9 years younger than the average age of those people residing in the Sydney Statistical Division.

[257] Average Age was calculated by averaging the median values of each age bracket from .id – the population experts (http://home.id.com.au/), with the median value of the '85 and over' age bracket set as 92.5. The average for Sydney Statistical Division was obtained from the ABS website.

The average age in the region is expected to grow over time, as shown in Figure 50:

Figure 50: Age distribution for Richmond



Source: NSW Department of Planning and Infrastructure Population Projections

This figure demonstrates that between 2006 and 2036, the proportion of the region's population over 65 will grow from 8.3% to 15.3%. At the same time, the population over 65 in the Sydney Statistical Division will grow from approximately 12.0% to 18.0%.[258]

The average income of residents within the region is $842 per week,[259] compared to $1,254 per week in the Sydney Statistical Division. Richmond residents currently earn approximately $21,500 per annum less income (on average) than the wider Sydney region.[260] Furthermore:

- 20% of households within the region earn less than $399 per week, compared to 8% in the Sydney Statistical Division.
- 61% of households within the region earn between $400 and $1,299 per week, compared to 52% in the Sydney Statistical Division.
- 17% of households within the region earn over $1,300 per week, compared to 38% in the Sydney Statistical Division.

The region has a greater percentage of residents with only a high school education (46%) than the Sydney Statistical Division (30%) and the percentage of residents with a Bachelor Degree or higher (20%) is lower than that in Sydney (48%). This indicates that the skills mix in the region is different and more orientated toward lower skilled jobs relative to the wider Sydney region.

'Skilled'[261] employment makes up 52% of employment in Richmond, relative to 66% within the wider Sydney region. Of those workers who reside within the region, the greatest industry participation is in the retail trade sector (15%), followed by manufacturing (14%).

Of those persons who reside within the region, 47% are employed within the region; 27% are employed in the adjoining regions of Cessnock, Gosford, Baulkham Hills, Parramatta, Holroyd, Fairfield, Liverpool, Wollondilly and the Blue Mountains; and 8% work within the Sydney area.

Figure 51 provides a breakdown of where residents of the region are employed based on 2006 Census data.[262]

Figure 51: Employment distribution of Richmond Region's residents (each sub-region as a percentage of total)

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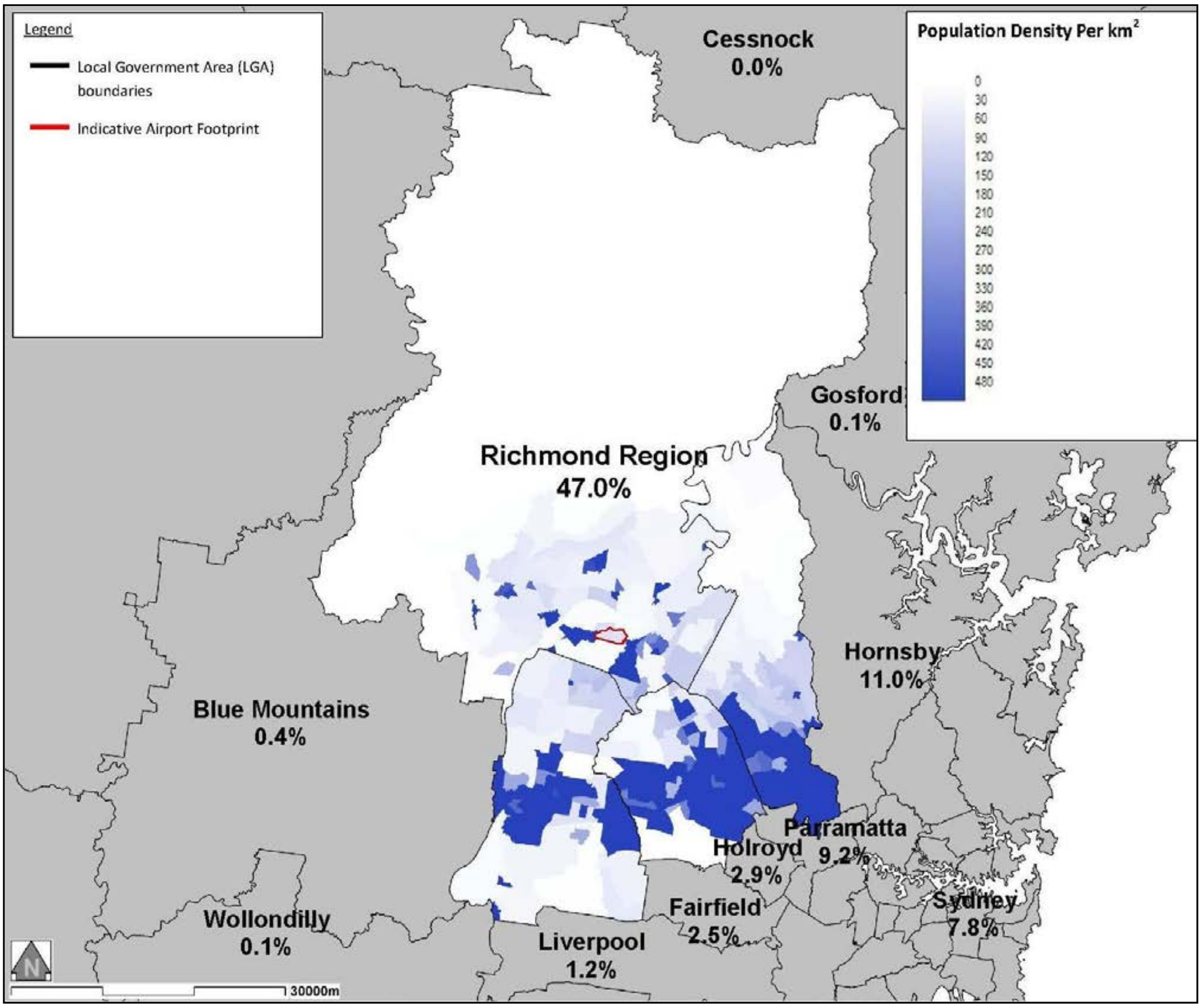
[258] Department of Planning and Infrastructure population projections for NSW
[259] Average Individual Weekly Income was calculated by averaging the median values of each age bracket from .id – the population experts (http://home.id.com.au/), with the median value of the '$200 or more' bracket set as $2,500.
[260] Sydney Statistic Division as described by the Australian Bureau of Statistics
[261] We have defined skilled employment as including managers, professionals, technicians and trade workers, as well as community and personal service workers
[262] Population representation based on Australian Bureau of Statistics 2006 Census data



Source: WorleyParsons analysis – Bureau of Transport Statistics, Journey to Work summary table by Workplace Local Government Area & Department of Planning and Infrastructure and Australian Bureau of Statistics 2006 Census data

14.1.1.1 Socio-economic Indexes for Areas

The Socio-economic Indexes for Areas (SEIFA) is a suite of four Australian community welfare measures provided by the Australian Bureau of Statistics (ABS).

For each index, every geographic area in Australia is given a SEIFA score that shows how disadvantaged that area is compared with other areas in Australia. This allows for ranking of regions and areas, providing a method of determining the level of social and economic wellbeing in each region.

The Index of Relative Socio-Economic Disadvantage (IRSD) focuses on disadvantage and is derived from 2006 Census variables such as low income, low educational attainment, unemployment and dwellings without motor vehicles. The IRSD for each of the LGAs surrounding the Richmond site is provided in the table below. Note that a lower score/rank indicates that an area is relatively disadvantaged compared to an area with a higher score/rank.

Table 40: SEIFA score and rank for each LGA surrounding Richmond

LGA	Population	Score	Ranking within Australia	Ranking within NSW	Minimum score for CDs in area	Maximum score for CDs in area
Baulkham Hills	159,391	1116	659	149	986	1167
Blacktown	271,710	973	324	74	596	1166
Hawkesbury	60,560	1033	578	125	834	1131
Penrith	172,141	1006	494	114	707	1137

Source: ABS
Note: CDs are Census Collection Districts

As highlighted in the table above:

- Baulkham Hills is ranked 149th in NSW and 659th in Australia with respects to social disadvantage, indicating its relatively high levels of socio-economic wellbeing. Baulkham Hills is ranked within the top 3% of LGAs in the state.
- Baulkham Hills, Hawkesbury and Penrith (3 of the 4 surrounding LGAs) are within the 25 percentile of NSW LGAs with the lowest socio-economic disadvantage.
- Blacktown is within the 50% of the state's LGAs with the highest levels of socio-economic disadvantage.

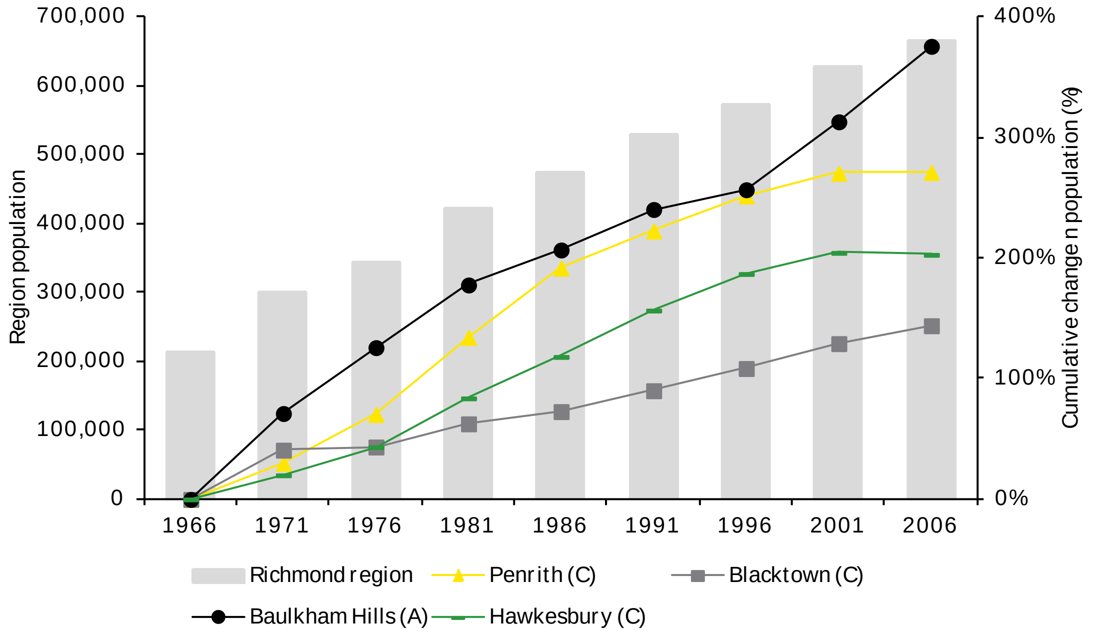
Overall, with an average score of 1032, the LGAs surrounding Richmond provide a relatively high level of socio-economic wellbeing.

14.1.2 Historic growth of the region

The Richmond region as a whole has experienced substantial growth over the past 40 years. In 1966, the region as a whole had a population of 211,000, which has grown to 664,000 in 2006, representing a growth rate of 5% per annum.

The number of people residing within the region over this period, and the cumulative change in population within the relevant LGAs is shown in the figure below.

Figure 52: Population growth within the region



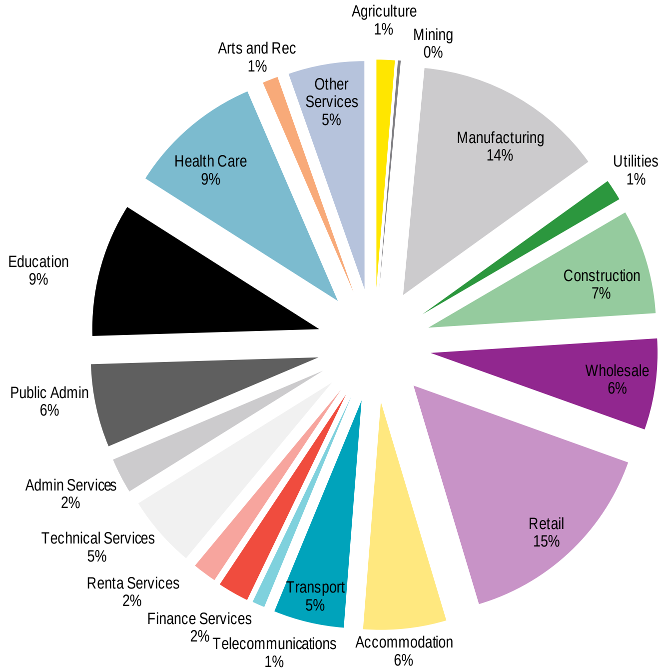
Source: ABS Census

As can be seen in the figure above, while Baulkham Hills realised the greatest percentage change in the number of persons residing in the region over the analysis period, Blacktown realised the greatest aggregate increase with 160,000 additional persons residing in the region now compared to 1966. Over the same period, Hawkesbury realised the least growth within the region in aggregate terms with only 40,000 additional persons residing in the region over the same period.

14.1.3 Current business and employment

An analysis was also undertaken of the industries that are located within the region. This analysis was undertaken to determine the current composition of these businesses to help examine how an airport will be beneficial to the region, as well as to analyse the potential for aviation-related industry sectors to develop within the region. Figure 53 presents a breakdown of employment by industry within the Richmond region.

Figure 53: Breakdown of employment by industry – Richmond Region



Source: .id – the population experts (http://home.id.com.au/) analysis on ABS, 2006 Census data

Figure 53 confirms that the highest employing industries within the region are retail trade (14.9%) followed by manufacturing (13.6%).

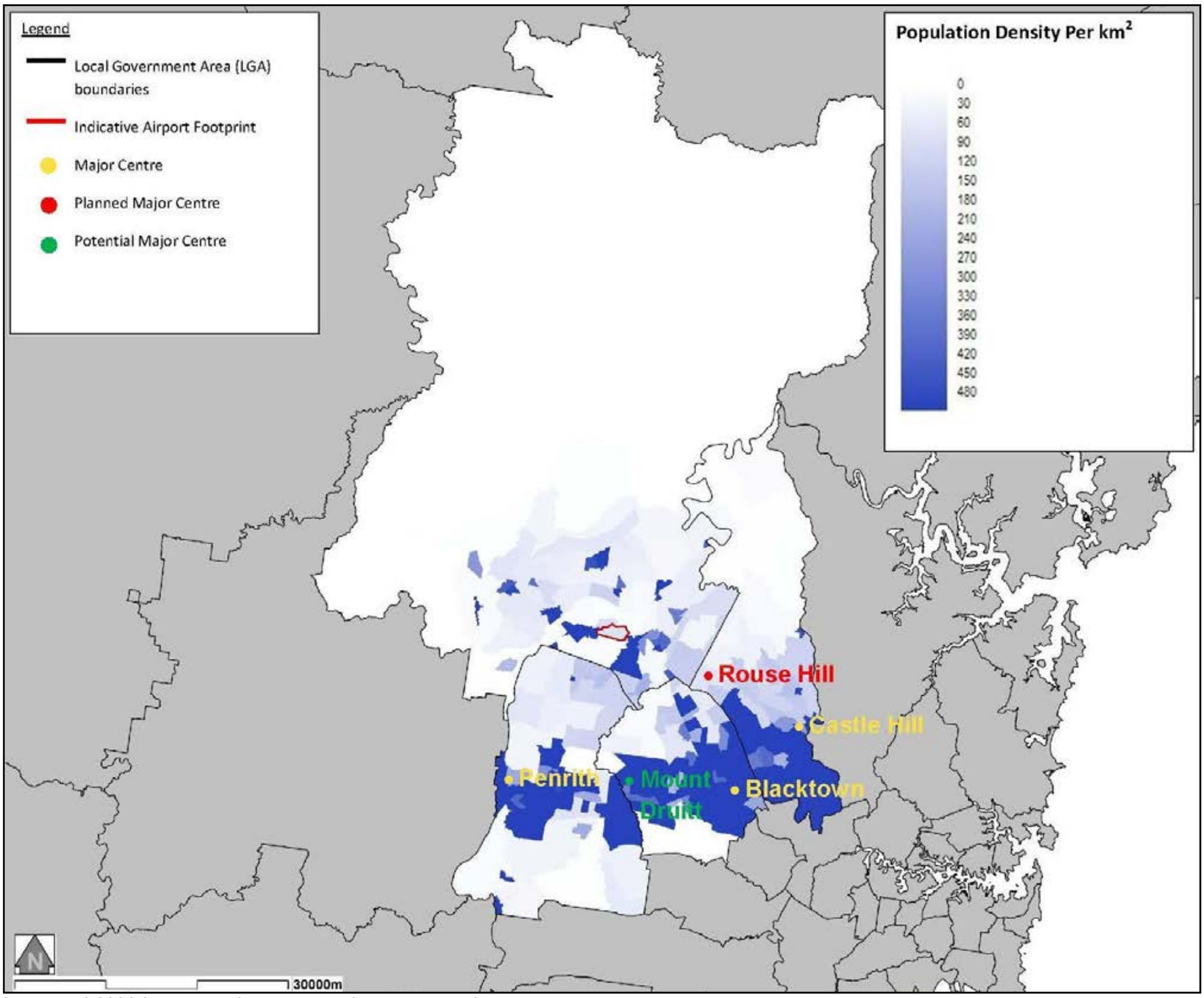
This statistic is supported by the nature of major businesses located within the region, including:

- Norwest Business Park
- Westfield Penrith
- The Hills Shopping Centre
- BHP House Framing
- Boral Concrete & Quarries Ltd.[263]

Figure 54 highlights the location of the major employment centres within the region. Penrith, Castle Hill and Blacktown are already established 'major centres' and Rouse Hill is a 'planned major centre'. Mount Druitt is a 'potential major centre'.

Figure 54: Richmond region's population distribution and location of major and planned employment centres

[263] A more complete list of employment centres within the region can be found in Appendix D.



Source: ABS 2006 Census data & Department of Planning and Infrastructure

Figure 131 which can be found in Appendix E shows existing and proposed North West Employment Lands that could impact on the development of the airport site.

14.1.3.1 Economic impact of RAAF Base Richmond

KPMG Econtech[264] analysed the economic impact of the Richmond RAAF airbase on the North Western Sydney (NWS) region using a computable general equilibrium model.

This analysis found that the Richmond RAAF airbase makes an important contribution to the NWS region, including:[265]

- 6,116 jobs, both directly and indirectly (equivalent to 2.1% of total employment in NWS):
  - Of these jobs, 2,143 are military personnel.
  - The RAAF airbase also contributes to indirect employment (3,973 jobs) in NWS via the Australian Public Service and contractors, and as a result of spending by the RAAF airbase and its personnel.
  - Spending by the RAAF airbase and its personnel on goods and services in the NWS region contributes to employment in construction (756 jobs), retail (633), transport (557), finance and insurance (512) and wholesale trade (314).
- $401 million annually in value added in NWS. Of this amount, $191 million is directly contributed from the airbase. There are also indirect benefits across other industries: construction ($39 million), health and community services ($38 million), retail trade ($33 million) and transport and storage ($29 million).

[264] Econtech, (20 December 2006), *Modelling the Economic and Social Impacts of Various Scenarios for the RAAF Base Richmond*, Department of Defence
[265] Option STAY: Defence to maintain its current presence at RAAF Richmond while simultaneously carrying out required upgrades to existing facilities and construction of new facilities to meet operational requirements. This is estimated to involve a total investment of $361.6 million.

► $389 million to annual household consumption in the NWS region.

The KMPG Econtech study found that if the RAAF airbase was to be sold and only a few RAAF operations continued,[266] the NWS region would see a loss of 3,923 jobs (direct and indirect). In addition, it was forecast that value added in the region would be $259 million lower each year and household consumption in the medium term would fall by around $250 million due to the direct and indirect impacts of cuts in the RAAF airbase activity.

The report also found that the community of Hawkesbury feels that the RAAF airbase has certain social impacts that have not been quantified but are considered important to the region, including the historic and heritage value of the RAAF airbase, its existence value, and its value to educational services and community organisations.

14.1.4 Current infrastructure provision

This section presents a high level analysis of the main transport, public transport and utility infrastructure that currently serves the region.

14.1.4.1 Roads

Motorways in the region include the M4, providing access from the east, and the M7, which links the region from the south. Access to the Richmond RAAF airbase is provided by Blacktown Road, which links the site to the main motorways via Richmond Road and The Northern Road.

Four major roads provide access to the general area of Richmond:

► From the west – Bells Line Of Road

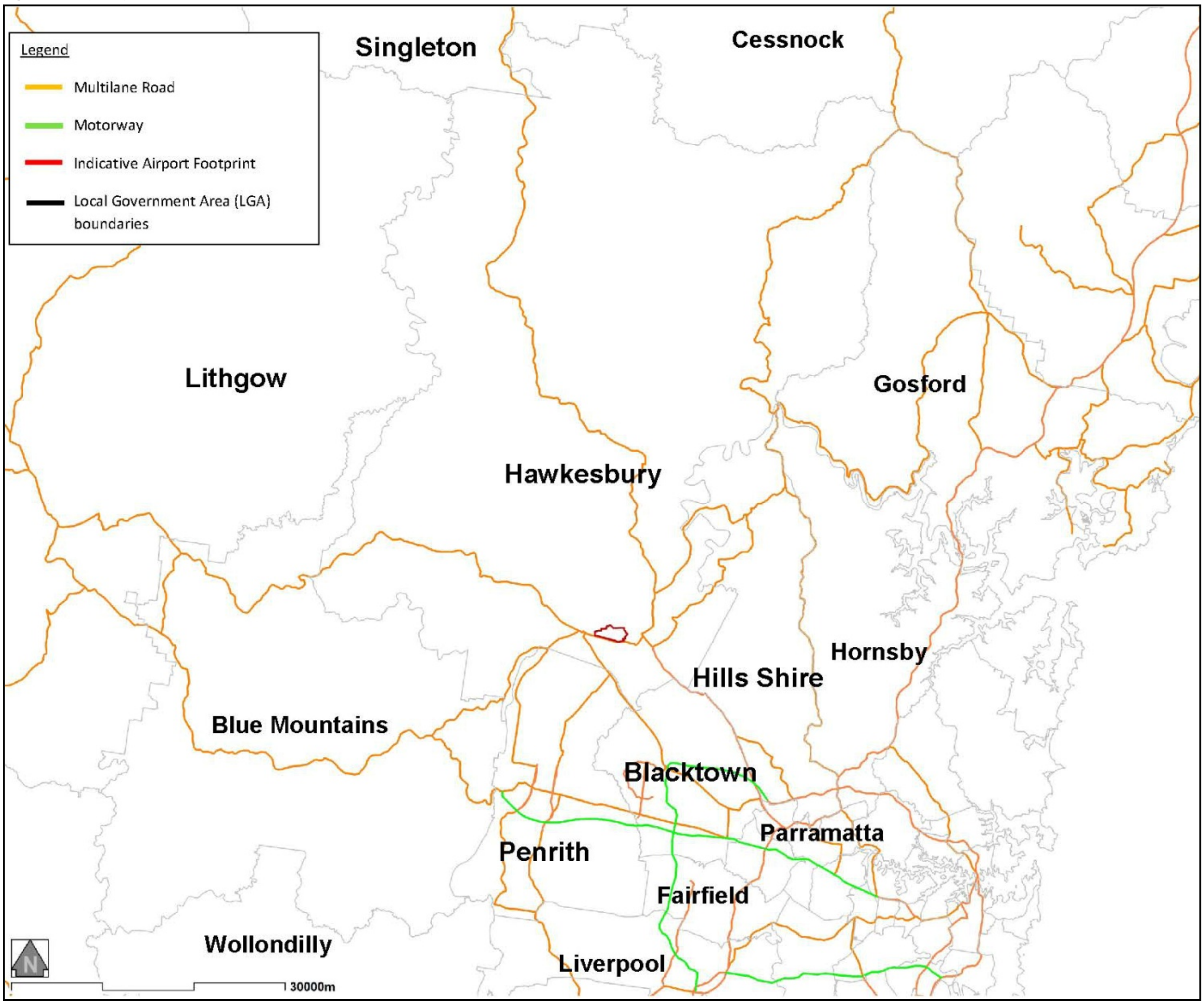
► From Penrith and the South - Castlereagh Road, Londonderry Road and The Northern Road

► From Liverpool, Blacktown and the South East – Richmond and Blacktown Roads

► From the north and east – Windsor Road.

[266] Option GO: Defence to reduce the scale of operations at RAAF Richmond while simultaneously carrying out deep maintenance for the C-130 and P-3 Orion aircraft. The GO option operates on the assumption that Defence sells the base and leases back the required facilities for operations that remain at the base. Furthermore, the current numbers of air force reserves and cadets on the airbase will be maintained and the base hospital and related support facilities would continue to operate at the base.

Figure 55: Sydney road network



Source: Department of Planning and infrastructure and Google Maps

To highlight the current service level and capacity of these roads, the current peak hour volume to capacity ratio, AADT (annual average daily traffic) and the projected increase in traffic volumes of the main motorways that link the region are shown in Table 41.

Table 41: Current and projected use of the major motorways within the Richmond region

Motorways	V/C ratio	AADT	Projected growth
M4	0.45	87,273	1.1% pa
M7	NA	NA	1.1% pa
M2	0.31	38,634	1.1% pa
Richmond Road	0.40	20,387	1.1% pa

Source: NSW Roads and Maritime Services – Traffic Volume Data and Bureau of Transport Statistics – Travel forecasts 2006 – 2036
NA – data not available

Table 41 confirms that the motorways and main roads currently have capacity on an annualised basis; however, it is envisaged that even without the development of an airport, the population and economic growth forecast to occur within the Sydney basin will mean that additional capacity is likely to be needed on these motorways.

NSW Roads and Maritime Services has proposed a number of upgrades to the road network around the Richmond Airport site. The planned upgrades include:

- ► The upgrade of Richmond Road from 1 lane to 2 lanes running in each direction between the exit of the M7 to South Street at Marsden Park
- ► Construction of WestConnex over 10 years which will include widening and extension of the M4 along Parramatta Road and duplication of the M5 east linking up with the M4 extension

14.1.4.2 Freight and restricted access vehicles

The Richmond site is strategically located near the North West Growth Centre and close to significant freight industry clusters.[267] This means that it is within the catchment of the planned intermodal freight terminal at the Western Sydney Employment Area (approximately 28km by road).[268]

The Restricted Access Vehicle (RAV) network is managed by NSW Roads and Maritime Services. The RAV network identifies roads that are approved for B-double trucks, over-dimension vehicles (high and wide loads), higher mass limits (HML) and mobile cranes.

With the existence of the RAAF Base, the Richmond site already has approved B-double (26m long and 4.6m high) access via Blacktown Road and Windsor Street. Both of these roads are also specified as HML and mobile crane routes. Access for B-double trucks will be important for on-going freight operations and broader network connections to the M4, M2 and M7 motorways.[269]

14.1.4.3 Public transport

The main rail line that provides access to the region is the Western line. With only two stations beyond the existing and any future airport, any airport at Richmond is essentially at the end of the Richmond Branch line and is likely to remain so for the foreseeable future. The line connects with the main Western line at Blacktown and, as a part of the North Shore and Western line component of the network, provides direct services to the Sydney CBD via Parramatta, Strathfield and intermediate stations before continuing across the bridge to the North Shore and Hornsby.

In the vicinity of the site, the line is single track and is served by a half hourly service. However, significant upgrading is taking place through the duplication of the line extending to Riverstone, in response to the expected increased demand generated by the growing urbanisation in the NWS region.

Delivery of the North West Rail Link is underway, with the first Environmental Impact Statement placed on public exhibition in April 2012. A potential future extension of the North West Rail Link may provide a future opportunity to connect to any airport site.

WorleyParsons' analysis relating to public transport for the 5 million passengers east-west alignment airport has not been undertaken. Richmond, as well as the stations leading up to Richmond from Central station, are not heavily utilised along the North Shore and Western line.

The North Shore and Western line is the predicted preferred route for passengers from the Sydney CBD, as well as for passengers who will be required to switch trains at Central station to get to the airport. Information from the Bureau of Transport Statistics (BTS)[270] indicates that between 2006 and 2036 there is a predicted increase of 47.8% in the number of trips being made across the rail network for the Sydney Statistical Division. The information, however, does not include a breakdown by train line or by region of where these increases may occur.

[267] The Blacktown to Seven Hills Freight Industry Cluster is the closest to the Richmond site, approximately 25km by road.
[268] Metropolitan Plan for Sydney, page 144
[269] NSW Roads and Maritime Services, Higher Mass Limits, accessed 28 August 2012
[270] Bureau of Transport Statistics, Transport for NSW - Electronic Publication No E2012-01-STM

14.1.4.4 *Utility infrastructure*

The region has well established utility infrastructure, able to service the current population and businesses.

In the long-term, increases in population and industries will require the augmentation of utility infrastructure to improve service levels over time. As highlighted in section 14.1.5.1, the population in the region is anticipated to grow by 37% to 90,083 in 2036.

Infrastructure that is likely to be upgraded as a result of natural growth within this area over the medium to long-term includes:

- ► Water and wastewater – Sydney Water has established a plan to ensure water and wastewater services are provided for the North West Growth Centre region, which includes areas near the Richmond site. These upgrades will more than likely improve the existing infrastructure in Richmond.

- ► Electricity – Endeavour Energy has established a plan to ensure the reliability and expansion of the electricity network and has incorporated the North West Growth Centres in major substations being planned for the region.

- ► Telecommunications – Telstra has an obligation to connect any future developments to the telephone network. The area is covered currently and expansion is planned for the North West Growth Centre region, which includes the areas near the Richmond site. These upgrades will more than likely improve the existing infrastructure in Richmond.

The upgrades, as well as timing of those upgrades that would be required as a result of the development of an airport within the region are described further section 15.4.

14.1.5 Future growth

This section of the report highlights publicly available government strategies, plans and forecasts that describe how the region is likely to look like in the short, medium and longer term.

14.1.5.1 *Population growth projections*

The number of persons that are projected to live within the Sydney basin within the medium to long-term is anticipated to increase substantially in line with national population growth. The Australian Bureau of Statistics has forecast 9.2 million persons living in Sydney by 2056, 46% more people than live in the city today and a compounded annual growth rate of 1.27%.[271]

The NSW Department of Planning and Infrastructure has provided forecasts for the foreseeable distribution of where people are likely to reside in the short to medium term. With regards to the Richmond region, the population is forecast to increase by 45% to 1.06 million residents by 2036, compared to a 38% projected population growth rate in the broader Sydney region. A breakdown of this projected level of population growth by LGA is shown in Table 42.

Table 42: Projected level of population growth by LGA

LGA	2006 population	Forecast population 2036	Projected growth (2006-2036)
Hawkesbury	62,105	90,083	37.0%
Penrith	177,152	234,308	25.6%
Blacktown	280,612	481,267	56.7%
Hills	165,143	258,840	49.9%

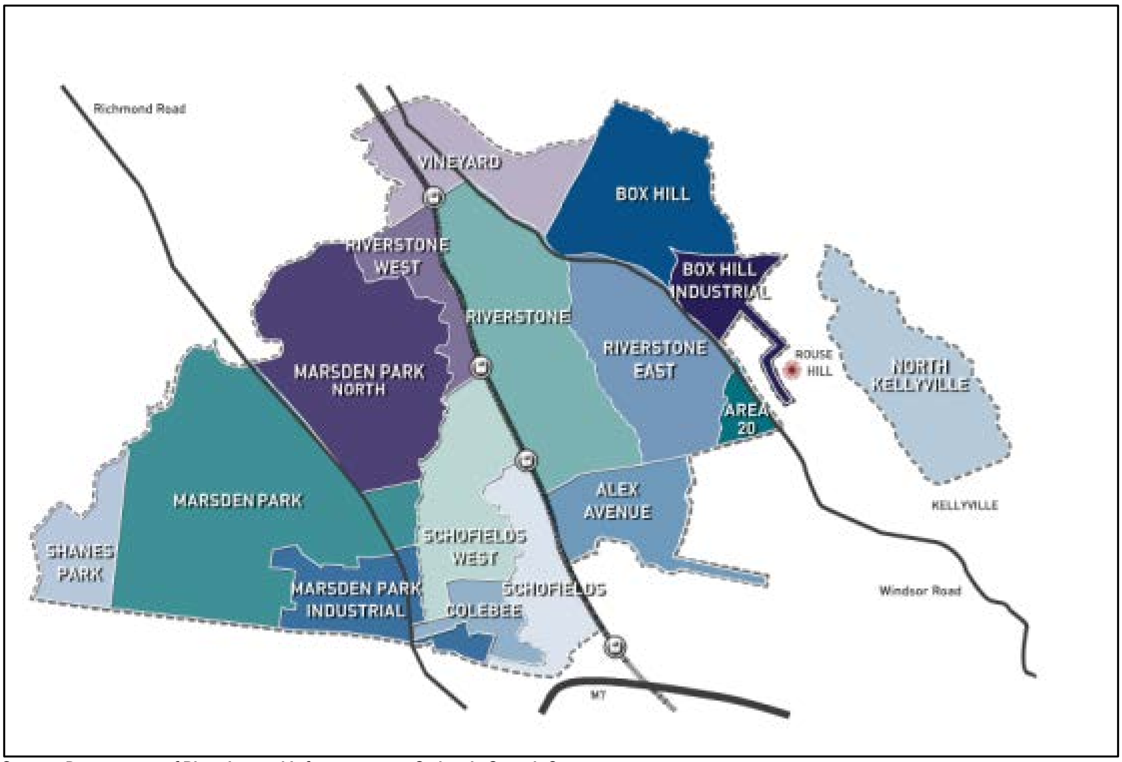
Source: Department of Planning and Infrastructure population forecasts

As can be seen in the table above the greatest level of population growth in the region is anticipated to occur within the Blacktown LGA, followed by The Hills.

Figure 56 identifies the proposed development of Sydney's North West Growth Centre.

Figure 56: Sydney's North West Growth Centre

[271] ABS forecasts (3222.0) – Population growth Scenario B



Source: Department of Planning and Infrastructure – Sydney's Growth Centres

14.1.5.2 Regional government planning

The North West Growth Centre and the regional city of Penrith are all part of the region that surrounds Richmond. Governments have developed a number of plans to support and manage growth in the region. A brief overview of local and State Government plans that will impact the region in the longer term is set out below.

State

The NSW Government has stated that one of its key objectives is to assist in the development of the Western Sydney Employment Area in order to create more jobs closer to where people live.

The North West Sub-region is the largest and fastest growing region within the Sydney basin. The Government's vision for the North West Subregion involves plans to accommodate 140,000 new dwellings by 2031 and deliver the North West Rail Link.

Richmond, as a Town Centre, has numerous infrastructure projects planned, including the Richmond TAFE Equine Studies Facility, Richmond RAAF Base Busbar and New 33KV Feeder and Richmond Zone Substation Augmentation. In relation to rail projects, the Richmond line duplication is currently under construction and the Western Express Program is being planned to provide express train services between Richmond, Penrith, Blacktown and Parramatta.[272]

Other NSW Government plans that are designed to assist in the development of specific LGAs include:

- Penrith and Liverpool have been identified as Regional Cities[273] and there are plans to increase both employment and residents by 10,000 in each location by 2036. This will ensure that both cities play a vital role as employment and residential hubs and service centres for Western and North Western Sydney.
- Norwest, as a Specialised Centre of the Sub-region, is expected to grow to support 30,000 jobs by 2031 and will reach its planned capacity in the next two decades.

To support this growth and investment in infrastructure, the NSW Government aims to accelerate the process required to release employment lands. The Employment Lands Task Force (as part of the Government's Employment Lands Development Program) has identified that the North West Sub-region provides 2,140 hectares of undeveloped land (47% of the Sydney region's undeveloped

[272] http://metroplansydney.nsw.gov.au/Portals/0/pdf/METRO2036_COMPLETE.pdf
[273] Note that this is strategic direction is likely to change with the release of a number of new strategic documents including the Metropolitan Strategy.

land), making it the contributor of the largest amount of undeveloped land to support new industrial development.[274] However, less than a quarter (55 hectares) is serviced to support industrial uses (water and sewer connections).[275]

Local

The Future Directions Western Sydney 2030 report by the Western Sydney Regional Organisation of Councils (WSROC) advocates the promotion of business investment, accessible employment opportunities and – most importantly – the establishment of a number of employment hubs within Western Sydney. In this way, Western Sydney will aim to reduce its disparity with Sydney in terms of job options, unemployment and residential population, which has lead to 50% of Western Sydney's potential workforce not being engaged in effective work.[276]

Different LGAs within the region are attempting to ensure their future growth:

► Penrith council is planning the construction of intermodal freight terminals, to improve the freight rail network and reduce pressure on public roads.

► The Hawkesbury City Council is seeking to accommodate 5,000 to 6,000 additional dwellings by 2031.

► The Blacktown LGA will be a focus for regional growth, planning to use its strategic location and connections to key transport links to further growth in housing and employment, as well as its increase its market share of freight logistic services.[277] Plans are in place to attract major government departments and commercial offices to the Blacktown CBD, focusing efforts on Sunnyholt Road and additional restaurant facilities on Old Windsor Road.[278]

► Penrith is expected to be a focal point for regional transport, employment and housing. Major future employment areas include Erskine Business Park, the Western Sydney Employment Hub and the Western Sydney Employment Land Investigation Area. Penrith City Centre and St Marys Town Centre will both experience significant intensification.[279] The Penrith industrial and learning-based precincts provide a wide range of businesses that service local, regional and export markets and support potential clustering.

► Within the Baulkham Hills LGA, the Rouse Hill Regional Centre is planned for major retail and residential development, and is expected to house approximately 3,000 people upon completion. The Norwest Business Park, a commercial and industrial hub, is expected to continue to offer employment opportunities for residents of the Baulkham Hills Shire.[280]

A list of major projects (2010 to current) in the Hawkesbury, The Hills, Blacktown and Penrith LGAs is included in Appendix E.

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[274] Department of Planning and Infrastructure, (May 2011), *ELDP 2010: Report 9 – North West Subregion*, Employment Lands Development Program
[275] Employment Lands Task Force, (October 2011), *Employment Lands Development Program; Report 1 – South West Subregion*, 2010
[276] Western Sydney Regional Organisation of Councils, *Future Directions Western Sydney 2030*
[277] http://www.blacktown.nsw.gov.au/planning-and-development/public-exhibitions/parklea-markets-planning-proposals---additional-uses-and-friday-trading.cfm
[278] http://www.blacktown.nsw.gov.au/planning-and-development/public-exhibitions/parklea-markets-planning-proposals---additional-uses-and-friday-trading.cfm
[279]http://www.penrithcity.nsw.gov.au/uploadedFiles/Website/Planning_&_Development/Planning_Studies_&_Strategies/Penrith%20Regional%20City%20Infrastructure%20Strategy%20(Reduced%20File%20Size).pdf
[280] http://www.thehills.nsw.gov.au/Documents-and-Policies.html#economicplan

15. The potential airport development

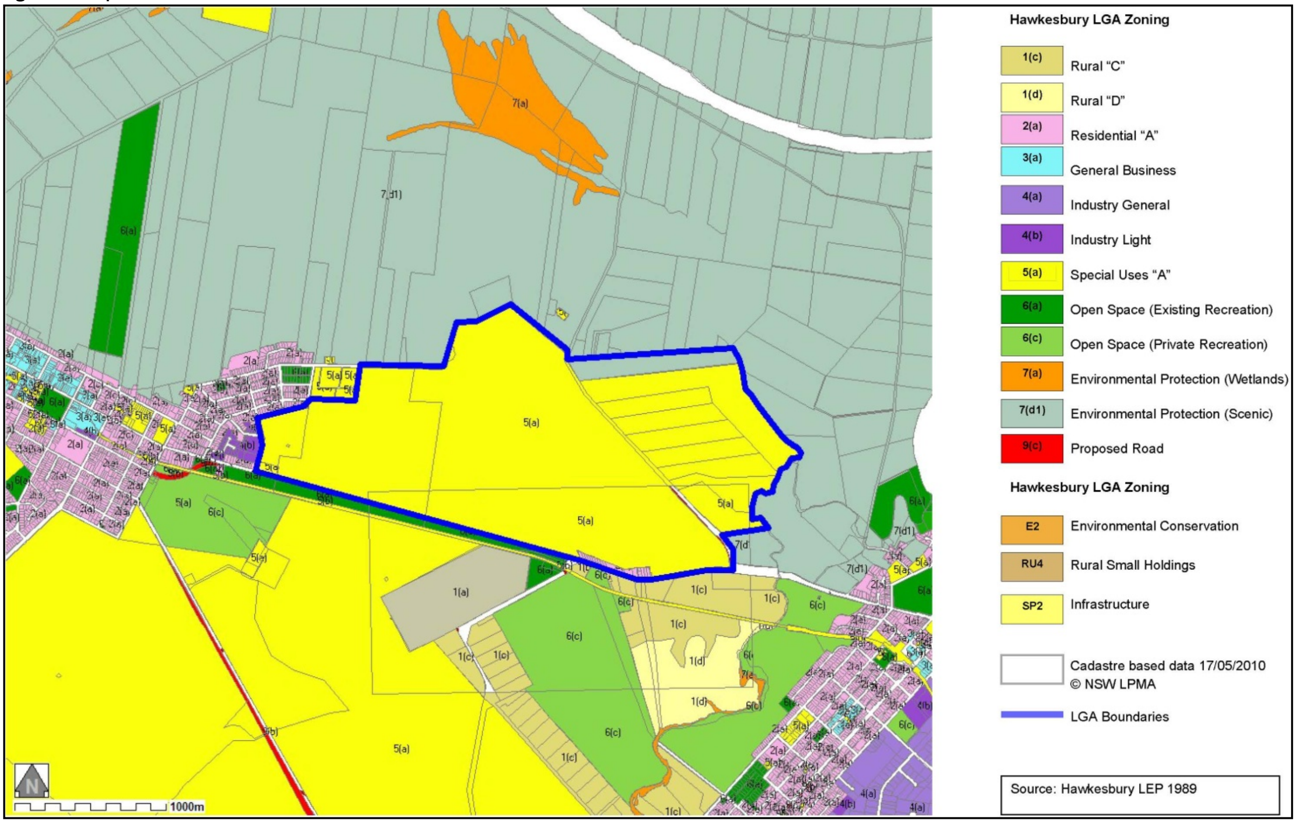
This section of the report introduces the potential Richmond site and surrounding area. It also presents what is being proposed to be developed at the site, including airside and landside infrastructure, to cater for the expected aviation services.

15.1 The site

The development of a civil aviation airport in Richmond would rely upon the site currently occupied and used by the Royal Australian Air Force. It is proposed that the development of an airport with an annual passenger throughput of 5 million per year will be able to co-exist on the site with the current and planned use of the site by the RAAF.

RAAF Base Richmond is located approximately 48 km north-west of the Sydney CBD and is accessed from Percival Street off Richmond Road. The site has a total area of 279.14 hectares. The majority of the site is zoned Special Uses 5(a) with a small portion of the site along Richmond Road zoned 2(a) Residential and one allotment along the northern boundary zoned 7(d1) Environmental Protection (Scenic).[281] This site is indicated in the figure below by the unbroken blue line.

Figure 57: Airport site



Source: Hawkesbury LEP 1989

As highlighted in section 3.1.2, a number of alterations to the current airport will be required to be able to accommodate both civil aviation and air force operations on the site. Furthermore, the proposed conceptual design to accommodate both operations may potentially require the acquisition of land around the site that is currently not owned by the Commonwealth or State Governments.

15.2 Airport design[282]

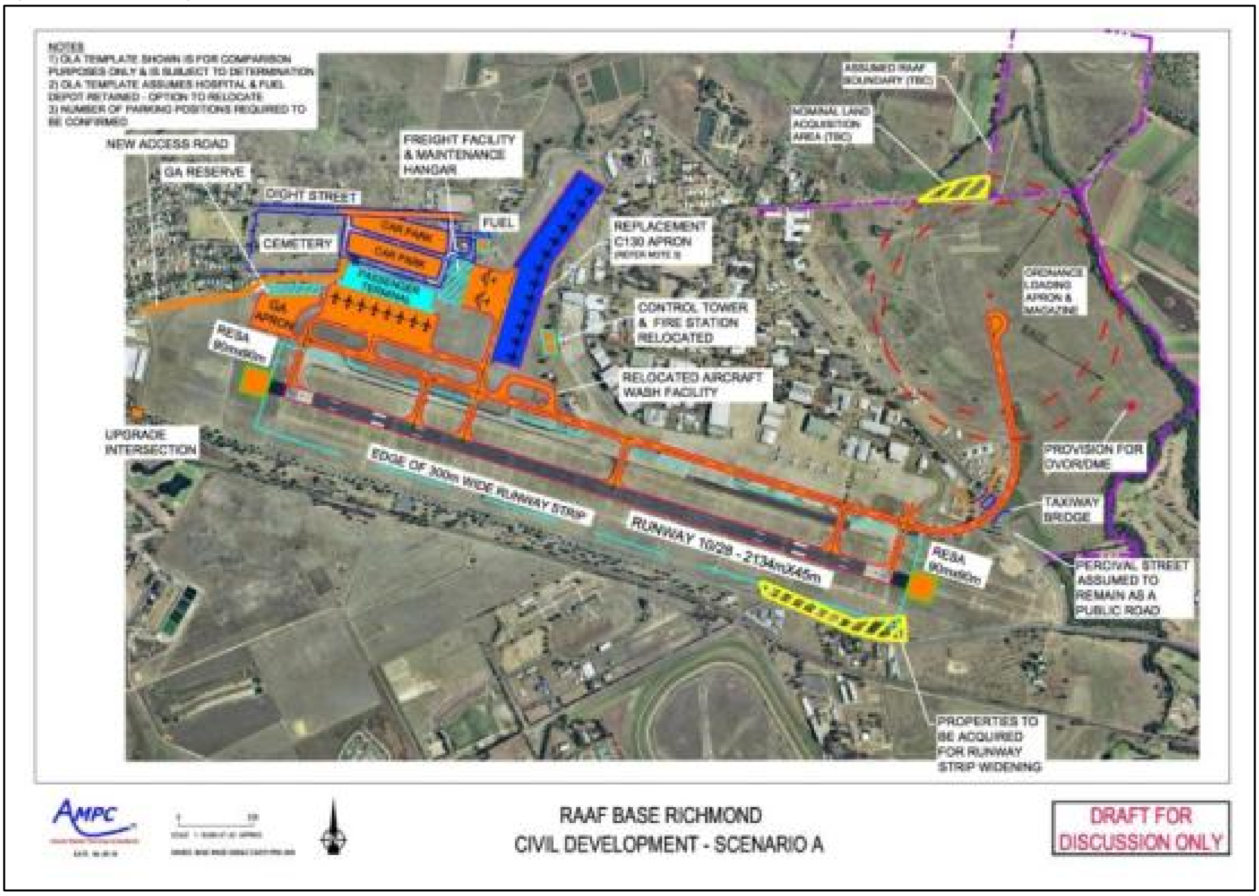
The proposed development of an airport at the Richmond RAAF air base is based on using the core infrastructure established for the current east-west alignment. Given the nature of the core infrastructure that supports the air base, namely the length and width of the runway, it is envisaged that a civil aviation airport at this site will be only capable of catering for up to 5 million passenger movements annually.

[281] Based on the Hawkesbury LEP 1989

[282] This section presents one of a range of alternative development options that could be undertaken on the Richmond site that could cost more or less depending on the complexity of design.

A visual representation of what an airport could look like on the site, and its potential interactions with the RAAF base, is shown in Figure 58.

Figure 58: Proposed upgrades to site



Source: AMPC

As can be seen from the figure above, the development of an airport that is capable of catering to this level of aircraft and passenger throughput will require the construction of infrastructure on the site, including:

- 409,960 m^2 of aprons and taxiways
- 26,050 m^2 of terminal buildings
- 8 gates
- Air navigation aids including instrument landing systems, visual guidance systems and landing aids
- Air traffic control facilities including, control tower, service centres, route surveillance and surface movement radars and radio transmitter and receiver sites.

Furthermore there are a number of additional facilities that will have to be developed to support an operational airport, including:

- Access services including car parking, taxi ranks and hire car facilities
- General services such as postal, catering, banking and other services.

The interaction of civil aviation operations with those of the RAAF at the site will result in a number of specific issues with the potential use of this site. These issues include security issues: there will be a clear differentiation between the public and RAAF areas at the airport and there will be no civilian access to the RAAF area.

15.3 The surrounding region

An analysis of the potential for surrounding land that could be readily developed to accommodate commercial and industrial businesses has been undertaken. [283]

An area enclosed by a radius of approximately 3kms from the site centre was investigated to determine potential locations for industrial business parks. Within this region, there are two locations where industrial businesses can potentially be located. The area to the south east of the site, which is already zoned 4(a) (Light Industrial), is a suitable location. A small area to the west of the site, which is also zoned 4 (a) (Light Industrial), is also suitable.

Given that the development area is currently a working airport, the expansion works largely do not have immediate barriers that prevent the development of land. There are, however, areas outside the footprint that may be susceptible to flooding. This may have an effect on the north-east corner of the development, but further flood modelling will need to be undertaken to confirm this.

15.4 Supporting infrastructure

An analysis of the upgrades and redevelopments to existing infrastructure that will be required with the development of an airport was completed as part of the Joint Study.

The analysis of the Richmond RAAF site found that, given the size of the airport development and the existing infrastructure that supports RAAF operations on the site, no major infrastructure will have to be constructed to support the proposed airport. However, the analysis did find that a number of small upgrades and relocation of services will be required to allow both RAAF and civil aviation operations to co-exist on the site.

15.4.1 Roads

WorleyParsons has calculated that the proposed development of an airport at Richmond that can cater for approximately 5 million passenger movements per annum by 2060 will result in an increase in land transport movements of 4.5 million vehicle trips per annum[284] based on 2060 movement projections for the area. These trips represent people accessing the proposed airport for aviation services only.[285]

The four major roads described previously make connections with the M4, M2 and M7 motorways, which then provide access to and around the metropolitan area of Sydney. Given that an RPT airport will become a major source and attractor of road users, progressive upgrading of some of these roads is likely to be needed, with the prime candidates being Windsor and Richmond Roads.

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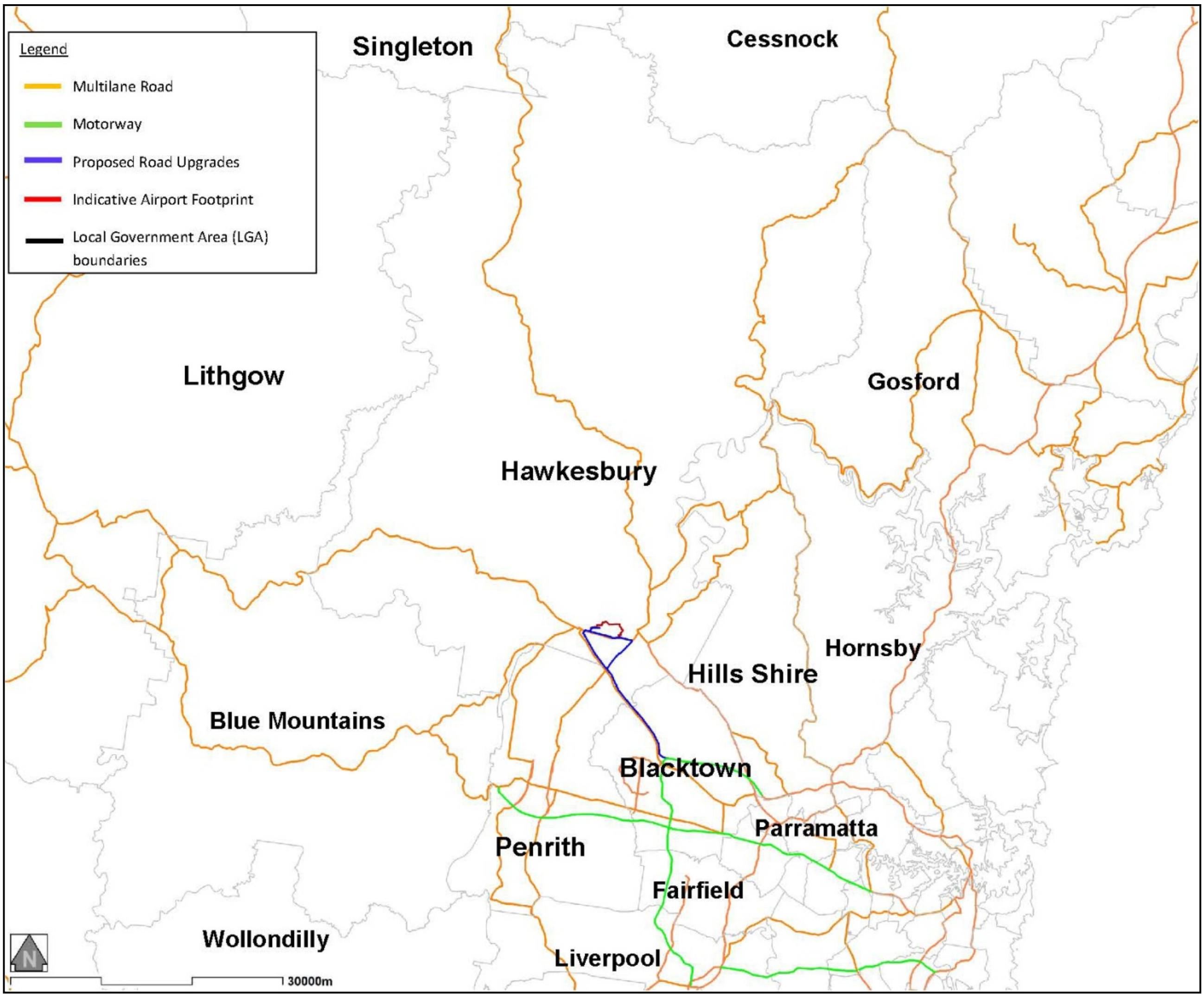
[283] The assumptions and methodology used in undertaking this analysis are presented in Appendix B.
[284] There is not a one-for-one relationship between passengers and vehicle trips as more than one person can use each vehicle
[285] WorleyParsons assumption based on annualised passenger throughput projections. Note that it is assumed that more than one PAX can be travelling within one car

The Joint Study found that the proposed development of an airport at Richmond[286] will require upgrades of Blacktown Road, Hawkesbury Valley Way, Macquarie Street, George Street and Richmond Road, and a new connection to the airport will be required. Figure 59 shows the existing multi-lane roads and motorways and the proposed road upgrades.

Figure 59: **Existing major roads and proposed road upgrades associated with the airport**



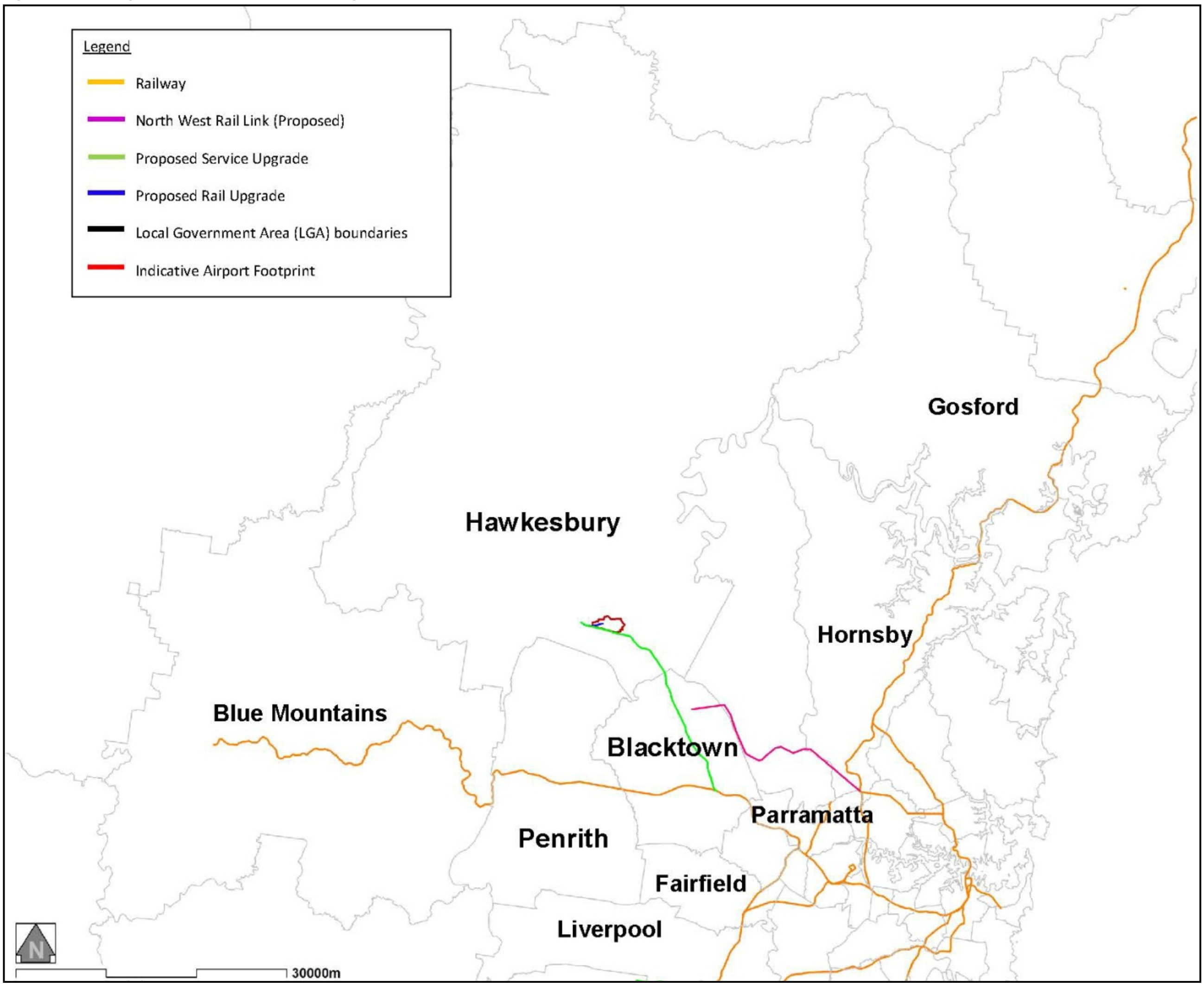
Source: WorleyParsons analysis &Department of Planning and Infrastructure and Google Maps

15.4.2 Public transport

Figure 60 shows the existing rail network, proposed rail upgrades, proposed North West Rail Link and proposed rail service upgrades.

[286] Analysis only takes into account passenger demands, and does not include travel for employed personnel or freight.

Figure 60: Existing rail network and proposed upgrades



Source: WorleyParsons analysis &Department of Planning and Infrastructure and Google Maps

A number of underlying assumptions were made by WorleyParsons when undertaking the analysis of infrastructure capability, including:

- It is assumed that the trains used in the new system will be the rolling stock in use at the time of the development.
- All passengers will require the use of a new shuttle service from Richmond station, similar to that used at Lidcombe to get to Sydney Olympic Park.
- It is envisioned that most airport users will access the airport services from Strathfield station if they are coming from the North Shore or the Central Coast and Hunter regions. Passengers and commuters who are travelling from the South Coast or Hurstville and Sutherland can catch the train from Central and then onto the airport. All users from the western suburbs will travel to Granville and catch a connecting airport train.

Table 43 provides an indication of travel times (based on current service levels and patterns) and the potential make-up of the journey (such as the need to transfer between trains) for a number of sample suburbs to access the airport site.

Table 43: Approximate rail travel times

Route	Approximate Travel Time[287]

[287] Source: Google Maps. Travel time does not include wait time. Travel times are based on expected travel times in August 2012. Travel time from Richmond to Airport obtained by using travel times for similar distances on other parts of the CityRail network.

Parramatta	North Shore and Western Line (Parramatta to Richmond)	52 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Hornsby	Newcastle and Central Coast Line (Hornsby to Strathfield)	24 min
	South Line (Strathfield to Richmond)	69 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Hurstville	Eastern Suburbs and Illawarra Line (Hurstville to Redfern)	20 min
	North Shore and Western Line (Redfern to Richmond)	82 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Penrith	North Shore and Western Line (Penrith to Blacktown)	25 min
	North Shore and Western Line (Blacktown to Richmond)	34 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Blacktown	North Shore and Western Line (Blacktown to Richmond)	34 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Liverpool	South Line (Liverpool to Granville)	22 min
	North Shore and Western Line (Granville to Richmond)	58 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Sutherland	Eastern Suburbs and Illawarra Line (Sutherland to Redfern)	31 min
	North Shore and Western Line (Redfern to Richmond)	82 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Campbelltown	South Line (Campbelltown to Granville)	45 min
	North Shore and Western Line (Granville to Richmond)	58 min
	Airport Shuttle Service (Richmond to Airport)	8 min
Central	North Shore and Western Line (Central to Richmond)	83 min
	Airport Shuttle Service (Richmond to Airport)	8 min

Source: WorleyParsons analysis
Note: these estimates do not take into account average wait or transfer times

As can be seen in the table above a person accessing the airport from the central city or Parramatta via the existing public transport network (with proposed changes) will take approximately 91 minutes and 60 minutes respectively.

15.4.3 Utility infrastructure

An analysis of the upgrades and redevelopments to existing infrastructure that will be required with development of an airport was undertaken by WorleyParsons as part of the Joint Study.

The analysis of the Richmond RAAF site found that no major infrastructure will have to be constructed to support the proposed airport at this site. However the analysis did find that a number of small upgrades and relocation of services will be required to allow RAAF and civil aviation operations to co-exist on the site, which includes:

- Water ($0.25 million) – to connect the terminal building to the existing water supply lines.
- Wastewater ($0.50 million) – to connect the terminal building to the existing wastewater supply lines.
- Power ($1.50 million) – to connect the terminal building to the existing power supply lines.

- RAAF facility relocation ($36.38 million) – to relocate the armaments loading facility and extend the runway to the eastern area of the airport. This is the most significant component of the works and will need to be undertaken for the proposed alignment and in order to properly separate RAAF and civilian activities.

Communications, gas and fuel costings were not undertaken during the Joint Study.

These infrastructure upgrades will benefit existing and future residents in the area. The resulting infrastructure capacity will ensure that residents in the surrounding regions have uninterrupted services. These upgrades will also attract industry to the region, given that the infrastructure is available and of a high capacity.

15.5 Other notable issues

A number of other issues can potentially have a significant impact on the cost and/or the effective operations of an airport in a particular location. Costs that are significantly dependent on the location of the airport include earthworks required to develop the airport platform and potential works to mitigate possible mine subsidence.

Other impacts that could significantly impact the operations of an airport in a particular location include meteorological conditions and airspace conflicts. These impacts will have a significant effect on the economic viability of the development of an airport. Each of these impacts is briefly discussed below.

15.5.1 Geology

The topology and the composition of the soil at the site will play a significant role in the total cost associated with the development of an airport given its proposed alignment.

WorleyParsons undertook an analysis of the geology and topology of each of the sites analysed as part of the Joint Study. This analysis found that the terrain of the Richmond site ranges from flat to gently undulating. Expansion of the airport on this site will require a minor portion of the site to be reshaped. The type of dirt/rock/soil that can be found on the proposed site includes sandstone and shale.

It was estimated that minimal earth will have to be excavated to reshape the site. This is due to the fact that an existing airport is in place on the site and only minimal earthworks will be required. Hence, no analysis has been done by WorleyParsons into the cost of any required earthworks.

The additional excavated earth (if any) will need to be stockpiled for use elsewhere on site or disposed of off-site.

15.5.2 Mine subsidence

The site at Richmond is not affected by mine subsidence.

15.5.3 Airspace conflicts and flight path obstructions

The development of an airport at Richmond will have to operate within the Sydney aeronautical network as a whole. Furthermore the development of any airport within the Sydney basin may require a change in use and/or acquisition of a number of assets within close proximity of the airport site.

An analysis was undertaken by both Air Services Australia ('ASA') and WorleyParsons of the impact of an operational airport at Richmond to determine its potential impact on current and projected airspace movements and flight path obstructions respectively.

15.5.3.1 Airspace conflicts

The development of an airport would have to fit and be able to operate within the Sydney aeronautical network as a whole. This will require ensuring that an airport at Richmond, as well as other airports within the region, can co-exist and operate at their potential capacity. Furthermore, the development of any airport within the Sydney basin may require the change in use and/or acquisition of a number of assets within close proximity of the airport site.

At present, there are four types of designated airspaces in the Sydney Basin:

- Control zones – established around busy airports to ensure the safe and orderly flow of traffic

- A control area – a volume of airspace centred on KSA that is determined by the climb and descent performance of the variety of aircraft using that airport

- ► Restricted areas – volumes of airspace around military facilities or civil installations such as Orchard Hills and Holsworthy military facilities

- ► Danger areas – designated volumes of airspace to identify potentially hazardous areas (such as flying training or parachuting areas).

The analysis undertaken by ASA found that the increased airspace movements that will occur with the development of civil aviation operations at the Richmond RAAF airbase will impact current and projected alignment of KSA and, to a lesser extent, Bankstown airport.

A preliminarily analysis found that the following changes to the current and proposed air movement patterns at Sydney Airport could be made to support an operational airport at Richmond:

- ► Runway 34L jet departures via Richmond, Katoomba and Wollongong
- ► Runway 34L prop departures via Richmond, Katoomba and northwest NSW destinations
- ► Runway 25 jet departures via Richmond, Katoomba and northern destinations
- ► Runway 25 prop departures via Richmond, Katoomba and northwest NSW destinations
- ► Runway 16R jet departures via Richmond and Katoomba
- ► Runway 16R prop departures via Richmond, Katoomba and northwest NSW destinations
- ► 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).

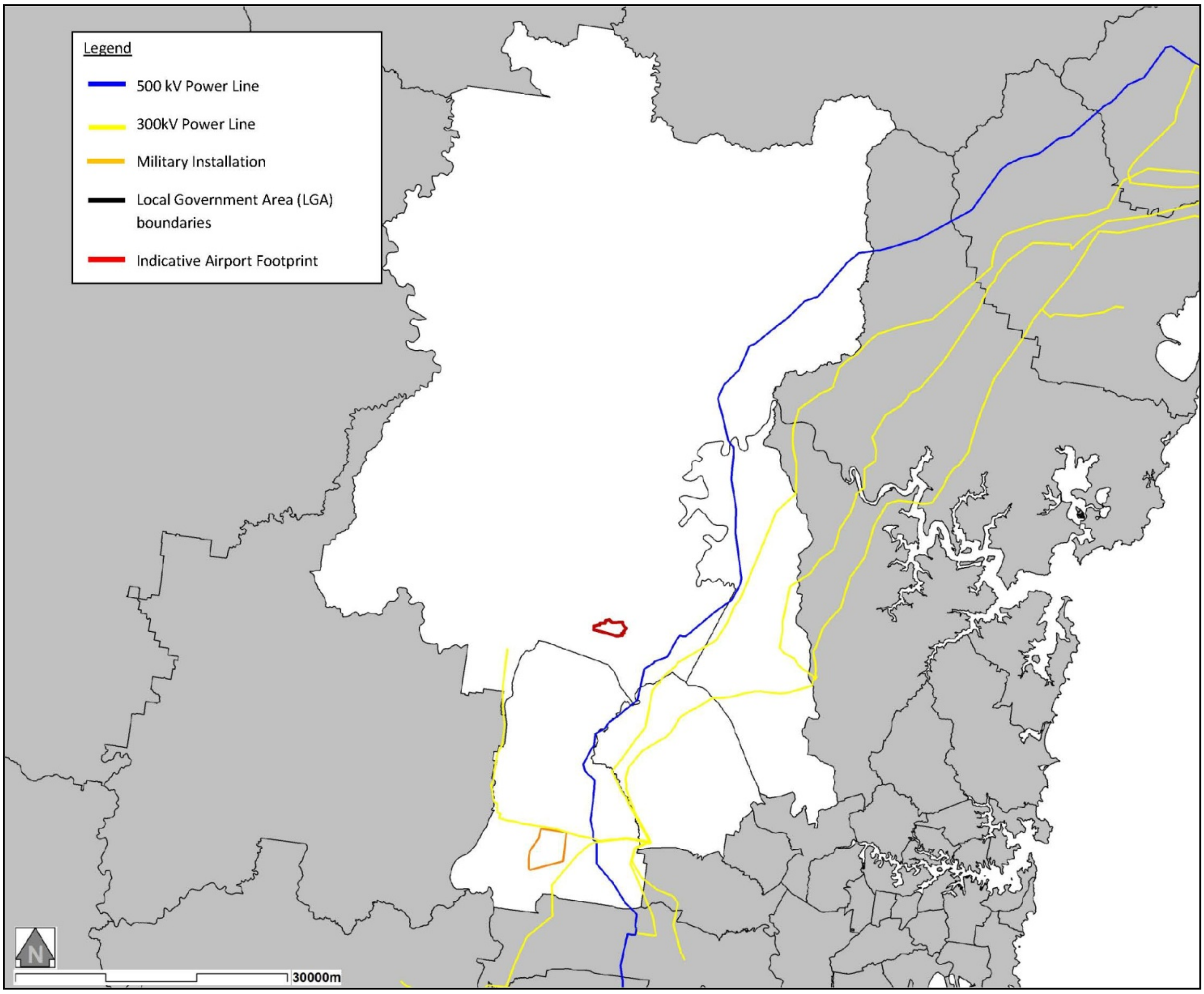
Air Services Australia concluded that an airport at Richmond with an east west runway alignment will be able to cater for up to 38 movements per day. This level of aircraft movements means that up to 5 million persons will be able to access aviation services through this airport. This analysis also found that there is no airspace limitation on the capacity of an airport constructed at this site, given its proposed design.

15.5.3.2 Flight path obstructions

A preliminary analysis of existing assets that may have their operations affected as a result of the development of an airport at Richmond was also undertaken. This analysis found that the development of an east-west runway alignment at the Richmond site will not result in a great deal of modification or necessary acquisition of assets. There is an impact on existing power supply lines, which will need to be relocated.

Figure 61 presents the relative location of these assets to the proposed Richmond airport.

Figure 61: Flight path obstructions



Source: WorleyParsons, Department of Planning and Infrastructure and Google Maps

Figure 61 shows that the main obstacle issues for the proposed airport will be the 300kV and 500kV power lines which would need to be relocated or moved underground to avoid any conflict.

Further to this, a number of additional assets may have to be acquired and/or relocated as a result of other aviation related impacts (e.g. noise). These issues are dealt with in section 17.2.2.

15.5.4 Meteorological conditions affecting the site

The meteorological conditions of the region can restrict the ability of an airport within a particular area to operate efficiently in accordance with air safety control regulations.

This section of the report addresses the impacts of wind direction, wind speed and visibility at the Richmond site to determine whether current conditions will impact a full international airport operating on the proposed site.

15.5.4.1 Applicable legislation/regulation

The International Civil Aviation Organization (ICAO) determines the safe level of wind speeds to operate an airport (Annex 14 of ICAO Edition 5). This criteria requires that runways at an airport should be oriented such that aircraft may be landed at least 95% of the time with the following crosswind components:

- ► 20 knots for aircraft reference field length 1,500 m or over
- ► 13 knots for aircraft reference field length greater than 1,200 metres and less than 1,500 metres.

The Richmond airport has a field length of 2,000 metres and therefore a maximum crosswind of 20 knots applies (according to ICAO runway design criteria).

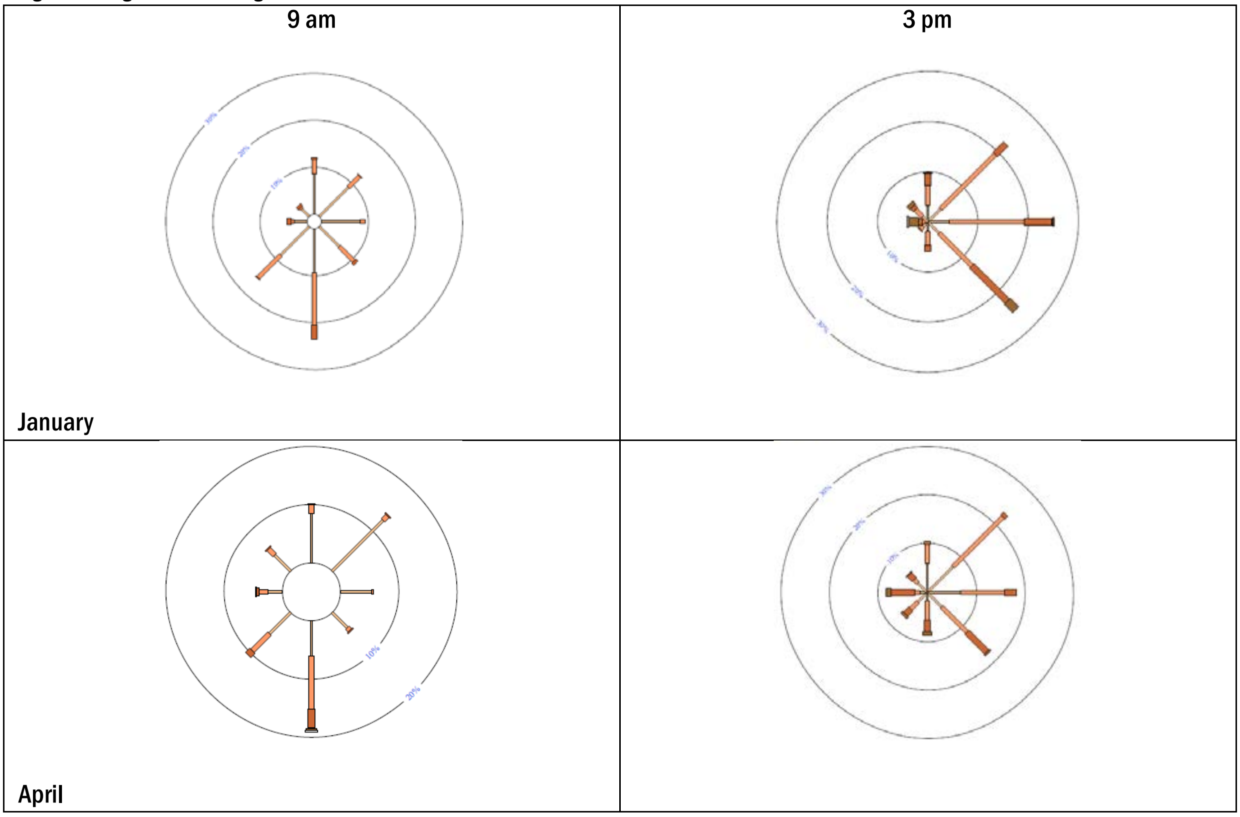
In the event that crosswind conditions are more than 20 knots, an alternative cross runway must be used (if one exists) or operations must be suspended until adverse weather passes.

The instrument landing system operating limits (ILS minima) requires a cloud base of 100 metres above ground level and a visibility of 800 metres. It was assumed that there will need to be more than scattered cloud below the ILS minima to render the airport unusable.

15.5.4.2 Meteorological conditions at Richmond RAAF Base.

WorleyParsons obtained data from the AWS at Richmond RAAF base. The seasonal variations in wind direction and strength are indicated in Figure 65.

Figure 62: Region's meteorological conditions



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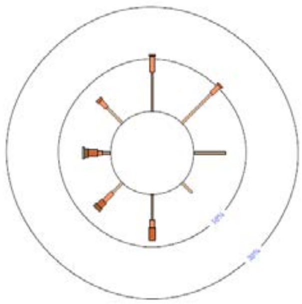
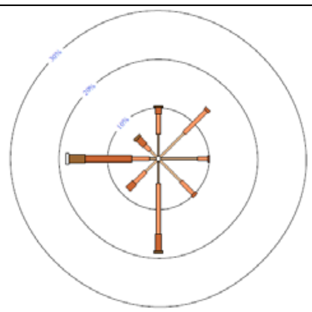
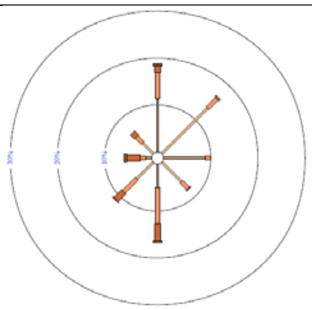
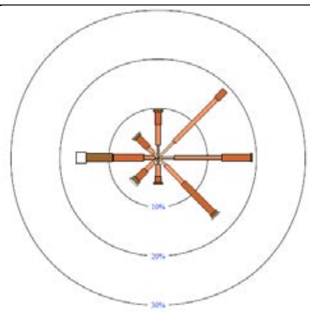
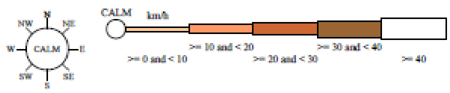
 July	
 October	
	

Source: WorleyParsons analysis of BoM Monthly Climate Statistics

On average over the year, calm conditions prevailed 10.2% of the time. In the morning, the prevailing wind direction is southerly and northerly with smaller south-west and north-east components. In the afternoon the wind favours easterly/north-easterly/south-easterly directions, suggesting the influence of summer sea breezes. There are small southerly and northerly components. Table 44 indicates the number of exceedences of the crosswind limit.

Table 44: Wind speed exceedences

Airport Type	Average wind speed exceedence	Gust wind speed exceedence
1, 2, or 3	0.03% or 3 hours pa	0.49% or 43 hours pa
4	1.22% or 107 hours pa	5.61% or 491 hours pa

Source: WorleyParsons

As can be seen in the table above, there is a potential for the Richmond main parallel runways to be temporarily closed for up to 491 hours per annum as a result of gusts in excess of the regulated safety levels.

The impact of visibility and fogs at Richmond means that the airport is closed to landings for 1.27% of the time or 111 hours per annum.[288]

[288] Cloud base and visibility data from the Bureau of Meteorology were compared with average Instrument Landing System (ILS) minima to determine whether the airport will be closed due to weather conditions.

16. Demand for Richmond airport services

Airports play a significant role in the integration and connectivity of otherwise isolated cities and countries through the facilitation of international and domestic trade and tourism.

This section of the report presents the forecast demand for passenger and freight services at an airport developed within Richmond. Further information regarding the assumptions that underlie this analysis can be found within Appendix B.

16.1 Demand forecast methodology

The forecast demand for aviation services, with regards to passenger and freight throughput at an airport at the proposed Richmond site, has been undertaken by Booz & Co.[289]

As highlighted in chapter 6, the location of an airport relative to the origin/destination of users within the wider region will ultimately impact on the level of demand as well as the type of services that it provides. This is because the generalised cost (that is, time and vehicle operating costs) of accessing the services of the airport will impact on a person's willingness to use the services relative to alternative services (such as using KSA, driving or taking a bus) or taking up the services at all (not undertaking the trip).

Furthermore, the proximity of the airport site to existing and forecast population and employment centres will also increase the probability of or, conversely, reduce the risks associated with potential demand for the services provided by the airport. This factor is an underlying assumption within the estimated forecast of travel demand from the airport as undertaken by Booz & Co.[290]

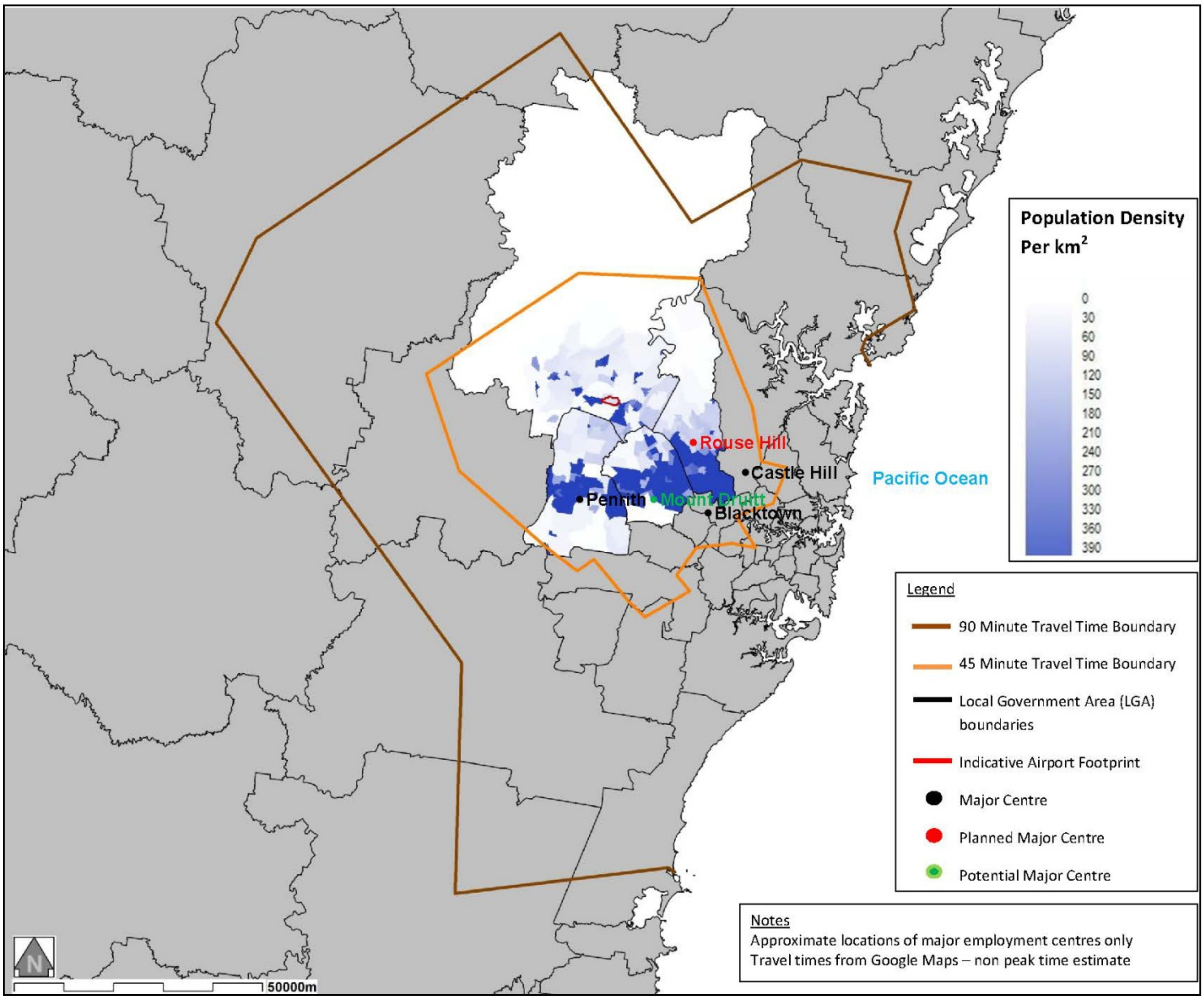
16.2 Demand catchment area

Analysis previously undertaken by WorleyParsons found that the average aviation passenger is willing to travel up to 90 minutes to access an airport.

Figure 63 provides an illustration of the breadth of the Sydney basin that can access the proposed Richmond site within 90 minutes of private vehicle travel time.

[289] These forecasts have not distinguished between Regular Public Transport (RPT) services and General Aviation services.
[290] Further information regarding the assumptions underlying the Booz & Co analysis can be found Appendix B.

Figure 63: Travel time distance to proposed Richmond Airport



Source: WorleyParsons

As can be seen in Figure 63, the residents of each of the planned, potential and existing major centres that surround the proposed Richmond site are able to access the proposed site within 45 minutes. Additionally, residents of inner Sydney, as well as the South West Growth Centre, are able to access the site within 90 minutes.

As found within the previous phase of the analysis and presented in section 2.1, 65% of the population growth that is anticipated to occur between 2006 and 2036 in Greater Sydney as a whole is expected to be realised in Western Sydney.[291] This growth is anticipated to occur in brownfield areas such as Parramatta and Liverpool, as well as greenfield areas that have been designated for population growth by the State Government.

Taking into account this expected pattern of growth, Ernst & Young undertook a study of the potential travel times that will be required to access the airport at Richmond from a number of key centres within Western Sydney, given current and projected travel speeds (by road) over the operational period of the airport. The findings of this analysis are set out in Table 45.

[291] NSW Government, NSW Metropolitan Plan for Sydney 2036, p. 5, accessed 31 August 2012

Table 45: Projected private vehicle travel times from Western Sydney (minutes)

Region	Current	2030	2050
South West Growth Centre	53	62	69
North West Growth Centre	26	29	31
South West	49	61	71
West	45	53	60
North West	34	40	44
Outer west	30	33	36

Source: Ernst & Young analysis – BTS and Google maps

As highlighted in Table 45, travel speeds over the next 40 years are anticipated to decrease by approximately 30%.[292] The resulting increase in travel time will reduce the effective radial distance of the airport's potential passenger catchment over time.

16.3 Services provided by an airport at Richmond

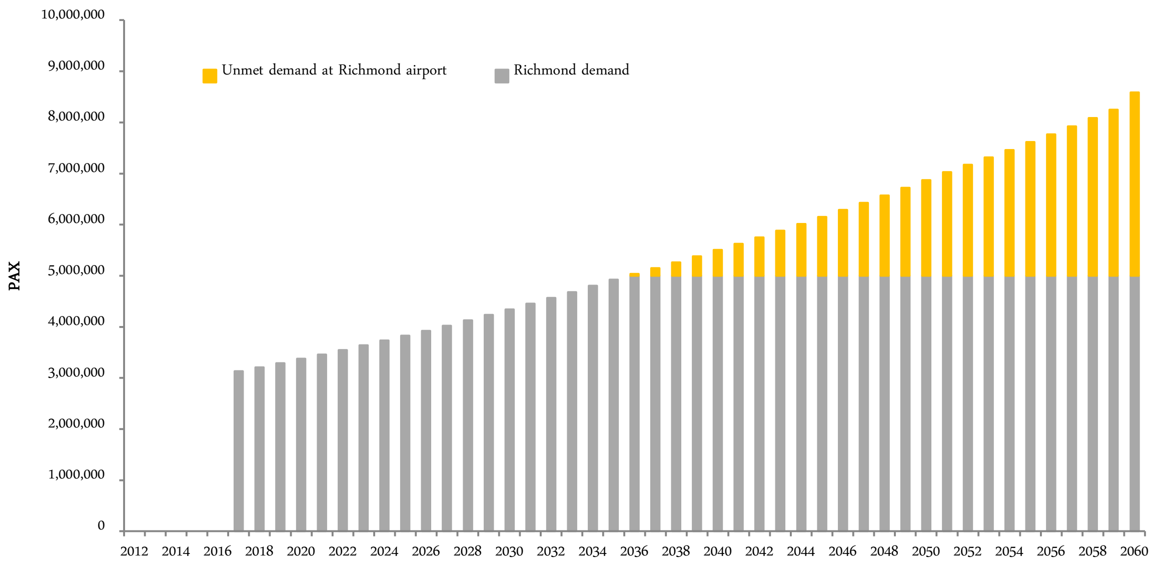
A civil airport development at the Richmond site, as defined within this report (based on Booz & Co analysis), would generally cater for smaller aircraft and provide short to medium haul east coast services, operated by low cost carriers. As such, this airport will largely complement services at Kingsford-Smith Airport.

Once the Richmond airport reaches capacity, it is forecasted to cater for approximately 37 domestic flights per day servicing 8 different locations including, Melbourne (10 per day) and Brisbane (8 per day).[293]

16.4 Passenger demand

The demand analysis undertaken by Booz & Co found that 3 million passengers could use aviation services at a Richmond airport when it opens in 2017 and that the airport will reach its capacity of 5 million passengers per annum by 2036. Figure 64 presents the annual demand for aviation services at an airport at Richmond with respect to total annual PAX.

Figure 64: Passenger demand



Source: Booz & Co

[292] This is an average of the percentage increase in travel time for each of the areas listed in the table
[293] Booz & Co

Because of the low cost carrier service operating model at this airport, it is assumed that all passengers that use the airport will do so for leisure purposes.[294]

Furthermore, as can be seen above, because of the operational capacity of the proposed infrastructure at the airport, there will be a level of demand for services provided by the airport that will not be able to be accommodated within the analysis period.

16.4.1 Origins/destinations of passengers within Sydney

As noted above, the services provided at an airport on the site will generally cater for smaller aircraft and provide short to medium haul east coast services.

16.5 Freight demand

At this stage, it is anticipated in the Booz & Co analysis that the proposed site at Richmond will not service freight (either belly freight or dedicated services).

[294] Ernst & Young assumption based on limitations of Booz & Co analysis

17. Operational impacts of a Richmond airport

This chapter of the report identifies and analyses the environmental and social issues regarding the development and operation of an airport at Richmond.

This report builds on the analysis that was undertaken by the Joint Study, taking into account some additional impacts as well as looking at the time series implications of these factors when applicable. The results in this section draw upon analysis undertaken by WorleyParsons and set out in detail at Appendix D.

It should be noted that the environmental and social issues identified and analysed are directly related to the airport footprint and runway orientation and that the impacts assessed in this section are based on the airport footprint and runway orientation shown in chapter 15.

17.1 Environmental

A number of environmental issues will impact on the ultimate potential success of an airport developed in the region. These environmental issues have a range of impacts on the acceptance of an airport operating within the region. The environmental factors analysed for this report includes:

- Landscape and visual effects
- Air quality
- Drainage and water quality
- Flora and Fauna species within footprint.[295]

17.1.1 Landscape and visual effects

The current location is made up of undulating terrain on the slopes of the Hawkesbury River valley with some areas of floodplain and open rural land, rising to higher ground to the west and north.[296] There will be no dramatic change to the existing landscape and visual effects as the airport is already in place, with only an extension required.

17.1.2 Air quality

Air pollution is one of the main negative impacts associated with the construction and operation of an airport. Despite modern aircraft becoming increasingly fuel efficient, the rapid growth of air travel in recent years has contributed to an increase in total aviation emissions, accounting for 3% of total European Union greenhouse gas emissions.[297] For example, a seven-hour return flight generates approximately the same level of emissions as the average household in a developed country emits through heating for an entire year. [298]

Due to this, and the increasing social concern for the environment, a range of government legislation applies to air quality for the construction and operation of an airport.

This section provides a high-level quantitative analysis of the additional air pollutants that will be released through the operational phases of an airport development. Construction related emissions (for example, from land clearing and earthworks) were not considered in detail as these emissions are likely to be relatively low.

Emissions of five of the six NEPM (Ambient Air) pollutants were assessed for airport operations. Note that Co2 emissions were not included within this analysis

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[295] This analysis looked at the overall environmental impacts of an airport and did not look to quantify these impacts in order to provide a level of subjective assessment within the decision making process
[296] WorleyParsons
[297] European Union Press Release, *Climate Change: Commission proposes bringing air transport into EU Emissions Trading Scheme*, 20 December 2006
[298] European Union Press Release, *Climate Change: Commission proposes bringing air transport into EU Emissions Trading Scheme*, 20 December 2006

The pollutants assessed in this analysis included nitrogen oxides, particulate matter as PM_{10}, [299] sulphur dioxide, carbon monoxide and hydrocarbons. The air emissions were divided into three categories: aircraft emissions, ground-based aircraft handling emissions and increased road traffic emissions.[300]

The air emissions from all sources in relation to the proposed airports at Richmond are summarised in Table 46.

Table 46: Forecast additional air emissions as a result of proposed airport[301]

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Total Sydney Basin emissions (tonnes/year)	555,357	94,353	13,833	24,004	164,822
All Richmond airport related emissions (tonnes/year)	3,511	904	41	21	257
Percentage increase due to proposed airport	0.6%	0.9%	0.3%	0.1%	0.2%

Source: WorleyParsons calculations

This analysis has found that the additional air emissions that result from a second airport will make a contribution to four of the NEPM pollutants and total hydrocarbons in the Sydney region. The analysis presented here is likely to be conservative and uses the maximum number of passenger and aircraft movements forecast for 2060. One of the key uncertainties is the volume of the additional vehicle traffic that will be generated by the various airport developments near the proposed airport.

This means that the precise nature of the impacts on local and regional air quality cannot be accurately quantified. One of the complexities is the movement of clean and polluted air parcels over the sites and the potential for these to produce additional air pollution. The flow of pollution out of the airport into the Sydney and Hawkesbury basins is governed by a number of drainage flows. The present frequencies at which these drainage flows operate are not known. To resolve the complexities of air pollution formation in the vicinity of the airport site, it is recommended that monitoring of ambient meteorological conditions and sampling of pollutants over a 12-month period be carried out. Detailed dispersion modeling should also be carried out to determine the temporal and geographical extent to which air emissions from the site will impact on the Sydney basin.[302]

Note that the above figures are based on the existence of a fully operational airport with a capacity of 5 million passengers. As such, these air pollution levels will not occur at the opening of the airport. Instead it will grow over time. There is not a one-to-one relationship between passenger throughput and air emissions, as air emissions are impacted by the following factors:

- ► Congestion and ease of movement on the supporting transport network
- ► Efficiency of the aviation services at the airport

[299] Particulate matter of 10 micrometers or less in diameter
[300] Assessment of ozone levels as a result of the operation of a second airport is beyond the scope of this study. Ozone is a secondary pollutant and its concentrations at a particular site are governed by a combination of complex photochemical processes and prevailing meteorological conditions. Lead levels were not assessed as they are presently well below the NEPM standards and are currently not monitored in NSW.
[301] WorleyParsons undertook an analysis of local but not national/global air quality impacts as a result of an airport development at Richmond airbase
[302] Further information regarding the impacts of air quality as a result of the Richmond airport development can be found within Appendix D

17.1.3 Drainage and water quality

WorleyParsons undertook an analysis of the potential impact existing surface water and ground water systems and the potential for flooding as a result of the expansion of the Richmond air base.

This analysis found that water runoff from the site up to and including the 20 year ARI event[303] is expected to be treated prior to discharge from the site. Events above and including the 100 year ARI event will be discharged from the site untreated; however, as the site is not within the Warragamba Catchment it is not expected to impact on the drinking water catchment.

The potential contaminants in run-off and effluent as a result of the construction and operation of an airport are set out in Table 47.

Table 47: Source and types of potential water contaminants

Contaminant	Source
Sediment	Erosion, earthworks
Nutrients	Sediment, fertilisers, sewage
Contaminated food/water	Kitchen waste from international flight
Sulphuric Acid	Wet oil batteries used for standby power supplied
Emulsified oil, Grease, Solvent Cleaners	Workshops and aircraft maintenance
Detergents	Aircraft washdown, service and maintenance areas
Paint Strippers	Maintenance
Acid, fluorocarbon and Hydrocarbon Solvents	Fire-fighting
Trade Wastes	Kitchens
Aircraft Fuel	Fuel storage, refuelling
Rubber Detritus	Tyre wear and tear
Pesticides/herbicides	Ground maintenance
Heavy Metals	Aircraft/vehicle wear and tear

Source: WorleyParsons analysis

Measures to minimise the potential impacts of contaminants in stormwater runoff will be taken via a treatment train prior to discharge. A typical treatment train involves stormwater being diverted to a first flush system, such as a retention pond, where initial runoff (which is considered to be most polluted) is retained. Additional runoff will be directed to stormwater retarding basins, which will be designed to contain the peak flow of a storm and ensure that the discharge from the site does not exceed the present peak flows from such an event.[304]

Other additional water quality treatment measures will include rainwater tanks, swales, gross pollutant traps, and hydrocarbon separators. [305]

17.1.4 Flora and fauna species within footprint

An Environment Protection and Biodiversity Conservation (EPBC) search revealed the likely presence of no Endangered Ecological Communities in the Richmond study area. The EPBC search found that there could be 5 bird, 2 fish, 3 frog, 7 mammal, 3 plant and 1 reptile threatened species that may exist within the footprint of the site.

A complete list of Threatened species as found by the EPBC search can be found in Appendix D.

A number of measures can be undertaken to minimise the impact on endangered flora and fauna that will be affected by the development of an airport, including fauna relocation, the creation of habitat corridors and environmental offsets.

17.2 Direct social impact

The development of an airport will have a direct impact on the local region, notably through: [306]

303 Average recurrence interval event
304 Based on industry standard and DECCW water quality requirements
305 Further information regarding the impacts of water quality as a result of the Richmond airport development can be found within Appendix D

- Impacts to local heritage
- Noise
- Displacement of local residents
- Amenity
- Development and spatial distribution of the region's commercial/industrial businesses.

17.2.1 Heritage

The Joint Study found that no Aboriginal and European heritage items will be affected by the airport.

17.2.2 Noise

The noise that is created as a result of airplanes taking off and landing is one of the major impacts of any airport on the surrounding community.

Residents living in the vicinity of airports or under busy flight routes are exposed to the ongoing impacts of aircraft noise. These effects vary from low levels of annoyance to real effects on amenity and health, reducing residents' quality of life and lowering property values.

Elevated sound levels can have various health consequences such as hearing impairment, hypertension, cardiovascular effects, rising blood pressure, annoyance and sleep disturbance. These consequences can then result in stress, increased workplace accidents, reduced performance in school and work and even anti-social behaviour.

These effects have caused multiple examples of community pressures to reduce airport activity or to not build an airport in the first place. Such pressures have been effective in Australia, with the introduction of the *Sydney Curfew Act* in 1995 being just one example.[307]

At existing airports, whilst individual aircraft have become quieter, the number of aircraft movements has typically increased substantially over time. This, along with the increase in population density, has meant that the number of complaints has grown and that community pressure for operational constraints at airports is coming increasingly from residents living outside the typical high noise impact areas. The source of complaint is now more often about the higher number of over-flights rather than individual noise impacts.[308]

To measure the impact of an operational airport on the local community, WorleyParsons undertook an analysis of the noise impact of an operational airport at Richmond on the surrounding region. This analysis looked at the noise impact on households, as well as the likely number of events that will be experienced by local residents.

This section of the report builds on the findings of the previous analysis and highlights the likely noise impact over time, with respect to both ANEF contours and N70 events, as a result of the development of an airport at Richmond. The following measures were analysed:

- The Australian Noise Exposure Forecast (ANEF) is used to regulate aircraft operations and to report on the effects of those activities. This system takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location. Staged noise analysis has not been undertaken for this study.

- N70 events refer to the minimum number of events above 70 decibels one can expect to experience for the average day. A 70 decibel noise impact is equivalent to an operating machine or the noise of a car while driving.

Further information regarding the definition and measurement of these noise impact assessments, as well as examples of relative noise level impacts, can be found in Appendix D.

[306] This section of the report only presents the social impacts that are directly associated with the development of the airport. A number of wider social impacts that indirectly result from the development of an airport within the region have been analysed and are presented in section 20.
[307] National Aviation Policy White Paper, page 214
[308] National Aviation Policy White Paper, page 214

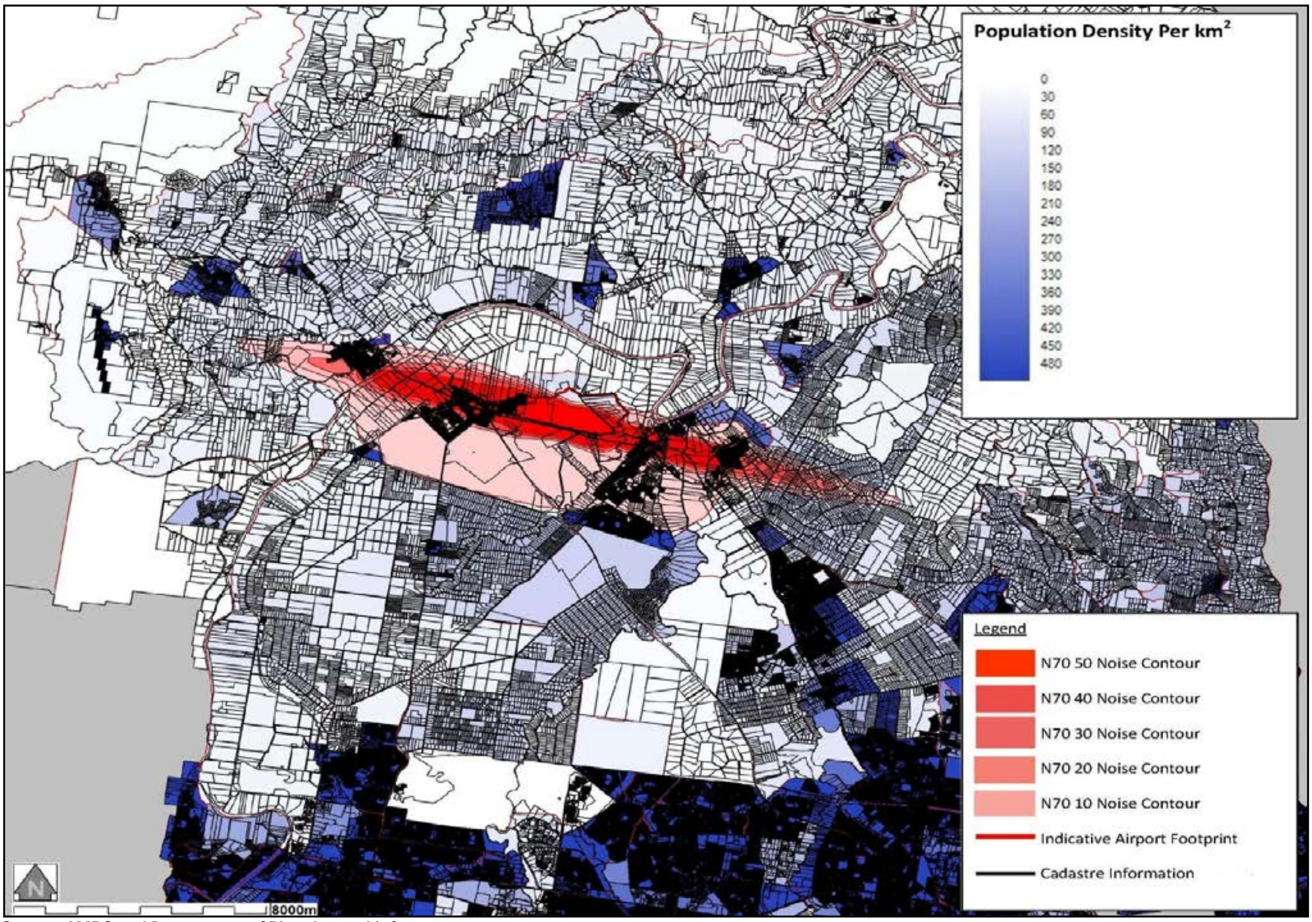
The analysis to date has only been undertaken on the noise impact of the airport at its maximum capacity on the current structure and composition of the population. Therefore, the actual noise impact on the local community will be smaller at the beginning of the analysis period as the airport scales up its operations to reach capacity.

The following sections highlight the forecast noise impact of an airport at Richmond on the local community.

17.2.2.1 N70 noise impact

Figure 65 displays a range of N70 noise contours for the proposed fully operational airport of 5 million passengers.

Figure 65: Richmond airport N70 event distribution



Source: AMPC and Department of Planning and Infrastructure

As can be seen in the figure above, the N70 events will primarily be directed toward the east and west of the proposed airport site due to the direction of the aircraft runways. Immediately, in either direction, there is a relatively low level of population that will be affected by severe of aircraft noise.

However, the figure also indicates that there are some residents to the south of the proposed airport site who will be affected by the N70 events caused by the development of the airport. These areas have a relatively higher level of population density.

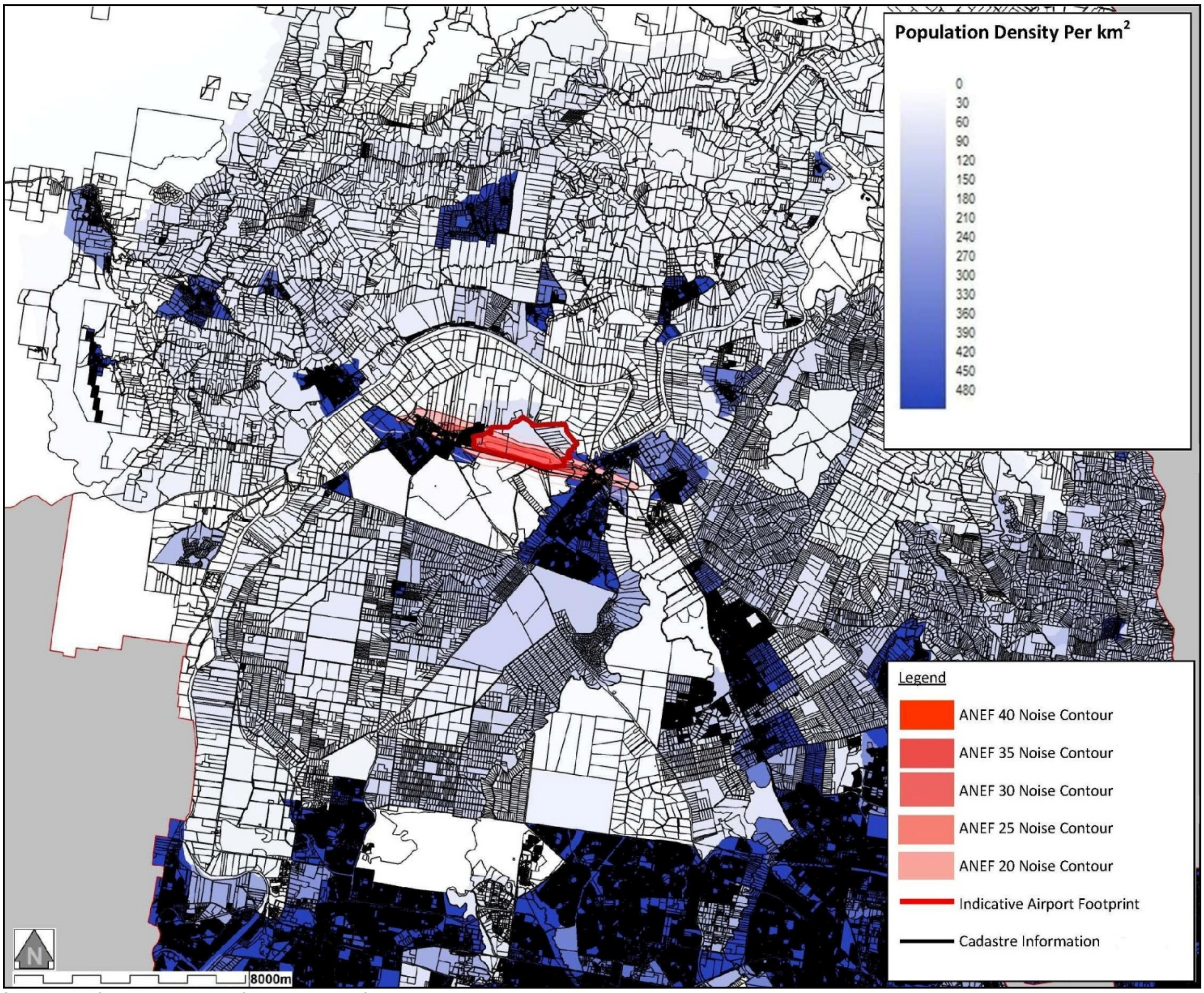
This analysis has found that by 2060 a total of 5,086 persons are likely to experience 50 additional N70 events every day, while 12,356 persons are likely to experience 20 additional N70 events per day and 24,131 persons are likely to experience 10 additional N70 events per day.[309] Table 169 lists all N70 events and is included in Appendix D.

17.2.2.2 Australian Noise Exposure Forecast impact of Richmond

Figure 66 displays a range of ANEF noise contours for the proposed fully operational airport (5 million passengers per annum) at Richmond.

Figure 66: ANEF noise exposure

[309] WorleyParsons analysis of ABS data, Census 2006



Source: AMPC and Department of Planning and Infrastructure

This figure shows that – based on the fully operational airport of 5 million passengers per annum (ultimate practical capacity of the airport) – approximately 110 hectares will be within the ANEF 35 noise contour. Furthermore, a total of 371 allotments or 265 hectares are within the ANEF 30 noise contour and 901 allotments or 629 hectares are within the ANEF 25 noise contour.

17.2.2.3 Noise mitigation measures

A range of measures can be undertaken to minimise the impact of noise that will result from an operational airport:

- ► The most effective, but most costly, mitigation measure is to purchase all lands within a specified ANEF noise contour.
- ► Residential properties within a specified ANEF noise contour can be 'noise proofed'.
- ► Advancements in aircraft engine technology may also provide a reduction in ANEF noise contours.

17.2.3 Displacement

The construction of an airport at Richmond will require a number of properties to be compulsorily acquired through the *Land Acquisition Act 1989,* which provides specific powers to the Commonwealth Government to acquire interests in land.[310]

Properties will have to be acquired as a result of the Richmond airport development includes those properties within the proposed airport site and those properties that will fall within specified boundaries around the airport (such as properties within specified ANEF noise contours).

[310] Further information regarding the legislative process for the government to acquire land through these means can be found within Appendix D

WorleyParsons has undertaken an analysis of the total number of properties that will have to be compulsorily acquired as a result of the development of an airport at Richmond.

17.2.3.1 Houses within the site

As described in section 15.1, the development of a civil-aviation airport in Richmond will use the site currently occupied and used by the RAAF.

A number of alterations to the current airport will be required to be able to accommodate both civil aviation and air force operations on the site. Furthermore, the proposed conceptual design to accommodate both operations may potentially require the acquisition of land around the site that is currently not owned by the Commonwealth or State Government.

The proposed footprint of the site will require some property – approximately 30 lots – to be compulsorily acquired at the northern end of the site as they are located within the potential airport footprint.[311]

The Department of Infrastructure and Transport has prepared a Discussion Paper[312] that provides a comparison of planning controls for aircraft noise between a number of countries. In relation to Australia, the paper indicates the following:

- 40 ANEC or greater – no housing
- 30 -40 ANEC – no new housing
- 25-30 ANEC – insulation of existing housing and no new housing
- 20 – 25 ANEC – new housing with insulation
- Less than 20 ANEC – no restrictions.

The table below shows that there are approximately 371 allotments[313] above the 30 ANEF noise contour. In line with the Australian Standard AS2021-2000, properties located within ANEC contours 40, 35 and 30 should be acquired by the Commonwealth Government. No new housing should be developed within the ANEF ranges 25-30 and all new houses developed within the ANEF ranges 20-25 must be constructed with insulation.

Table 48: Compulsory acquisition as a result of noise impacts

ANEF	Allotments[314] within noise footprint[315]
25	901
30	371
35	32
40	0

Source: AMPC, WorleyParsons
Note – properties within the higher ANEF contours are already included in the lower contours

Even though an airport that is developed within the region will not reach this level of operational output and thus present this level of noise in the short to medium run, it is anticipated that the Government will seek to acquire these houses at the earliest opportunity and put in place relevant procedures to ensure that any residential development within the area will conform with the changing nature of the airport's noise footprint.

17.2.4 Amenity impacts

Throughout its lifecycle, an airport will have a range of other amenity impacts on the local community (eg: visual, smell etc.).[316] Given the size and scale of the potential Richmond airport development, and the range of aviation related services that already exist within the region, a civil airport at the airbase is expected to have a relatively low additional impact on the social amenity of the region.

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[311] This estimate of compulsorily acquired lots only applies to this 'reference case' airport configuration as defined by the Department. The land purchased would differ under alternative configurations
[312] http://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/index.aspx
[313] Note that the number of allotments does not equate to the number of households. For the purpose of this exercise we have tallied the number of allotments in which housing is permissible.
[314] Note that the number of allotments does not equate to the number of households. For the purpose of this exercise we have tallied the number of allotments in which housing is permissible.
[315] WorleyParsons analysis on noise impact on residents (Airport Suitable Sites – Specified Localities, matrix) and person per dwelling ratio from ABS Census Data-2006

17.2.5 Associated development and spatial distribution of region's commercial / industrial businesses

As a core element in a range of supply chains, airports and the infrastructure that supports them can significantly affect the location decisions of firms, leading to a clustering of firms near airports (including within an airport business park precinct) and associated agglomeration and efficiency benefits. This section outlines projected demand and supply for land adjacent to an airport at the Richmond site.

As described in section 6.2, the more businesses that chose to locate and utilise the services provided by the airport the more viable the airport is likely to be. Furthermore, the more land that is available to be developed around the site, the relative proximity and access of this area to the airport and the availability and quality of other infrastructure will have an impact on the number of businesses that will relocate their operations to this area.

17.2.5.1 Supply of land

WorleyParsons has undertaken a preliminary analysis of the land surrounding the site to comment on its potential to meet industrial and business park purposes. This analysis considered:

- Proximity to airport footprint
- Least fragmented land
- Ability to connect with airport footprint and access existing transport infrastructure
- Current zoning may not permit 'commercial' and 'industrial' land uses and may require a change in land zoning.

An area enclosed by a radius of approximately 3kms from the site centre was investigated to determine potential industrial land and business parks.

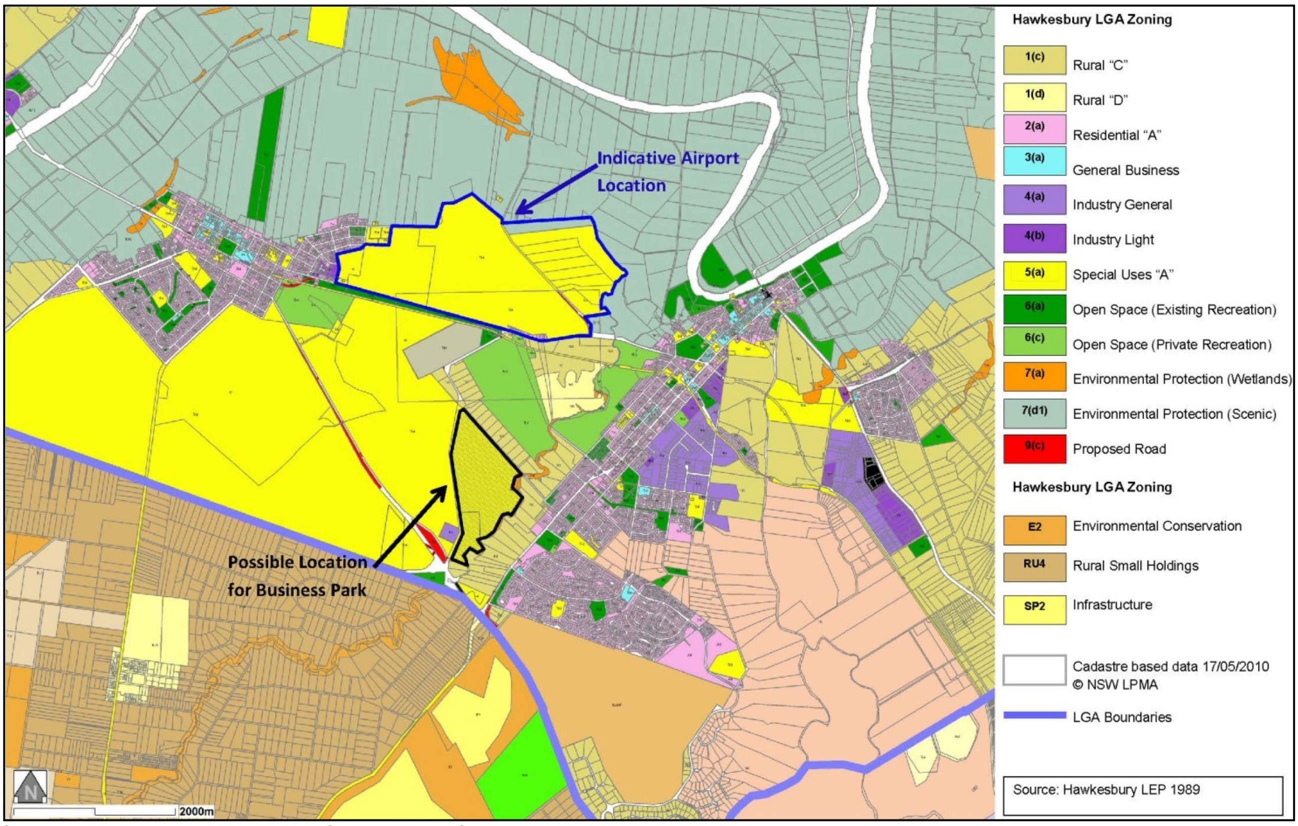
Currently the land surrounding the airport site is predominately zoned 7(d1) Environmental Protection (to the north), 5(a) Special Uses (to the south) and a mix of Open Space, Residential and Industrial (to the east and west).

Should the site be selected for use as a passenger airport there is the potential for some of the land to the south of the site (currently zoned 5(a) Special Uses) to be assessed and, if suitable, rezoned for the purpose of permitting business parks and industrial land uses. This area of land is approximately 93 hectares.

Figure 67 shows the current zoning of land surrounding the potential airport site.

Figure 67: Area around airport site

[316] These impacts have not been analysed within this evaluation



Source: WorleyParsons and Department of Planning and Infrastructure

17.2.5.2 Demand for land

To determine the potential uptake of industrial/commercial development around an airport, an analysis of the demand of such businesses to locate in the region was undertaken. This analysis was undertaken through a search of similar airports internationally and a qualitative analysis of the factors that may entice a business to locate in a specific location within Sydney. Refer to Appendix B for more details regarding our methodology.

The results of this analysis are shown in Table 49.

Table 49: Forecast industrial land uptake at Richmond

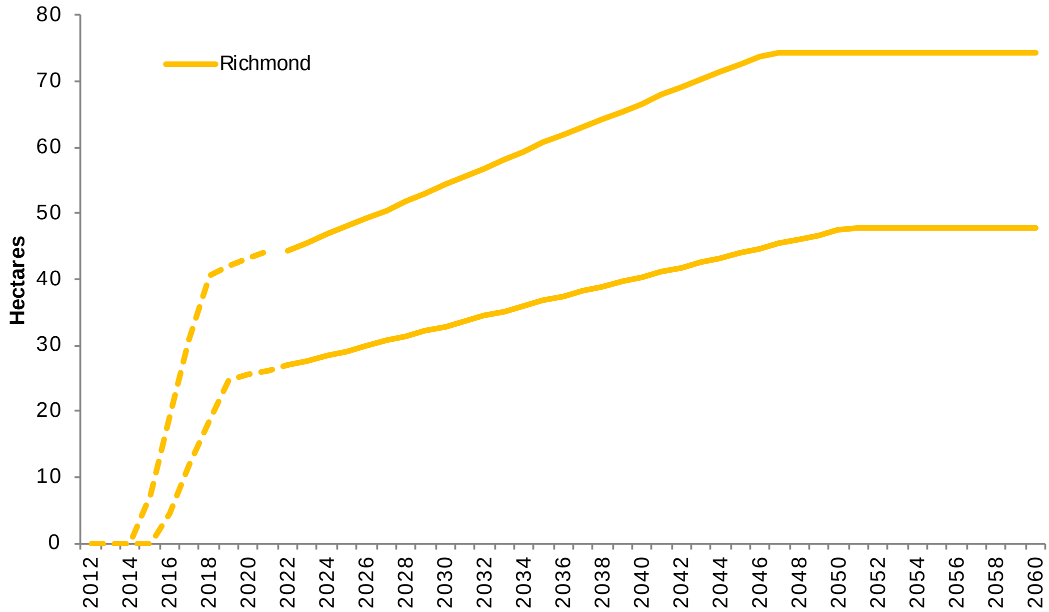
	2035 (ha)	2050 (ha)	2060 (ha)
Low	37	47	48
High	61	74	74

Source: Booz & Co data, analysis by Ernst & Young
Note that 74 hectares is the maximum footprint for Industrial commercial land around the airport site

The results show that by 2035 the level of demand for industrial land is likely to be in the order of 37 to 61 hectares. With the anticipated increases in airport activity, this land use demand is forecast to grow to between 47 to 74 hectares by 2050. Furthermore, demand for this land is improved due to the site's relative closeness to the Sydney CBD and other business districts in Sydney. From 2050 onwards, land use demand is expected to remain static due to the forecast end to growth in airport passenger numbers. However, overall demand is quite low due to the relatively small estimates of PAX and no freight movements.

Figure 68 presents the results of applying the methodology for determining the demand for land around an airport at Richmond over the analysis period.

Figure 68: Forecast demand for land use at Richmond



Source: Booz & Co data, analysis by Ernst & Young (low and high estimates)

Figure 68 shows the range and expected levels of demand for industrial land at the proposed site. Analysing the strengths and weaknesses of the site can help to determine where demand might be within this range. The strengths of the region are:

- Good existing infrastructure network
- Large employment catchment within the region.

The comparative weaknesses of the regions are:

- Limited PAX and freight throughput
- Competing growth centres within the wider region.

On balance, it is likely that the uptake of this potential range of demand will be on the higher side.

As can be seen above, the potential supply of land (93 hectares) for the development of industrial and commercial businesses in close proximity to the airport over the medium to long-term is likely to be sufficient to meet forecast demand (up to 74 hectares). However, government, local businesses and the airport stakeholders may find it beneficial to also zone additional areas around the site for future business development to protect the long-term strategic benefit of the area and its infrastructure.

17.2.5.3 Associated sub-regional business development

Those businesses that choose to locate in close proximity to the airport could either be induced (will not be realised without the airport) or enticed to move to the area (will have located either within the local or wider region, but choose to relocate close to the airport).

Those businesses that will be developed purely as a result of the operational airport will produce a substantial impact on the economy, with the turnover they generate resulting in a near 'one for one' benefit to the economy as a whole.

A number of benefits are associated with a business centre such as that, which is likely to develop around an international airport at Richmond, including:

- Clustering and agglomeration of 'like minded' businesses – the close location of simular businesses can result in a variety of economic benefits including sharing resources and reducing the cost of inputs (for example, lower transportation costs).

- Increased competitiveness of other centres – competition between major centres can increase competition, which will increase choice for consumers and decrease the effective price of goods and/or services.

- Improvement in the use of land – The development of such a centre can encourage businesses and industries with high land use needs but low value output to locate in a less developed area, allowing higher value operations to move into more appropriate locations. An example of this is the movement of industrial businesses away from a town centre to allow higher value residential and commercial development.

Those businesses that will locate in close proximity to the airport (and that are likely not to base themselves within the wider region if the airport is not developed) are most likely to be aviation-oriented (such as aviation engineers and caterers). Businesses that are likely to move to the area that otherwise would have been located somewhere else within the wider region include those engaged in R&D and light industry activities. Finally, those businesses that are likely to locate in close proximity to the airport that would otherwise have been located within the region in any case are likely to include retail and hospitality services.

18. Employment impacts at a Richmond airport

The development of an airport and associated industrial/commercial development will result in new employment opportunities during construction and operational phases. These employment opportunities will be realised through direct employment at the airport, as well as indirect employment as a result of increased business activity within the surrounding region.

This section of the report looks at the aggregate level of direct and indirect employment that is likely as a result of the construction and operation of the airport. It also analyses the types of employment opportunities likely to be generated and the sources of workers that will be needed.

18.1 Direct employment

The development of an airport will result in a number of additional direct employment opportunities throughout both the construction and operation phases.

18.1.1 Construction employment

Ernst & Young have undertaken a calculation to determine the potential number of persons that will be employed on the construction of an airport and supporting infrastructure over the initial construction period. This calculation is based on the capital expenditure on infrastructure and the number of construction workers typically required to build these types of assets[317] (this information has been sourced from Treasury NSW). The results from this analysis have been compared to a number of domestic and international case studies.[318]

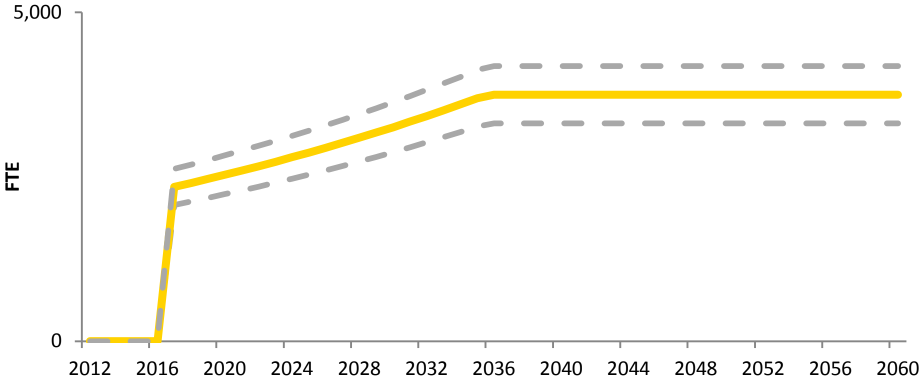
We have calculated that, on average, approximately 350 to 500 FTE persons will be employed to build the airport over the construction period.

18.1.2 Operational employment

Ongoing operations at the airport will create a range of direct employment opportunities at the airport that will otherwise not be generated within the region.

The number and type of employees that will be directly employed in the operation of an airport has been determined based on forecast airport activity (passenger and freight throughput) and the relationship between employment and airport activity identified from a sample of other domestic and international airports.[319] The number of persons estimated to be directly employed at the airport is shown in Figure 69.

Figure 69: Forecasts of direct employment for Richmond



Source: Booz & Co data, Analysis by Ernst & Young (upper and lower bounds and midpoint)

Table 50 breaks down the number of full time equivalent (FTE) positions estimated for an airport at Richmond.

Table 50: Forecast PAX, freight and employment

Year	PAX	Freight (tonnes)	Direct FTE
2035	4,926,944	-	3,693

[317] This analysis only looks at the employment and impacts of the initial construction phase and does not analyse the potential for further employment as a result of periodic renewal of the asset.
[318] Case studies included the Brisbane airport second runway, the new Indianapolis Airport development and Tom Bradley International Airport.
[319] Further information regarding the methodology and assumptions utilised in undertaking the evaluation of direct employment at the airport can be found in Appendix B

2050	5,000,000	-	3,748
2060	5,000,000	-	3,748

Source: Booz & Co data, Analysis by Ernst & Young

The number of direct full-time employees at Richmond airport (in addition to those already employed there in relation to its current military purpose) is expected to 3,748 in 2060. This represents a 1% increase over 25 years or an average annual growth rate of 0.1%.

18.1.2.1 Composition of Employment

Based on our analysis of other airports, we have been able to disaggregate our forecasts of direct employment into four broad employment categories as follows:

- Passenger facing employment: airlines, air services, and general aviation
- Freight services: this includes employment related to the movement of freight at the airport
- Support services: this includes ground transport, administration, retail, car parking and security at the airport
- Other services: this includes government services, maintenance and construction at the airport.

Using international observations, we analysed the relationships between airport activity and the proportion of direct employees in each category at the airport. [320] These relationships were then applied to forecast activity levels for Richmond. The results of this analysis are provided in the table below.

Table 51: Number and proportion of direct employees for each employment category

Year	Passenger facing employment		Freight		Supporting services		Other services	
	No.	%	No.	%	No.	%	No.	%
2035	1,220	33%	0	0%	1,108	30%	1,365	37%
2050	1,239	33%	0	0%	1,123	30%	1,385	37%
2060	1,239	33%	0	0%	1,123	30%	1,385	37%

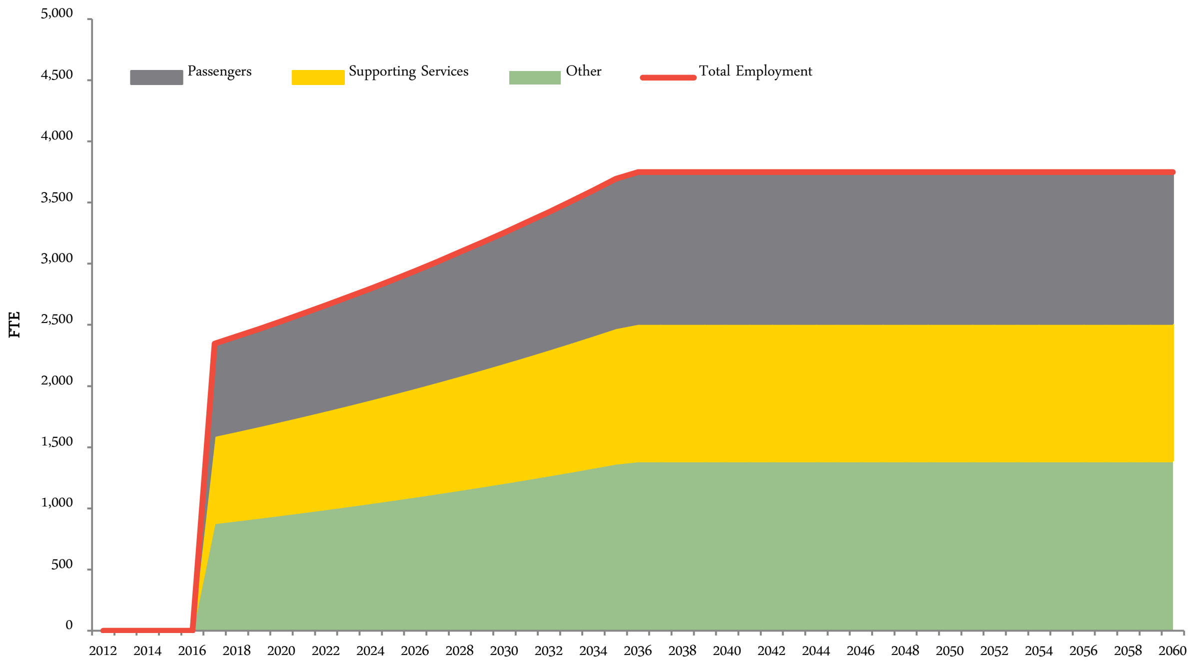
Source: Booz & Co data, Analysis by Ernst & Young

As indicated in the table above, as airport activity increases, the number and proportion of employees related to the different types of services will remain unchanged.

The results of this analysis and the evolution of forecast employment at Richmond is presented in Figure 70.

Figure 70: Absolute levels of different types of direct employment

[320] Further information regarding the methodology and assumptions utilised in undertaking the evaluation of direct employment at the airport can be found in Appendix B.



Source: Booz & Co data, analysis by Ernst & Young

An analysis of the skill level composition of each of these types of jobs has found that approximately 50% to 51% are lower skilled employment opportunities, while 49% to 50% are higher skilled employment opportunities over the operational life of the airport.

18.2 Sub-regional (associated) development and employment

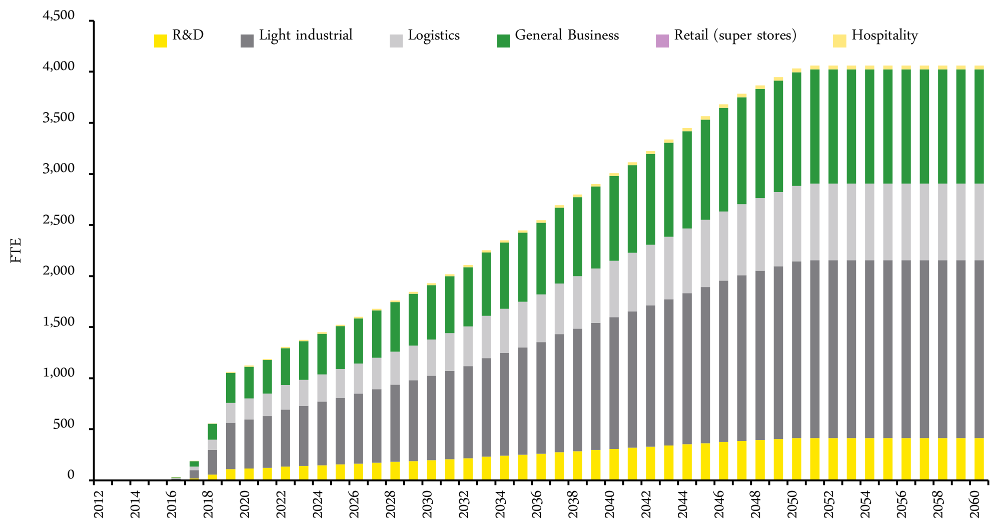
An airport also impacts the economy through flow-on effects from 'off-site' businesses in the region that supply the airport and its users or form part of a growing airport 'city' or sub-regional economic centre with close links to the airport. For this study, this is referred to as the associated impact of the airport.

As identified in section 6.2, the level of industrial/commercial land development around the proposed airport site at Richmond was estimated based on the 'unconstrained' demand for land in close proximity to the airport and the 'constrained' supply of suitable land parcels. Further information regarding the methodology used in undertaking this analysis can be found in Appendix B.

Using this estimated level of industrial/commercial land development around the airport site the number of employees, by type of industry, was calculated using employment density industry benchmarks.[321] The estimated level of employment, by type of industry, is shown in Figure 71.

[321] Further information regarding the methodology and values utilised within this calculation can be found within Appendix B.

Figure 71: Medium landside commercial/industrial employment projections (FTE)



Source: Ernst & Young analysis[322]

We project that employment in the industrial/commercial developments near the airport will grow to approximately 4,060 employees by 2060.The general business sector will have the highest employment levels in these industrial/commercial developments, with warehousing/logistics and light industrial also being key employment sectors.

Furthermore, we estimate that the industrial/commercial developments will require approximately 20% higher skilled employees and 80% lower skilled employees.

A number of business activities (and associated employment) will occur within the region and/or the wider Sydney basin irrespective of the development of an airport. However, there are businesses that establish operations around airport sites as a direct result of increased aviation activity, such as logistics and hospitality services. In both instances, the concentration of businesses around airport sites provides benefits to the wider community.[323] One key benefit is the potential for land releases in other areas to be used for alternative productive uses, including housing, high end retail or other commercial/industrial uses, as a result of businesses relocating their operations to the airport.

18.3 Total employment

As identified in the sections above, employment within the region that will occur in conjunction with the development of an airport includes direct employment in constructing or operating the airport, sub-regional (associated) development and indirect economic activity.

Table 52 provides a summary of the likely total employment generated within the region at different points across the analysis period.

Table 52: Total employment (medium estimate)

	Construction[324]		2030		2060	
	Higher skilled	Lower skilled	Higher skilled	Lower skilled	Higher skilled	Lower skilled
Direct - construction	86	343				
Direct - operational			1,648	1,606	1,903	1,845
Indirect -associated landside			396	1,534	834	3,227
Total	86	343	2,044	3,139	2,736	5,072

Source: Ernst & Young analysis

322 Note that this is a forecast based on a number of variables, in reality the development of industrial and commercial businesses as a result of the airport is likely to occur in a staggered step change fashion.
323 See chapter 6.2
324 It has been assumed that 80% of construction labour will be lower skilled jobs

As outlined in section 6.3, not all of these employment opportunities represent new jobs within the region. In other words, a number of these business and employment opportunities will reflect a transfer of activity that would have otherwise occurred elsewhere. Analysis of the wider economic impact of the airport development, undertaken by Monash University general equilibrium model has found that the development of a Richmond airport will increase the number of jobs within NSW by 400 in 2030, increasing to 500 in 2060. [325]

Furthermore Additional indirect employment opportunities will be created as a result of the development of an airport. These employment opportunities will arise from increased economic activity at the airport and the spending of wages from direct employment that will ultimately result in increased employment elsewhere within the economy.[326]

The employment and economic activity derived from the development of the airport is projected to support[327] 2,000 to 3,000 jobs[328] within the wider region (over and above what is realised at the airport or the adjoining industrial/commercial area),[329] which is forecast to decrease slightly over time to 2060 as the airport receives greater support from those businesses within the adjoining business park.[330]

18.4 Sources of employment

This section of the report analyses the number of residents (current and future) who will benefit from additional employment opportunities created by the construction and operation of Richmond airport.

The analysis assumes that the majority of people employed at the airport and associated industrial/commercial developments will reside in areas within 30 minutes travel time. As noted in section 6.3.3, this assumption is broadly consistent with the distribution of KSA employees' places of residence.

A number of current NSW Government policies, including the State Plan and the Metropolitan Plan, indicate a desire to provide more jobs closer to residents and to reduce the amount of time people spend travelling to work. The benefits of achieving these policies include improved productivity, better infrastructure utilisation, reduced car use, reduced energy consumption, emissions reductions and more active living.[331]

For this analysis, we have assumed that there are three potential primary sources of labour in the study region to support the airport and associated industrial/commercial developments:

► Unemployed residents seeking employment (excluding the natural long-term rate of structural unemployment assumed to be 4.5%)

► Underemployed residents seeking full-time employment (excluding the natural long-term rate of part-time employment assumed to be 50%)

► Future resident labour force not employed by new jobs planned for the region (excluding the natural long-term rate of unemployment/underemployment).[332]

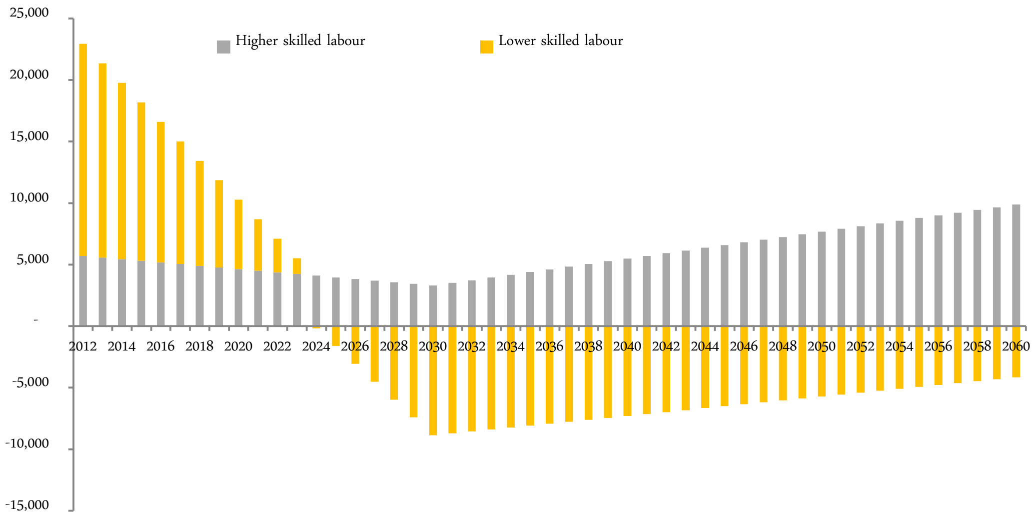
These three sources of labour are divided into higher skilled labour (managers, professionals and technical experts) and lower skilled labour (labourers, machine operators and retail personnel).

Identifying sources of labour is complex. In part, labour will be sourced from those who are unemployed/underemployed but also from those who shift from other jobs in the region. This employment redistribution is not taken directly into account by this analysis as the focus is on aggregate employment opportunities. Furthermore, a large proportion of this potential labour pool will be able to obtain gainful employment outside the region, notably in the Sydney CBD, irrespective of the development of an airport within the region.

The potential labour pool within the Richmond region that could support an operational airport and related industrial/commercial development is illustrated in Figure 72.

[325] The CoPS modelling assumes that there is no project that can by itself change the total number of people employed within Australia as a whole.
[326] The amount of indirect economic activity and employment that will occur as a result of developing an airport at Richmond has been analysed using the Monash University, Centre of Policy Studies, general equilibrium model. More detail about this model can be found in Appendix B.
[327] These do not reflect additional employment opportunities created, but jobs that are somewhat supported by the activities of the airport.
[328] These reflect jobs outside of the airport and the associated business park.
[329] We are unable to determine whether these jobs will be within the region as defined within this study or elsewhere within the Sydney basin
[330] The number of additional jobs that are supported as a result of the development of the airport reduces over time as the business park and its associated businesses develop to support the operations of the airport.
[331] NSW Government (2011), NSW 2021: A Plan to Make NSW Number One, http://www.2021.nsw.gov.au/
[332] As identified with the NSW Department of Planning and Infrastructure forecasts

Figure 72: Potential labour supply within the Richmond region



Source: Ernst & Young calculation
Note: negative labour supply highlights that in the future there will be more jobs within the Richmond region than potential labour supply (ie: the region will be a net importer of labour)

There are 158 FTE workers within the region who are currently unemployed and a further 22,700 who are underemployed. These workers could be redirected to potential employment opportunities. This level of regional underutilised labour supply is anticipated to fall to 5,000 by 2060 as a greater level of employment opportunities are created in the region than population increases.

As can be seen in the figure above, it is anticipated that the demand for lower skilled employees within the region will be greater than the number of lower skilled persons within the labour force that reside within the region, even without the development of an airport.

This level of potential labour supply is compared to the total demand for labour that would result from the operations of the airport and related businesses operations in the table below.

Table 53: Forecast labour supply and demand within the Richmond region

Year	Demand		Supply	
	Higher skilled	Lower skilled	Higher skilled	Lower skilled
current			5,711	17,227
2030	2,044	3,139	3,296	-8,869
2060	2,736	5,072	9,881	-4,146

Source: Ernst & Young calculation

The airport and associated business activity will create approximately 5,200 jobs by 2030, rising to 7,800 in 2060. As seen in the table above, over the operational period of the airport (2025 to 2060) the airport and other supporting businesses will have to import labour from within other regions within the Sydney basin.

19. Economic impacts of a Richmond airport

This section of the report analyses the potential economic impact of the construction and operations of an airport at Richmond, from both a NSW and national perspective.

The economy wide study was undertaken using a general equilibrium modelling approach. Under this approach, the direct expenditure associated with the development and operations of the airport on the wider NSW and Australian economies forms the foundation of the wider economic analysis. The economic impact assessment was undertaken using the MMRF model, developed at the Monash University Centre of Policy Studies.

It should be noted that this analysis assumes that without the development of an airport, in this case at Richmond, the majority of aviation movements that would transfer through the airport will be suppressed. Furthermore, a range of high level assumptions were made regarding the proportion of landside business operations that will be developed as a result of the airport development. Our approach regarding the direct impacts assessment and the general equilibrium modelling is summarised in Appendix B.

The result of this analysis is the presentation of a range of state and national economic variables that highlight the potential aggregate impact of the development of an airport at Richmond. The measures presented in the analysis include:

- Real private consumption – presents the changes in expenditure on goods and services intended for individual consumption or use
- Real investment – presents the changes in investment in tangible and productive assets such as plant and machinery, as opposed to investment in securities or other financial instruments
- International export volumes – a measure of the change in international trade of products and services from NSW and the national economy
- International import volumes – a measure of the change in international trade of products and services into NSW and the national economy
- Real Gross State/Domestic Product – a measure of the total market value of all final goods and services produced in NSW and Australia in a given year which is equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports.

The assessment of aviation capacity economic impacts has been produced at the NSW and national economy levels. The assessment has been produced for the period from 2012 to 2060.

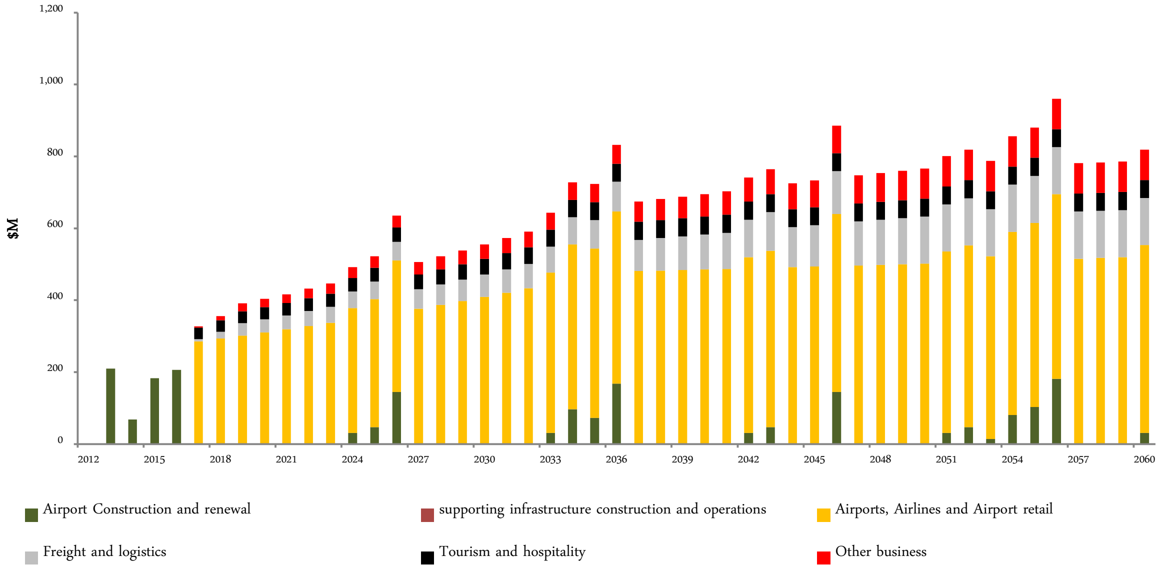
19.1 Direct expenditure impacts

A number of direct expenditure impacts are associated with the development and operations of an airport at Richmond. These direct impacts include:

- Construction of the airport and supporting infrastructure
- Ongoing renewal and maintenance of the airport and supporting infrastructure
- Airlines, airports and airport retail
- Tourism and hospitality
- Freight and logistics
- Other business activities – including R&D, retail and general businesses that will be developed and operate as a direct result of the additional economic activity that an airport will generate.

The direct expenditure outcomes between 2012 and 2060, divided by industries, are presented in the figure below.

Figure 73: Direct economic impact (2012 – 2060)



Source: Ernst & Young analysis

The figure above indicates that after the construction and commencement of operations of an airport at Richmond, the direct economic impact will grow over the evaluation period much in line with projected demand forecasts. When airport operations commence in 2017, direct expenditure impacts are forecast to be approximately $327 million. This will grow to $695 million in 2040 and $819 million in 2060, a compound annual growth rate of 2.2%.

Airports, airlines and airport retail are expected to contribute the largest direct expenditure impact from an airport at Richmond, averaging 68% of total direct expenditure impacts over the evaluation period.

Importantly, due to expected phases of airport renewal at the proposed Richmond airport site, airport construction and renewal will add to the direct expenditure impacts after the opening of the airport in 2017. This explains the spikes in direct expenditure impacts in the above figure.

19.2 Wider economic impact

The direct expenditure impact that will result from the construction and operation of an airport at Richmond will have a range of flow-on economic impacts including output, consumption, investment and net exports. The forecast impact on both the state and national economies, as calculated within the CoPS general equilibrium modelling, are presented below.

19.2.1 Impact on NSW economy

The estimated impact of additional aviation capacity on NSW Gross State Product (GSP) is shown in the table below. This impact is given as percentage deviations and as absolute deviations ($m) away from simulated values that would be applied if an airport is not constructed at Richmond.

Table 54: NSW impact on GSP (real)

NSW ($'m)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real GSP ($m)	15.1	227.1	292.0	346.9	423.2	451.9	484.2	514.6	549.8	563.3
Real GSP (% change from Base)	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Source: CoPS and MMRF

The annual impact to the NSW economy of enhancing aviation capacity is estimated to be $292 million in 2025 in real GSP terms. By 2060, the annual effect of increasing aviation capacity is estimated to benefit the NSW economy by $563 million in real GSP terms. This is equivalent to a 0.1 per cent increase in the growth of the State's economic output as a result of this investment by 2060.

The benefit of increasing aviation capacity through the development of a Richmond airport on the regions of NSW is produced in Table 55. The variable reported here is real Gross Regional Product, which is analogous to real GSP at the state level. The largest economic cost impacts are produced in the Sydney metropolitan region, but there are general impacts in economic performance across NSW.

Table 55: NSW regional distribution of GSP

Gross Regional Product ($m, 2010 prices)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Sydney	13	191	246	292	355	379	405	429	458	468
Hunter	1	15	20	24	30	32	35	38	42	44
Illawarra	1	12	16	19	23	25	27	29	31	32
Richmond Tweed	1	6	8	9	11	12	13	14	15	15
Mid North Coast	1	7	9	10	12	13	14	15	16	17
Northern	0	4	5	6	7	8	9	9	10	10
North West	0	2	3	3	4	5	5	6	6	6
Central West	0	3	5	6	7	8	8	9	10	11
South East	1	6	8	9	11	12	13	14	15	15
Murrumbidgee	0	4	5	6	7	8	9	9	10	10
Murray	0	3	4	4	5	6	6	7	7	7
Far West	0	0	0	1	1	1	1	1	1	1

Source: CoPS and MMRF

The impacts of increasing aviation capacity at Richmond on the main components of GSP from the expenditure side are reported in the table below. At a State level, subsequent to the commencement of operations at the airport there is an increase to all components of real expenditure, with the greatest increase realised through real private consumption which is anticipated to increase to $195 million in 2060.

Table 56: NSW impact on real expenditure

NSW	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
($'m, 2010 prices)										
Real private consumption	-58.4	37.1	50.1	87.9	92.3	134.0	154.7	173.5	157.7	195.3
Real investment	125.8	125.0	143.1	117.1	182.8	129.6	129.9	132.9	209.5	159.2
International export volumes	-3.6	99.3	129.9	158.1	185.5	203.3	215.0	225.9	230.0	240.5
International import volumes	15.9	71.9	77.6	81.3	99.2	92.9	93.7	95.3	106.1	100.9
(% deviation, 2010 prices)										
Real private consumption	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%
Real investment	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
International export volumes	0.0%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
International import volumes	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Source: CoPS and MMRF

The negative impacts to real expenditure that will be realised within the NSW economy within the evaluation period up to 2016 occur as a result of the initial investment required to construct the airport and the likely change in investment and consumption that will result.

19.2.2 Impact on national economy

The total impact to the national economy as a result of increasing aviation capacity in the Sydney basin through the development of an airport at Richmond has been calculated using the CoPS MMRF model. The difference between the economic impact to the national economy compared to the NSW economy is determined by the impacts on other Australian states (which may be positive or negative depending on the economic transfers experienced through aviation capacity increases) and the impacts caused as a result of constrained aviation capacity, such as depreciation in the exchange rate and the effect on traveller's behavioural decisions (which have been determined in the direct expenditure analysis).

The estimated impacts of increasing aviation capacity on Gross Domestic Product (GDP), including NSW, are shown in the table below, both in real dollar terms and percentage changes away from the simulated case of where there is no additional capacity created (the Base Case).

Table 57: GDP impact on Australian economy

Australia ($m, 2010 prices)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real GDP	7.2	313.8	423.3	523.0	644.4	721.9	801.1	878.0	948.0	1005.0
Real GDP (%)	0.0%	0.02%	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%

Source: CoPS and MMRF
Note: due to the small nature of the impact of the proposed Richmond airport to the size of the national economy there is minimal impact on GDP

The annual impact of developing a Richmond airport on real GDP has been estimated to be approximately $7 million in 2015, rising to $722 million by 2040 and $1,005 million in 2060. The impact on the Australian economy as a result of the development of the airport is generally higher than the impact on the NSW economy after the commencement of operations in 2017.

There are two possible general influences on real GSP of other Australian states:

- ► Real GSP of the remaining Australian states will increase as a result of the expected increase in NSW GSP. This will occur due to flows of increased expenditure in NSW affecting other states, as well as expected increased tax revenue for the Commonwealth Government being redistributed nation-wide. Additionally, real GSP of the remaining Australian states will increase due to an expected increase in interstate tourism by NSW residents that will occur with the introduction of a new airport.

- ► Real GSP of the remaining Australian states will decrease with a second Sydney airport as it will pull international exports and real investment to NSW. GSP will also decrease relative to the Base Case because under the Base Case when KSA reaches capacity both passengers and freight will continue to make their way to Australia, but through other states. With the introduction of a new airport, other Australian states will lose these benefits.

It is an empirical matter as to which of these two effects dominate. Based on the analysis in this case it appears that the former will apply.

The impacts of the development of an airport at Richmond on the main expenditure-side components within the economy are reported in Table 58.

Table 58: Australia (including NSW) impact on real expenditures

Australia	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
($m, 2010 dollars)										
Real private consumption	-80.0	166.8	224.9	315.1	362.6	450.9	508.1	561.2	561.8	631.7
Real investment	106.0	149.4	166.5	149.1	211.7	172.4	179.0	189.0	261.3	225.9
International export volumes	-9.1	132.8	179.9	225.6	268.4	304.6	332.0	358.1	367.4	395.1
International import volumes	12.1	117.7	126.8	139.0	166.3	167.0	174.5	182.5	195.7	195.0
(% change, 2010 dollars)										
Real private consumption	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
Real investment	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
International export volumes	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
International import volumes	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Source: CoPS and MMRF
Note: due to the small nature of the impact of the proposed Richmond airport to the size of the national economy there is minimal impact on GDP

As can be seen above, it is expected that after the commencement of operations in 2017 the national economic impacts as a result of the airport will be positive and growing on all of the main expenditure-side components. Real private consumption is expected to be the largest source of whole of Australia impact throughout the evaluation period, totalling approximately $632 million in 2060, while the expected increase in international export volumes relative to the Base Case is the largest: in 2060, international exports are forecast to be 0.1% higher than they would been without the increase in aviation capacity.

When comparing the expected impacts in NSW and Australia, it is important to note that because it is expected that there will be no freight throughput and because there remains considerable unmet passenger demand with the development of a Richmond airport, the negative impacts to the remaining states of Australia of developing a second Sydney airport are limited.

As such, the impacts to Australia are higher than the impacts to NSW alone across all of the main expenditure-side components within the economy.

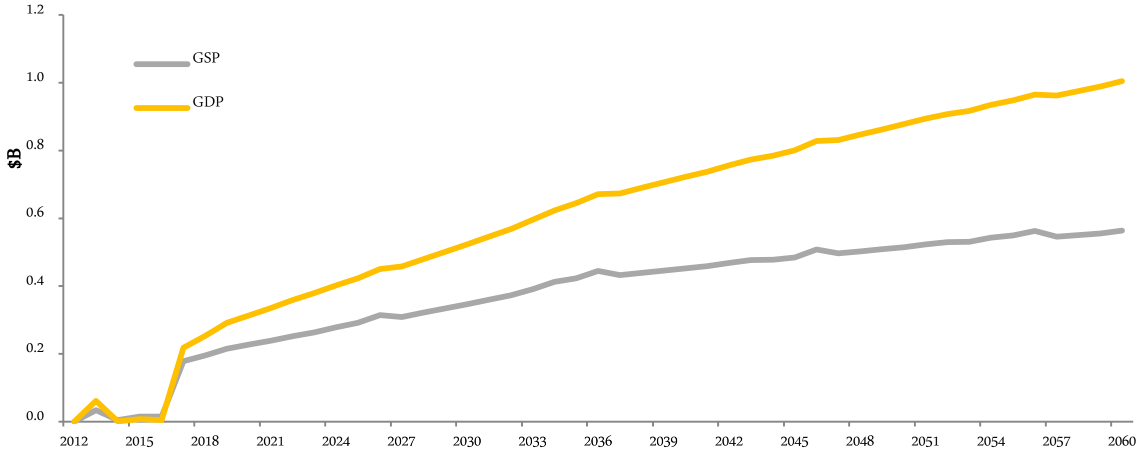
19.2.3 Comparison of NSW and national quantifiable impacts

An assessment of the economy wide impacts of increasing aviation capacity in Sydney through the development of an airport at Richmond has been undertaken using the direct expenditure impacts.

The economic impact assessment was undertaken using general equilibrium analysis to estimate the historic and future growth in the economy as a result of maintaining the status quo in aviation capacity in the Sydney region.

The GSP/GDP outcomes experienced at the NSW and national level are presented in the figure below. The changes projected for the NSW economy as a result of additional aviation capacity are less than the changes projected for the Australian economy. This illustrates the extent to which the positive impacts on NSW flow through to the rest of Australia.

Figure 74: Total GSP / GDP outcomes



Source: CoPS data and Ernst & Young analysis

20. Wider social impacts of a Richmond airport

A civil airport within the Richmond region and its associated economic activity will result in a range of social impacts on those who live within the region and those outside the region. The social benefits of airports are typically considered to be substantial and widespread, complementing their associated economic contributions. However the social contribution of the airport industry is more difficult to quantify as it often represents non-market activities that provide intangible welfare gains to users.

The table below presents the range of social and cultural impacts that are expected to result from the development of an airport at the Richmond site.

Table 59: Social and cultural impacts of airports

Social and cultural impact	Result of impact
Living standards	► Social and cultural benefits resulting from enhanced connectivity ► Social benefits of employment opportunities ► Jobs closer to home and impact on work/life balance ► Land prices
Strengthening communities and supporting development	► Supporting the growth of Sydney (benefit of 'City of Cities' approach) ► Increased tax revenue as a result of additional economic activity (eg: tax spend per GSP)

Source: Ernst & Young

20.1 Living standards and quality of life factors

The following sections analyse the possible impacts of an airport on living standards in the Richmond area, considering:

- ► Social and cultural benefits resulting from the ability to fly
- ► Social benefits of employment opportunities
- ► Jobs closer to home and impact on work/life balance
- ► Land prices.

These factors have been described in section 6.4. The following sections discuss the specific factors and benefits associated with the development of an airport at Richmond.

20.1.1 Social and cultural benefits resulting from enhanced connectivity for local residents

The aviation sector provides an essential service by physically connecting people and businesses to one another and the rest of the world.

Introducing Richmond airport as a secondary service to support the current supply of aviation services will provide marginal support to the Sydney basin in enhancing national connectivity and increasing the country's ability to attract tourism through service frequency and affordability.

A Richmond airport will provide additional access to those persons that demand the limited types of services that are likely to be provided by this airport (low cost carrier services). Those that are most likely to realise this benefit are low to medium income families who are travelling for tourism purposes within Australia.

The development of a civil aviation airport at the proposed Richmond site may increase stability, social cohesion and sense of community identity in the local community surrounding the site, as it will give local residents greater certainty with regards to industry and employment growth within the region.

It may also help to strengthen the identity of the communities of Western Sydney, enhancing community pride and promoting economic investment and community development.

20.1.2 Social benefits of employment opportunities

Employment (and its associated income) provides benefits to communities beyond personnel subsistence and consumption. Adequate economic opportunities within a community not only offer the psychological benefits associated with a stable and satisfying workplace, but also additional career choices without relocation. With less long-term economic disincentives for residing in the area, there will likely be higher social cohesion and a stronger sense of community in the region. This feeds into other social benefits including greater social inclusion, positive mental health outcomes and life satisfaction.

The development of an airport at Richmond is forecast to increase the total number of jobs within NSW by 400 in 2030 to 500 in 2060. [333] Monash University's modelling suggests that this rise in the total number of people employed as a result of the development of a Richmond airport will result in a decrease in Sydney's unemployment rate by 0.01% by 2030.[334]

In this instance, due to the relatively small employment impacts of a proposed Richmond airport, communities within the North West Growth Centre (which is located near the potential airport site) will experience relatively small benefits from the incremental economic opportunities. Due to the smaller scope and activities of the proposed site, these opportunities will only apply to a small portion of the community.

20.1.3 Jobs closer to home and impact on work/life balance

The opportunity to work closer to home provides a number of social benefits to individuals, employers and society as a whole. It has the potential to reduce commuter times and thereby reduce energy use, cut carbon emissions, raise the overall productivity of the workforce and increase people's leisure time. It also helps to promote active and healthy lifestyles, reduce congestion on roads and public transport, and lower the incidence of inaccessibility and isolation experienced by some residents in new, outer suburban areas.

The development of a Richmond airport and the associated activity around the airport will create some employment opportunities for the current and projected future population within the North West Growth Centre.

Creating jobs closer to home is strongly aligned with the NSW Government's NSW 2021 State Plan, which seeks to use strategic and land use planning to increase the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney.[335] This report assumes that approximately 90% of new jobs stemming from the airport will be taken up by persons who live within 30 minutes private vehicle access time.[336] Between 2,000 and 3,100 employment opportunities by 2030 and 2,700 and 5,000 opportunities by 2060 are likely to be provided closer to the person's home then would have otherwise been the case.

The employment opportunities developed in the region as a result of the airport[337] have the potential to save up to 0.72 million hours travel time as a result of people working closer to home by 2030. This could increase to up to 1.23 million hours by 2060.[338] These time savings realised by local residents would furthermore benefit other local commuters by effectively reducing the congestion that would have otherwise been realised on major transport networks from the region to access major employment centres.

20.1.4 Land prices

The development of a civil aviation airport at Richmond will have an impact on the dynamics of the area and the value of land. The table below presents Ernst & Young's Real Estate Advisory team's assessment of the likely impact of the development of an airport on land prices within the surrounding vicinity to the airport. Actual land and property prices are affected by a large number of factors and so only a broad guide to the direction and scale of potential change due to each airport-related factor in turn are given below.

Table 60: Impact on property values in the surrounding area

Assumption	Anticipated impact	Likely impact on value	Main areas affected
Employment	Less than 5% positive	The value uplift on residential property is dependent on the type of employment created (Reed & Pettit 2004): that is, where a number of highly skilled employment opportunities are created, the value uplift to the surrounding residential development may be significant. Airports and their surrounding business parks generally employ low to medium skilled workers for roles such as retail assistants, baggage handlers and cleaners.	- Richmond - North Richmond - Windsor - South Windsor - Bligh Park

[333] The CoPS modelling assumes that no project can by itself change the total number of people employed within Australia as a whole.
[334] Assuming that future employment and participation rates are consistent with future population growth
[335] NSW Government, (2011), NSW 2021; A Plan to Make NSW Number One, http://www.2021.nsw.gov.au/
[336] Ernst & Young assumption
[337] Either at the airport or the landside development
[338] Ernst & Young calculation based on BTS trip distribution matrix of current origin/destination of trips of residents within the surrounding region, assumed (current and future travel speeds). Further information regarding how this was calculated can be seen in Appendix B

Assumption	Anticipated impact	Likely impact on value	Main areas affected
		The airport is likely to provide directly and indirectly a large number of employment opportunities having a positive impact on residential property values. However, due to the anticipated number of lower skilled positions, the positive impact is anticipated to be limited.	
Airport connectivity	Less than 5% positive	Many people require the airport on a regular basis for their employment, business or lifestyles. For this reason, being within an easy drive of the airport may be a consideration for some when seeking to acquire residential property. Areas that are not detrimentally impacted by noise or other negative impacts are likely to experience a slight increase in value due to the additional demand for housing by those with greater purchasing power. As a number of suburbs will benefit from this, the value will be limited.	Properties within 30 minutes drive of the proposed airport
Accessibility	Less than 5% positive	When governments construct new airports it is common practice to also upgrade the transport network and links to the airport, which can have the effect of improving accessibility and commuter times for journeys not beginning or ending at the airport.	Properties in proximity to new or upgraded transport links.
Noise	More than 5% negative	Airport noise has a negative impact on residential property values, particularly in suburbs directly in line with the runway and in proximity to the airport. Some studies suggest higher value properties are likely to fall more than affordable properties.	Suburbs towards the north, north-east and east of the proposed development
Traffic	More than 5% negative	Depending on size, airports are likely to create additional road and rail traffic. This is likely to create additional noise and pollution. Without sufficient capacity on transport infrastructure, traffic congestion will occur, creating further pollution. This congestion, or increasing the capacity of existing networks or building new networks is likely to have a negative impact on residential properties on the corridors impacted by the additional noise and pollution.	All properties within proximity to main arterial networks leading to and from the proposed airport
Landscape/views	Less than 5% negative	This will impact properties in proximity to the airport, particularly those with views overlooking the site. As most of the land around each of the sites is near level, this is unlikely to impact on many properties. Properties in proximity to recreation or conservation areas affected by the airport are likely to experience a fall in value.	Properties overlooking the site and within a short distance of the proposed airport and properties adjoining or close to recreational or conservation areas
Public safety risk	Less than 5% negative	This will impact properties within proximity to the airport, in particular those in line with the runway. This is because aircraft accidents generally occur on landing or just after takeoff. Because of the safety record of the commercial airline industry in Australia, this impact is likely to be minor.	Suburbs towards the north, north-east and east of the proposed development
Pollution	Less than 5% negative	Airport pollution is generally aligned with noise and local air pollution and has a negative impact on residential property values. Those suburbs directly in line with the runway and in proximity to the airport are likely to be impacted the most by pollution.	Suburbs towards the north, north-east and east of the proposed development

Source: Ernst & Young analysis

Overall, properties surrounding the Richmond site are likely to experience relatively little change as a result of civil aviation services provided at the site. This is primarily due to the fact that the market has already priced in the main impacts of aviation as a result of the operations of the RAAF on the site.

However, there will be changes in the price of certain parcels of land due to increased noise and traffic as a result of the additional activity within the region. Furthermore, there is the potential for some land near the airport to be rezoned in the future to meet the likely demand for industrial and commercial businesses to support the airport's operations (over and above those that already are located in close proximity to the site and that currently provide services to RAAF). This rezoning may have a positive impact on the price of the asset, but may have negative impacts on surrounding land.

Overall, as the proposed Richmond site is located near industrial areas, with aviation services already provided, the impacts on land prices are likely to be smaller than would otherwise be the case in a more densely urbanised environment or a rural context.

20.2 Strengthening communities and supporting development

Airports play a significant role in the regional economy and the development of their surrounding communities. For these communities, airports are able to increase accessibility to business and leisure flights, employment and vital infrastructure such as health and education; positively impacting community living standards, stability and identity.

20.2.1 Supporting the growth of Sydney

As identified previously, it is important to maintain a sustainable distribution of population and economic growth across Sydney over the medium to long-term. An airport at Richmond will support the NSW Government's plans to develop Sydney as a 'City of Cities' with a number of compact, connected major centres offering services, employment, retail and entertainment and cultural facilities at a regional scale and acting as 'capitals' for their regions.

A second airport at the proposed Richmond site will provide an important piece of infrastructure that could support the growth of Western Sydney. The relatively small passenger throughput and possible agglomeration opportunities will attract a small amount of capital and labour resources away from the Sydney CBD and toward the North West Growth Centre. A Richmond airport will provide some support for future population growth and assist the development of a new major centre.

20.2.2 Increase in tax revenue

The increase in economic activity, both aeronautical and non-aeronautical, that will result from the development of an airport at Richmond will ultimately result in additional tax revenue at all levels of government. This additional government revenue may then be re-distributed in the form of increased social welfare transfers or lower income and corporate taxes. It may also be spent by different levels of government on other important projects. Accordingly, an increase in tax revenue can potentially further add to the social benefits indirectly generated by the introduction of a second airport in the Sydney basin.

Some of the taxes that are likely to increase as a result of the development of an airport include Commonwealth Government (GST, income tax and corporate tax) and State Government taxes (stamp duties, land taxes, import duties and payroll taxes).

The table below outlines a range of potential outcomes for incremental tax revenue that may accrue to the Commonwealth and NSW State Governments as a result of an airport at Richmond. These outcomes use the expected increment in GDP and NSW GSP[339] caused by the introduction of a second airport to the Richmond site and the historic average tax take from economic activity obtained from the ABS. These results should be interpreted with caution and should be read alongside the assumptions and methodology used in their estimation (see Appendix B for more detail).

Table 61: Estimated incremental tax revenues for all levels of government and the NSW government

$m in 2010 dollars	All levels of Government[340]		NSW State Government[341]	
	Low	High	Low	High
2025	119	124	20	23
2040	204	211	31	35
2060	283	293	38	44

Source: CoPS modelling, ABS data and Ernst & Young analysis

Noting that it is estimated that the additional tax revenue that may be collected by all levels of government in 2025 to be in the range of $119 and $124 million. This will increase to between $204 million and $211 million in 2040 and between $283 and $293 million in additional tax revenue in 2060.

Furthermore, between $20 million and $23 million could be collected by the NSW State Government in 2025 as incremental tax revenue.[342] This will increase to between $31 million and $35 million in 2040 and between $38 million and $44 million in 2060.

[339]As sourced from CoPS modelling
[340] This includes NSW Government incremental tax revenue
[341] This includes GST contributions from the Federal Government
[342] This includes GST contributions from the Federal Government

Part F –
Analysis of Wilton

Wilton airport summary

The region

- The Wilton site covers an area of approximately 2,000 hectares and is approximately 63 kilometres south-west of the Sydney CBD and 28 kilometres north-west of Wollongong.
- The region in which the Wilton site is located has a population of 413, 922 people.
- The Wilton sub-region is well-served by a number of major road links, including the M5, the M4 and the Hume Highway.

The proposed development

- A Wilton airport, with supporting infrastructure, would be capable of catering for up to 70 million passenger movements per annum.
- The demand analysis undertaken by Booz & Co found that 7 million passengers would use aviation services at a Wilton airport when it opens in 2030. This would increase to 19.5 million passengers by 2040 and ultimately 44.2 million in 2060.

Operational impact of the airport

- An operational airport at Wilton would increase carbon emissions within the Sydney basin, in addition there would be an estimated 8% to 9% increase in NOx emissions.
- A total 181 persons would experience 100 additional N70 events every day (equivalent to a truck driving past 10 metres away), while 264 persons would experience 50 additional N70 events per day and 817 persons would experience an 10 additional N70 events each day.

Employment impacts of the airport

- Approximately 2,400 to 3,400 FTE persons will be employed to build the airport over the construction period.
- Approximately 28,000 FTE jobs will be created at the airport by 2060.
- Industrial/commercial developments near the airport will support approximately 12,700 employees by 2060.

Economic impacts of the airport

- The development of an airport at Wilton is forecast to increase GDP by $1,442 million in 2030, increasing to $20,017 million in 2060.
- The airport has the potential to save up to 3.6 million commuting hours per annum by 2060 as a result of people working closer to home.
- The economic activity generated from an operational airport will result in an increase in federal, state and local government tax revenue by $1,682 million in 2040, rising to $5,747 million in additional tax revenue in 2060.

21. Wilton regional context

This section introduces the background context for the Wilton study region and provides a baseline for comparison against potential impacts that an airport may have on the region.

21.1 The study region

The Wilton study region is defined as the area bounded by Wollondilly, Camden, Campbelltown and Wollongong Local Government Areas (LGAs). This study region was defined by Ernst & Young in consultation with government stakeholders, other consultants and the Bureau of Infrastructure, Transport and Regional Economics.

Figure 75 highlights the proposed airport site, relative to the region and the wider Sydney basin.

Figure 75: Proposed Wilton airport site and region

Source: Department of Planning and Infrastructure

The following analysis of the region includes the relevant socio-economic composition, current business and employment drivers, and the current provision of infrastructure that supports the region. This section also provides a snapshot of other planned developments in the region.

21.1.1 Socio-economic composition

A socio-economic analysis was undertaken of residents within the study region. This analysis was undertaken to establish the current socio-economic composition of local residents within the region to determine how an airport will impact on their lives.

Table 62 presents the socio-economic composition of the Wilton region.

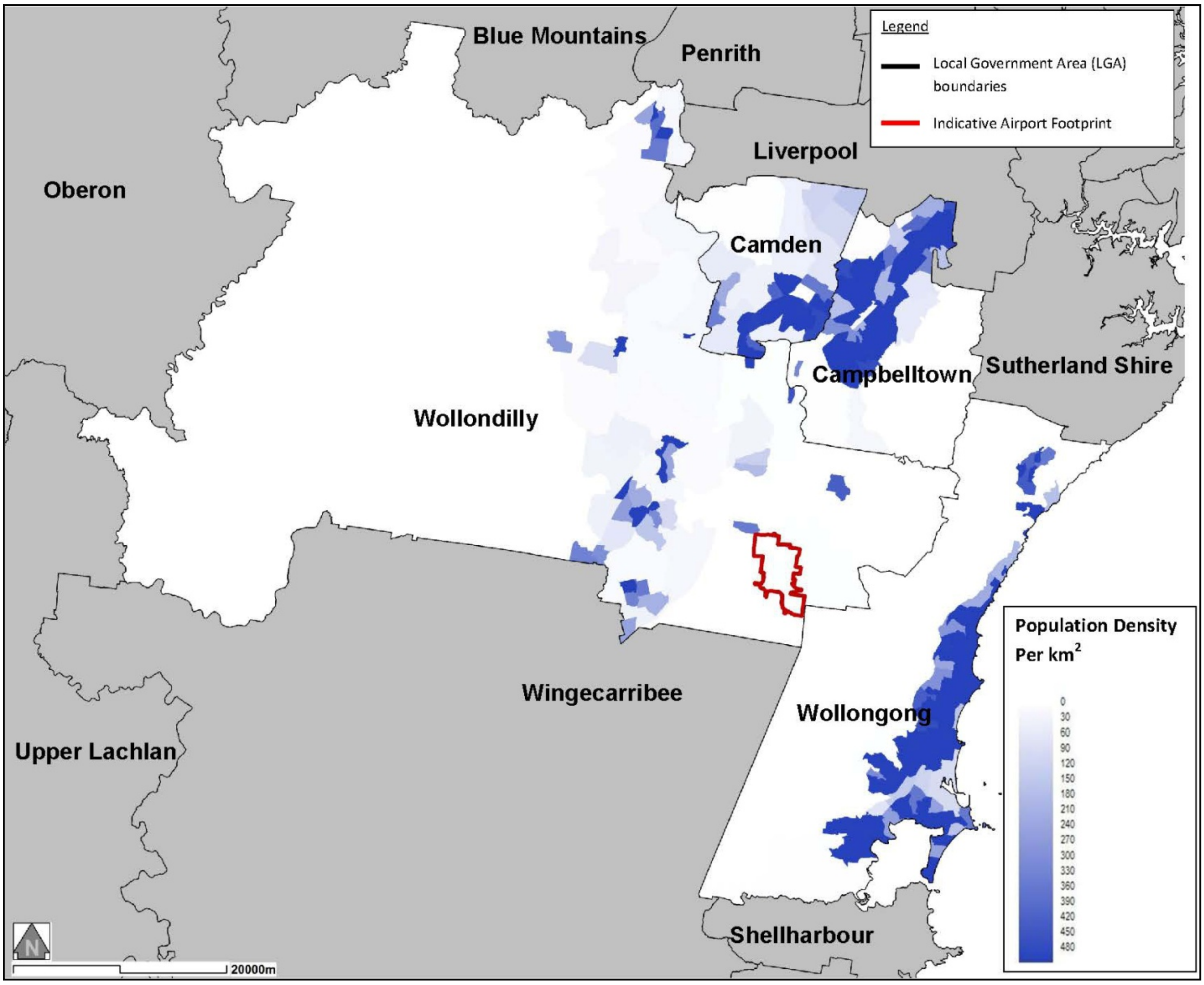
Table 62: Socio-economic statistics for Wilton

Statistical Indicator	Value
Population	413.922
Households	148,699
Person Per Dwelling Ratio	2.8
Age Profile	
Infants 0 to 4 years	29,130
Children 5 to 17 years	82,058
Adults 18 to 64 years	256,170
Mature adults 65 to 84 years	41,551
Senior citizens 85 years and over	5,017
Average Age	36.2
Employment	
Full Time	118,516
Part Time	58,955
Unemployed	13,258
Not in Labour Force	107,828
Type of employment	
Managers	11%
Professionals	19%
Technicians and Trades Workers	15%
Community and Personal Service Workers	10%
Clerical and Administrative Workers	15%
Sales Workers	11%
Machinery Operators And Drivers	10%
Labourers	10%
Not Stated/Inadequately Described	1%
Qualification Attainment	
Postgraduate Degree Level	4%
Graduate Diploma and Graduate Certificate Level	2%
Bachelor Degree Level	14%
Advanced Diploma and Diploma Level	10%
Certificate Level	23%
No post-school qualification	47%
Not Stated/Inadequately Described	6%
Household Income Profile (pa)	
Negative income	0%
$1-$149	6%
$150-$249	6%
$250-$399	11%
$400-$599	19%
$600-$799	16%
$800-$999	12%
$1,000-$1,299	13%
$1,300-$1,599	9%
$1,600-$1,999	5%
$2,000 or more	4%
Not Stated	1%
Home Ownership	
Residents Own/Mortgage	71%
Rent	29%

Source: .id – the population experts (http://home.id.com.au/) analysis on Australian Bureau of Statistics, 2006 Census data

Figure 76 presents the geographical distribution of where people reside within the region.

Figure 76: Geographical distribution of population



Source: Australian Bureau of Statistics 2006 Census data and Department of Planning and Infrastructure

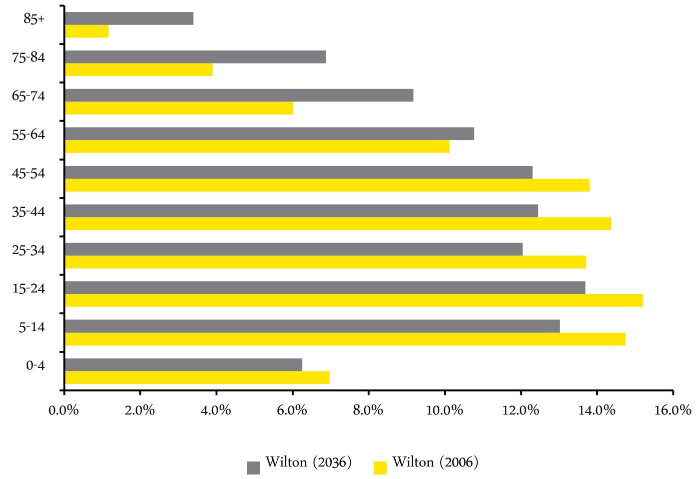
Figure 76 highlights that the areas with greatest population densities are to the far north and south-east of the proposed airport site. The area to the west of the proposed site is sparsely populated, with small pockets of large population densities. The area to the immediate north-west of the proposed site has a relatively higher population density.

The region currently has 7% unemployment, with 36% of the working age population (18 to 64) not in the labour force. Within the Sydney Statistical Division, the unemployment level is 5.3%, with 31.8% of the working age population not in the labour force. Within Australia, the unemployment figure is 5.2%, with 26.5% of the working age population not in the labour force.

The average age of residents within the region is 36.2;[343] this is 1.5 years younger than the average age of people residing in the Sydney Statistical Division. The average age in the Wilton region is expected to grow over time, as shown in Figure 76.

[343] Average Age was calculated by averaging the median values of each age bracket from .id – the population experts (http://home.id.com.au/), with the median value of the '85 and over' age bracket set as 92.5. The average for Sydney Statistical Division was obtained from ABS website.

Figure 77: Age distribution for Wilton



Source: Department of Planning and Infrastructure Population Projections

This figure demonstrates that between 2006 and 2036, the proportion of the region's population over 65 will grow from 11.1% to 19.4%.[344] At the same time, the population over 65 in the Sydney Statistical Division will grow from approximately 12.0% to 18.0%.[345]

The average income of residents within the region is $832 per week,[346] compared to $1,254 per week in the Sydney Statistical Division. Wilton's residents currently earn approximately $22,000 per annum less income (on average) than the wider Sydney region.[347] Furthermore:

- 22% of households within the region earn less than $399 per week, compared to 8% in the Sydney Statistical Division.
- 59% of households within the region earn between $400 and $1,299 per week, compared to 52% in the Sydney Statistical Division.
- 18% of households within the region earn over $1,300 per week, compared to 38% in the Sydney Statistical Division.

The region has a greater number of residents with only high school education (47%) than the Sydney Statistical Division (30%). This may indicate that the skills mix in the region is different and more orientated toward lower skilled jobs relative to the wider Sydney region.

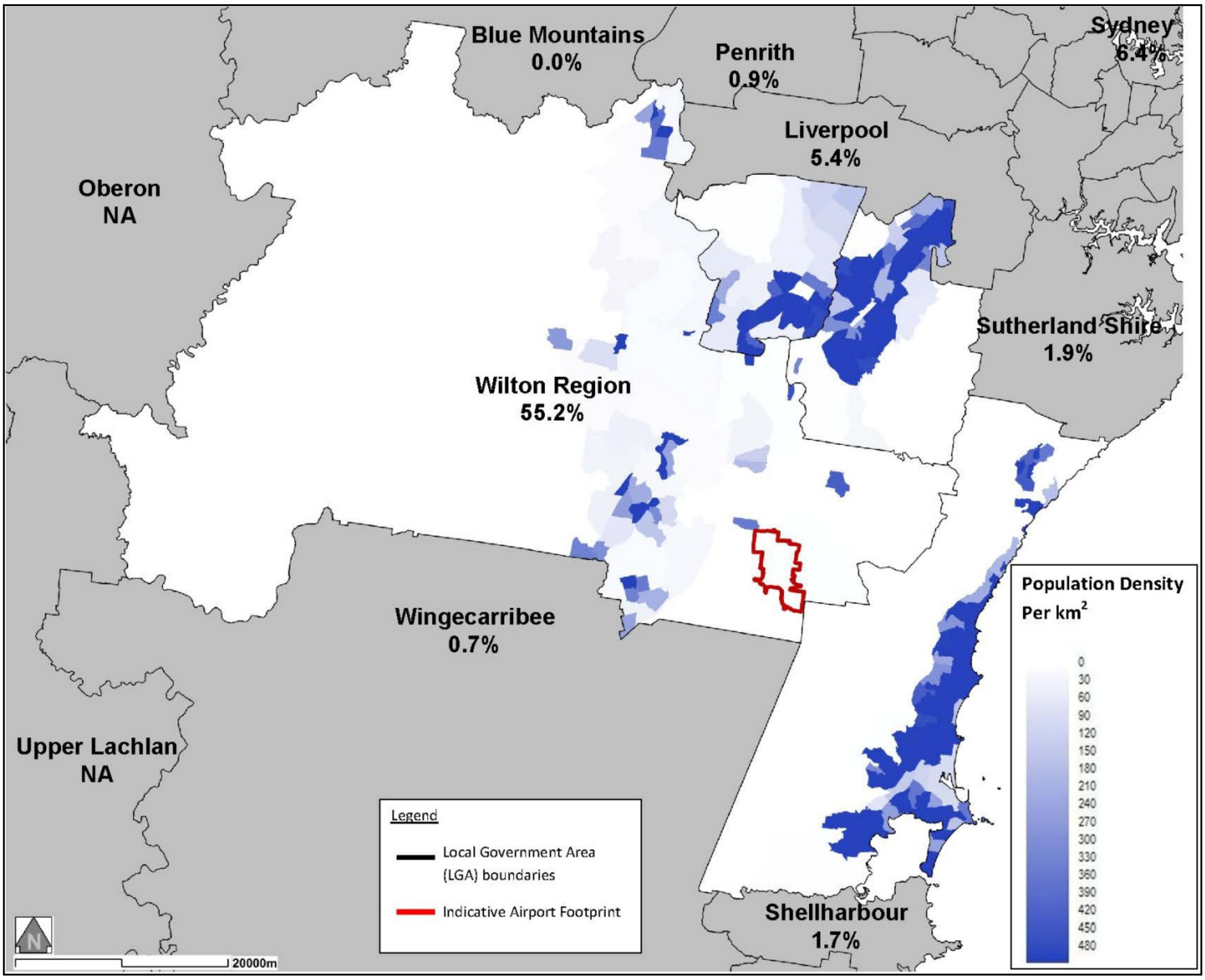
'Skilled'[348] employment makes up 55% of employment in Wilton, relative to 66% within the wider Sydney region. Of those workers who reside within the region, the greatest industry participation is in the manufacturing sector (15%), followed by retail trade (13%).

Of those persons who reside within the region, 55% are employed within the region; 10% are employed in the regions of the Blue Mountains, Penrith, Liverpool and Sutherland; and 6% work within the Sydney CBD area.

[344] Department of Planning and Infrastructure population projections for NSW
[345] Department of Planning and Infrastructure population projections for NSW
[346] Average Individual Weekly Income was calculated by averaging the median values of each income bracket from .id – the population experts (http://home.id.com.au/), with the median value of the '$2,000 or more' bracket set as $2,500.
[347] Sydney Statistical Division as described by the Australian Bureau of Statistics
[348] We have defined skilled employment as including; managers, professionals, technicians and trade workers as well as community and personal service workers

Figure 78 illustrates the region's employment distribution based on 2006 Census data.[349]

Figure 78: Employment distribution of Wilton residents (each sub-region as a percentage of total)



Source: Bureau of Transport Statistics, Journey to Work summary table by Workplace LGA, Department of Planning and Infrastructure and Australian Bureau of Statistics 2006 Census data
NA – Data not available.

21.1.1.1 Socio-economic Indexes for Areas

The Socio-economic Indexes for Areas (SEIFA) is a suite of four Australian community welfare measures provided by the Australian Bureau of Statistics (ABS).

For each index, every geographic area in Australia is given a SEIFA score that shows how disadvantaged that area is compared with other areas in Australia. This allows for ranking of regions and areas, providing a method of determining the level of social and economic wellbeing in each region.

The Index of Relative Socio-Economic Disadvantage (IRSD) focuses on disadvantage and is derived from 2006 Census variables such as low income, low educational attainment, unemployment and dwellings without motor vehicles. The IRSD for each of the LGAs surrounding the Wilton site is provided in the table below. Note that a lower score/rank indicates that an area is relatively disadvantaged compared to an area with a higher score/rank.

349 The population representation is based on the Australian Bureau of Statistics 2006 Census data

Table 63: SEIFA score and rank for each LGA surrounding Wilton

LGA	Population	Score	Ranking within Australia	Ranking within NSW	Minimum score for CDs in area	Maximum score for CDs in area
Camden	49,646	1057	617	133	893	1136
Campbelltown	143,075	955	234	46	549	1153
Wollondilly	40,345	1045	592	127	917	1143
Wollongong	184,213	984	382	90	596	1150

Source: ABS
Note: CDs are Census Collection Districts

As highlighted in the table above, Camden and Wollondilly are ranked 133rd and 127th respectively in NSW (617th and 592nd in Australia) with respects to social disadvantage, indicating their relatively high levels of socio-economic wellbeing. Both are ranked within the top 20% of LGAs in the state.

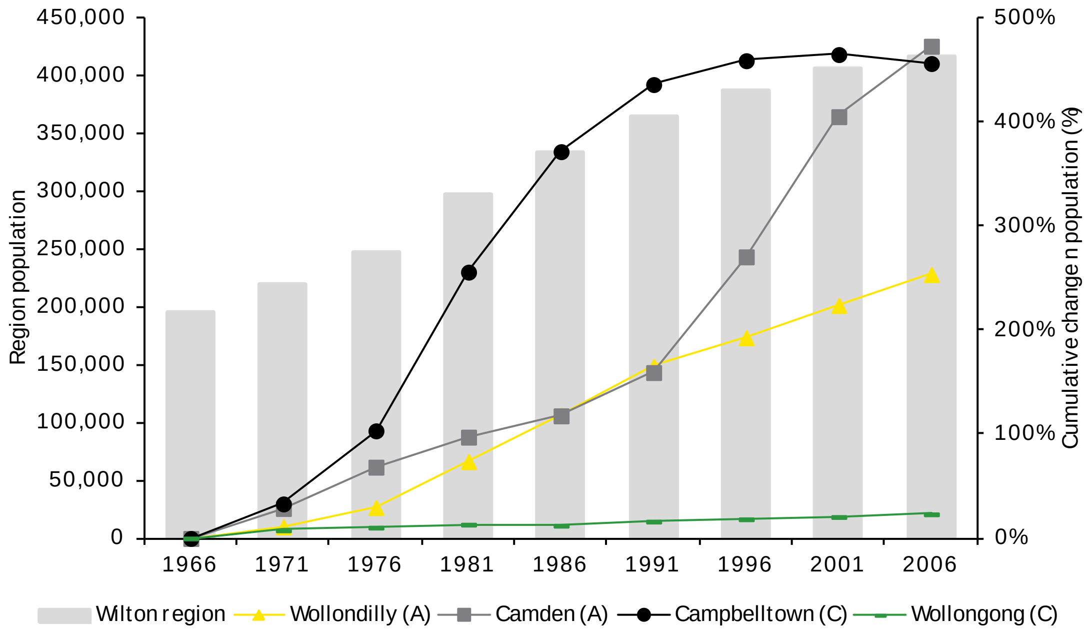
Overall, with an average score of 1010, the surrounding LGAs of the Wilton region currently provide a relatively high level of socio-economic wellbeing.

21.1.2 Historic growth of the region

The Wilton region as a whole has experienced substantial growth over the past 40 years. In 1966, the region as a whole had a population of 195,000, which has grown to 417,000 in 2006, representing a growth rate of 3% per annum.

The number of people residing within the region over this period and the cumulative change in population within the relevant LGAs is shown in the figure below.

Figure 79: Population growth of the region



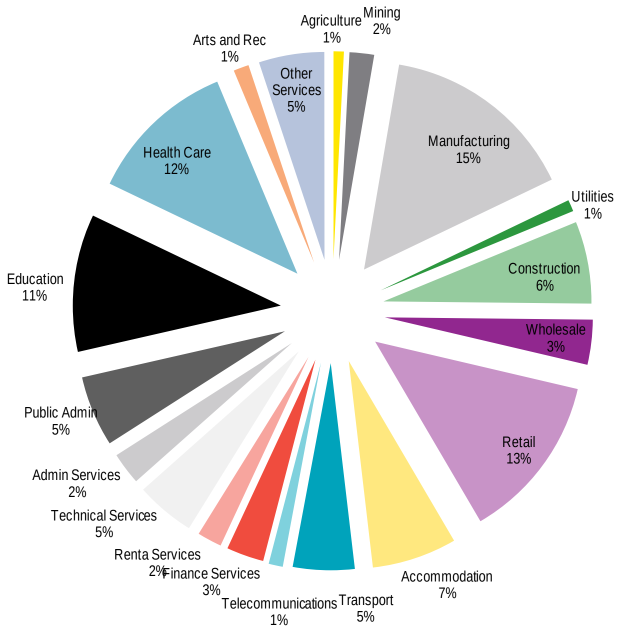
Source: ABS Census

As can be seen in the figure above, while Campbelltown experienced the greatest growth in terms of aggregate population increase (117,000), Camden experienced the greatest growth within the region with an increase of 473%. Over the same period, the Wollongong area only realised an increase in population of 35,000, or 23%.

21.1.3 Current economic activity and employment

An analysis was also undertaken of the composition of industries that are located within the region, to help examine how an airport will be beneficial to the region, as well as to analyse the potential for aviation-related industry sectors to develop within the region. Figure 80 presents a breakdown of employment by industry within the region.

Figure 80: Region's industry composition



Source: .id – the population experts (http://home.id.com.au/) analysis on ABS, 2006 Census data

As can be seen in Figure 80, the highest employing industries within the region are manufacturing (15.2%) followed by retail trade (12.9%).

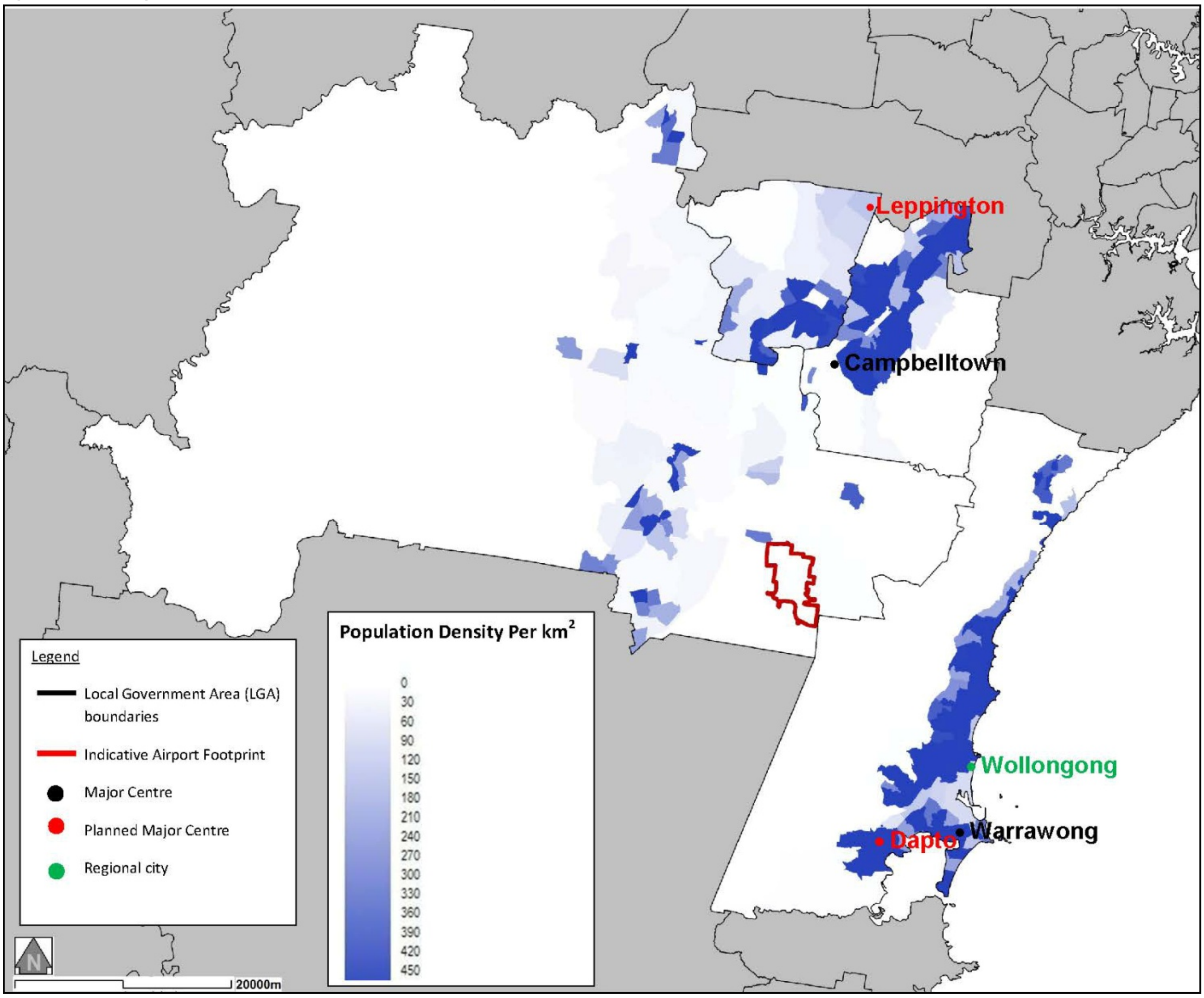
Major businesses that operate within the region include:

- Port Kembla
- Steel mills and metal manufacturers
- Government departments in Wollongong.[350]

Figure 81 highlights the location of the major employment centres within the region. Wollongong is an established 'regional city', while Warrawong and Campbelltown are established 'major centres'. Dapto and Leppington are 'planned major centres'.

[350] A more complete list of employment centres within the region can be found in Appendix E.

Figure 81: Wilton region's population distribution and location of major and planned employment centres



Source: Australian Bureau of Statistics 2006 Census data and Department of Planning and Infrastructure

Figure 132 in Appendix E provides a map of the existing and proposed South West Employment Lands that could affect the region and the airport development.

21.1.4 Current infrastructure provision

This section presents a high level analysis of the main transport, public transport and utility infrastructure that currently serves the region.

21.1.4.1 Roads

The Hume Highway (National Route 31, M5 route), located approximately nine kilometres north-west of the Wilton study area is a National Highway. Widening of an 11 kilometre section of the F5 Freeway, which is located 25km north of the study area between Brooks, Ingleburn and Narellan Roads in Blair Athol, commenced in February 2009 and was completed in March 2012. The widening of the F5 Freeway will create eight lanes between Brooks Road and Raby Road and six lanes between Raby Road and Narellan Road.

The Princes Highway is a part-freeway road linking Sydney to Wollongong and is located 22km east of the Wilton study area. As Wollongong and Port Kembla are industrial centres, road freight traffic is heavy and frequent.[351] The emergence of Wollongong as a commuter city of greater Sydney keeps the freeway and the adjacent Mount Ousley Road busy and often congested in peak periods. Access to the potential Wilton airport could be from Picton Road (off the Hume Highway), which intersects with Macarthur Drive. Picton Road (State Route 88) is a New South Wales highway linking Picton and Wollongong. It provides an important link between the Hume and Southern Freeways. From Picton, the highway runs in a south-east direction, crosses the Hume Highway and continues over grass-forested ranges east of Wilton (passing through Sydney Water Catchment areas) until it meets Mount Ousley Road (Southern Freeway), which leads to Wollongong or Helensburgh.

Appin Road (State Route 69) is a State Route and New South Wales secondary highway linking Campbelltown and Sydney's western suburbs with Wollongong. It is located approximately 15km north of the Wilton study area. The route passes through the town of Appin and is the southern half of State Route 69. State Route 69 begins where Metroad 9 ends on the Narellan Road/Hume Highway interchange and continues until the Southern Freeway (leading to Wollongong) interchange at Bulli Tops, passing through Campbelltown and Appin along the way. The route is dual carriageway in Campbelltown and then narrows to a single carriageway southwards, with frequent overtaking lanes thereafter. Appin Road also serves as a freight connection between Illawarra/Port Kembla and southwest Sydney/Campbelltown. The potential Wilton site has good road access via the Wilton bypass realignment of Picton Road south from the F5 Freeway, completed in 1993. This road provides for high numbers of truck movements between the freeway, surrounding coalfields and Port Kembla in Wollongong. The Wilton bypass realignment was constructed as a 2-lane two-way concrete roadway with overtaking lanes from the F5 south of Macarthur Road.

Access to Wilton is also via Wilton Road and Appin Road from Campbelltown in southern Sydney, but with a steep narrow river crossing not suitable for trucks or large vehicles. Wilton Road passes through Broughtons Pass, which involves negotiating hairpin bends across a narrow bridge through a gorge on the Cataract River, severely restricting traffic and freight capacity from Wilton to the north via Appin.

Douglas Park Drive and Macarthur Drive provide a road link from Picton Road (Route 88) south of Wilton to Wilton Road and the north under, but not intersecting with, the Hume Highway (Route 31) to cross the Nepean River into Menangle Road (Route 56) at Douglas Park.

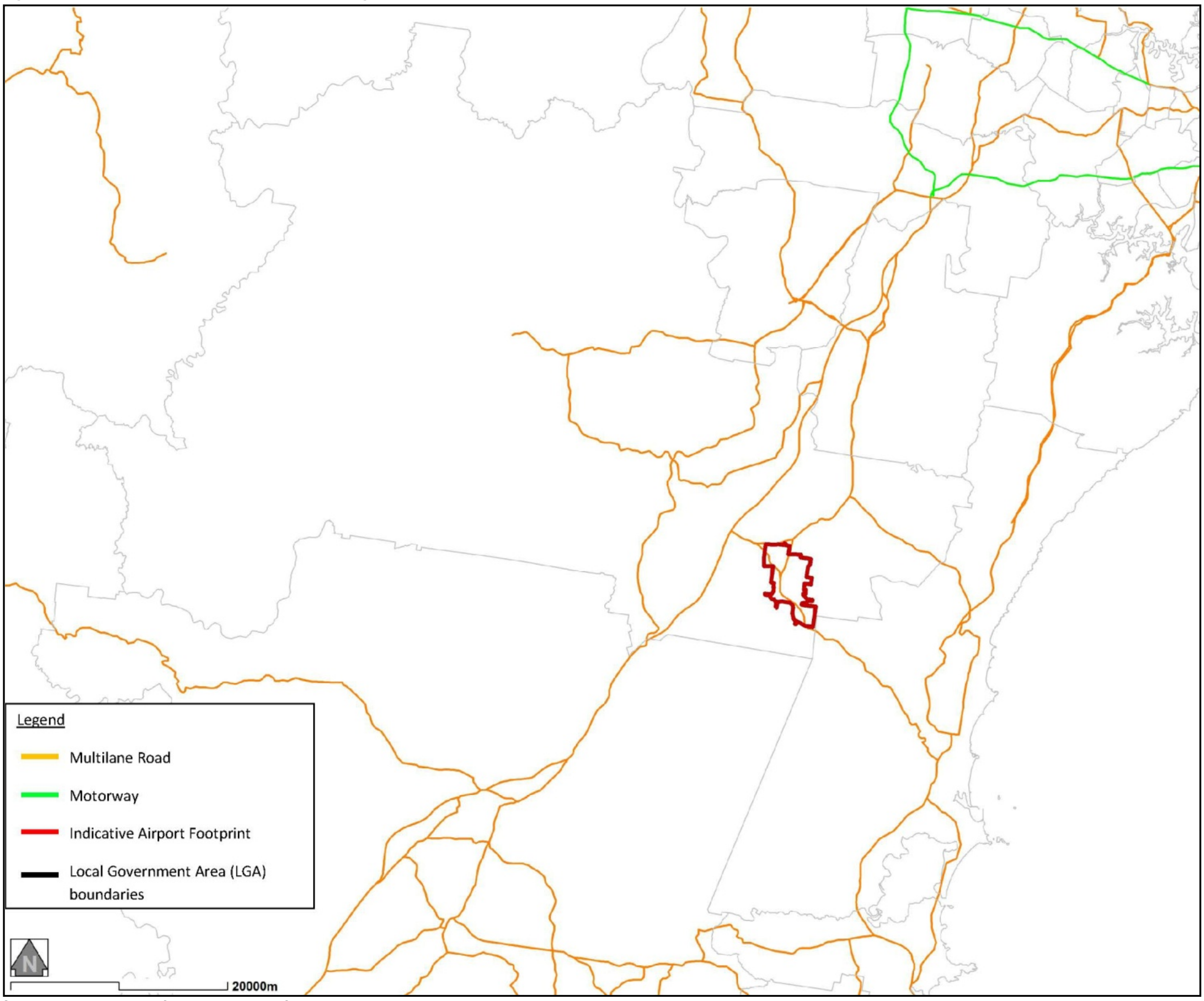
Other roads in the area serve minor access functions and are generally 2-lane rural roads of variable standard.

The M7 tollway opened in December 2005 (later than the time of the most recent publicly available traffic data) and has had some impacts on traffic patterns and volumes on key roads providing access to the proposed site, particularly the F5 Freeway. Therefore, the outcomes of the analysis should be considered in the context of the quality of available baseline traffic data.

Figure 82 shows the current road transport network in the region.

[351] Mount Ousley Road: 5.3% trucks and 8.4% articulated vehicles, Bulli Seam Operations, Road Transport Assessment, Traffic, May 2009

Figure 82: Road transport network in the Wilton region



Source: Department of Planning and Infrastructure

To highlight the current service level and capacity of these roads, the current peak hour volume to capacity ratio, AADT (annual average daily traffic) and the projected increase in traffic volumes of the main motorways that link the region are shown in Table 64.

Table 64: Use of major motorways that support the region

Motorways	V/C ratio	AADT	Projected growth
Hume Highway @ Picton	0.29	35,531	1.1%
Hume Highway @ Narellan Rd	0.41	50,514	1.1%
Hume Highway @ Brooks Rd	0.40	77,814	1.1%
M4	0.45	87,273	1.1%
M5	0.80	98,194	1.1%

Source: Department of Roads and Maritime Services – Traffic Volume Data and Bureau of Transport Statistics – Travel forecasts 2006 – 2036

The current motorways around the Wilton site have capacity on an annualised basis to take further traffic. However, the M5 is already close to serviceable capacity. NSW Roads and Maritime Services has proposed a number of upgrades to the road network that will affect the proposed airport site. The planned upgrades are as follows:

- Widening of the M5 West from 2 lanes to 3 lanes running in each direction. This project has begun and is scheduled to be finalised by 2014. The widening will extend from the beginning of the M5 at Prestons through to King Georges Road at Beverly Hills.

- Construction of WestConnex over 10 years which will include widening and extension of the M4 along Parramatta Road and duplication of the M5 east linking up with the M4 extension

21.1.4.2 *Freight and restricted access vehicles*

The Wilton site is the most remote of the three sites; however, it is still strategically located near the South West Growth Centre (approximately 37km by road). Additionally, the region is serviced by the Hume Highway, which is the main freight route between Sydney and Melbourne.[352]

The Restricted Access Vehicle (RAV) network is managed by NSW Roads and Maritime Services. The RAV network identifies roads that are approved for B-double trucks, over-dimension vehicles (high and wide loads), higher mass limits (HML) and mobile cranes.

The Wilton site already has approved B-double (26m long and 4.6m high) access via the Hume Highway and Picton Road. Both of these roads are also specified as HML and mobile crane routes. Access for B-double trucks will be important for on-going freight operations and broader network connections to the Hume Highway.[353]

21.1.4.3 *Public transport*

Public transport provides critical infrastructure that supports a region's development by providing access for residents to major centres within the region and elsewhere.

The closest railway station is in the town of Douglas Park, located some 12km north of the proposed airport site.

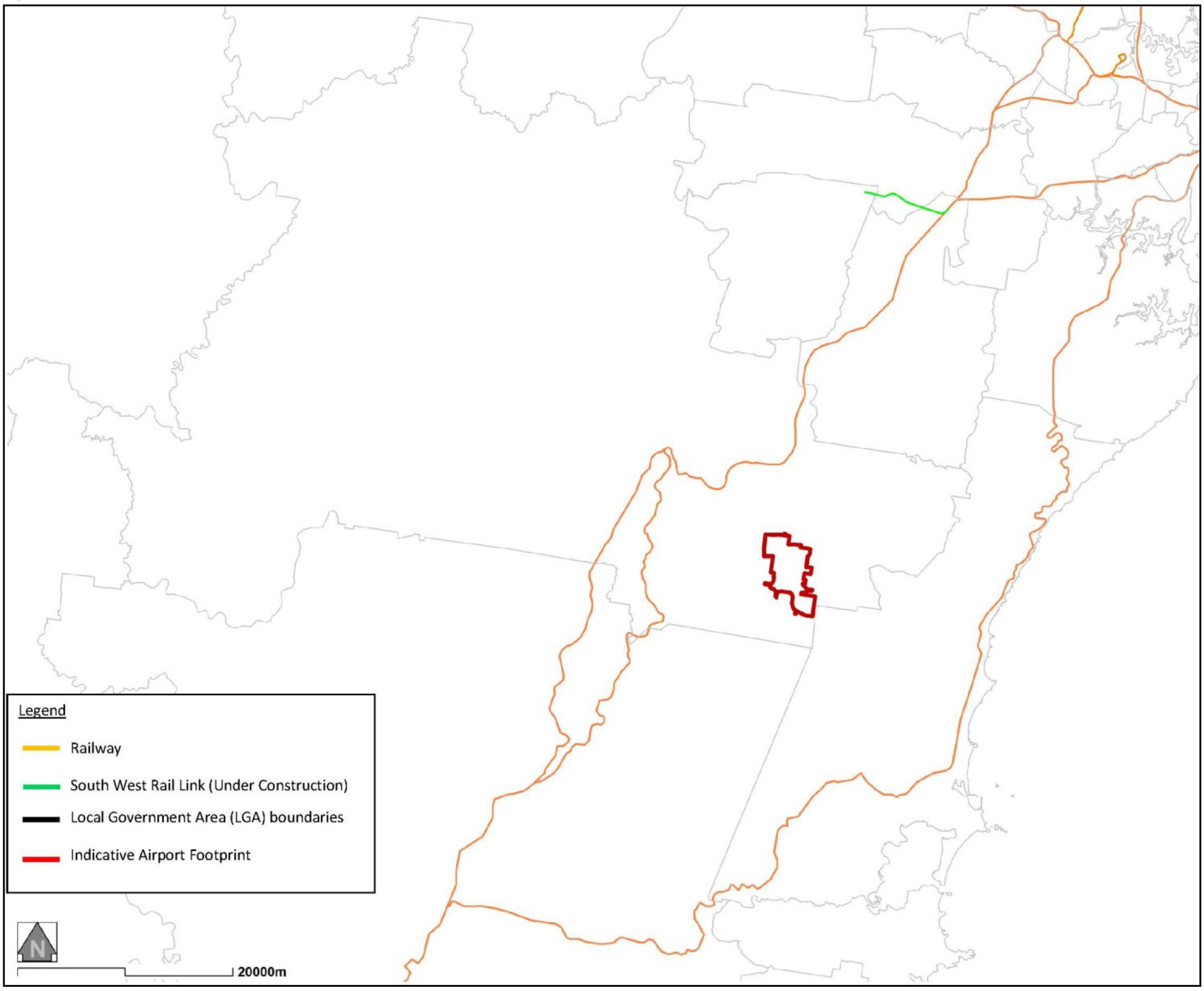
Rail access to the western section of the region is provided predominantly via the East Hills line to Macarthur. The broader area is also accessible via the Bankstown and Inner West lines to Liverpool and the Cumberland line from Bankstown to Campbelltown. Access to the eastern section of the region down to Wollongong is via the Illawarra line. None of these lines extend to within close proximity to the proposed airport site.

The Main Southern line was built in stages from Parramatta Junction to the border with Victoria near Albury between 1855 and 1881, and connected to the Victorian railways at a break-of-gauge in 1883. The existing rail alignment lies to the west of the Hume Highway in the vicinity of Wilton. It passes approximately 15 kilometres north-west of the proposed airport site. Any future extension of the rail network to Wilton will likely be from the existing Main Southern Railway south of Campbelltown/Macarthur.

Figure 83 highlights each of these railways with respect to the relative location of the proposed Wilton site.

[352] NSW Roads and Maritime Services, *Hume Highway Duplication*, accessed 27 August 2012, http://www.rta.nsw.gov.au/roadprojects/projects/south_western_region/hume_hway_dup/index.html
[353] NSW Roads and Maritime Services, Higher Mass Limits, accessed 28 August 2012,

Figure 83: Sydney's rail network



Source: Department of Planning and Infrastructure and Google Maps

There are two main train routes available for the region's residents. The Airport/East Hills line, boarding/alighting approximately 124,980 passengers per day and the South line, which boards/alights approximately 207,570 passengers on a daily basis.

21.1.4.4 Utility infrastructure

The region has well established utility infrastructure that is able to service the current population and businesses.

In the long-term, increases in demand and service requirements will require an augmentation of utility infrastructure to improve service levels over time. The infrastructure that is likely to be upgraded as a result of natural growth within this area over the medium to long-term includes:

- ► Water and wastewater – Sydney Water has established a plan to ensure wastewater services are provided for the region, which includes the areas near Wilton. The Wilton area currently does not have a sewerage system, with residents using septic tanks. The region has a well-established water supply.
- ► Electricity – Endeavour Energy has established a plan to ensure the reliability and expansion of the electricity network with upgrades in the region currently being undertaken. Some lines may be required to be relocated.
- ► Telecommunications[354]– Telstra has an obligation to connect any future developments to the telephone network. Expansion of the existing Wilton telecommunication exchange is proposed.

[354] WP16 – Utilities Final Draft

These upgrades, as well as timing of upgrades that will be required as a result of the development of an airport within the region, can be seen in section 22.3.

21.1.5 Future growth

21.1.5.1 Population growth projections

The number of persons that are projected to live within the Sydney basin within the medium to long-term is anticipated to increase substantially in line with national population growth. The Australian Bureau of Statistics has forecast 9.2 million persons living in Sydney by 2056, 46% more people than live in the city today and a compounded annual growth rate of 1.27%.[355]

The NSW Department of Planning has provided forecasts for the foreseeable distribution of where people are likely to reside in the short to medium term. With regards to the Wilton region, the population is forecast to increase by 65% to approximately 786,000 residents by 2036, compared to a 38% projected population growth rate in the broader Sydney region. A breakdown of this projected level of population growth by LGA is shown in Table 65.

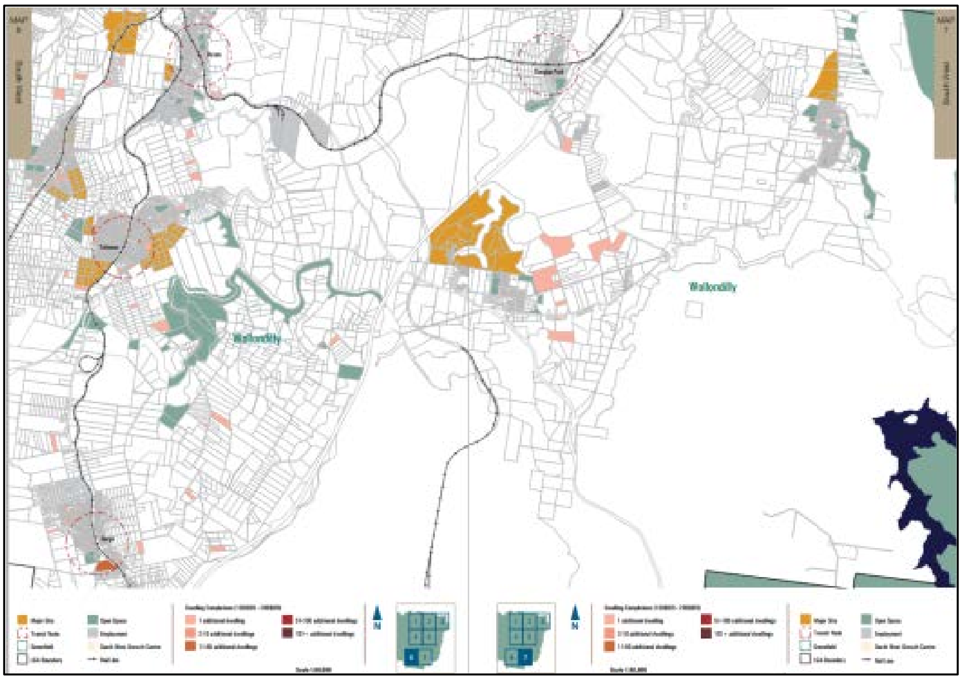
Table 65: Projected level of population growth by LGA

LGA	2006 population	Forecast population 2036	Projected growth (2006- 2036)
Wollondilly	41,221	66,877	48.5%
Camden	50,940	249,771	318.1%
Campbelltown	147,440	233,757	46.0%
Wollongong	194,543	235,797	17.3%

Source: Department of Planning and Infrastructure Population Forecasts

Table 65 indicates that the greatest level of population growth in the region will occur within the Camden LGA, followed by Wollondilly. This is illustrated in Figure 84, which identifies the regions projected Growth Centres.

Figure 84: Regional Growth Centres



Source: Department of Planning and Infrastructure – Metropolitan Development Program Residential Forecasts 2009/10 – 2018/19

21.1.5.2 Regional government planning

The South West Growth Centre, regional cities such as Liverpool and Penrith, and planned major centres such as Leppington are all part of the region that surrounds Wilton. Governments have developed a number of plans to develop the region. A brief overview of local and State Government plans that will impact the region in the longer term is set out below.

[355] ABS forecasts (3222.0) – Population growth Scenario B

State

The NSW Government has stated that one of its key objectives is to assist in the development of the Western Sydney Employment Area to create more jobs closer to where people live.

- Wollondilly's population is forecast to increase from 38,000 to 53,000 between 2001 and 2031, while the local workforce will increase from 20,000 to 28,000. The local council has identified that, with its close access to Sydney, the region has a significant opportunity to tap into the growing international visitor market[356] and take advantage of commercial development opportunities in the area.

- Campbelltown's emergence as a regional centre will provide a wide range of education and employment opportunities, especially in the retail and health sectors.[357]

- Camden is set to accommodate significant population growth over the next 25 years with the planned major centre of the South West Growth Centre to be located at Leppington. The South West Rail Link is planned to run from Glenfield to Leppington.

- The State Government has released a list of proposed sites for the Coal Seam Gas Northern Gas Project, including certain sites in the vicinity of the Camden LGA.[358] The Camden Council is expected shortly to give consideration to a policy position on Coal Steam Gas projects generally.[359]

To support this growth and investment in infrastructure, the NSW Government aims to accelerate the process required to release employment lands. The Employment Lands Task Force (as part of the Government's Employment Lands Development Program) has identified that the South West Subregion has the greatest amount of potential future employment lands identified across the Sydney region. Around 2,600 hectares of potential unzoned Employment Lands have been identified in the South West, approximately 74% of all potential future Employment Lands supply in the Sydney region. [360]

Local

The Future Directions Western Sydney 2030 report by WSROC advocates the promotion of business investment, accessible employment opportunities and – most importantly – the establishment of a number of employment hubs within Western Sydney. In this way, Western Sydney will aim to reduce its disparity with Sydney in terms of job options, unemployment and residential population, which has lead to 50% of Western Sydney's potential workforce not being engaged in effective work.[361]

The Illawarra Region aims to attract economic investment and new jobs through a revitalised Wollongong City Centre and the development of the University of Wollongong Innovation Campus. Medium and high density housing opportunities are also part of the strategy to guide sustainable growth and economic development within this region until 2031.[362] There are plans to develop major new urban growth areas such as West Dapto and to diversify the region's industry base to attract new and innovative industries.[363]

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[356] http://www.wollondilly.nsw.gov.au/images/documents/wollondilly/mig/20863-EconomicDevelopmentStrategy_Adopted21April2008.pdf
[357] http://www.campbelltown.nsw.gov.au/Assets/2597/2/CommunityStrategicPlan.pdf
[358] A proposed expansion of AGL's Camden Gas Project represents that first Australian coal seam gas drilling project in a residential area is currently open to public submissions. The proposed expansion involves twelve well surface locations containing six wellheads each.
[359] http://www.camden.nsw.gov.au/files/media_releases/2012/Coal_Seam_Gas_Mining.pdf
[360] Employment Lands Task Force, *Employment Lands Development Program – South West Subregion*, 2010
[361] Western Sydney Regional Organisation of Councils, *Future Directions Western Sydney 2030*, October 2011
[362] http://www.planning.nsw.gov.au/plansforaction/pdf/illawarra_regional_strategy.pdf
[363]http://www.wollongong.nsw.gov.au/council/publicdocuments/Documents/Wollongong%202022.%20Community%20Strategic%20Plan%20Summary.pdf

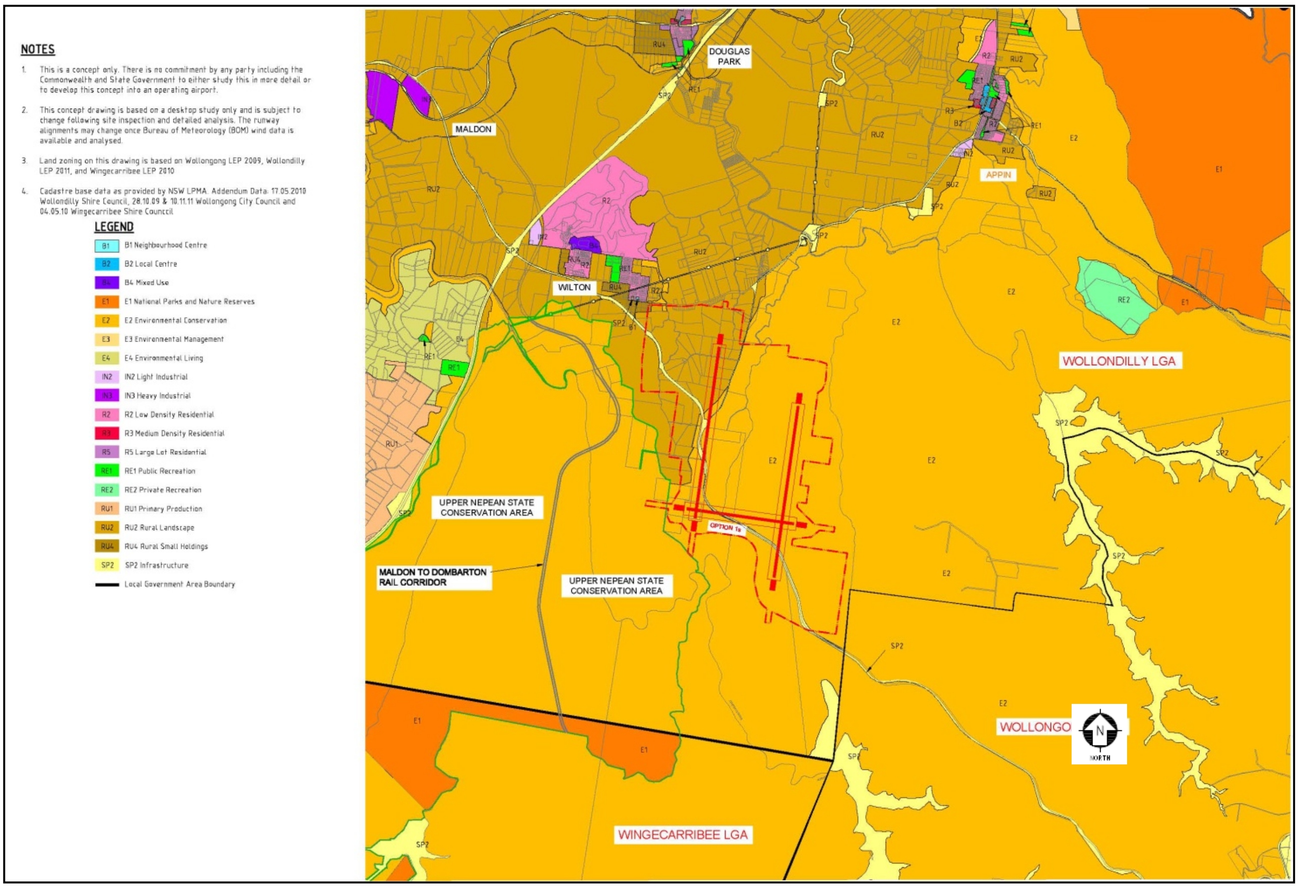
22. The potential airport development

This section of the report introduces the proposed site and surrounding area if an airport is to be developed in this region. This section also presents what associated infrastructure is likely to be developed at the site, including airside and landside infrastructure, as well as the demand for such services.

22.1 The site

The potential site for the development of an airport at Wilton is located approximately 66 kilometres south-west of the Sydney CBD and 57 kilometres south-west of Parramatta in the Wollondilly LGA. The site covers an area of approximately 2,000 hectares[364] and is zoned RU2 (Rural Landscape), E2 (Environmental Conservation), RU4 (Rural Small Holdings) and SP2 (Infrastructure), as shown in Figure 85.

Figure 85: Potential airport site at Wilton



Source: WorleyParsons

The development of a fully functional airport, with annual passenger throughput of 70 million, is proposed for the site, as set out in the Joint Study.

The western boundary of the site is generally limited by the Upper Nepean State Conservation Area and the need to provide for the relocation of Picton Road. The southern boundary is limited by steep terrain (and obstacles due to high terrain further to the south that may affect the runway location). The eastern boundary is limited by Wallandoola Creek and the northern boundary impinges on Cascade Creek.

The general layout of the airport includes a terminal and freight and airport support between the main runways. Aircraft maintenance hangars are to one side. The proposed business park is to the east of the airport entrance, which has good access to Picton Road.

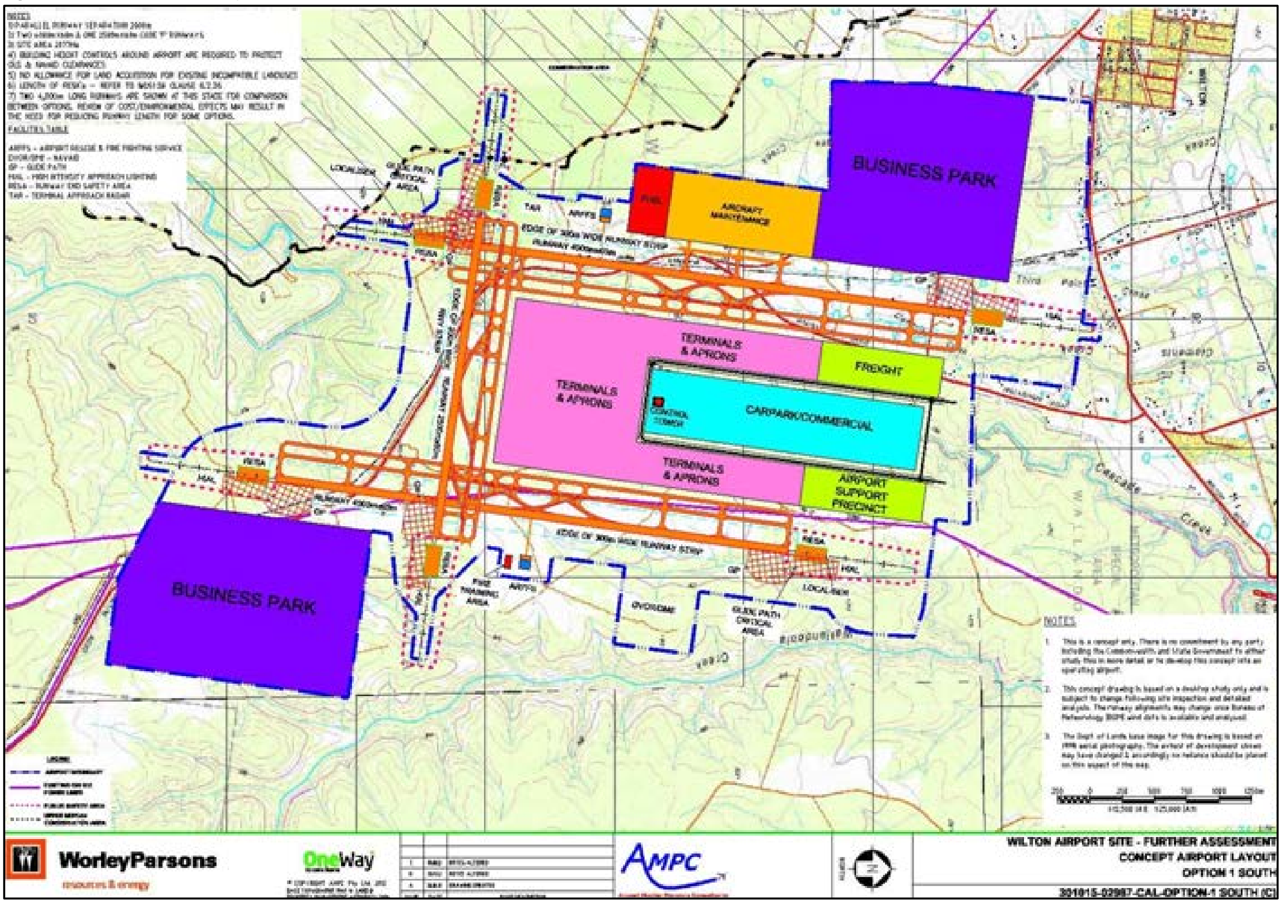
[364] Land clearing and earthworks draft WP14

22.2 Airport design

The proposed development of an airport at the Wilton site is based on a broad north south alignment that is capable of catering up to 70 million passenger movements per annum. This level of passengers represents approximately 450,000 aircraft movements annually.[365]

A visual representation of what an airport could look like on the site can be seen in Figure 86.

Figure 86: indicative airport layout



Source: AMPC

The development of an airport that is capable of catering to this level of aircraft and passenger throughput will require the construction of infrastructure that is likely to include:

- Two 4,000 metres long, 60 metres wide runways
- One 2,500 metres long, 60 metres wide cross runway
- 1,050,000 m^2 of taxiways
- 1,670,000 m^2 of aprons to support the general aviation and air cargo areas, while also providing sufficient area for aircraft maintenance facilities
- 500,000 m^2 of terminal buildings
- 122 gates
- 4,533,840 m^2 for the development of an on-site business park
- Air navigation aids including, instrument landing systems, visual guidance systems and landing aids

[365] Passenger and aircraft movement projections based on full sized airport (70 million)

- Air traffic control facilities including control tower, service centres, route surveillance and surface movement radars and radio transmitter and receiver sites.

The development of an airport on the site would also require a range of support services to be developed which will include:

- Government departments – Federal Police, Customs and agencies with responsibility for overseeing aviation maintenance and safety, and aviation administration

- Access services including car parking, taxi ranks and hire car facilities

- General services such as hotel/motels, postal, catering, banking and so on.

22.3 The surrounding region

The analysis reviewed the potential of the land immediately surrounding the site with regard to its suitability to readily supply developed land for business parks and employment and industrial land uses.[366]

An area enclosed by a radius of approximately 4km from the site centre was investigated to determine potential locations for industrial zones and business parks.

Under the Wollondilly Local Environmental Plan (LEP) 2011, the Wilton study area is zoned:

- RU2 - Rural Landscape

- RU4 - Rural Small Holdings

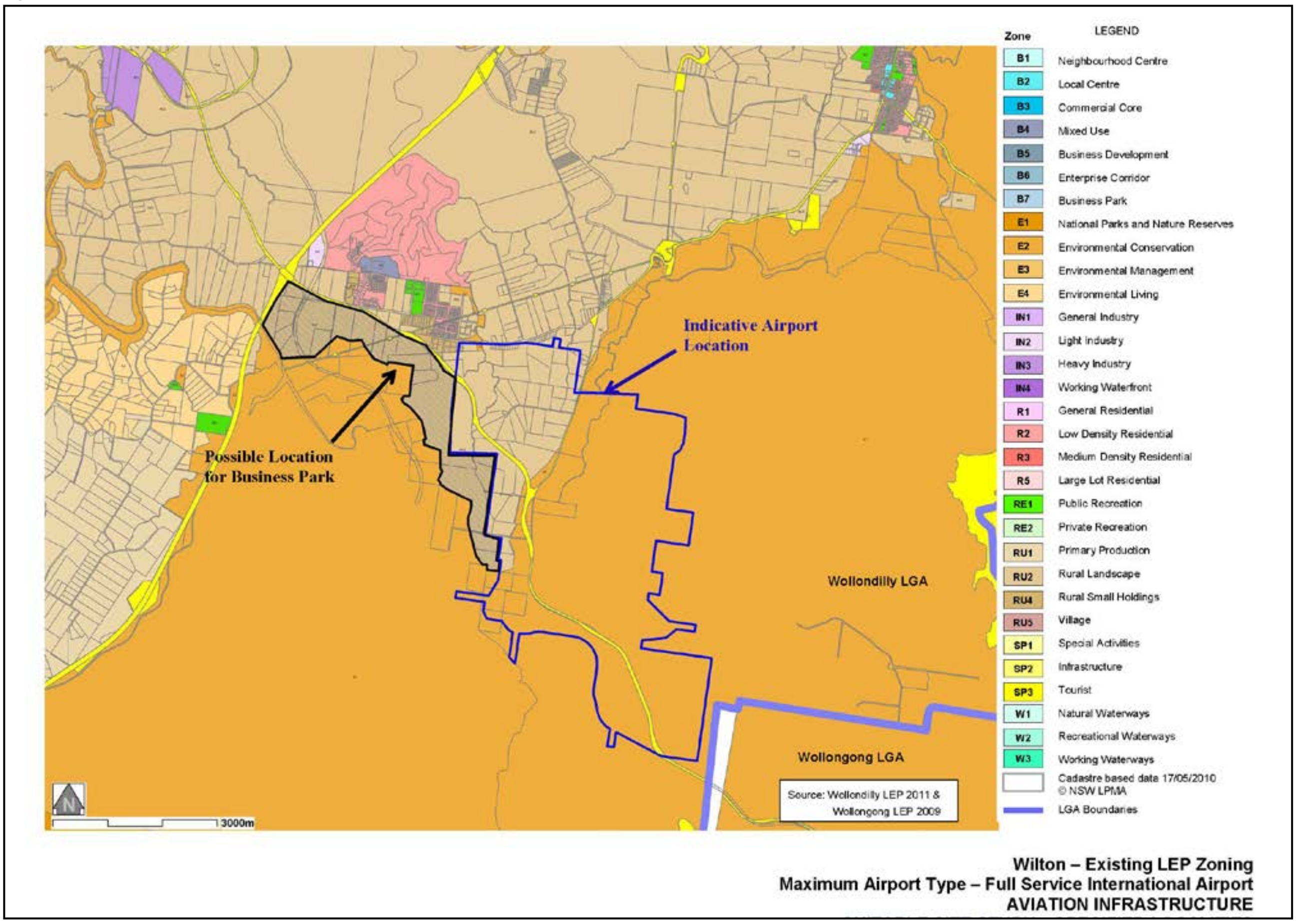
- E2 - Environmental Conservation

- SP2 – Infrastructure.

Figure 87 shows the zoning of land surrounding the proposed airport site.

[366] The assumptions and methodology used in undertaking this analysis are presented in Appendix B.

Figure 87: Wilton site – industrial zones



Source: Department of Planning and Infrastructure

Currently, there are no significant natural barriers that will affect the potential airport footprint. However, there are HV power lines running through the proposed site. These power lines will need to be relocated or placed underground. There are completed and planned residential developments in the area that will also affect the site.

The following planned industrial and business park lands were identified by the Department of Planning and Infrastructure in 2010 as proposed for the South West Growth Centre:

- Turner Road (96ha)
- Austral (162ha)
- Lowes Creek (79ha)
- Catherine Fields (82ha)
- Catherine Fields North (12ha)
- Future Industrial 1 (644ha)
- Future Industrial 3 (520ha)
- Kemps Creek (489ha)
- Maryland (46ha)
- Rossmore (52ha)
- Oran Park (18ha)

The above list indicates that there are around 2,200ha of industrial and business park land planned for the South West Growth Centre. This planned development could be aligned with the development of the airport to optimise its use, although the distance from the airport site will be a limiting factor.

22.4 Supporting infrastructure

A number of upgrades and redevelopments to existing infrastructure were identified as being required with the development of an airport at Wilton, including transport, public transport and utility infrastructure.

22.4.1 Roads

WorleyParsons calculated that the proposed development of an airport at Wilton[367] that will cater for approximately 44 million passenger movements per annum by 2060[368] will result in an increase in land transport movements of 38.7 million vehicle trips per annum.[369] These trips represent people accessing the proposed airport for aviation services only. [370]

The analysis found that that there will be an increase in traffic volume along the major arterial road, the Hume Highway, as a result of increased vehicle movements on the network due to people accessing the airport. As a result of these increased vehicle movements, there will be a need for further upgrades to the M5 and Hume Highway (see Table 66).

The projected change in the volume to capacity of the main roads and motorways – with and without the airport development – is set out in the table below.

Table 66: Projected change in daily road use as a result of an airport development

Motorways	Road Type	2006	2036		2060	
		V/C	V/C without airport[371]	V/C with airport	V/C without	V/C with airport[372]
Hume Highway @ Picton Road	4 lane divided carriageway	0.29	0.57	0.69	0.54	1.40
Hume Highway @ Narellan Rd	4 lane divided carriageway	0.41	0.58	0.86	0.77	1.63
Hume Highway @ Brooks Rd	4 lane divided carriageway	0.40	0.41	0.7577	0.75	1.30
M5	3 lane Local highway	0.80	0.72[373]	0.8384	0.95	1.29
M4	Local Highway, dual carriageway	0.45	0.64	0.66	0.84	0.92

Source: NSW Roads and Maritime Services – Traffic Volume Data, Bureau of Transport Statistics – Travel forecasts 2006 – 2036 and Booz & Co projections
Note: these estimates only take into account the additional passenger movements on the local road network as a result of passenger movements.

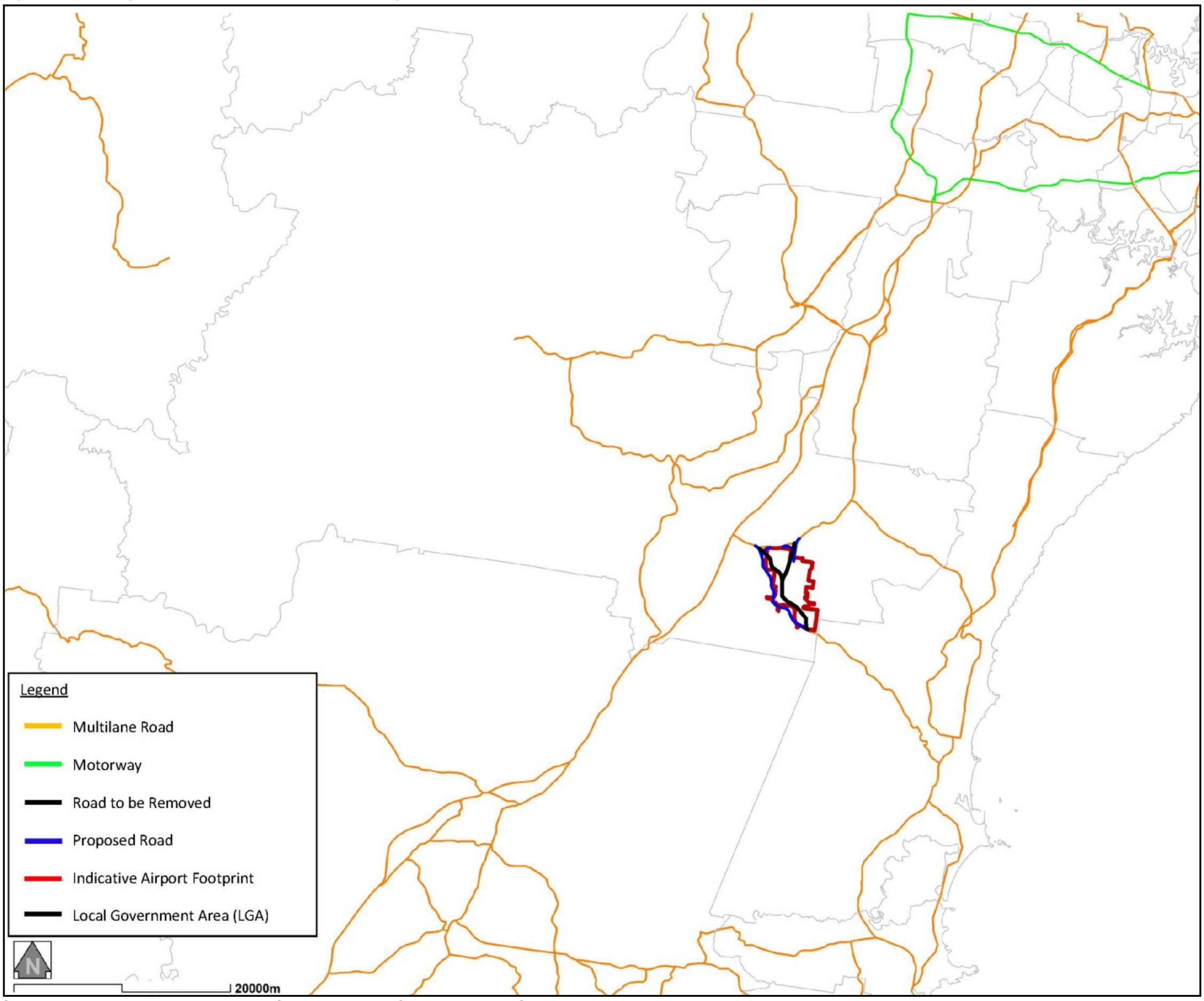
The volume to capacity ratios increase substantially for the motorways with the development of the airport, with very large increases in volumes occurring on the Hume Highway and M5. These roads are likely to need long-term modifications to handle the predicted volumes.

Picton Road is likely to need to be upgraded to accommodate the additional traffic movements to and from Wollongong and the Wilton airport site. Furthermore, an additional 9 km of road would have to be constructed to link the site to the existing road infrastructure. The estimated cost of upgrading this road is approximately $456 million.[374]

Figure 88 shows the existing multi-lane roads and motorways and these proposed road upgrades.

[367] Analysis only takes into account passenger demands, and does not include travel for employed personnel and does not include freight
[368] 2060 forecasted demand calculated by Booz & Co
[369] There is not a one-for-one relationship between passengers and vehicle trips as more than one person can use each vehicle
[370] WorleyParsons assumption based on annualised passenger throughput projections. Note that it is assumed that more than one PAX can be travelling within one car
[371] Projections assume that there will be one car movement per passenger. Passenger projection data supplied by Booz & Co
[372] Projections assume that there will be one car movement per passenger. Passenger projection data supplied by Booz & Co
[373] M5 widening to King Georges Road is currently being undertaken and scheduled for completion by 2014
[374] This value excludes design, project management and contingency

Figure 88: Existing major roads and, proposed road upgrades to the airport site



Source: WorleyParsons, Department of Planning and Infrastructure and Google Maps

22.4.2 Public transport

WorleyParsons estimated within this stage of analysis that the proposed development of an airport at Wilton[375] able to cater for approximately 44 million passenger movements per annum by 2060 will result in an 4.3 million increase in public transport trips per annum.[376] These trips represent people accessing the airport for aviation services only. [377]

The analysis found that providing rail access to an airport at Wilton will require completion of the Maldon-Dombarton Railway.[378] The use of this line for passenger rail services would require a spur to gain access to the site and a reduction of 4 freight trains per hour on the main South line to free up access. This restraint on rail freight movements would have a significant restraint on the growth and It is noted that this line will only enable diesel hauled rail services to access the site (the line is not electrified at this time).

Furthermore, it was found that the Main Southern Railway/East Hills line does not have sufficient capacity to serve the increased demand that will result from the development of a new airport at Wilton. The Worley Parsons analysis found that the need for:

- 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

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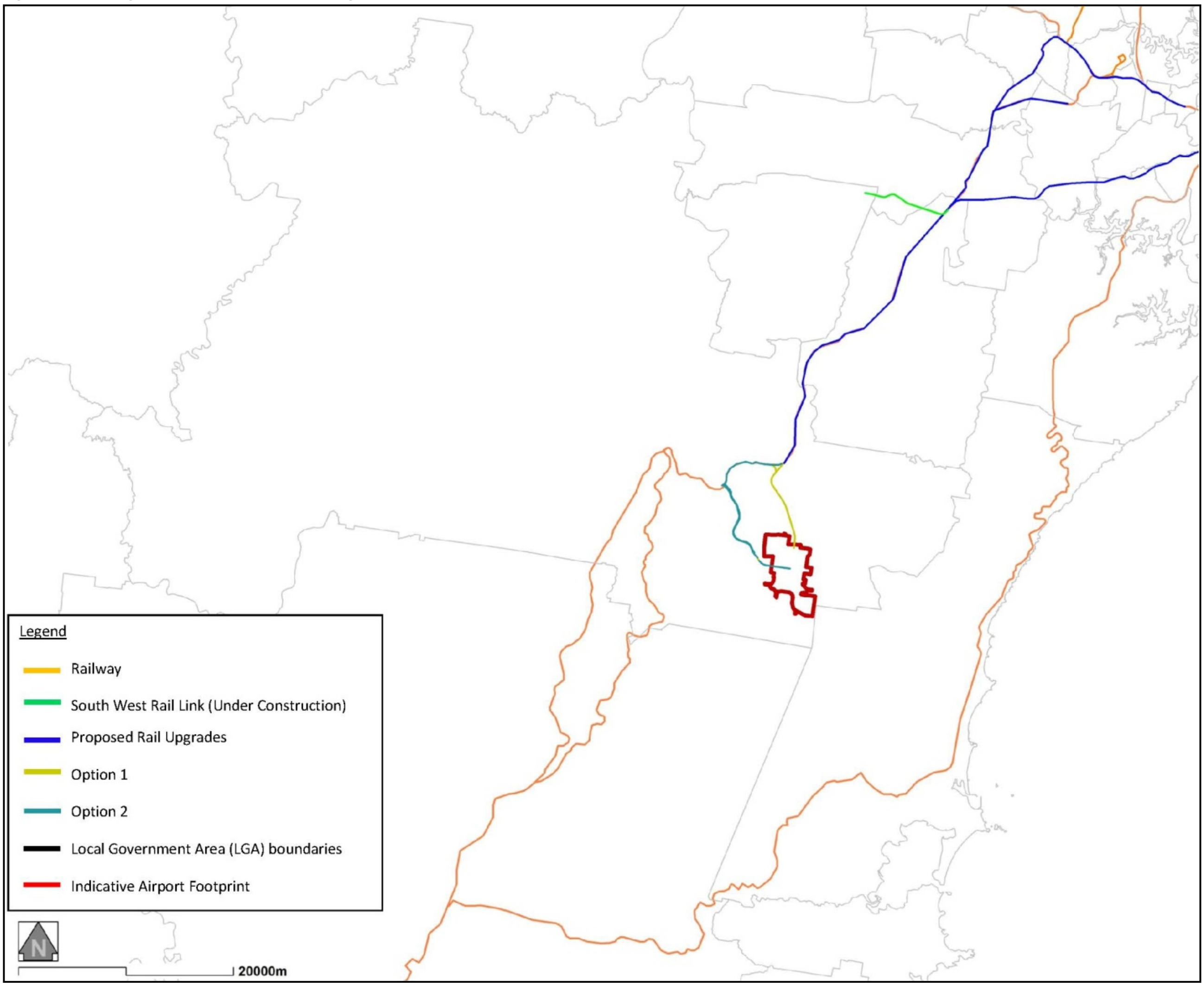
375 Analysis only takes into account passenger demands does not include travel for employed personnel and does not include freight
376 There is not a one-for-one relationship between passengers and vehicle trips as more than one person can use each vehicle
377 WorleyParsons assumption based on annualised passenger throughput projections
378 Note that there are issues with operating a freight and passenger services on the same rail line. The impact of these issues has not been analysed as part of this study.

- ► Re-signalling and electrification
- ► New refuges south of Macarthur.

Costing for these proposed upgrades has not been undertaken at this stage.

Figure 89 shows the existing rail network, proposed rail upgrades and proposed rail service upgrades.

Figure 89: Existing rail line and proposed rail upgrades



Source: WorleyParsons , Department of Planning and Infrastructure and Google Maps

This improvement in rail service levels will benefit other East Hills line users – those using the line to gain access to other areas of the network – once the airport and the rail line become operational.

Two alternatives are proposed at this stage of the analysis due to the uncertainty over the availability of the Maldon Dombarton Rail Line, shown as Option 2 in the above figure. Should this option be unavailable, then a route from Douglas Park (Option 1) could be undertaken.

Table 67 provides an indication of travel times (based on current service levels and patterns) and the potential makeup of the journey (such as the need to transfer between trains) for a sample of Sydney suburbs to access the airport site.

Table 67: Approximate rail travel times

Route	Approximate Travel Time[379]

[379] Source: Google Maps. Travel time does not include wait time. Travel times are based on expected travel times in August 2012. Travel time from Campbelltown to Airport obtained by using travel times for similar distances on other parts of the CityRail network.

Parramatta	North Shore and Western Line (Parramatta to Granville)	3 min
	South Line (Granville to Campbelltown)	50 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Hornsby	Newcastle and Central Coast Line (Hornsby to Strathfield)	23 min
	South Line (Strathfield to Campbelltown)	61 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Hurstville	Eastern Suburbs and Illawarra Line (Hurstville to Wolli Creek)	10 min
	East Hills Line (Wolli Creek to Campbelltown)	45 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Penrith	North Shore and Western Line (Penrith to Granville)	42 min
	South Line (Granville to Campbelltown)	50 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Blacktown	North Shore and Western Line (Blacktown to Granville)	17 min
	South Line (Granville to Campbelltown)	50 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Liverpool	South Line (Liverpool to Campbelltown)	23 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Sutherland	Eastern Suburbs and Illawarra Line (Sutherland to Wolli Creek)	21 min
	East Hills Line (Wolli Creek to Campbelltown)	45 min
	Southern line upgrade (Campbelltown to Airport)	34 min
Campbelltown	Southern line upgrade (Campbelltown to Airport)	34 min
Central	Airport and East Hills Line (Central to Campbelltown)	55 min
	Southern line upgrade (Campbelltown to Airport)	34 min

Source: WorleyParsons analysis of Google Maps
Note: these estimates do not take into account average wait or transfer times

As can be seen in Table 67, a person accessing the airport from the central city and Parramatta via the existing public transport network (with proposed changes) would take approximately 89 minutes and 87 minutes respectively based on current service provision.

22.4.3 Utility infrastructure

WorleyParsons analysis found that to service an operational airport at Wilton, a range of utility infrastructure in the area will have to be developed and/or upgraded. This includes:[380]

- Water – Connections to existing water services will need to be provided.
- Wastewater – A total upgrade of the wastewater network will be required. Wilton currently runs off a septic tank system, with no sewerage line connecting it to the sewerage network.
- Power – A connection will need to be made to the existing power grid. In addition, existing 500kV distribution lines will need to be relocated to allow a fully functional airport to be constructed and operate in the area. There is also at least one 66 kV distribution line that impinges the footprint of the proposed sites. This line largely runs east-west and is owned by Endeavour Energy. There are a number of 11 kV lines that largely run beside roads and that lie within most site footprints.

[380] Costings obtained from Joint Study on aviation capacity in the Sydney region – matrix. The study was based on an airport with a similar footprint and location.

- Communications – This infrastructure will need upgrading as it currently only caters for ADSL, which does not have sufficient capacity to cope with the proposed usage. This option will be costly, but it will be a long-term solution as it gives the exchange the ability to support significant growth in the area. Another element involves the connection to existing large regional exchanges at Campbelltown and Wollongong or expansion of the existing roll out of the NBN network. Scheduled to roll out in the Wilton area by 2015, this will need to be expanded to include the airport footprint.

- Gas – Connection to the existing gas network will need to be undertaken, as well as relocation of the existing Wilton – Wollongong gas pipeline.

- Fuel – A direct connection from the airport site to existing refineries at Clyde and Port Botany is one of the main elements in achieving a reliable supply of aviation fuels to the proposed airport. Such a connection will ensure a constant supply of fuel. However, it will be a costly exercise as the fuel lines will need to run 60km to connect the site to the refineries.

Costing for the above upgrades has not been undertaken at this stage of the study.

These infrastructure upgrades will benefit existing and future residents and businesses in the area. The resulting infrastructure capacity will ensure that residents in the surrounding regions have uninterrupted services and meet the growing needs of the community. These upgrades will also attract industry to the region, given that the infrastructure is available and of a high capacity.

22.5 Other notable issues

A number of other issues can potentially have a significant impact on the cost and/or the effective operations of an airport in a particular location. Costs that are significantly dependent on the location of the airport include earthworks required to develop the airport platform and potential works to mitigate possible mine subsidence.

Other impacts that could significantly affect the operations of an airport in a particular location include meteorological conditions and airspace conflicts. These impacts will have a significant effect on the economic viability of the development of an airport. Each of these impacts is briefly discussed below.

22.5.1 Geology

The topology and the composition of the soil at the site will play a significant role in the total cost associated with the development of an airport given its proposed alignment.

WorleyParsons undertook an analysis of the geology and topology of each of the sites analysed as part of the Joint Study. This section of the report provides a brief overview of the current nature and composition of the land within the proposed site to determine the ability to construct an airport, as well as the likely cost incurred in shaping the landscape in its current form to develop a platform that is suitable for an operational airport.

The terrain of the proposed Wilton site ranges from flat to gently undulating. Construction of an airport on this site will require a major portion of the site to be reshaped. The type of dirt/rock/soil that can be found on the site includes sandstone and shale. While shale is not generally considered difficult to excavate, sandstone is considered to be exceedingly difficult.

It was estimated that approximately 9,400,000 m^3 of earth[381] will have to be moved (cut plus fill) to develop a suitably flat platform required for the construction of an airport.[382]

The additional excavated earth will need to be stockpiled for use elsewhere on the site or disposed of off-site.

22.5.2 Mine subsidence

Mine subsidence present on a site will impact the viability of an airport due to the requirement to stabilise the material and the potential to be required to compensate title holders to forgo the right to that material.

The proposed airport will not be compatible with mining subsidence if it occurs after airport construction. However, if the subsidence has occurred prior to construction, the proposed airport may be compatible on the subsided land.

Within the north-west and western part of the proposed Wilton site, there has been no mining to date. However, the area is underlain by the Bulli and Wongawill seams, with a coal sale value estimated at about $1 billion dollars per square kilometre. Given that the

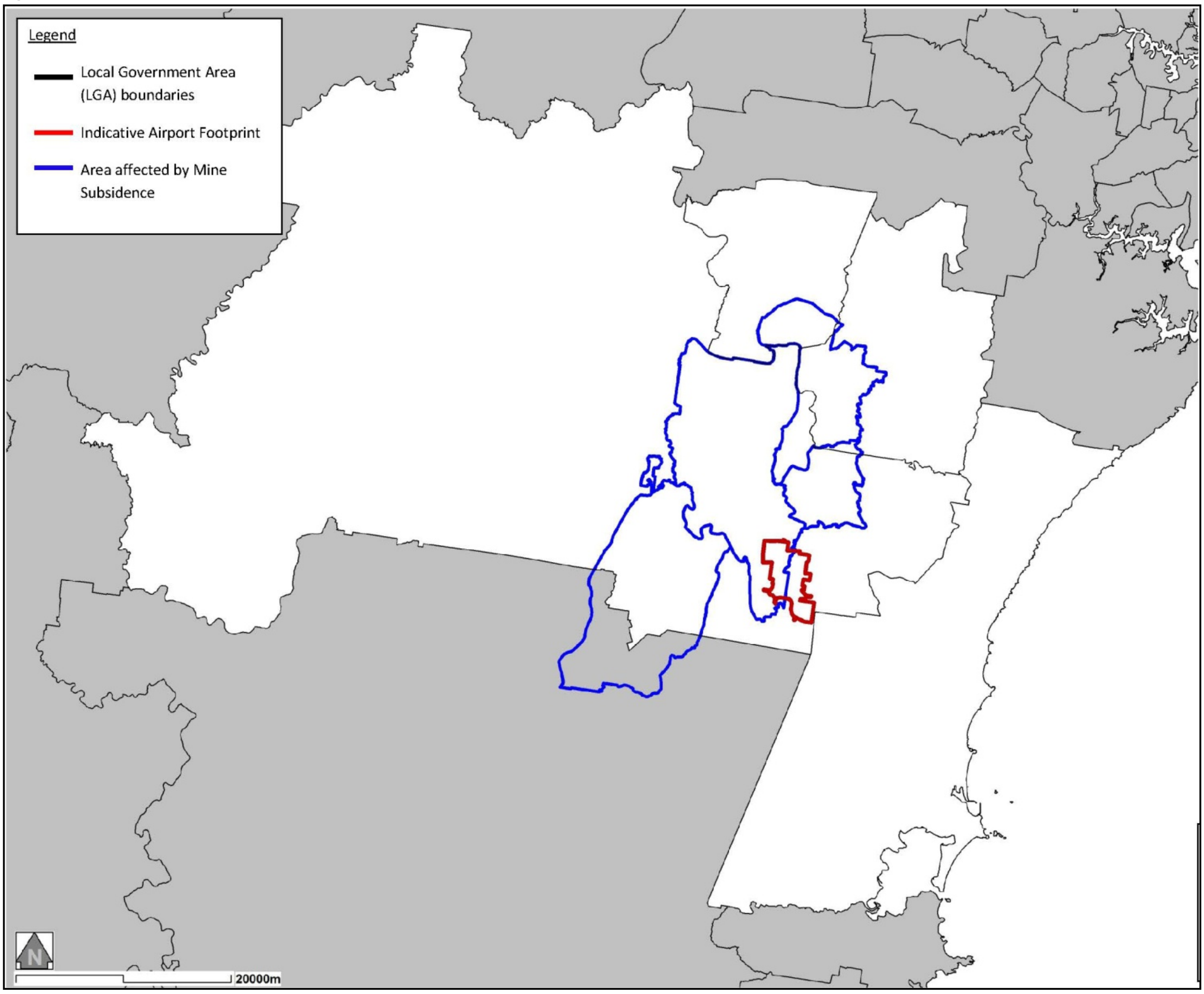
[381] WP14 – Land Clearing and Earthworks (Draft)
[382] Costing for the above has not been undertaken at this stage of the study.

site area for the typical options prepared for this study is about 20 square kilometres, and assuming that active mining beneath runways, taxiways and major buildings is not acceptable, it is clear that the potential value of sterilised coal is in theory quite substantial, not withstanding other (e.g. environmental) issues which may affect the feasibility of coal mining in the area.

Within the south-east portion of the Wilton site there has already been mining in the Bulli seam and Gujarat NRE is planning to mine the Wongawill seam between the present time and, probably, around 2035. Once the mining is completed, there is likely to be little residual subsidence, which could be accommodated in the design of the runways and other components of the airport.

Areas affected by mine subsidence are shown in Figure 90.

Figure 90: Mine subsidence



Source: WorleyParsons

22.5.3 Airspace conflicts and flight path obstructions

The development of an airport at Wilton would have to be able to operate within the Sydney aeronautical network as a whole. Furthermore, the development of any airport within the Sydney basin may require the change in use and/or acquisition of a number of assets within close proximity of the airport site.

An analysis was undertaken by Airservices Australia (ASA) and WorleyParsons of the impact of an operational airport at Wilton to determine its potential impact on current and projected airspace movements and flight path obstructions respectively.

22.5.3.1 Airspace conflicts

At present, there are four types of designated airspaces in the Sydney basin:

- Control zones – established around busy airports to ensure the safe and orderly flow of traffic
- A control area – a volume of airspace centred on KSA that is determined by the climb and descent performance of the variety of aircraft using that airport
- Restricted areas – volumes of airspace around military facilities or civil installations such as Orchard Hills and Holsworthy Army Facilities
- Danger areas – designated volumes of airspace to identify potentially hazardous areas (such as flying training or parachuting areas).

This analysis undertaken by ASA found that a north-south runway alignment at the Wilton site will impact current and projected alignment of airspace movements. ASA have advised that modifications to the existing KSA flight regime will be required to ensure there are no conflicts with the proposed site.

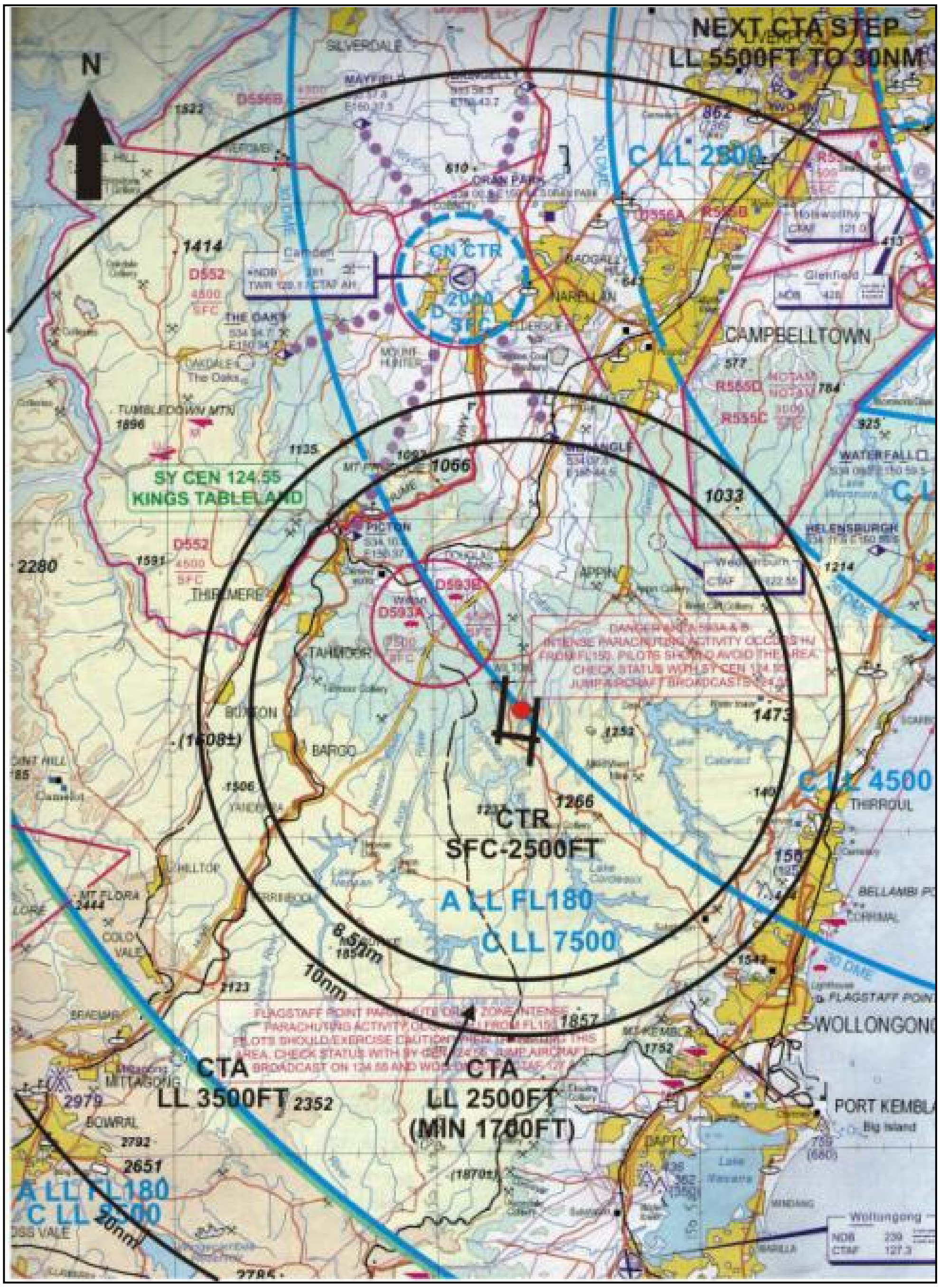
The main conclusions from the analysis are as follows:[383]

- ► Sections of the current controlled airspace (CTA) associated with Sydney Airport will require lateral and vertical restructuring to incorporate a new CTR/CTA arrangement for Wilton. Overall, this will result in a general extension to the controlled airspace environment in the Sydney region.
- ► The existing uncertified/unregistered aerodromes[384] of Wedderburn and Wilton fall within the new Wilton CTR. This makes them incompatible with the new airport and they will have to close, as will the existing Wilton parachuting operations.
- ► Camden Airport (which currently accommodates IFR and VFR operations) will be limited to VFR operations and the adjacent training area D552. Parts of D556A/B (Bankstown flying training) will need to be restructured vertically and possibly laterally to cater for the new CTA steps. The existing VFR routes from Picton and Menangle will not be compatible with the airport and alternatives will need to be evaluated.
- ► R536 series (Orchard Hills) with an upper limit of 4,500ft will lie beneath the 20 nm CTA step lower limit of 5,500ft and should be compatible with a Wilton airport.
- ► Wollongong Aerodrome (certified) will be compatible, although parts of the current published IFR approaches will be within the CTA established for Wilton, requiring pilots to obtain a clearance before operating in this section of airspace.
- ► Southern VFR access to Bankstown Airport will require a transit lane, probably west of the CTR and the first Class C airspace step. There is the possibility of additional access via the coast and then north of R555C (Holsworthy). Provision of a transit lane will reduce the probability of violations of controlled airspace.
- ► In relation to Richmond Military Control Zone (and R468, R493 overlying), Airservices Australia has identified access will be required for northern arrivals (and possibly departures).
- ► Airservices Australia has identified the primary constraint is R555 series (Holsworthy) – artillery range activity in the circuit area – not compatible above 3000ft (i.e. R555B/D).
- ► R495A/B (Navy) – Airservices Australia has identified the northern portions may need to be civil airspace to segregate Sydney and new airport traffic.
- ► The north-east corner of D451 (unmanned aerial vehicle testing) will fall within the lower limit of the 20nm CTA step, requiring lateral and/or vertical restructuring.
- ► Flagstaff Point parachuting (near Wollongong) will be significantly restricted and is probably not compatible. It is understood a new parachuting danger area (to be designated D530), for an area of approximately 1 nm by 2nm from the surface to the base of the CTA lower limit of 7,500ft near Flagstaff Point, will be promulgated in November 2012.
- ► Hang gliding activities undertaken along the Illawarra escarpment may be impacted by the new CTR and 10 nm CTA step.

The effects of the proposed Wilton site on the existing airspace within the Sydney basin can be seen graphically in Figure 91.

Figure 91: Indicative airspace arrangements (not to scale)

[383] These conclusions incorporate ASA's preliminary findings reported in the Joint Study on Aviation Capacity for the Sydney Region, combined with issues identified by AMPC based on further analysis
[384] The terms certified, registered and uncertified/unregistered refer to the Civil Aviation Safety Authority/s aerodrome categorisation system. Specific operational and aerodrome standards apply to these categories.



Source: Base Image Airservices Australia 2012 and AMPC analysis.

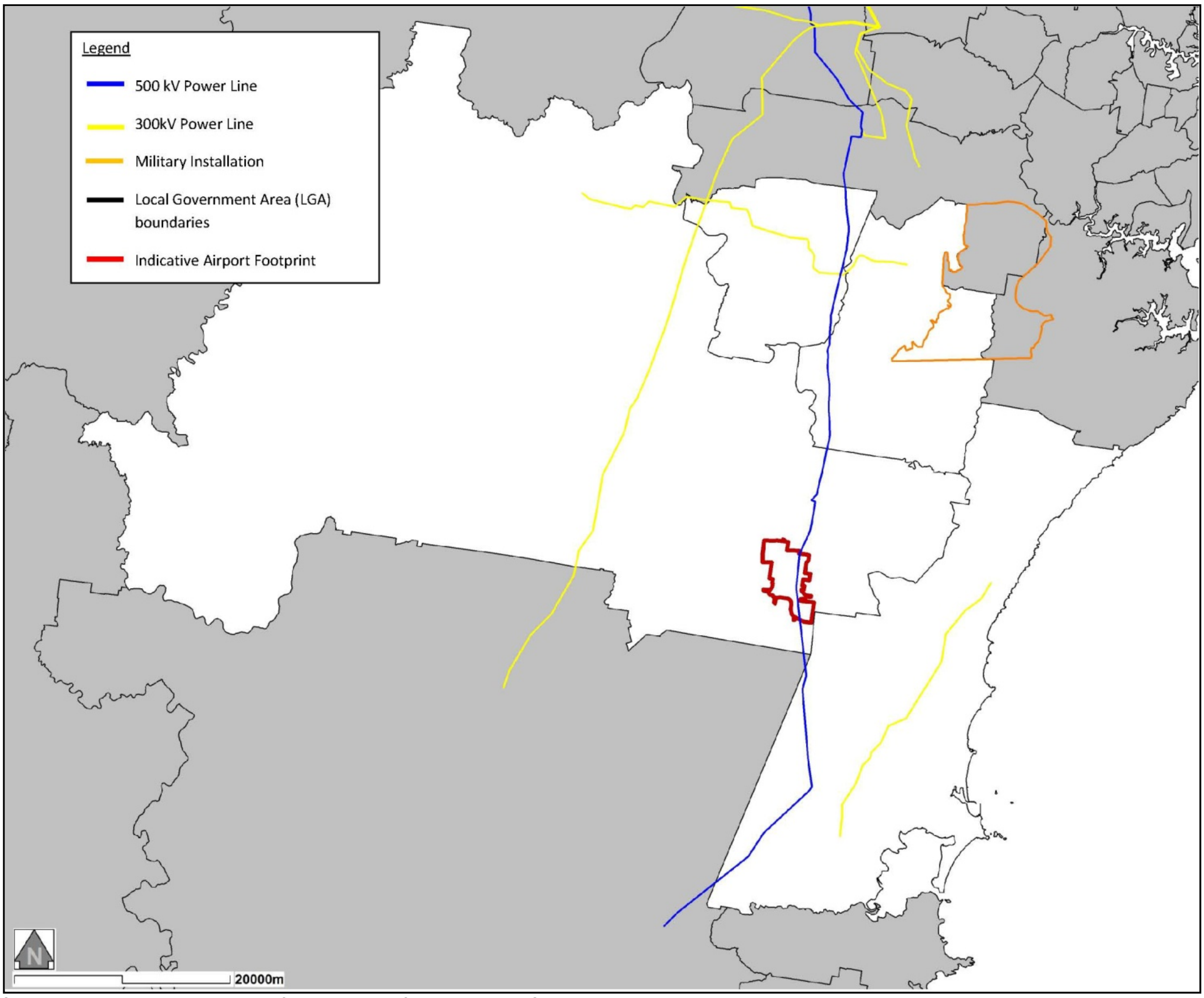
22.5.3.2 Flight path obstructions

WorleyParsons also undertook a preliminary analysis of existing assets that may have their operations affected as a result of the development of an airport at Wilton. This analysis found that the development of a north-south runway alignment at the Wilton site will result in the potential for a number of assets to be compulsory acquired or may impact on their current operational patterns. These assets include:

- ► Holsworthy Military Installations
- ► 300kV and 500kV power lines running through the site

Figure 92 shows the relative location of these assets to the proposed Wilton airport. As noted earlier, the power lines within the area can be relocated or placed underground to avoid any conflict.

Figure 92: Flight path obstructions



Source: Worley Parsons, Department of Planning and Infrastructure and *Google Maps*

22.5.4 Meteorological conditions at the Wilton site

The meteorological conditions of the region can restrict the ability of an airport within a particular area to operate efficiently in accordance with air safety control regulations.

This section of the report addresses the impacts of wind direction, wind speed and visibility at the Wilton site to determine whether current conditions will impact a full international airport operating on the proposed site.

22.5.4.1 Applicable legislation/regulation

The International Civil Aviation Organization (ICAO) determines the safe level of wind speeds to operate an airport (Annex 14 of ICAO Edition 5). This criteria requires that runways at an airport should be oriented such that aircraft may be landed at least 95% of the time with the following crosswind components:

- 20 knots for aircraft reference field length 1,500 metres or over
- 13 knots for aircraft reference field length greater than 1,200 metres and less than 1,500 metres.[385]

The Wilton airport has a field length of 4,000 metres and therefore a maximum crosswind of 20 knots applies (according to ICAO runway design criteria).

In the event that crosswind conditions are more than 20 knots, an alternative cross runway must be used (if one exists) or operations must be suspended until adverse weather passes.

[385] This criteria is applicable in all weather conditions.

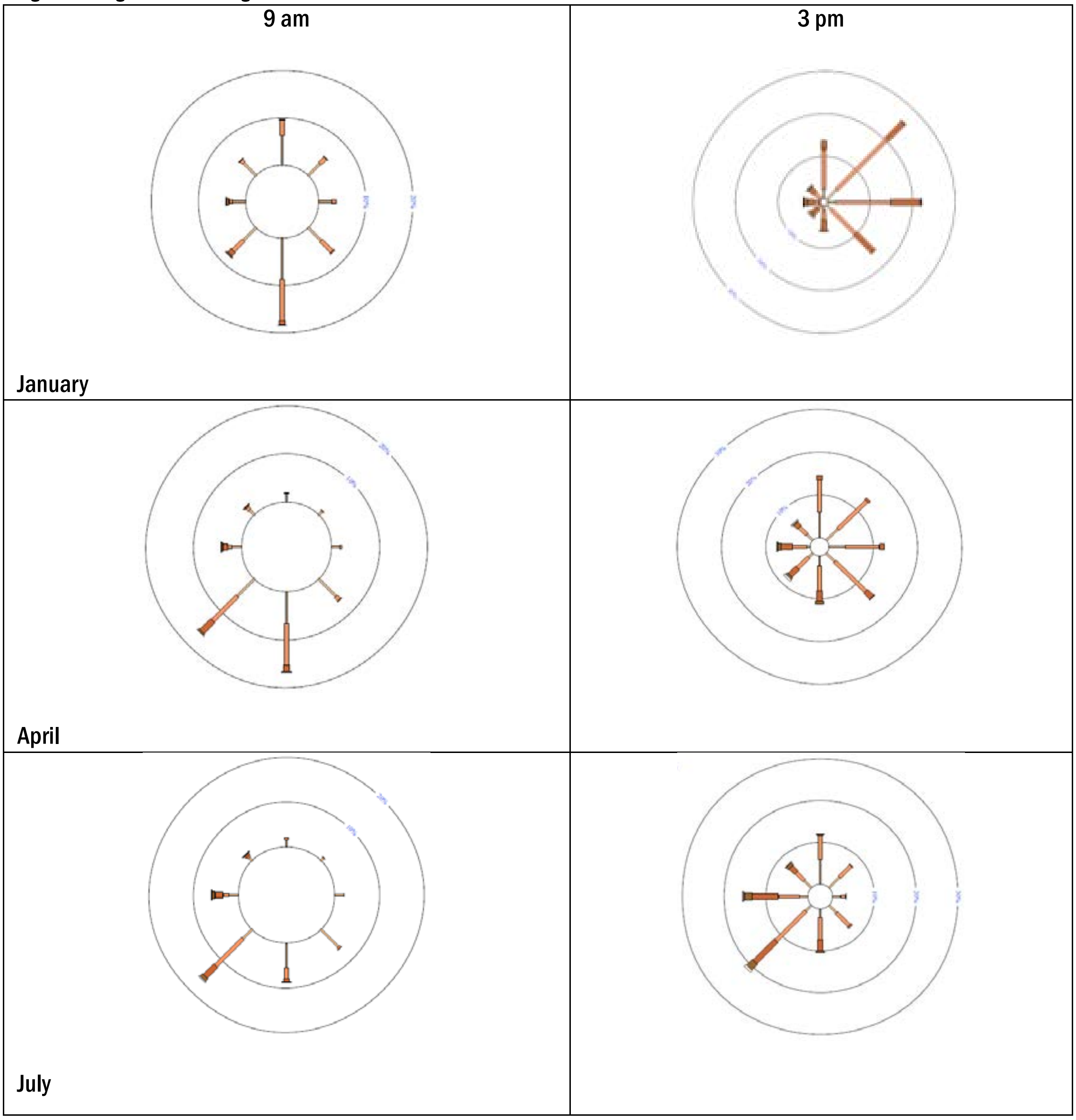
The instrument landing system operating limits (ILS minima) require a cloud base of 100 metres above ground level and a visibility of 800 metres. It was assumed that there will need to be more than scattered cloud below the ILS minima to render the airport unusable.

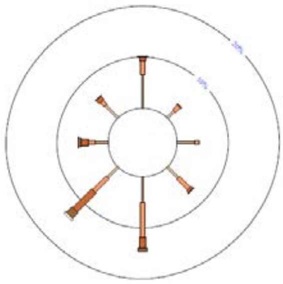
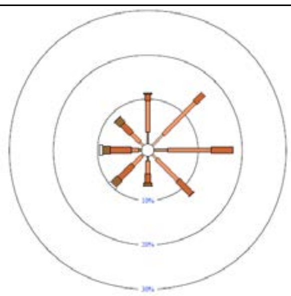
22.5.4.2 Meteorological conditions at Wilton site

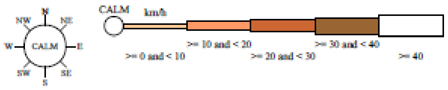
There are no Bureau of Meteorology (BoM) recording sites located near the proposed airport site at Wilton. The nearest site is Camden Aerodrome, 27 km NNW of the Wilton site. The proposed Wilton airport site is at an altitude of 290 m above sea level (ASL), whereas Camden aerodrome is at 80 m ASL. Therefore, the overall wind patterns at each site should be similar, but the potential exists for greater mechanical turbulence at the Wilton site. The observations at Camden in relation to low cloud, fog and reduced visibility are therefore not a reliable guide to conditions at Wilton.

The seasonal variations in wind direction and strength at Camden are indicated in Figure 93.

Figure 93: Regional meteorological conditions



9 am	3 pm
 October	



Source: Worley Parsons and BoM Monthly Climate Statistics

At Camden aerodrome, 22% of the wind observations showed calm conditions. In the morning the prevailing wind direction is south and south-westerly with a small northerly component. In the afternoon the wind favours the north-easterly direction, suggesting the influence of summer sea breezes. There are smaller west and south-westerly components. The predominant wind patterns are therefore southerly at Camden and this is assumed to hold for the Wilton site. Table 68 indicates the number of exceedences of the crosswind limit at Camden.

Table 68: Wind speed exceedence

Average wind speed exceedence	Gust wind speed exceedence
0.17% or 15 hours pa	1.27% or 111 hours pa

Source: WorleyParsons

As can be seen in the table above, there is a potential for Wilton's main parallel runways to be temporarily closed for up to 111 hours per annum as a result of gust wind speeds in excess of the regulated safety levels.

The impact of visibility and fog at Camden means that the airport is closed to landings for 1.72% of the time or 151 hours per annum based on data from November 2007. Again, the observations made at Camden Aerodrome are not an accurate proxy for the Wilton site.

23. Demand for Wilton aviation services

This section of the report present the forecast demand for passenger and freight services at an airport developed within Wilton. Further information regarding the assumptions that underlie this analysis can be found in Appendix B.

23.1 Demand forecast methodology

The forecast demand for aviation services, with regards to passenger and freight throughput at an airport at the proposed Wilton site, has been undertaken by Booz & Co.[386]

Patronage at the Wilton site was estimated through a generalised cost model accounting for the impact of ground access on aviation demand for each specific site. The model replicates passenger decision-making based on the relative generalised cost of the end-to-end journey for alternative airport sites. Where the generalised cost of travel using one airport is cheaper than the alternative airport, a portion of the passengers (as determined by the magnitude of the difference in generalised cost and inherent customer bias factors) will be assigned to that airport. In addition to this component of the market, the forecasts also include a portion of the demand that KSA cannot accommodate due to capacity constraints.

As highlighted in chapter 6, the location of an airport relative to the origin/destination of users within the wider region will ultimately impact on the demand as well as the type of services that it provides. This is because the generalised cost (that is, time and vehicle costs) of accessing the services of the airport will impact on a person’s willingness to use the services relative to alternative services (such as using KSA, driving, or taking a bus) or taking up the services at all (not undertaking the trip).

Furthermore, the proximity of the airport site to existing and forecast population and employment centres will also increase the probability of or, conversely, reduce the risks associated with potential demand for the services provided by the airport. This factor is an underlying assumption within the demand forecast of travel demand from the airport as undertaken by Booz & Co.[387]

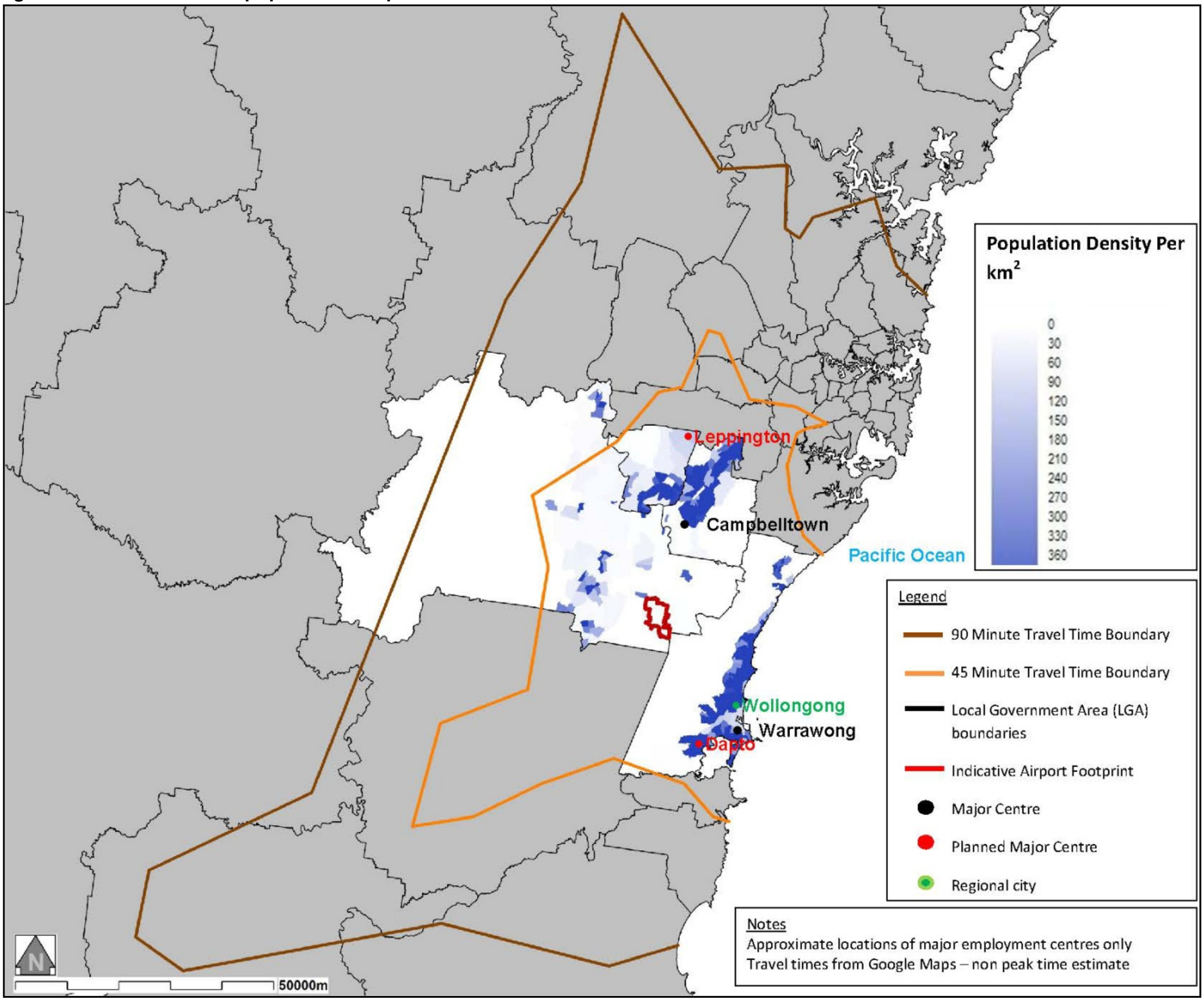
23.2 Demand catchment area

Analysis previously undertaken by WorleyParsons found that the average aviation passenger is willing to travel up to 90 minutes to access an airport.

Figure 94 provides an illustration of the breadth of the Sydney basin that can access the proposed Wilton site within 90 minutes of private vehicle travel time.

[386] These forecasts have not distinguished between Regular Public Transport (RPT) services and General Aviation.
[387] Further information regarding the assumptions underlying Booz & Co analysis can be found in Appendix B

Figure 94: Travel time distance to proposed Wilton airport



Source: WorleyParsons and Google Maps

As can be seen from this figure, the residents of each of the planned, potential and existing major centres that surround the proposed Wilton site are able to access the site within 45 minutes. Additionally, residents of inner Sydney as well as the South West Growth Centre are able to access the site within 90 minutes. This indicates that these residents could potentially be attracted to Wilton airport.

As found within the previous phase of the analysis and presented in section 2.1, 65% of the population growth that is expected to occur between 2006 and 2036 is anticipated to be realised in Western Sydney.[388] This growth is anticipated to occur in brownfield areas such as Parramatta and Liverpool, as well as in greenfield centres that have been designated for population growth by the State Government.

Taking into account this expected pattern of growth, Ernst & Young undertook a study of the potential travel times that will be required to access the airport at Wilton from a number of key centres within Western Sydney given current and projected travel speeds (by road) over the operational period of the airport. The findings of this analysis are set out in Table 69.

[388] NSW Government, NSW Metropolitan Plan for Sydney 2036, p 5, accessed 31 August 2012

Table 69: Projected private vehicle travel times from Western Sydney (minutes)

Region	Current	2030	2050
South West Growth Centre	31	35	38
North West Growth Centre	60	69	75
South West	36	42	47
West	56	67	77
North West	51	59	65
Outer west	56	64	70

Source: Ernst & Young analysis – BTS and Google maps

As highlighted in Table 69, the general travel speed over the next 40 years is anticipated to decrease by approximately 28.0%.[389] The resulting increase in travel time will reduce the effective radial distance of the airport's potential passenger catchment.

23.3 Services provided by an international airport at Wilton

An airport at the Wilton site would be developed to cater for both international and domestic services.

In 2040, a Wilton airport servicing approximately 20 million passengers per annum is forecast to cater for 139 domestic and short to medium-haul international flights per day. The majority of services will be domestic, with the airport forecast to cater for 13 domestic locations and 6 international locations including New Zealand, South East Asia and India.

Melbourne (48 flights per day) and Brisbane (20 flights per day) will be the most frequently serviced domestic locations. Auckland (6 flights per day) and Christchurch (4 per day) are expected to be the most frequently serviced international locations.[390]

Table 70 shows the services that an airport at Wilton is forecast to provide in 2060.

Table 70: Indicative daily services provided at a competitive Wilton airport

Destination	2060	
	No. Airlines	Frequency
Domestic		
Brisbane	3	32
Gold Coast	3	15
Sunshine Coast	2	4
Cairns	3	7
Townsville	1	2
Melbourne	Multiple	58
Adelaide	3	12
Canberra	2	4
Hobart	2	7
Darwin	2	4
Perth	3	11
International		
China	Multiple	14
Japan	2	6
Korea	2	2
Taiwan	2	2
Malaysia	2	3
Indonesia	1	1
Thailand	2	2
Vietnam	1	1
Philippines	1	1
India	Multiple	12
Sri Lanka	2	3
Europe	Multiple	7
Other (e.g. South America)	Multiple	5
North America	Multiple	6
Auckland	2	8
Christchurch	2	8
Wellington	2	4
Queenstown	2	3
Regional		
Albury Wodonga	2	3

[389] This is an average of the percentage increase in travel time to each of the areas listed in the table
[390] Booz & Co

Destination	2060	
	No. Airlines	Frequency
Dubbo	2	3
Orange	1	2
Wagga Wagga	1	1
Lismore	1	1

Source: Booz & Co

By 2060 the number of passenger aircraft movements will increase to:

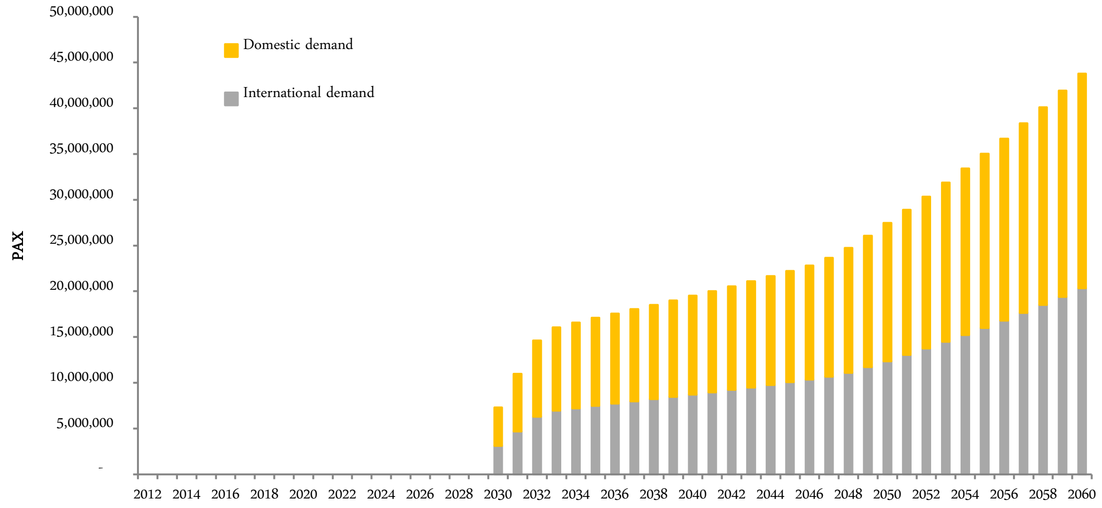
- ► 10 regional flights servicing 5 locations
- ► 156 domestic flights servicing 11 locations
- ► 88 international flights servicing 18 locations

Additionally, by 2060 Wilton is forecast to service 12 dedicated international freighters, 12 domestic freighters and 11 general aviation flights on a daily basis.

23.4 Passenger demand

The demand analysis undertaken by Booz & Co found that 7.3 million passengers will use aviation services at a Wilton airport when it opens in 2030, increasing to 19.5 million PAX by 2040 and ultimately 44.2 million in 2060. Figure 95 presents the annual demand for aviation services at an airport at Wilton with respect to total annual PAX, domestic/regional PAX, and international PAX. As can be seen, domestic and regional transport constitutes the majority of the airport's business, with international travel a significant source of demand, particularly later in the evaluation period.

Figure 95: Wilton demand forecasts (domestic and international)

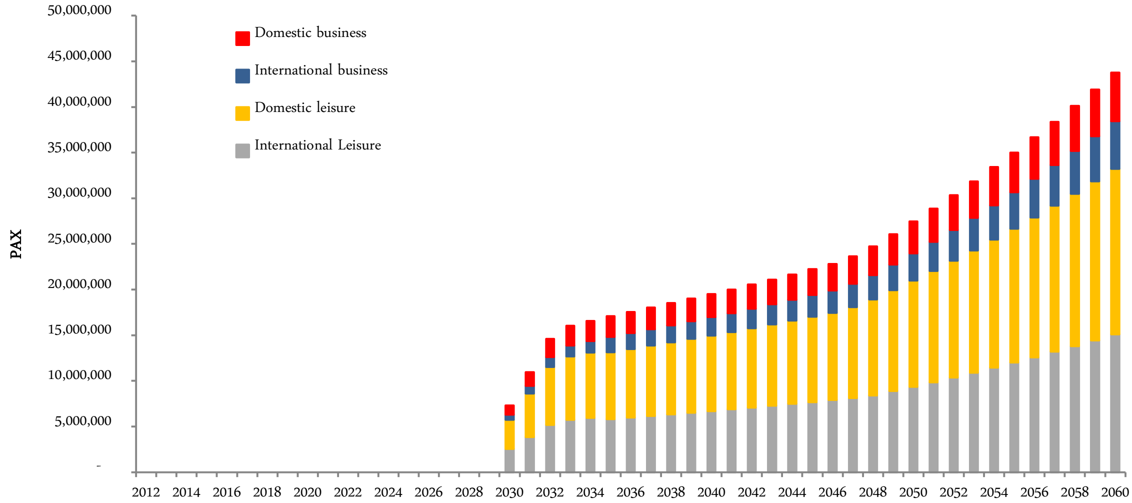


Source: Booz & Co

This analysis forecasts that approximately 42 % of passengers who acquire aviation services at an airport developed at Wilton when it is first opened will be accessing international locations, increasing to 45 % by 2040 and ultimately 46 % in 2060.

This analysis has found that between 75% and 79% of passengers will require aviation services for leisure purposes, and 21% and 25% for business purposes at an airport developed at Wilton. Furthermore, between 74% and 83% of international passengers and between 76% and 77% of domestic passengers that use the airport will be travelling for leisure purposes. The figure below presents annual demand for aviation services at Wilton, characterised by trip purpose between leisure and business.

Figure 96: Wilton demand forecasts (domestic, international, business and leisure)



Source: Booz & Co.

23.4.1 Origins/destinations of passengers within Sydney

A breakdown of the origin/destination of passenger aviation demand both within the Sydney basin as outside Sydney can be seen in Table 71.

Table 71: Origin/destination of aviation passengers (within Sydney basin)

	2030 demand				2060 demand			
	KSA		Wilton		KSA		Wilton	
	International	Domestic	International	Domestic	International	Domestic	International	Domestic
North East	14%	14%	11%	10%	13%	14%	10%	10%
Metro Sydney	52%	56%	31%	31%	56%	56%	35%	30%
South and South West	10%	7%	18%	20%	9%	7%	17%	20%
West Central	11%	9%	20%	20%	10%	9%	19%	20%
North and North West	10%	10%	14%	14%	10%	10%	13%	14%
Newcastle	2%	2%	4%	4%	2%	2%	3%	4%
Wollongong	0%	0%	0%	0%	0%	0%	0%	0%
Canberra	0%	0%	0%	0%	0%	0%	0%	0%
West	0%	1%	1%	2%	0%	1%	1%	2%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Booz & Co

The greatest number of passengers that will use a Wilton airport for both domestic and international flights will come from Metropolitan and south and south west Sydney. This is because Metropolitan Sydney has a relatively high level of aviation demand, and south and south west Sydney residents will use a proposed Wilton airport due to its convenient location.

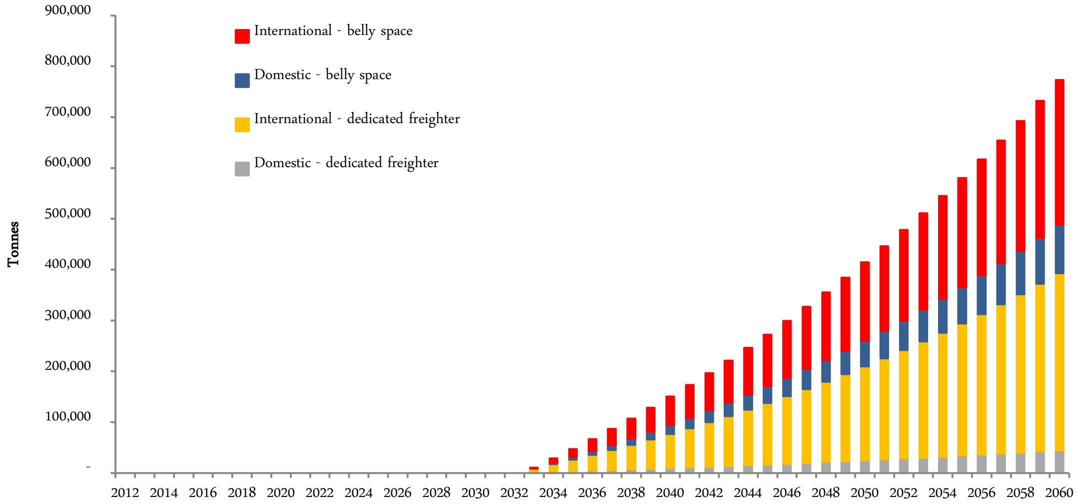
Table 71 indicates that the mix of passengers that will use an airport at Wilton will come from a more diverse set of locations relative to KSA, with more than half of all domestic and international passengers of KSA originating from or destined for Metropolitan Sydney. This high level of demand from this area represents the large tourist and business travel market that will prefer to use the services of KSA over an alternative airport at Wilton because of KSA's close proximity to the city.

23.5 Freight demand

It is estimated that 150,000 tonnes of freight will pass through the airport by 2040, increasing to 773,000 tonnes in 2060.[391]

The type of freight that will use the services of this airport includes both freight carried on passenger services and dedicated freighter services. Figure 97 provides a breakdown of the freight throughput, in tonnes per annum, by type of freight.

Figure 97: Wilton freight demand forecasts (domestic, international, dedicated and non-dedicated)



Source: Booz & Co

Between 82% and 85% of freight that is forecast to go through a secondary airport at Wilton will either originate from or be destined for international locations. Furthermore, it is estimated that approximately 51% of all freight movements to the airport will be through dedicated freight providers, with 49% of freight movements through civil aviation belly space.

[391] Booz & Co– it is assumed within analysis that there will be no transfer of dedicated freight from KSA to an alternative airport site

24. Operational impacts of a Wilton airport

This chapter of the report identifies and analyses a number of strategic, environmental and social issues regarding the development and operation of an airport at Wilton.

This report builds on the analysis that was undertaken by the Joint Study, taking into account some additional impacts as well as looking at the time series implications of these factors where applicable. The results in this section draw upon analysis undertaken by WorleyParsons and set out in detail at Appendix B.

It should be noted that the environmental and social issues identified and analysed are directly related to the airport footprint and runway orientation and that the impacts assessed in this section are based on the airport footprint and runway orientation shown in chapter 22.

24.1 Environmental

A number of environmental issues will impact on the ultimate success of an airport developed in the region. These environmental issues have a range of impacts on the acceptance of an airport operating within the region. The environmental factors analysed for this report include:

- Landscape and visual effects
- Air quality
- Drainage and water quality
- Flora and fauna species within the airport footprint.[392]

24.1.1 Landscape and visual effects

As part of the 1985 Second Sydney Airport Site Selection Programme, a Draft Environmental Impact Statement (Draft EIS) was prepared. The Draft EIS analysed the visual quality of the study area and concluded that “the proposed site does not contain any significant or prominent features that can be viewed from public roads in the area. Over 80% of the site is classified as being of minimal landscape or visual quality. The only distinctive landscape and visual features consist of a small part of Cascade Creek and a small section of escarpment on the eastern boundary which forms part of the Wallandoola Gorge. However, these cannot be seen from any public road and occupy only about 5% of the site”.[393]

The overall conclusion in relation to the visual impact of airport development at Wilton was: “The site’s landscape and visual character would be irreversibly altered by airport construction, as it would be transformed from its present largely natural vegetated form to one that had marked linear and block built forms surrounded by areas of natural landscape to the east, west and south. These forms would dominate the landscape when viewed from the air but would be made aesthetically acceptable when viewed from ground level by careful design and extensive landscaping and tree planting around major buildings and car parks. During the operational phase it might be necessary to selectively clear vegetation impinging on the required approach part clearance surface about 2km from the eastern end of the long runway. However, the effect of this is considered to be minimal, as it would involve only a small area of land and this would not need to be totally cleared of all vegetation”.[394]

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[392] This analysis looked at the overall environmental impacts of an airport and did not look to quantify these impacts in order to provide a level of subjective assessment within the decision making process
[393] Draft EIS, Second Sydney Airport Site Selection Programme (1985), p. 512
[394] Ibid., p. 515

24.1.2 Air quality

Air pollution is one of the main negative impacts associated with the construction and operation of an airport.[395] Despite modern aircraft becoming increasingly fuel efficient, the rapid growth of air travel in recent years has contributed to an increase in total aviation emissions, accounting for 3% of total European Union greenhouse gas emissions.[396] For example, a seven-hour return flight generates approximately the same level of emissions as the average household in a developed country emits through heating for an entire year. [397]

Due to this, and the increasing social concern for the environment, a range of government legislation applies to air quality for the construction and operation of an airport.

This section provides a high-level quantitative analysis of the additional air pollutants that will be released through the operational phases of an airport development. Construction related emissions (for example, from land clearing and earthworks) were not considered in detail as these emissions are likely to be immaterial.

Emissions of five of the six NEPM (Ambient Air) pollutants were assessed for airport operations.

The pollutants assessed in this analysis included nitrogen oxides, particulate matter PM_{10},[398] sulphur dioxide, carbon monoxide and hydrocarbons. The air emissions were divided into three categories: aircraft emissions, ground-based aircraft handling emissions and increased road traffic emissions.[399]

The air emissions from all sources in relation to the proposed airports at Wilton are summarized in Table 72.

Table 72: Calculated impact of Wilton airport on regional air emissions[400]

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Total Sydney Basin emissions (tonnes/year)	555,357	94,353	13,833	24,004	164,822
All Wilton airport related emissions (tonnes/year)	23,659	8,174	352	179	1,847
Percentage increase due to proposed airport	4.1%	8.0%	2.5%	0.7%	1.1%

Source: WorleyParsons calculations and Department of Environment and Climate Change NSW, Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, Criteria Pollutant Emissions for all Sectors: Results, 2007, http://www.environment.nsw.gov.au/resources/air/tr1aei0712.pdf

This analysis has found that the additional air emissions that result from a second airport will make a small contribution to four of the NEPM pollutants and total hydrocarbons in the Sydney region. The analysis presented here is conservative and uses the maximum number of passenger and aircraft movements forecast for 2060. One of the key uncertainties is the volume of the additional vehicle traffic that will be generated by the various airport developments near the proposed airport.

The largest impact from the Wilton option is expected to be the 8% to 9% increase in NOx emissions due to the rise in motor vehicle trips by passengers and employees. As NOx is a precursor for the formation of photochemical smog, such an increase will likely lead to a reduction in air quality. However, the precise nature of the impacts on local and regional air quality cannot be accurately quantified.

One of the complexities is the movement of clean and polluted air parcels over the site and the potential for these to produce additional air pollution. The flow of pollution out of the airport site into the Sydney and Hawkesbury basins is governed by a number of drainage flows. The present frequencies at which these drainage flows operate are not known. The present frequency of temperature inversions in Wilton is also not precisely known (inversions tend to isolate air emissions near their point of origin). The air quality issue is of concern as relatively high ozone levels are currently measured in semi-rural areas near Wilton, such as Bargo and Oakdale.

To resolve the complexities of air pollution formation in the vicinity of the airport site, it is recommended that monitoring of ambient meteorological conditions and sampling of pollutants over a 12-month period be carried out. This is especially important in the case

[395] Analysis undertaken by WorleyParsons
[396] European Union Press Release, *Climate Change: Commission proposes bringing air transport into EU Emissions Trading Scheme*, 20 December 2006
[397] European Union Press Release, *Climate Change: Commission proposes bringing air transport into EU Emissions Trading Scheme*, 20 December 2006
[398] Particulate matter of 10 micrometers or less in diameter
[399] Assessment of ozone levels as a result of the operation of a second airport is beyond the scope of this study. Ozone is a secondary pollutant and its concentrations at a particular site are governed by a combination of complex photochemical processes and prevailing meteorological conditions. Lead levels were not assessed as they are presently well below the NEPM standards and they are currently not monitored in NSW.
[400] WorleyParsons analysis only determined the local air quality impacts rather than wider national/global impacts as a result of the development of the airport

of Wilton as the nearest monitoring site is 27 km away. Detailed dispersion modeling should also be carried out to determine the temporal and geographical extent to which air emissions from the site will impact on the Sydney basin. [401]

Note that the above figures are based on the existence of a fully operational airport with a capacity of 70 million passengers. As such, these air pollution levels will not occur at the opening of the airport in 2030. Instead it will grow over time. There is not a one-to-one relationship between passenger throughput and air emissions, as air emissions are impacted by the following factors:

► Congestion and ease of movement on the supporting transport network

► Efficiency of the aviation services at the airport.

24.1.3 Drainage and water quality

This section provides a brief summary of how an operational airport will impact existing surface water and ground water systems and the potential for flooding, and the measures required to protect water quality within the surrounding areas.

► All waterways draining to the Drinking Water Catchment were previously classified as Class S waters (*Specially Protected waters*, as per the system in use at the time). This includes all waterways in the vicinity of the site, other than Allens Creek and other minor tributaries, draining to the Nepean River system downstream from the water supply off-take weirs. Allens Creek and the downstream reaches of the Nepean River system were classified as Class P waters (*Protected waters*).

► Treatment of clean-water runoff would be via small retention ponds as part of a first flush system. Contaminated stormwater would be treated appropriately prior to disposal, potentially using a separate first flush system, with subsequent runoff to the clean stormwater treatment system. [402]

► All stormwater from airport areas (plus treated wastewater) may be collected and treated and eventually discharged to Allens Creek at the northern corner of the site and then discharged to the Nepean River system downstream from the water supply off-takes.

► Accordingly, discharge to the Drinking Water Catchment could be avoided, including during all rainfall events up to the Probable Maximum Precipitation event.

► However, in terms of the discharge of untreated stormwater during extreme storm events, the possibility of discharging excess flow into the Drinking Water Catchment (that is, the flow above a peak 20 or 100 year ARI flow threshold) was raised with the Sydney Catchment Authority (SCA). Any discharge will only occur once the threshold event has been exceeded and only following the diversion of initial flows to suitable first-flush systems and Allens Creek as part of the stormwater treatment system.

► A large retarding dam may be designed such that downstream peak flows do not exceed existing flows during events up to and including a 100 year ARI event.

The potential contaminants in runoff and effluent as a result of the construction and operation of an airport are set out in Table 73 .

Table 73: source and type of potential water contaminants

Contaminant	Source
Sediment	Erosion, Earthworks
Nutrients	Sediment, Fertilisers, Sewage
Contaminated food/water	Kitchen waste from international flight
Sulphuric Acid	Wet oil batteries used for standby power supplied
Emulsified oil, Grease, Solvent Cleaners	Workshops and aircraft maintenance
Detergents	Aircraft washdown, service and maintenance areas
Paint Strippers	Maintenance
Acid, fluorocarbon and Hydrocarbon Solvents	Fire-fighting
Trade Wastes	Kitchens
Aircraft Fuel	Fuel storage, refuelling
Rubber Detritus	Tyre wear and tear
Pesticides/herbicides	Ground maintenance

[401] Further data regarding the impacts of air quality as a result of the Wilton airport development can be found within Appendix D
[402] Based on industry standard and DECCW water quality requirements

Heavy Metals	Aircraft/vehicle wear and tear

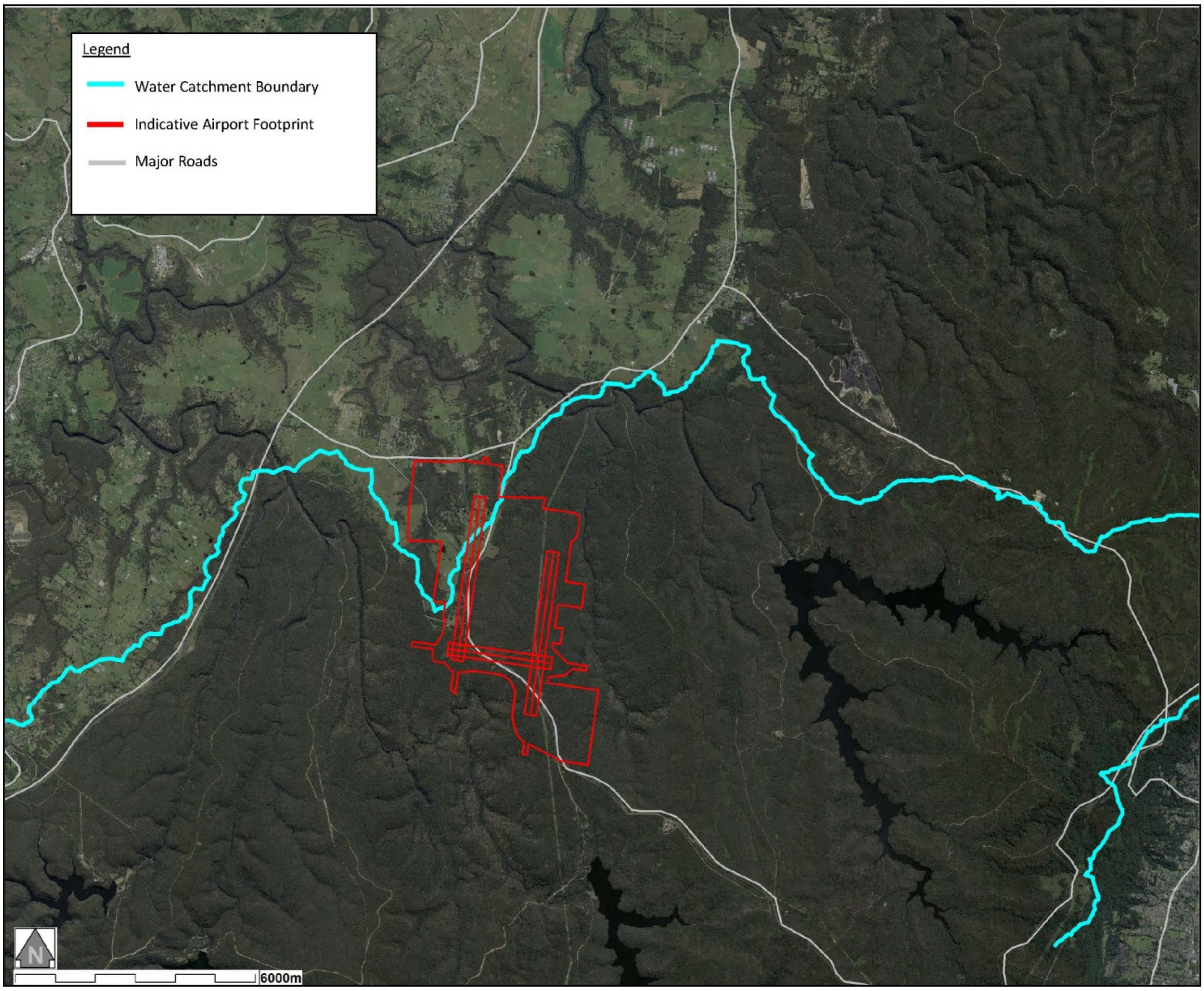
Source: WorleyParsons analysis

Measures to minimise the potential impacts of contaminants in stormwater runoff could be taken via a treatment train prior to discharge. A typical treatment train involves stormwater being diverted to a first flush system, such as a retention pond, where initial runoff (which is considered to be the most polluted) is retained. Additional runoff could be directed to stormwater retarding basins, which could be designed to contain the peak flow of a storm and ensure that the discharge from the site does not exceed the present peak flows from such an event.[403]

Other additional water quality treatment measures will include rainwater tanks, swales, gross pollutant traps and hydrocarbon separators. [404]

A map of water catchments within close proximity of the site is shown in Figure 98.

Figure 98: Water Catchment Boundary



Source: WorleyParsons

24.1.4 Flora and fauna species within footprint

WorleyParsons undertook an EPBC search which revealed the likely presence of several Endangered Ecological Communities (EECs) in the Wilton study area, as shown in Table 74.

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403 Based on industry standard and DECCW water quality requirements

404 Further information regarding the impacts of water quality as a result of the Wilton airport development can be found within Appendix D

Table 74: Flora and fauna within footprint

Name	Conservation Status EPBC Act
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically endangered
Shale/Sandstone Transition Forest	Endangered
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically endangered
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered
Coastal Upland Swamp in the Sydney Basin bioregion	-

Source: WorleyParsons

A full flora and fauna impact assessment and species impact statement (SIS) will be required as part of a potential Environmental Impact Statement conducted to comply with Commonwealth and NSW legislation. This statement will require an assessment of the potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance. The findings of this analysis are set out below

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest was formerly extensive across the Cumberland Plain, but now occurs as mostly small patches. The Federal Environment Minister listed the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest as a critically endangered ecological community in December 2009. The advice by the Threatened Species Scientific Committee indicated that this ecological community is critically endangered because it has a very restricted distribution, faces significant ongoing threats and has undergone a very severe reduction in its integrity. The committee also found that the ecological community had undergone a severe decline in its extent and that it was experiencing a substantial rate of continuing detrimental change.

The local ecological communities

The ecological community Shale/Sandstone Transition Forest (SSTF) is listed as endangered under the EPBC Act and the TSC Act. It is restricted to transitional areas between the clay soils derived from Wianamatta shale and sandy soils derived from Hawkesbury sandstone within the Sydney Basin Bioregion. The SSTF is a naturally restricted ecological community that has declined significantly in extent and, due to its location within the Sydney Basin Bioregion, is subject to ongoing threatening processes (including clearing, weed infestation and changed fire regimes). These threats reduce the community's regeneration processes.

The ecological community known as 'Turpentine-Ironbark Forest in the Sydney Basin Bioregion' is listed as critically Endangered under the EPBC Act and endangered under the TSC Act. The Turpentine-Ironbark Forest ecological community listed under the EPBC Act is narrower in scope than the Sydney Turpentine-Ironbark Forest and Blue Mountains Shale Cap Forest communities listed under the TSC Act. The first includes only remnant patches that meet specific condition criteria, including patch size and canopy cover. The latter two include all remnants of Turpentine-Ironbark Forest and Blue Mountains Shale Cap Forest vegetation irrespective of the size of a remnant patch or its condition.

The Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion ecological community is listed as endangered under the EPBC Act. Since January 2011, the ecological community incorporates two NSW-listed endangered ecological communities: ‘Robertson Basalt Tall Open Forest in the Sydney Basin Bioregion’ and ‘Mt Gibraltar Forest in the Sydney Basin Bioregion.

Upland Swamps have been identified as a priority fauna habitat as they contain a diverse and unique array of fauna, many of which are of conservation concern. These swamps are key habitat for at least 12 of the most-threatened fauna species, including the Beautiful Firetail, Eastern Bristlebird and Giant Burrowing Frog.

The Cumberland Koala Linkage

The Cumberland Koala Linkage consists of linked remnant vegetation around the edge of the Cumberland Plain, which provides a connection of suitable habitat between the four koala colonies at Wedderburn, Avon/Nepean, south Nattai and Glenbrook. It is probable that these koala colonies were once part of the same population, but have been fragmented by development on the Cumberland Plain.

To the south of the Study Area, these colonies may be linked to populations in the Southern Highlands and Wollondilly. The koala populations at Avon-Nepean and southern Nattai, like those at Wedderburn and in the Lower Blue Mountains, appear to be relatively small and their continued survival will be enhanced by ensuring gene-flow between these colonies. Gene-flow will more likely occur if suitable vegetation connects the colonies, enabling dispersing koalas to readily migrate from one area to another.

Mitigate and management

The key measure used to prevent, mitigate and manage potential impacts to all vegetation clearing – particularly, Coastal Upland Swamps, Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest, Shale/Sandstone Transition Forest, Turpentine-Ironbark Forest, Upland Basalt Eucalypt Forest and Cumberland Koala Linkage – involves the retention and protection of substantial areas of these communities, particularly those areas with the greatest biodiversity value and ecological viability. Other measures include:

- Fauna relocation and corridors
- Environmental offsets.

The preservation of woodland remnants, such as these ecological communities, will contribute to native vegetation corridors that will improve quality of life as the area becomes increasingly urbanised. It will also help to maintain valuable connectivity among native vegetation remnants that are essential to retain the fauna that live or migrate through the region. For example, birds and bats, including some threatened species, use these ecological communities to move from north to south through western Sydney and beyond, and from east to west across the Great Dividing Range to the coast as the seasons change.

Overall the EPBC search found that there could be 24 bird, 2 fish, 6 frog, 16 mammal and 2 reptile threatened species that may exist within the footprint of the site.[405] A complete list of threatened species found by the EPBC search is contained in Appendix D.

A number of measures can be undertaken to minimise the impact on endangered flora and fauna as a result of the development of a Wilton airport.

24.2 Direct social impact

The development of an airport will have a direct social impact on the local region, notably through:[406]

- Impacts to local heritage
- Noise
- Displacement of local residents
- Amenity
- Development and spatial distribution of the region's commercial/industrial businesses.

24.2.1 Heritage

The Joint Study, which found no European heritage items within the proposed airport footprint.[407] WorleyParsons preliminary analysis indicates that 13 Aboriginal heritage sites are within the proposed airport footprint. [408]

The provision of likely footprints and the initial identification and location of heritage sites using data provided by the NSW Aboriginal Heritage Information Management System (AHIMS) – along with the findings of the Draft EIS – has established a good basis for the next phase of the review/investigative process. This phase should include further research and field surveys in collaboration/consultation with the relevant Indigenous representatives. It is not possible to conclude one way or the other whether the significance of any of the sites will prevent development associated with the airport. However, it appears unlikely that the Aboriginal sites in the Wilton area would be declared places of 'special significant' under relevant Acts and therefore prevent airport development in Wilton. This comment is based on a review of material in which representations and statements have been made by community members. An issue that will need to be considered is the impact, if any, on the significance of streams, creeks and waterways that may be of heritage significance to the Aboriginal community.

24.2.2 Noise

The noise created as a result of airplanes taking off and landing is one of the major impacts of an airport on the surrounding community.

Residents living in the vicinity of airports or under busy flight routes are exposed to the ongoing impacts of aircraft noise. These effects vary from levels of annoyance to real effects on amenity and health, reducing residents' quality of life and lowering property values.

Elevated sound levels can have various health consequences such as hearing impairment, hypertension, cardiovascular effects, rising blood pressure, annoyance and sleep disturbance. These consequences can then result in stress, increased workplace accidents, reduced performance in school and work and even anti-social behaviour.

These effects have caused multiple examples of community pressures to reduce airport activity or to not build an airport in the first place. Such pressures have been effective in Australia, with the introduction of the *Sydney Curfew Act* in 1995 being just one example.[409]

At existing airports although individual aircraft have become quieter, the number of aircraft movements has increased substantially over time. This, along with the increase in population density, has meant that the number of complaints has grown and that community pressure for operational constraints at airports is coming increasingly from residents living outside the typical high noise

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[405] A full flora and fauna impact assessment and species impact statement (SIS) will be required as part of a potential Environmental Impact Statement conducted to comply with Commonwealth and NSW legislation.

[406] This section of the report only presents the social impacts that are directly associated with the development of the airport. Analysis of a number of wider social impacts that indirectly result from the development of an airport within the region is presented in chapter 26.

[407] European Heritage draft WP19

[408] Aboriginal Cultural Heritage draft WP20

[409] National Aviation Policy White Paper, page 214

impact areas. The source of complaint is now more often about the higher number of over-flights rather than individual noise impacts.[410]

To measure the impact of an operational airport on the local community, WorleyParsons undertook an analysis of the noise impact of an operational airport at Wilton on the surrounding region. This analysis looked at the noise impact on households as well as the likely number of events that will be experienced by local residents.

This section of the report builds on the findings of the previous analysis and highlights the likely noise impact over time, with respect to both ANEF contours and N70 events, as a result of the development of an airport at Wilton. The following measures were analysed:

- The Australian Noise Exposure Forecast (ANEF) is used to regulate aircraft operations and to report on the effects of those activities. This system takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location. Staged noise analysis has not been undertaken for this study.

- N70 events refer to the minimum number of events above 70 decibels one can expect to experience in an average day. A 70 decibel noise impact is equivalent to an operating machine or the noise of a car while driving.

Further information regarding the definition and measurement of these noise impact assessments can be found in Appendix D.

The analysis to date has only been undertaken on the noise impact of the airport at its maximum capacity on the current structure and composition of the population. Therefore, the actual noise impact on the local community will be smaller within the analysis period as the airport scales up its operations to reach capacity.

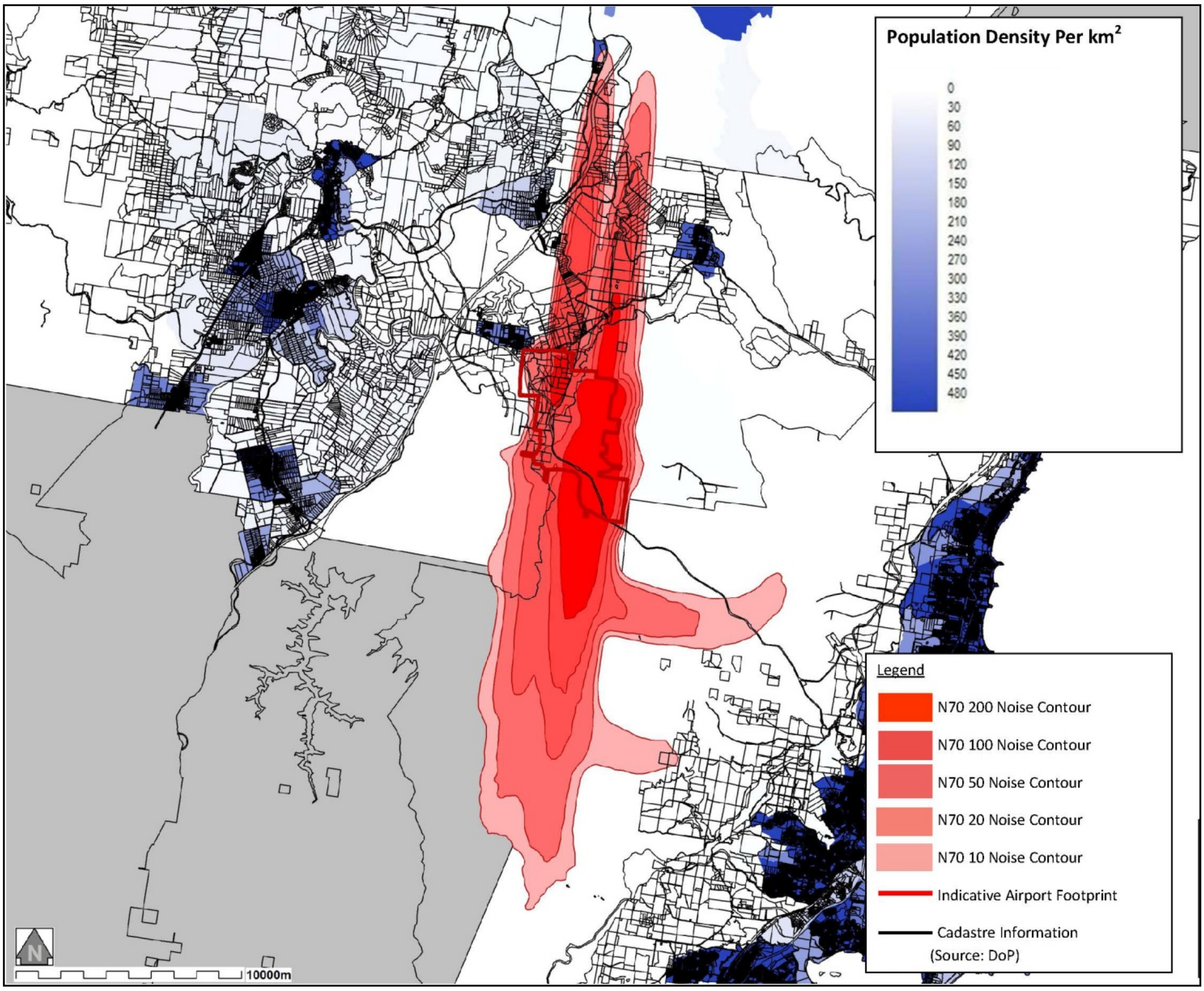
The following sections highlight the forecast noise impact of an airport at Wilton on the local community.

[410] National Aviation Policy White Paper, page 214

24.2.2.1 N70 noise impact

Figure 99 displays a range of N70 noise contours for the proposed fully operational airport (70 million passengers) at Wilton.

Figure 99: Wilton airport noise impact



Source: AMPC

The N70 events will primarily be directed toward the north-east and south-west of the site due to the direction of the aircraft runways. Immediately, in either direction, the population levels that will be affected by the most severe aircraft noise are relatively low.

The map illustrates that some light to moderately populated areas to the north of the proposed site could be impacted by the noise emitted by aircraft. However, the remainder of the surrounding areas have low population densities. This analysis has found that by 2060 a total of 181 persons would experience 100 additional N70 events every day, while 264 persons would experience 50 additional N70 events per day and 817 persons would experience 10 additional N70 events each day.[411] Table 170 lists all N70 events and is included in Appendix D.

[411] WorleyParsons analysis of ABS data, Census 2006

24.2.2.2 Australian noise exposure forecast impact of Wilton

Impact of noise over time

The noise generated at the airport is predominantly as a result of aircraft taking off and landing. Therefore, the noise impact of the airport will grow over time in line with the number of services provided (number of aircraft movements).

All of the above noise estimates have been based on an airport operating on the site that will cater for the maximum level of services (the aircraft movements required to support 70 million passenger movements per annum).

The Department of Infrastructure and Transport, with the assistance of WorleyParsons, has undertaken an analysis of the likely number of persons[412] who will be affected by the noise of the airport over the operational period on an ANEF 20 basis.

The findings of this analysis can be seen in the table below.

Table 75: Sound levels of familiar sources

Passenger movements (million PAX)	Aircraft movements (per day)	Population under ANEF 20
5	74	55
20	280	120
70	824	290

Source: Commonwealth Department of Infrastructure and Transport and WorleyParsons

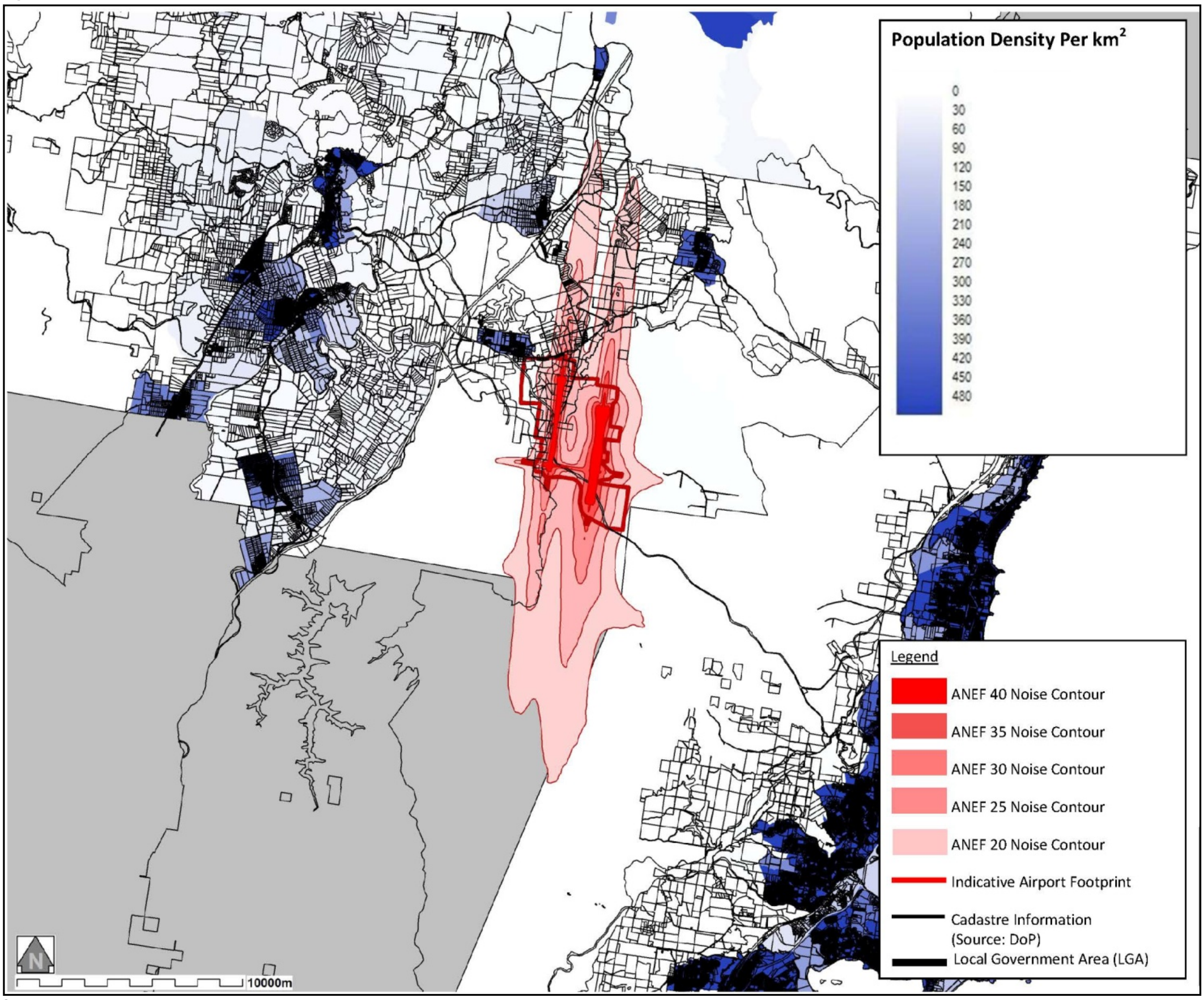
This analysis found that when the airport first commences operations, up to 55 people will be affected.[413] By 2040, when the airport is servicing up to 20 million passengers per year with up to 120 services per day, up to 605 people will be adversely affected by the additional noise. Finally, between 2041 and 2060 when the airport is servicing between 20 million and 70 million passenger movements per annum, up to 290 persons will be adversely affected by the additional noise created from the operational airport.[414]

Maximum noise impact

Figure 100 displays a range of ANEF noise contours for the proposed fully operational airport (70 million passengers per annum) at Wilton.

[412] Based on current population
[413] Reside within the ANEF 20 contour
[414] This analysis is based on the Department's classification of different airport sizes. Note that the actual services provided at each airport may differ from these classification

Figure 100: ANEF noise impact



Source: WorleyParsons

Based on the fully operational airport of 70 million passengers per annum (ultimate capacity of the airport) – approximately 6 allotments or 321 hectares are currently within the ANEF 40 noise contour. Furthermore, a total of 27 allotments or 1,608 hectares are within the ANEF 30 noise contour and 66 allotments or 4,146 hectares are within the ANEF 25 noise contour.

24.2.2.3 Noise mitigation measures

A range of measures can be undertaken to minimise the impact of noise that will result from an operational airport:

- ► The most obvious, but most costly, mitigation measure is to purchase all lands within a specified ANEF noise contour.
- ► Residential properties within a specified ANEF noise contour can be 'noise proofed'.
- ► Advancements in aircraft engine technology may also provide a reduction in ANEF noise contours.

24.2.3 Displacement

The construction of an airport at Wilton will require a number of properties to be compulsorily acquired the *Land Acquisition Act 1989,* which provides specific powers to the Commonwealth Government to acquire interests in land.[415]

Properties that will have to be acquired as a result of the Wilton airport development includes those properties within the proposed airport site and those properties that fall within specified boundaries around the airport (such as properties within specified ANEF noise contours).

[415] Further information regarding the legislative process for the Government to acquire land through these means can be found in Appendix D.

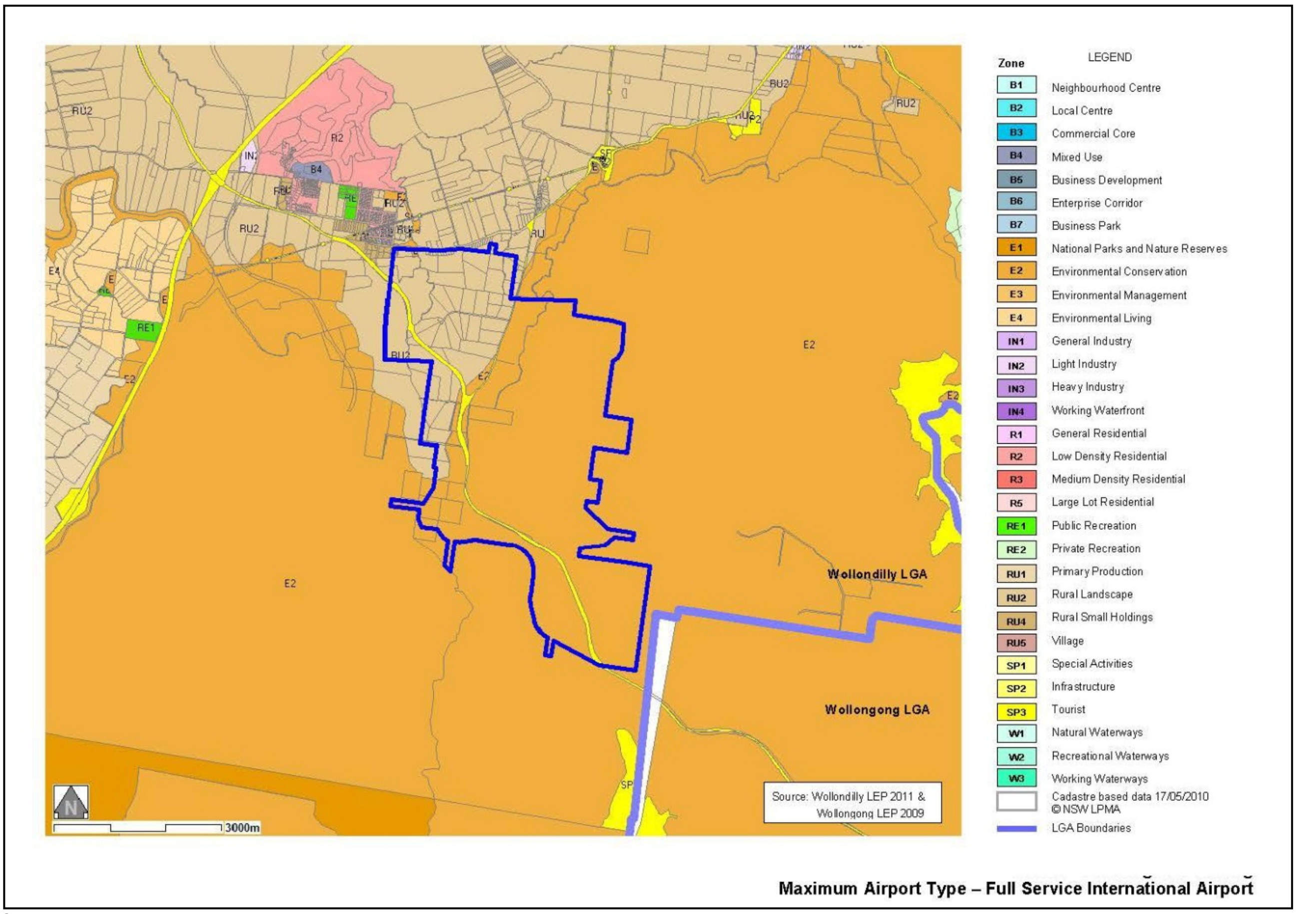
WorleyParsons has undertaken an analysis of the total number of properties that will have to be compulsorily acquired as a result of the development of an airport at Wilton.

24.2.3.1 *Houses within the site*

As described in section 22.1, the general layout of the airport includes a terminal and freight and airport support between the main runways. Aircraft maintenance hangars are to one side. The proposed business park is to the east of the airport entrance, which has good access to Picton Road.

As seen in Figure 101, the proposed footprint of the site will require some property – approximately 90 lots – to be compulsorily acquired as they are located within the potential airport footprint.[416]

Figure 101: Wilton site



Source: WorleyParsons analysis

24.2.3.2 *Houses acquired due to noise impact*

The Department of Infrastructure and Transport has prepared a Discussion Paper[417] that provides a comparison of the planning controls for aircraft noise between a number of countries. In relation to Australia, the paper indicates the following:

- 40 ANEC or greater – no housing
- 30 - 40 ANEC – no new housing
- 25 - 30 ANEC – insulation of existing housing and no new housing
- 20 - 25 ANEC – new housing with insulation
- Less than 20 ANEC – no restrictions.

[416] This estimate of compulsorily acquired lots only applies to this 'reference case' airport configuration as indicated by the Department. The land purchased would differ under alternative configurations
[417] http://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/index.aspx

Table 76 shows that there are approximately 27 allotments[418] above the 30 ANEF noise contour. In line with the Australian Standard AS2021-2000, properties located within ANEC contours 40, 35 and 30 should be acquired by the Commonwealth Government. No new housing should be developed within the ANEF ranges 25-30, and all new houses developed within the ANEF ranges 20-25 must be constructed with insulation.

Table 76: Compulsory acquisition as a result of noise impacts

ANEF	Households within noise footprint[419]	Other Zoning
20	NA	
25	66	54 Rural Landscape 12 Environmental Conservation
30	27	21 Rural Landscape 6 Environmental Conservation
35	15	11 Rural Landscape 4 Environmental Conservation
40	6	4 Rural Landscape 2 Environmental Conservation

Source: WorleyParsons
Note – those properties within the higher ANEF contours are already counted within the lower contours

Even though an airport that is developed within the region will not reach this level of operational output and present this level of noise for over 50 years, it is anticipated that the Government would acquire these houses at the earliest opportunity and put in place relevant procedures to ensure that any residential development within the area will conform with the changing nature of the airport's noise footprint.

24.2.4 Amenity impacts

Throughout an airports lifecycle, the local community will experience a range of amenity impacts. These impacts will differ greatly throughout the various phases of the airports development and operation. As the proposed airport development at the Wilton site is a greenfield development, the development will have significant amenity impact on the local community. Potential impacts that would arise as a result of the development of the proposed Wilton site at each phase include:

- Planning phase - The proposed development would see a dramatic shift in the development planning for not only for the site but also the wider Wilton region. At a local level a number of occupied dwellings and other assets would have to be relocated as a result of land acquisitions for the airport development and surrounding infrastructure. Similarly at a regional level, planning changes would be made to transport infrastructure to facilitate the increased traffic flows caused by the airport.

- Construction phase – as with the construction of any large piece of infrastructure, the construction phase will result in a range of amenity impacts to local and regional residents. These impacts include, noise, dust and traffic disruptions.

- Operational phase - Once the airport at the Wilton site transitions from the construction phase to the operational phase, the nature of the land use would change dramatically, with the introduction aircraft traffic potentially causing noise pollution beyond the immediate airport site location. Similarly, the introduction of aircraft traffic would change the visual amenity of the site and the character of the landscape at Wilton.

24.2.5 Associated development and spatial distribution of region's commercial / industrial businesses

As a core element in a range of supply chains, airports and the infrastructure that supports them can significantly affect the location decisions of firms, leading to a clustering of firms near airports (including within an airport business park precinct) and associated agglomeration and efficiency benefits. This section outlines projected demand and supply for land adjacent to an airport at the Wilton site.

As described in section 6.2, the more businesses that choose to locate near and use the services provided by the airport the more viable the airport is likely to be. Furthermore, the amount of land that is available to be developed around the site, the relative proximity and access of this area to the airport and the availability and quality of other infrastructure will have an impact on the number of businesses that will relocate their operations to this area.

[418] Note that the number of allotments does not equate to the number of households. For the purpose of this exercise we have tallied the number of allotments in which housing is permissible.
[419] Property Impacts draft WP13

24.2.5.1 Supply of land

WorleyParsons has undertaken a preliminary analysis of the land surrounding the site to comment on its potential to meet industrial and business park purposes. This analysis looked at:

- Proximity to airport footprint
- Least fragmented land
- Ability to connect and access existing transport infrastructure
- Current zoning that may not permit 'commercial' and 'industrial' land uses and may require a change in land zoning.

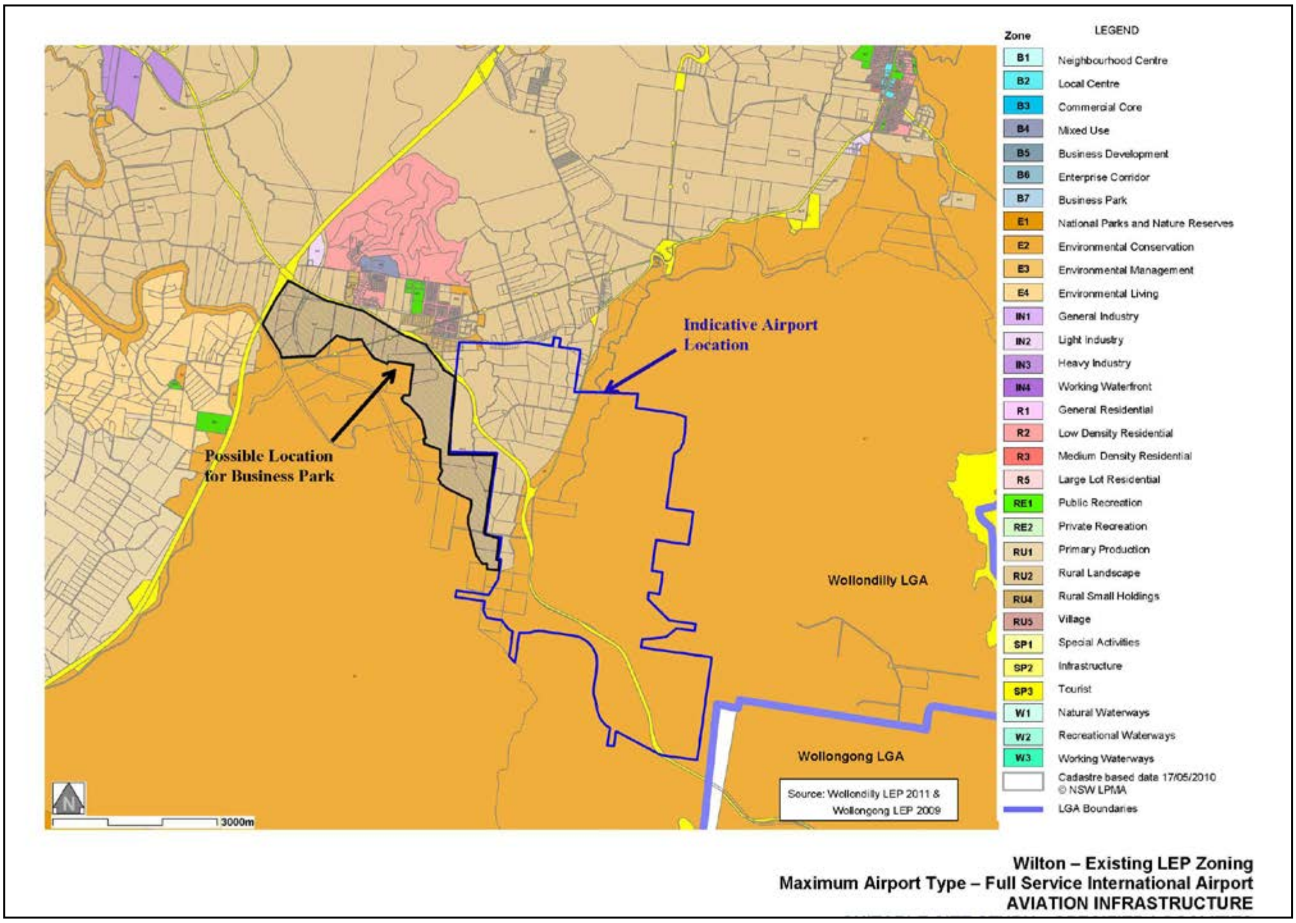
An area enclosed by a radius of approximately 4km from the site centre was investigated to determine its potential use for industrial land and business parks.

The existing zoning surrounding the proposed airport is predominately zoned E2 (Environment Conservation) and RU1 (Primary Production). The villages of Wilton and Douglas Park are located to the north of the site. The current zoning of the land surrounding the potential airport site does not permit development for the purpose of business parks or industrial land uses.

Should the site be selected for use as an airport, there is the potential that some of the land adjoining the site could be assessed and, if suitable, rezoned for the purpose of permitting business parks and industrial land uses. The areas of land to the north–west of the site could be investigated for employment land uses as they are less fragmented than the land to the north, are outside of the drinking water catchment boundary and are located near to the airport site with good connections to existing road infrastructure. This area of land is approximately 444 hectares.

Figure 102 shows the current zoning of land surrounding the potential airport site with the site of a potential business park.

Figure 102: Area around proposed site



Source: WorleyParsons and the Department of Planning and Infrastructure

24.2.5.2 Demand for land

To determine the potential uptake of industrial/commercial development around an airport, an analysis of the demand of such businesses to locate in the region was undertaken. This analysis was undertaken through a search of similar airports internationally and a qualitative analysis of the factors that may entice a business to locate in a specific location within Sydney. See Appendix B for more details on our methodology.

The results of this analysis are shown in Table 77:

Table 77: Land uptake forecasts for Wilton

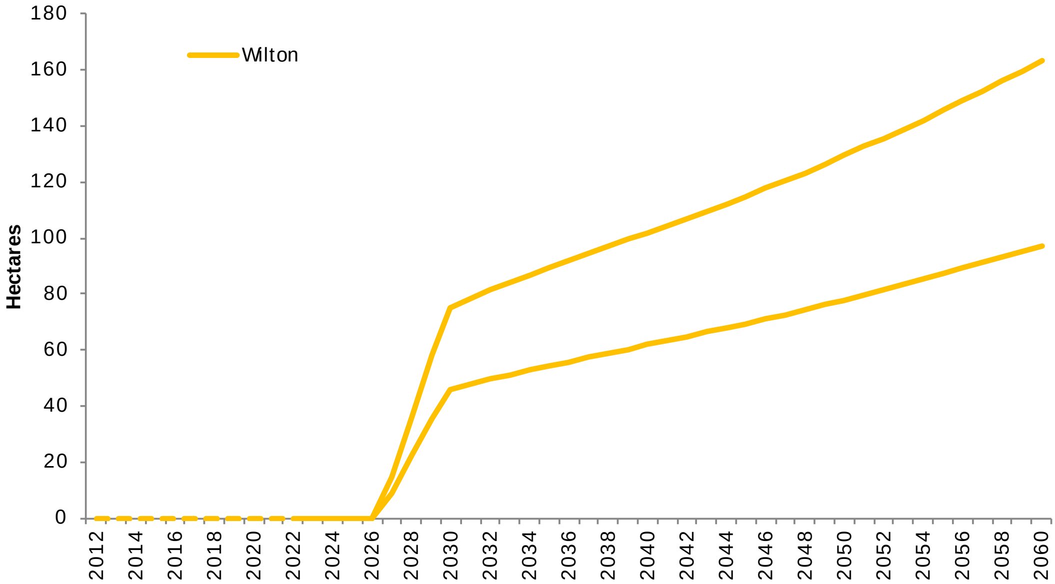
	2035 (ha)	2050 (ha)	2060 (ha)
Low	54	78	97
High	89	129	163

Source: Booz & Co data, analysis by Ernst & Young

The results show that by 2035 the level of demand for industrial land will be in the order of 54 to 89 hectares. With the anticipated increases in airport activity, this land use demand is forecast to grow to roughly 97 to 63 hectares by 2060. Demand for industrial land around Wilton has been adversely affected due to its distance to the Sydney CBD, which is close to double that of Badgerys Creek or Richmond.

Figure 103 presents the results of applying the methodology for determining the demand for land around an airport at Wilton over the analysis period.

Figure 103: Forecast demand for land use at Wilton



Source: Booz & Co data, analysis by Ernst & Young (high and low estimates)

Figure 103 shows the range and expected levels of demand for industrial land at the proposed site. Analysing the strengths and weaknesses of the site, can help to determine where demand could be greatest. The strengths of the region are:

- Good north-south transport links
- Forecast demand for aviation services.

The comparative weaknesses of the regions include:

- Limited labour supply
- Distance from existing supply chain
- Relatively expensive land
- Limited infrastructure provision.

Accordingly, it is likely that the demand for industrial land will most probably be in the lower half of the forecast presented above range. Indeed, the potential demand for land for the development of industrial and commercial businesses in close proximity to the airport is unlikely to exceed potential supply in the medium to long run by a significant margin.

24.2.5.3 Associated sub-regional business development

Those businesses that choose to locate in close proximity to the airport could either be associated (will not be realised without the airport) or enticed to move to the area (will have located within the local or wider region, but choose to locate or relocate close to the airport).

Those businesses that will be developed purely as a result of the operational airport will produce a substantial impact on the economy, with the turnover they generate resulting in a near 'one for one' benefit to the economy as a whole.

A number of benefits are associated with a business centre such as that which is likely to develop around an international airport at Wilton, including:

- Clustering and agglomeration of 'like minded' businesses – The close location of simular businesses can result in a variety of economic benefits including sharing resources and reducing the cost of inputs (for example, lower transportation costs).

- Increase competitiveness of other centres – Competition between major centres can increase competition, which will increase choice for consumers and reduce the effective price of goods and/or services.

- Improvement in the use of land – The development of such a centre can encourage businesses and industries with high land use and low output and with operations that are not location-dependent to locate in a less developed area, allowing higher value operations to move into more appropriate locations. An example of this is the movement of industrial businesses away from a town centre to allow residential and commercial development.

Those businesses that will locate in close proximity to the airport (and that are likely not to base themselves within the wider region if the airport is not developed) are most likely to be aviation-oriented (such as aviation engineers and catering services). Businesses that are likely to move to the area that otherwise would have been located somewhere else within the wider region include those engaged in R&D activities. Finally, those businesses that are likely to locate in close proximity to the airport that would otherwise have been located within the region in any case are likely to include retail and hospitality services.

25. Employment impacts of a Wilton airport

The development of an airport and associated industrial/commercial development will result in new employment opportunities during construction and operational phases. These employment opportunities will be realised through direct employment at the airport, as well as indirect employment as a result of increased business activity within the surrounding region.

This section of the report looks at the aggregate level of direct and indirect employment that is likely as a result of the construction and operation of a Wilton airport. It also analyses the types of employment opportunities likely to be generated and the sources of workers that will be needed.

25.1 Direct employment

The development of an airport will result in a number of additional employment opportunities throughout both the construction and operation phases.

25.1.1 Construction employment

The construction of an international airport and its supporting infrastructure at Wilton will be one of the largest single capital investments in Australia's history. Such a large investment will result in a large number of people being employed to build the underlying infrastructure.

Ernst & Young have undertaken a calculation to determine the potential number of persons that will be employed on the construction of an airport and supporting infrastructure over the initial construction period. This calculation is based on the capital expenditure on infrastructure and the number of construction workers typically required to build these types of assets[420] (this information has been sourced from Treasury NSW).[421] The results from this analysis have been compared to a number of domestic and international case studies.[422]

We have calculated that, on average, approximately 2,400 to 3,400 FTE persons will be employed to build an airport over the construction period. We estimate that a further 1,300 to 1,800 FTE persons will be employed to construct the infrastructure necessary to support an operational airport (such as road and rail infrastructure) as described in section 22.4.

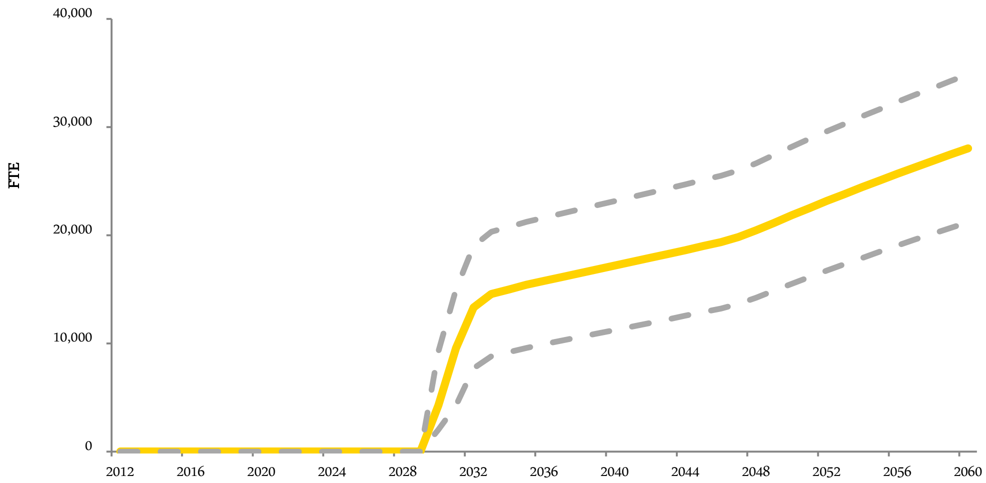
25.1.2 Operational employment

The ongoing operations at the airport will create a range of direct employment opportunities at the airport that will otherwise not be generated within the region.

The number and type of employees that will be directly employed in the operation of an airport has been determined based on forecast airport activity (passenger and freight throughput) and the relationship between employment and airport activity identified from a sample of other domestic and international airports.[423] The number of persons forecast to be directly employed at the airport is shown in Figure 104.

[420] This analysis only looks at the employment and impacts of the initial construction phase and does not analyse the potential for further employment as a result of periodic renewal of the asset.
[421] http://www.treasury.nsw.gov.au/__data/assets/pdf_file/0020/17309/trp09-3_dnd.pdf
[422] Case studies that were analysed include Brisbane airport second runway, the new Indianapolis Airport development and Tom Bradley International Airport.
[423] Further information regarding the methodology and assumptions utilised in undertaking the evaluation of direct employment at the airport can be found in Appendix B.

Figure 104: Forecasts of direct employment for Wilton



Source: Booz & Co data, analysis by Ernst & Young (upper and lower bounds and median estimate)

Table 78 breaks down the number of full time equivalent (FTE) positions estimated for an operating airport at Wilton.

Table 78: Forecast PAX, Freight and Employment

Year	PAX	Freight (tonnes)	Direct FTE
2035	17,094,050	47,219	15,403
2050	27,598,619	414,642	21,825
2060	44,245,253	772,921	28,027

Source: Booz & Co data, Analysis by Ernst & Young

The number of direct full-time employees at Wilton airport is expected to increase from 15,403 in 2035 to 28,027 in 2060. This represents an 82% increase over 25 years or an average annual growth rate of 3.3%.

As airport activity increases, the airport will benefit from economies of scale whereby direct employment increases at a slower rate than growth in aviation activity. As such, the number of passengers per full time employee is anticipated to grow from 1,110 in 2035 to 1,579 in 2060, representing a 42% increase in efficiency.

25.1.2.1 *Composition of employment*

Based on our analysis of other existing airports, we have been able to disaggregate our forecasts of direct employment into four broad employment categories as follows:

- Passenger employment: airlines, air services, and general aviation
- Freight: this includes employment related to the movement of freight at the airport
- Support services: this includes ground transport, administration, retail, car parking, and security at the airport
- Other services: this includes government services, maintenance and construction at the airport.

Using international observations, we analysed the relationships between airport activity and the proportion of direct employees in each category at the airport. [424] These relationships were then applied to forecast activity levels for Wilton. The results of this analysis are provided in Table 79.

Table 79: Number and proportion of direct employees for each employment category

Year	Passenger facing employment		Freight		Supporting services		Other services	
	No.	%	No.	%	No.	%	No.	%
2035	6,007	39%	82	1%	4,172	27%	5,143	33%
2050	9,634	44%	1,016	5%	5,005	23%	6,170	28%
2060	14,658	52%	2,433	9%	4,898	17%	6,038	22%

Source: Booz & Co data, Analysis by Ernst & Young

424 Further information regarding the methodology and assumptions utilised in undertaking the evaluation of direct employment at the airport can be found in Appendix B

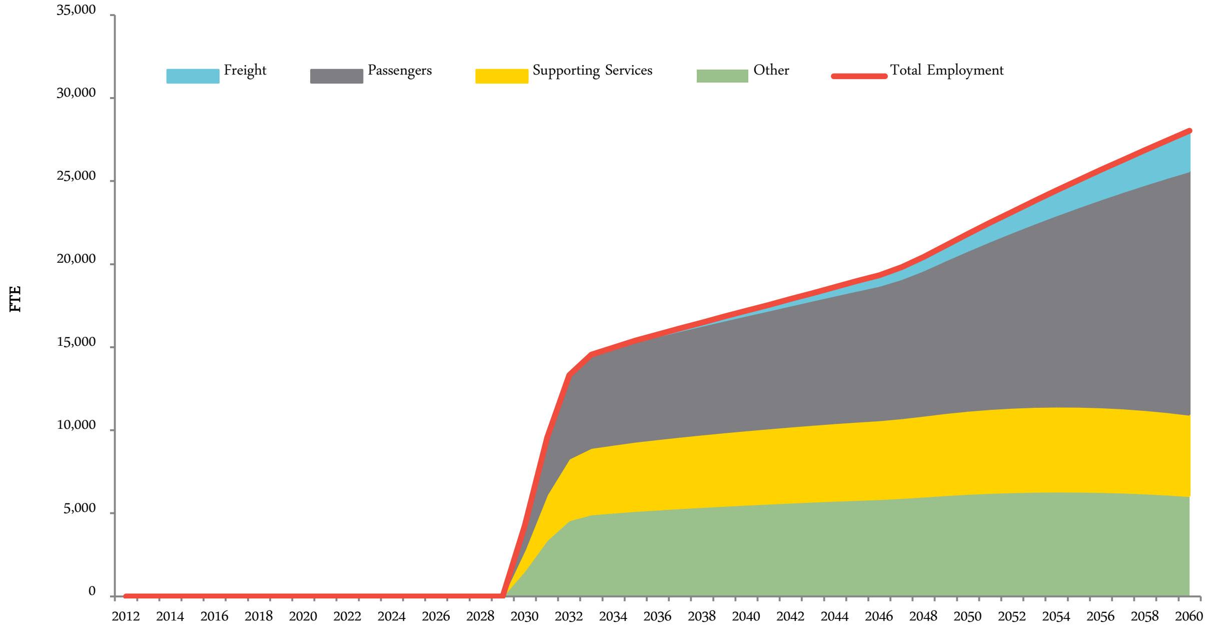
As indicated in the table above, as the airport activity increases, the number and proportion of employees related to passenger and freight services increases. For example, employment in passenger services at Wilton is forecast to increase from 39% of direct employees in 2035 to 52% in 2060.

According to the traffic forecasts, Wilton is not expected to cater for dedicated freight activity until 2033, and our forecasts for dedicated freight related employment are consistent with this timing. However, as freight activity increases, so does the proportion of freight-related employment, accounting for approximately 9% of direct employment by 2060.

The support services and other services categories represent a significant proportion of employment throughout the period. However, these employment categories are also more likely to experience economies of scale as aviation activity increases. Our forecasts for these categories show a slowing rate of growth until 2040 where it peaks.

The results of this analysis and the evolution of forecast employment at Wilton are shown in Figure 105.

Figure 105: Absolute levels of different types of direct employment



Source: Booz & Co data, Analysis by Ernst & Young

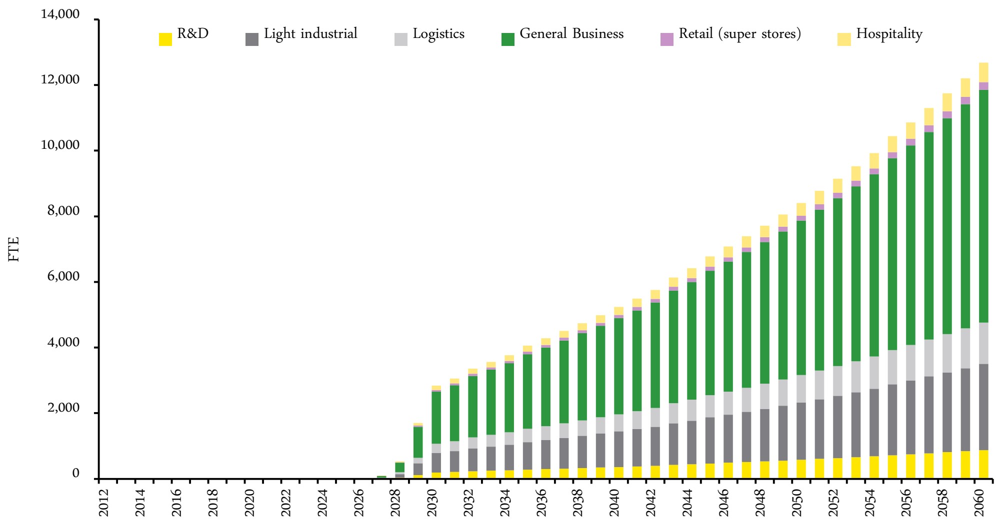
An analysis of the skill level composition of each of these types of jobs has found that approximately 52% to 58% are lower skilled employment opportunities while 42% to 48% are higher skilled employment opportunities over the operational life of the airport.

25.2 Sub-regional (associated) development and employment

An airport also impacts the economy through flow-on effects from 'off-site' businesses in the region that supply the airport and its users or form part of a growing airport 'city' or sub-regional economic centre with close links to the airport. For this study, this is referred to as the associated impact of the airport.

As identified in section 6.2, there is a growing trend of businesses locating in close proximity to airports. The level of industrial/commercial land development around the site at Wilton was estimated based on the 'unconstrained' demand for land in close proximity to the airport and the 'constrained' supply of suitable land parcels. Using this estimated level of industrial/commercial land development around the airport site the number of employees, by type of industry, was calculated using employment density industry benchmarks.[425] The estimated level of employment, by type of industry is shown in Figure 106.

Figure 106: Medium landside commercial/industrial employment projections (FTE)



Source: Ernst & Young analysis[426]

We project that employment in the industrial/commercial developments near the airport will grow to approximately 12,000 employees[427] by 2060.[428]

The general business sector will have the highest employment levels in these industrial/commercial developments, with warehousing/logistics and light industrial also being key employment sectors.

Furthermore, we estimate that the industrial/commercial developments will require approximately 20% higher skilled employees and 80% lower skilled employees.

A number of business activities (and associated employment) will occur within the region and/or the wider Sydney basin irrespective of the development of the airport. However, there are businesses that establish operations around airport sites as a direct result of increased aviation activity, such as logistics and hospitality services. In both instances, the concentration of businesses around airport sites provides benefits to the wider community.[429] As noted earlier, one key benefit is the potential for land releases in other areas to be used for alternative productive uses, including housing, high end retail, or other commercial/industrial uses, as a result of businesses relocating their operations to the airport.

25.3 Total employment

Employment within the region that will occur in conjunction with the development of an airport includes direct employment in constructing or operating of the airport, sub-regional (associated) development and indirect economic activity.

Table 80 summarises the likely total employment generated within the region at different points across the analysis period.

[425] Further information regarding the methodology and values utilised within this calculation can be found within Appendix B
[426] Note that this is a forecast based on a number of variables, in reality the development of industrial and commercial businesses as a result of the airport will likely occur in a staggered step change fashion.
[427] In the medium case scenario – the high and low case scenarios forecast 9,500 and 15,900 FTE employees respectively by 2060
[428] As noted earlier in the report, these jobs do not necessarily represent a net increase in jobs within the region
[429] See chapter 26

Table 80: Total employment (medium estimate)

	Construction[430]		2030		2060	
	Higher skilled	Lower skilled	Higher skilled	Lower skilled	Higher skilled	Lower skilled
Direct - construction	902	3,607				
Direct - operational			2,181	2,080	16,211	11,817
Indirect -associated landside			584	2,256	2,606	10,073
Total	902	3,607	2,764	4,336	18,817	21,890

Source: Ernst & Young analysis

As outlined in section 6.3, not all of these employment opportunities represent new jobs within the region. In other words a number of these business and employment opportunities will reflect a transfer of activity that would have otherwise occurred elsewhere. Analysis of the wider economic impact of the airport development, undertaken by Monash University general equilibrium model has found that the development of a Wilton airport will increase the number of people employed within NSW by 4,200 in 2030 rising to 27,700 in 2060.[431]

Furthermore, additional indirect employment opportunities will be created as a result of the development of an airport. These employment opportunities will arise from increased economic activity at the airport and the spending of wages from direct employment that will ultimately result in increased employment elsewhere within the economy. [432]

The employment and economic activity derived from the development of the airport is expected to support[433] 1,000 to 12,000 jobs[434] within the wider region[435] by 2030 and 16,000 to 27,000 jobs within the wider region by 2060. Therefore as the airport grows in size over the evaluation period it will require a greater level of support from a range of businesses outside of those situated as the business park to support its operations.

25.4 Sources of employment

This section of the report analyses the number of residents (current and future) who will benefit from additional employment opportunities created by the construction and operation of Wilton airport.

The analysis assumes that the majority of people employed at the airport and associated industrial/commercial developments will reside in areas within 30 minutes travel time. As noted in section 6.3.3, this assumption is broadly consistent with the distribution of where employees of KSA reside.

A number of current NSW Government policies, including the State Plan and the Metropolitan Plan, indicate a desire to provide more jobs closer to residents and to reduce the amount of time people spend travelling to work. The benefits of achieving these policies include improved productivity, better infrastructure utilisation, reduced car use, reduced energy consumption, emissions reductions and more active living.[436]

For this analysis, we have assumed that there are three potential primary sources of labour in the study region to support the airport and associated industrial/commercial developments:

- Unemployed residents seeking employment (excluding the natural long-term rate of structural unemployment assumed to be 4.5%)

- Underemployed residents seeking full-time employment (excluding the natural long-term rate of part-time employment assumed to be 50%)

- Future resident labour force not employed by new jobs planned for the region (excluding the natural long-term rate of unemployment/underemployment).[437]

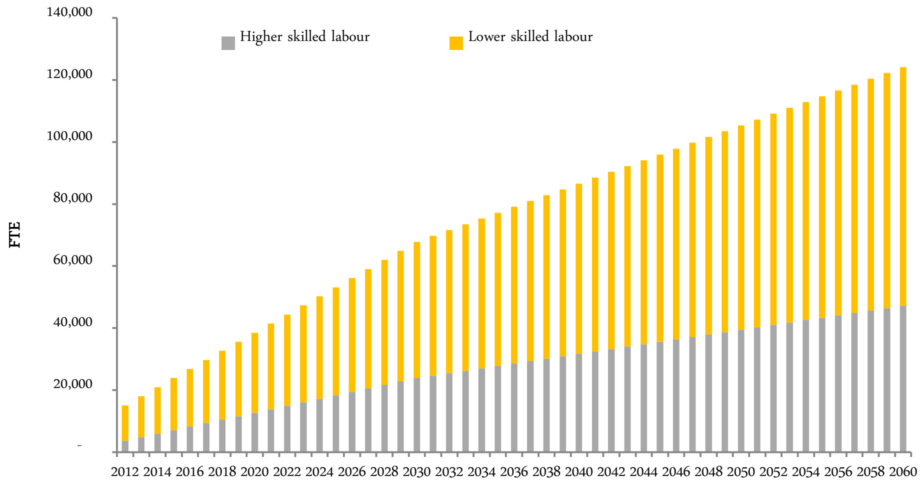
These three sources of labour are divided into higher skilled labour (managers, professionals and technical experts) and lower skilled labour (labourers, machine operators and retail personnel).

[430] It has been assumed that 80% of construction labour will be lower skilled jobs
[431] The CoPS modelling assumes that there is no project can by itself change the total number of people employed within Australia as a whole
[432] The amount of indirect economic activity and employment that will occur as a result of developing an airport at Wilton has been analysed using the Monash University, Centre of Policy Studies, general equilibrium model. More detail regarding this model can be found within Appendix B.
[433] These do not reflect additional employment opportunities created, but jobs that are somewhat supported by the activities of the airport.
[434] These reflect jobs outside of the airport and the associated business park.
[435] We are unable to determine whether these jobs will be within the region as defined within this study or elsewhere within the Sydney basin
[436] NSW Government, (2011), *NSW 2021: A Plan to make NSW Number 1*
[437] As identified with NSW Department of Planning and Infrastructure forecasts

Identifying sources of labour is complex. In part, labour will be sourced from those who are unemployed/underemployed but also from those who shift from other jobs in the region. This employment redistribution is not taken directly into account by this analysis as the focus is on aggregate employment opportunities. Furthermore, a large proportion of this potential labour pool will be able to obtain gainful employment outside the region, notably in the Sydney CBD, irrespective of whether or not an airport is developed within the region.

The potential labour pool within the Wilton region that could support an operational airport and related industrial/commercial development is illustrated in Figure 107.

Figure 107: Potential labour supply within the Wilton region



Source: Ernst & Young calculation

There are 325 FTE workers within the region who are currently unemployed and a further 15,000 who are underemployed. These workers could be redirected to potential employment opportunities. This level of regional underutilised labour supply[438] is anticipated to rise to 68,000 by 2030 and 124,000 by 2060.[439] Of this potential labour force, 35% to 38% will be higher skilled, while 62% to 65% will be lower skilled. Note that the increase in potential labour within the region is primarily as a result of the population growth that is projected within the South West growth centre.

This level of potential labour supply is compared to the total demand for labour that would result from the operations of the airport and related businesses operations, shown in Table 81.

Table 81: Forecast labour supply and demand within the Wilton region

Year	Demand		Supply	
	Higher skilled	Lower skilled	Higher skilled	Lower skilled
current			3,717	11,347
2030	2,764	4,336	23,888	43,933
2060	18,817	21,890	47,237	76,898

Source: Ernst & Young calculation

The airport and associated business activity is likely to create approximately 7,100 jobs by 2030, rising to 40,700 in 2060. As seen in the table above, over the operational period of the airport (2030 to 2060) there is likely to be sufficient supply of both higher skilled and lower skilled labour that can be sourced from the region.

438 Including the difference between projected persons in the labour force and projected jobs created in the region
439 Ernst & Young calculation based on ABS Census information and NSW Department of Planning and Infrastructure forecasts.

26. Economic impacts of a Wilton airport

This section of the report analyses the potential economic impact of the construction and operations of an international airport at Wilton, from both a NSW and national perspective.

The economy wide study was undertaken using a general equilibrium modelling approach. Under this approach, the direct expenditure associated with the development and operations of the airport on the wider NSW and Australian economies forms the foundation of the wider economic analysis. The economic impact assessment was undertaken using the MMRF model, developed at the Monash University Centre of Policy Studies.

It should be noted that this analysis assumes that without the development of an airport, in this case at Wilton, the majority of aviation movements that would transfer through the airport will be suppressed. Furthermore, a range of high level assumptions were made regarding the proportion of landside business operations that will be developed as a result of the airport development. Our approach regarding the direct impacts assessment and the general equilibrium modelling is summarised in Appendix B.

The result of this analysis is the presentation of a range of state and national economic variables that highlight the aggregate impact of the development of an airport at Wilton. The measures presented in the analysis include:

- Real private consumption – presents the changes in expenditure on goods and services intended for individual consumption or use
- Real investment – presents the changes in investment in tangible and productive assets such as plant and machinery, as opposed to investment in securities or other financial instruments
- International export volumes – a measure of the change in international trade of products and services from NSW and the national economy
- International import volumes – a measure of the change in international trade of products and services into NSW and the national economy
- Real Gross State/Domestic Product – a measure of the total market value of all final goods and services produced in NSW and Australia in a given year which is equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports

The assessment of aviation capacity economic impacts has been produced at the NSW and national economy levels. The assessment has been produced for the period from 2012 to 2060.

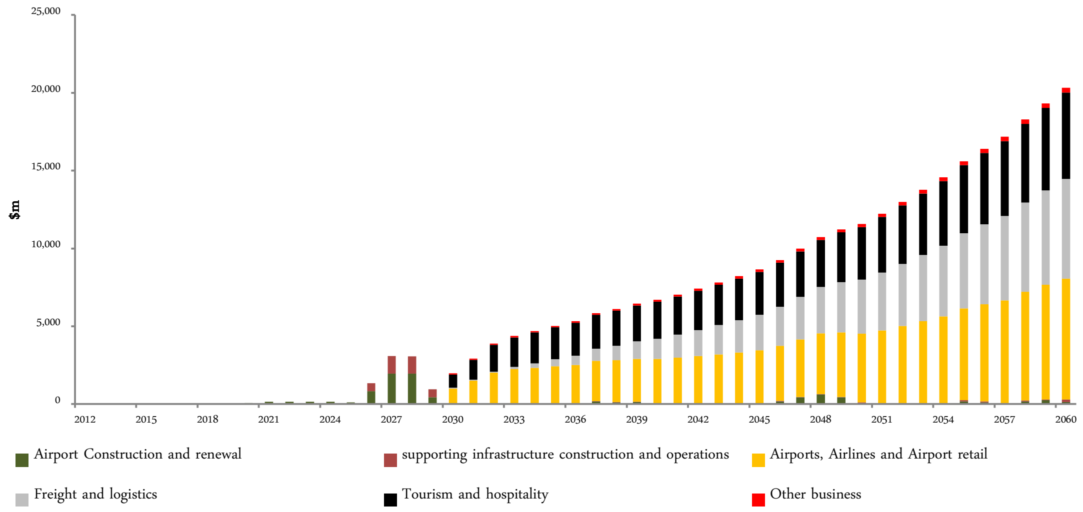
26.1 Direct expenditure impacts

As identified earlier in this report, a number of direct expenditure impacts are associated with the development and operations of an airport at Wilton. These direct impacts include:

- Construction of the airport and supporting infrastructure
- Ongoing renewal and maintenance of the airport and supporting infrastructure
- Airlines, airports and airport retail
- Tourism and hospitality
- Freight and logistics
- Other business activities – including R&D, retail and general businesses that will be developed and operate as a direct result of the additional economic activity that an airport will generate.

The direct expenditure outcomes between 2012 and 2060, divided by industries, are presented in the figure below.

Figure 108: Direct economic impact (2012 – 2060)



Source: Ernst & Young analysis

The figure above indicates that after the construction and commencement of operations of an airport at Wilton, the direct economic impact will grow each year much in line with projected demand forecasts. When airport operations commence in 2030, direct expenditure impacts are projected to be approximately $2.0 billion. This will grow to $6.7 billion in 2040 and $20.3 billion in 2060; a compound annual growth rate of 8.1%.

Airports, airlines and airport retail are expected to contribute the largest direct economic impact from an airport at Wilton, averaging 42% of total direct expenditure impacts over the evaluation period.

Importantly the direct impact from freight and logistics will grow over time as freight throughput is introduced to the proposed airport site post 2033.[440] The impact of freight is expected to grow from less than 3% of total direct impacts in 2030 to 19% of impacts in 2040 and 32% of total direct impacts in 2060.

26.2 Wider economic impact

The direct expenditure impact that will result from the construction and operation of an airport at Wilton will have a range of flow-on economic impacts including output, consumption, investment and net exports. The forecast impact on both the State and national economies, as calculated within the CoPS general equilibrium modelling, are presented below.

26.2.1 Impact on NSW economy

The estimated impacts of additional aviation capacity on NSW Gross State Product (GSP) are shown in Table 82. This impact is given as percentage deviations and as absolute deviations ($m) away from simulated values that would be applied if an airport is not constructed at Wilton.

Table 82: NSW impact on GSP (real)

NSW ($'m)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real GSP ($m)	0	13	11	1,284	3,777	5,226	6,898	9,282	12,654	16,853
Real GSP (% change from Base)	0.0%	0.0%	0.0%	0.3%	0.8%	1.0%	1.3%	1.6%	2.1%	2.7%

Source: CoPS and MMRF

The annual impact to the NSW economy of enhancing aviation capacity is estimated to be $1,284 million in 2030 in real GSP terms. By 2060, the annual effect of increasing aviation capacity is estimated to benefit the NSW economy by $16,853 million in real GSP terms. This is equivalent to a 2.7 per cent increase in the growth of the State's economic output as a result of this investment by 2060.

The benefit of increasing aviation capacity through the development of a Wilton airport on the regions of NSW is produced in Table 83. The variable reported here is real Gross Regional Product, which is analogous to real GSP at the state level. The largest economic cost impacts are produced in the Sydney metropolitan region, but there are general impacts in economic performance across NSW.

[440] This assumption is in line with the demand forecasts provided by Booz & Co

Table 83: NSW regional distribution of GSP

Gross Regional Product ($m, 2010 prices)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Sydney	0	11	11	1,062	3,107	4,307	5,687	7,653	10,426	13,877
Hunter	0	2	-1	106	326	444	584	785	1078	1444
Illawarra	0	1	1	76	227	313	413	557	761	1016
Richmond Tweed	0	0	1	44	121	158	200	262	351	462
Mid North Coast	0	1	1	50	137	179	226	295	395	520
Northern	0	0	0	26	79	105	133	173	231	301
North West	0	0	0	15	47	64	83	109	148	195
Central West	0	0	-1	25	81	110	145	193	264	351
South East	0	0	1	41	116	154	197	260	349	459
Murrumbidgee	0	0	0	27	80	108	138	180	241	316
Murray	0	0	0	21	60	81	103	134	179	235
Far West	0	0	0	2	8	11	15	21	30	41

Source: CoPS and MMRF

The impacts of increasing aviation capacity on the main components of GSP from the expenditure side are reported in Table 84. At a State level, subsequent to the commencement of operations at the airport there is an increase to all components of real expenditure, with the greatest increase realised through real private consumption which is anticipated to increase to $195 million in 2060.

Table 84: NSW impact on real expenditure

NSW	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
($'m, 2010 prices)										
Real private consumption	0	4	-42	883	2,602	3,263	4,023	5,150	6,899	9,145
Real investment	0	32	82	1,073	1,897	2,121	2,515	3,347	4,545	5,880
International export volumes	0	2	5	361	1,310	1,995	2,745	3,734	5,042	6,581
International import volumes	0	10	14	570	1,217	1,363	1,568	1,969	2,583	3,273
(% deviation, 2010 prices)										
Real private consumption	0.0%	0.0%	0.0%	0.3%	0.9%	1.1%	1.3%	1.6%	2.1%	2.6%
Real investment	0.0%	0.0%	0.1%	0.9%	1.5%	1.6%	1.8%	2.3%	3.0%	3.7%
International export volumes	0.0%	0.0%	0.0%	0.6%	1.9%	2.8%	3.7%	4.7%	6.1%	7.5%
International import volumes	0.0%	0.0%	0.0%	0.7%	1.4%	1.5%	1.7%	2.0%	2.5%	3.1%

Source: CoPS and MMRF

The negative impacts to real expenditure that will be realised within the NSW economy within the evaluation period up to 2029 occur as a result of the initial investment required to construct the airport and the likely change in investment and consumption that will result.

26.2.2 Impact on national economy

The total impact to the national economy as a result of increasing aviation capacity in the Sydney basin through the development of an airport at Wilton has been calculated using the CoPS MMRF model. The difference between the economic impact to the national economy compared to the NSW economy is determined by the impacts on other Australian states (which may be positive or negative depending on the economic transfers experienced through aviation capacity increases) and the impacts caused as a result of constrained aviation capacity, such as depreciation in the exchange rates and the effect on traveller's behavioural decisions (which have been determined in the direct expenditure analysis).

The estimated impacts of increasing aviation capacity on Gross Domestic Product (GDP), including NSW, are shown in Table 85, both in real dollar terms and percentage changes away from the simulated case of where there is no additional capacity created (the Base Case).

Table 85: GDP impact on Australian economy

Australia ($m, 2010 prices)	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Real GDP	0	50	72	1,442	4,139	5,861	7,899	10,837	14,954	20,017
Real GDP (%)	0.0%	0.0%	0.0%	0.1%	0.3%	0.4%	0.5%	0.6%	0.8%	1.0%

Source: CoPS and MMRF

The annual impact of developing a Wilton airport on real GDP has been estimated to be approximately $1,442 million in 2030, rising to $5,861 million by 2040 and $20,017 million in 2060. The impact on the Australian economy as a result of the development of the airport is generally higher than the impact on the NSW economy after the commencement of operations in 2030. There are two possible influences on real GSP of other Australian states:

- Real GSP of the remaining Australian states will increase as a result of the expected increase in NSW GSP. This will occur due to flows of increased expenditure in NSW affecting other states, as well as expected increased tax revenue for the Commonwealth Government being redistributed nation-wide. Additionally, real GSP of the remaining Australian states will increase due to an expected increase in interstate tourism by NSW residents that will occur with the introduction of a new airport.

- Real GSP of the remaining Australian states will decrease with a second Sydney airport as it will pull international exports and real investment to NSW. GSP will also decrease relative to the Base Case because under the Base Case when KSA reaches capacity both passengers and freight will continue to make their way to Australia, but through other states. With the introduction of a new airport, other Australian states will lose these benefits.

It is an empirical matter as to which of these two effects dominate. Based on the analysis in this case, it appears that the former will apply. The impacts of Sydney's aviation capacity network on the main expenditure-side components within the economy are reported in Table 86.

Table 86: Australia (including NSW) impact on real expenditures

Australia	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
($m, 2010 prices)										
Real private consumption	0	21	-6	1,196	3,477	4,678	6,069	8,039	10,868	14,409
Real investment	0	39	92	843	1,433	1,648	2,020	2,771	3,818	4,969
International export volumes	0	19	23	282	1,166	1,752	2,424	3,366	4,712	6,316
International import volumes	0	26	34	767	1,635	1,818	2,100	2,657	3,516	4,451
(% change, 2010 prices)										
Real private consumption	0.0%	0.0%	0.0%	0.2%	0.4%	0.5%	0.7%	0.8%	1.1%	1.4%
Real investment	0.0%	0.0%	0.0%	0.2%	0.3%	0.4%	0.4%	0.5%	0.7%	0.9%
International export volumes	0.0%	0.0%	0.0%	0.1%	0.4%	0.5%	0.7%	0.9%	1.2%	1.6%
International import volumes	0.0%	0.0%	0.0%	0.3%	0.6%	0.6%	0.7%	0.8%	1.0%	1.3%

Source: CoPS

It is expected that, after the commencement of operations in 2030, the national economic impacts as a result of the airport will be positive and growing on all of the main expenditure-side components. Real private consumption is expected to be the largest source of Australian impact throughout the evaluation period, totalling approximately $14,409 million in 2060, while the expected increase in international export volumes relative to the Base Case is the largest: in 2060, international exports are forecast to be 1.6% higher than they would have been without the increase in aviation capacity.

Importantly, when comparing the above figures to the expected impacts in NSW:

- The Australian increases in private consumption and international import volumes are larger than the increases expected in NSW over the evaluation period. This demonstrates that the effects on national productivity will not be limited to NSW alone; instead, GDP will increase by more than GSP.

- Real investment impacts in NSW is larger than in Australia, indicating that real investment in other states will contract slightly over the evaluation period relative to the Base Case as the development of an airport at Wilton will pull investment into NSW.

► The increase in international export volumes is larger in NSW relative to the Australian increase. This indicates that the development of an airport at Wilton may pull exports away from other states due to the increase in the freight and logistics capacity that a second airport will introduce to NSW.

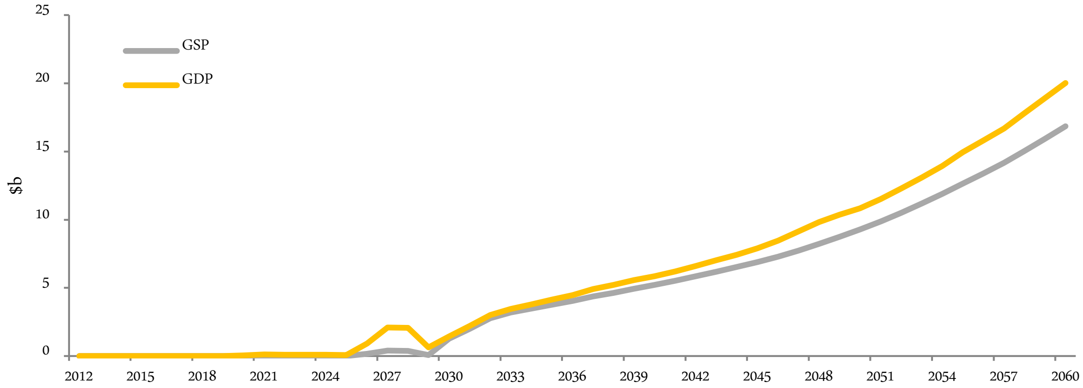
26.2.3 Comparison of NSW and national quantifiable impacts

An assessment of the economy wide impacts of increasing aviation capacity in Sydney through the development of an airport at Wilton has been undertaken using the direct expenditure impacts.

The economic impact assessment was undertaken using general equilibrium analysis to estimate the historical and future growth in the economy as a result of the maintaining the status quo in aviation capacity in the Sydney region.

The GSP/GDP outcomes experienced at the NSW and national level are presented in the figure below. The changes projected for the NSW economy as a result of additional aviation capacity are less than the changes projected for the Australian economy. This illustrates the extent to which the positive impacts on NSW flow through to the rest of Australia.

Figure 109: Total GSP / GDP outcomes



Source: CoPS data and Ernst & Young analysis

27. Wider social impacts of a Wilton airport

An airport within the Wilton region and its associated economic activity will result in a range of social impacts on those who live within the region and those outside the region. The social benefits of airports are typically considered to be substantial and widespread, complementing their economic contributions. However, these social benefits are difficult to quantify as they often represent non-market activities that provide intangible welfare gains to both users and non-users.

The table below presents the range of social and cultural impacts associated with the different forms of activity that would result from the development of an airport at the Wilton site.

Table 87: Social and cultural impacts of airports

Social and cultural impact	Result of impact
Living standards	► Social and cultural benefits resulting from enhanced connectivity ► Social benefits of employment opportunities ► Jobs closer to home and impact on work/life balance ► Land prices
Strengthening communities and supporting development	► National and regional benefits of aviation ► Supporting the growth of Sydney (benefit of 'City of Cities' approach) ► Increased tax revenue as a result of additional economic activity (eg: tax spend per GSP)

Source: Ernst & Young

27.1 Living standards and quality of life factors

The following sections of the report analyse the possible impacts of an airport on living standards in Wilton, considering:

- ► Social and cultural benefits resulting from the ability to fly
- ► Social benefits of employment opportunities
- ► Jobs closer to home and impact on work/life balance
- ► Land prices.

27.1.1 Social and cultural benefits resulting from enhanced connectivity for local residents

The aviation sector provides an essential service by physically connecting people and businesses to one another and the rest of the world. Introducing a second airport to the Sydney basin can enhance connectivity and increase the ability of NSW and Australia to attract tourism through service frequency and affordability. In turn, this may lead to an increase in the number of flights for leisure purposes and deliver to Australians a range of social and cultural benefits associated with increased travel.

An airport at the proposed Wilton site, capable of accommodating up to 70 million domestic and international passenger movements, will be able to provide these cultural and social benefits to surrounding regions. The patterns of aviation travel with and without the development of the Wilton airport are shown in the table below.

Table 88: Demand for aviation services with and without the Wilton development

	Without Wilton development			With Wilton development	
	2010	2030	2060	2030	2060
North East	4,870,835	9,133,758	12,502,235	11,722,676	18,196,299
Metro Sydney	17,538,860	32,622,502	44,408,239	43,239,949	68,890,526
South and South West	3,490,059	6,633,017	9,160,735	9,563,669	17,310,458
West Central	4,461,350	8,445,707	11,633,950	10,952,807	19,442,867
North and North West	4,038,552	7,609,235	10,448,791	9,786,843	16,382,737
Newcastle	974,692	1,839,944	2,529,750	2,338,701	3,925,909
The west	277,116	520,712	713,729	668,637	1,227,411
Total	35,651,464	66,804,875	91,397,429	88,273,282	145,376,207

Source: Booz & Co data, Ernst & Young analysis

Currently, residents in South Western Sydney take approximately 3.49 million flights per annum. The number of flights taken by people living in this area is anticipated to increase to approximately 9.16 million aviation trips per annum by 2060 without the development of a secondary airport within the Sydney basin. With the development of an airport at Wilton, approximately 2.9 million further flights per annum are forecast by 2030 and 8.1 million further flights per annum by 2060.

A Wilton airport will also provide aviation services to Wollongong residents. Wollongong is the largest centre in Australia without direct access to a local airport. Currently, Wollongong residents have to travel up to 1.5 hours by car to access Kingsford-Smith Airport. The proposed Wilton airport will provide these people with access to aviation services within 30 to 40 minutes from their homes.

The development of a second airport in the Sydney basin may help to increase stability, social cohesion and a sense of community identity, as the airport and its adjacent region develop over time into a hub for transport, industry and employment. Such development will increase local employment opportunities (reducing the need for local residents to relocate), 'pull' investment to the region and boost accessibility to valuable infrastructure such as education, health and communications.

As previously discussed, these factors are important determinants of the quality of life in a region and feed into other social benefits including higher levels of social inclusion, good mental health and greater life satisfaction.

These significant benefits indicate that an airport at Wilton has the potential to strengthen and support communities across a broad geographical area spanning South West Sydney to Wollongong.

27.1.2 Social benefits of employment opportunities

Employment (and its associated income) provides benefits to communities beyond personnel subsistence and consumption. These benefits include the psychological benefits associated with a stable and satisfying workplace, the provision of additional career choices without having to relocate, higher social cohesion and inclusion, and a stronger sense of community in the region.

The development of an airport at Wilton is forecast to increase the total number of jobs within NSW by 4,200 in 2030, rising to 27,700 in 2060.[441] Monash University's modelling suggests that this rise in the total number of people employed will result in a decrease in Sydney's unemployment rate by 0.12% in 2030 to 0.61% in 2060.[442]

Surrounding communities, including Wollongong and communities in the South West Growth Centre will benefit socially from the additional economic opportunities that will result from the development of a Wilton airport. This is important as the population in the South West Growth Centre is expected to increase significantly in the coming decades, potentially making it more difficult to establish a sense of community and encourage social inclusion in areas that are undergoing rapid population growth.

27.1.3 Jobs closer to home and impact on work/life balance

The opportunity to work closer to home provides a number of social benefits to individuals, employers and society as a whole, including a reduction in commuting times, energy use and carbon emissions, a rise in workforce productivity, an increase people's leisure time and the promotion of more active and healthy lifestyles.

[441] The CoPS modelling assumes that no project can by itself change the total number of people employed within Australia as a whole.
[442] Assuming that future employment and participation rates are consistent with future population growth

More people working close to home will also reduce congestion on roads and public transport, and lower the incidence of inaccessibility and isolation experienced by many residents in new, outer suburban areas.

The development of a Wilton airport and the associated activity around the airport will create more employment opportunities for the current and projected population in the high growth areas of the South West Growth Centre.

Creating jobs closer to home is strongly aligned with the NSW Government's NSW 2021 State Plan, which seeks to use strategic and land use planning to increase the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney.[443] Approximately 90% of new jobs stemming from the airport are likely to be taken up by persons who live within 30 minutes private vehicle access time. Between 2,700 and 4,300 employment opportunities by 2030 and 18,800 and 21,900 opportunities by 2060 will be provided closer to the person's home then would have otherwise been the case.

The employment opportunities developed in the region as a result of the airport development[444] have the potential to save up to 0.57 million hours in travel time as a result of people working closer to home by 2030, increasing to up to 3.6 million hours by 2060.[445] These time savings realised by local residents would furthermore benefit other local commuters by effectively reducing the congestion that would have otherwise been realised on major transport networks from the region to access major employment centres.

27.1.4 Land prices

The construction of an airport at Wilton will have an impact on the dynamics of the area in which it is located and ultimately impact on the value of land. The table below presents Ernst & Young's Real Estate Advisory team's assessment of the likely impact of the development of an airport on land prices within the surrounding vicinity to the airport. Actual land and property prices are affected by a large number of factors and so only a broad guide to the direction and scale of potential change due to each airport-related factor in turn are given below.

Table 89: Impact on property values in the surrounding area

Assumption	Anticipated impact	Likely impact on value	Main areas affected
Employment	Less than 5% positive	The value uplift on residential property is dependent on the type of employment created (Reed & Pettit 2004): that is, where a number of highly skilled employment opportunities are created, the value uplift to the surrounding residential development may be significant. Airports and their surrounding business parks generally employ low to medium skilled workers for roles such as retail assistants, baggage handlers and cleaners. The airport is likely to provide directly and indirectly a large number of employment opportunities having a positive impact on residential property values. However, due to the anticipated number of lower skilled positions, the positive impact is anticipated to be limited.	Suburbs towards the north, north-west and west of the proposed airport site
Airport connectivity	Less than 5% positive	Many people require the airport on a regular basis for their employment, business or lifestyles. For this reason, being within an easy drive of the airport may be a consideration for some when seeking to acquire residential property. Areas that are not detrimentally impacted by noise or other negative impacts are likely to experience a slight increase in value due to the additional demand for housing by those with greater purchasing power. As a number of suburbs will benefit from this, the value will be limited.	Properties within 30 minutes drive of the proposed airport
Accessibility	Less than 5% positive	When governments construct new airports it is common practice to also upgrade the transport network and links to the airport, which can have the effect of improving accessibility and commuter times for journeys not beginning or ending at the airport.	Properties in proximity to new or upgraded transport links.
Noise	More than 5% negative	Airport noise has a negative impact on residential property values, particularly in suburbs directly in line with the runway and in proximity to the airport. Some studies suggest higher value properties are likely to fall more than affordable properties.	Suburbs towards the north, north-west and west of the proposed airport site
Traffic	More than 5% negative	Depending on size, airports are likely to create additional road and rail traffic. This is likely to create additional noise and pollution. Without sufficient capacity on transport infrastructure, traffic congestion will occur, creating further pollution. This congestion, or increasing the capacity of existing networks or building new networks is likely to have a negative impact on residential properties on the corridors impacted by the additional noise and pollution.	All properties within proximity to main arterial networks leading to and from the proposed airport

443 NSW Government (2011), NSW 2021: A Plan to Make NSW Number One, http://www.2021.nsw.gov.au/
444 Either at the airport or the landside development
445 Ernst & Young calculation based on BTS trip distribution matrix of current origin/destination of trips of residents within the surrounding region, assumed (current and future travel speeds). Further information regarding how this was calculated can be seen in Appendix B

Assumption	Anticipated impact	Likely impact on value	Main areas affected
Landscape/views	Less than 5% negative	This will impact properties in proximity to the airport, particularly those with views overlooking the site. As most of the land around each of the sites is near level, this is unlikely to impact on many properties. Properties in proximity to recreation or conservation areas affected by the airport are likely to experience a fall in value.	Properties overlooking the site and within a short distance of the proposed airport and properties adjoining or close to recreational or conservation areas
Public safety risk	Less than 5% negative	This will impact properties within proximity to the airport, in particular those in line with the runway. This is because aircraft accidents generally occur on landing or just after takeoff. Because of the safety record of the commercial airline industry in Australia, this impact is likely to be minor.	Suburbs towards the north, north-west and west of the proposed airport site
Pollution	Less than 5% negative	Airport pollution is generally aligned with noise and local air pollution and has a negative impact on residential property values. Those suburbs directly in line with the runway and in proximity to the airport are likely to be impacted the most by pollution.	Suburbs towards the north, north-west and west of the proposed airport site

Source: Ernst & Young analysis

Overall, properties surrounding the Wilton site are likely to experience a small to moderate change as a result of the development of an airport within the region.

The area surrounding the proposed airport at Wilton is made up of small communities and dense bushland. The development of an airport at the site will have a significant impact on the range of activities that can be undertaken within the region. In turn, this will have both negative and positive impacts on local residents' standards of living and land prices. There a number of ways that these impacts can be mitigated and managed.[446]

Rural areas and bushland are likely to experience minimal or no impact as a result of the development of an operational airport at Wilton.

Overall, as the proposed Wilton site is located within rural areas, the impacts on residential land prices are likely to be larger, compared to an airport based in a more established industrial zone.

27.2 Strengthening communities and supporting development

Airports also play a significant role in the regional economy and the development of their surrounding communities. For these communities, airports are able to increase accessibility to business and leisure flights, employment and vital infrastructure such as health and education, positively impacting community living standards, stability and identity.

27.2.1 Benefits of greater connectivity – across the State and nation

More accessible and affordable flights will lead to an increased number of flights for business and leisure purposes and greater national connectivity. Greater national connectivity has the potential to deliver a range of benefits including increased national cohesion, reduced business costs, improved knowledge and awareness, and a stronger national identity.

Outside of the Sydney basin, the development of an airport at Wilton will increase the number of aviation services provided to rural and regional NSW. Booz & Co have forecast that by 2060 up to 10 additional flights per day will be provided to regional areas to access the Sydney area. Specifically, the following locations will benefit from additional services:

- Albury Wodonga
- Dubbo
- Orange
- Wagga Wagga
- Lismore.

These additional aviation services will increase the connectivity of regions and support economic development in regional NSW, as well as supporting regional tourism. They will also give regional communities greater access to vital public services in Sydney.

[446] Outside of the scope of this analysis

27.2.2 Supporting the growth of Sydney

Chapter 6 noted the importance – and the challenges – of maintaining a sustainable distribution of population and economic growth across Sydney over the medium to long-term. An airport at Wilton will provide support for the NSW Government's plans to develop Sydney as a 'City of Cities', with a number of compact, connected major centres offering services, employment, retail and entertainment and cultural facilities at a regional scale and acting as 'capitals' for their regions.

A second airport at the proposed Wilton site will introduce significant pieces of infrastructure to a growing South West Growth Centre and can act as a hub for transport, industry and employment. This infrastructure can encourage the movement of economic activity to areas where housing and commercial space is more affordable, and lessen pressure to invest in new capacity on congested infrastructure networks.

Freight and passenger throughput, supporting transport and communications infrastructure and possible agglomeration opportunities with business park industries will attract capital and labour resources away from the Sydney CBD and toward Wollongong and the South West Growth Centre. This will support projected population growth and assist in the development of a new major centre to support the future growth of the Sydney basin, with impacts flowing on to other centres through the distribution of employment opportunities and demand for public services, particularly public transport.

27.2.3 Increase in tax revenue

The increase in economic activity, both aeronautical and non-aeronautical, that will result from the development of an airport at Wilton will ultimately result in additional tax revenue at all levels of government. As noted in chapter 6, this additional government revenue may then be re-distributed in the form of increased social welfare transfers or lower income and corporate taxes. It may also be invested by different levels of government in other important projects. Accordingly, an increase in tax revenue can potentially further add to the social benefits indirectly generated by the introduction of a second airport in the Sydney basin.

Some of the taxes that are likely to increase as a result of the development of an airport include Commonwealth Government (GST, income tax and corporate tax) and State Government taxes (stamp duties, land taxes, import duties and payroll taxes).

The table below outlines a range of potential outcomes for incremental tax revenue that may accrue to the Commonwealth and NSW State Governments as a result of an airport at Wilton. These outcomes use the expected increment in GDP and NSW GSP[447] caused by the introduction of a second airport to the proposed Wilton site and the historic average tax take from economic activity obtained from the ABS. These results should be interpreted with caution and should be read alongside the assumptions and methodology used in their estimation (see Appendix B for more detail).

Table 90: Estimated incremental tax revenues for all levels of government and the NSW government

$m in 2010	All levels of Government[448]		NSW State Government[449]	
dollars	Low	High	Low	High
2030	407	421	87	100
2040	1,653	1,711	355	408
2060	5,645	5,845	1,146	1,315

Source: CoPS modelling, ABS data and Ernst & Young analysis

It is estimated that the additional tax revenue that may be collected by all levels of government when the airport opens in 2030 to be in the range of $407 and $421 million. This will increase to between $1,653 million and $1,711 million in 2040 and between $5,648 and $5,845 million in additional tax revenue in 2060.

Furthermore, between $87 million and $100 million could be collected by the NSW State Government when the airport is open in 2030 as incremental tax revenue.[450] This will increase to between $355 million and $408 million in 2040 and between $1,146 million and $1,315 million in 2060.

[447] As sourced from CoPS modelling
[448] This includes NSW Government incremental tax revenue
[449] This includes GST contributions from the Federal Government
[450] This includes GST contributions from the Federal Government.

Part G – Comparison and conclusions

28. At a glance comparison of key data

Each of the options for the development of a secondary airport within the Sydney basin possesses the same categories of likely positive and negative impacts. However the relative size of those impacts for each of the alternative sites vary. Table 91 presents a brief comparison of each of the major impacts of the development of an airport at Wilton and Badgerys Creek (as the two broadly comparable airports in terms of size and throughput).

Table 91: Comparison of options

Indicator	Metrics	Badgerys Creek	Wilton
Operational			
PAX capacity	Per annum (million)	70	70
Commencement of operations	Date	2025	2030
Passengers and Freight			
PAX in 2060	Million PAX	54.0	44.2
Cumulative PAX throughput	Total throughput over analysis period (million PAX)	1,139.1	769.5
Dedicated freight throughput	Over analysis period (million tonnes)	9.5	9.5
Employment			
Direct	2060 employment ('000)	30.5	28
Associated landside impacts	2060 employment ('000)	30	13
Net Additional jobs[451]	2060 employment ('000)	33	28
Environmental			
Noise impacts	Potential maximum number of persons who realise 10 N70 events per day (2060)	69,660	817
Air quality/ environmental emissions	Potential change in nitrogen oxides levels in Sydney basin (2060)	8.6%	8%
Potential threatened species that could be affected	Number	24	50
Water catchment contamination	Level of risk	Low	Medium
Social			
Displacement	Number of property lots acquired	92	96
Jobs closer to home	2060 time saved in commuting time (million hours)	3.92	3.60
Additional flights by local residents	2060 movements ('000)	6,500	8,100
Economic			
Additional economic activity	2060 GSP ($m)	20,296	16,853
Sub regional commercial/industrial developments	2060 - hectares	260	205
Additional tax revenue at all levels of Government	2060 ($m)	$6,871	$5,747

Source: Ernst & Young analysis
Notes: all factors are only analysed on a regional basis

[451] Total induced employment in NSW as a result of the development of an airport

Whilst the two proposed Greenfield sites have the capacity to cater for the same number of passengers, Badgerys Creek, which has the potential to commence operations 5 years earlier and is located closer to a relatively larger economic and population base of Western Sydney is expected to attract 9.8 million additional passengers than an airport located at Wilton by 2060. These factors are expected to draw more business investment and consequently an additional 5,000 induced jobs in NSW. Overall, it is projected that an airport at Badgerys Creek may lead to a larger state-wide economic impact; adding an extra $3,443 million to NSW GSP by 2060.

However locating an airport closer to population centres has a range of social and environmental impacts, most notably approximately 69,000 persons will experience an additional 10 N70 events per day as a result of the development of an airport at Badgerys Creek.

At this stage, it is anticipated that the proposed site at Richmond will be able to accommodate 5 million passengers per annum and will not be used to service freight. Therefore, whilst Richmond is located close in proximity to a number of major centres, its economic impacts are anticipated to be smaller than the other two potential developments. It is anticipated that by 2060, Richmond will be operating at capacity, employing approximately 4,200 FTE employees on-site and an additional 4,060 employees in the industrial/commercial developments near the airport.

Furthermore the induced state-wide impacts of developing the Richmond site into a civil aviation airport are forecast to be an additional 500 employees and $563.3 million in GSP by 2060. It is anticipated that if the Richmond site is developed, 24,131 persons will realise an additional 10 N70 events per day. This is larger than the noise impacts at Wilton, and smaller than those at Badgerys Creek.

Part H – Appendices

Appendix A Definition of the regions

As part of the analysis of the impact of an airport on its surrounds Ernst & Young were required to define the scope of the region (impact area) applicable for each site option.

The purpose of defining an impact area is to provide a bound on the analysis given the wide spread impacts expected for each airport site, which would overcomplicate the analysis and the development of clear findings and conclusions. The aim, therefore, is to define an impact area that identifies the majority of the impacts and supports the comparison of different airport sites.

At a high level we believe that there are three main alternative means of defining an airport region (impact area), which includes:

- A wider regional basis (e.g. Sydney basin sub-regional basis as defined by the Department of Planning)
- An LGA basis
- A distance based

Each of these alternatives are discussed in more detail below.

Sydney basin sub-regional basis

The Department of Planning and Infrastructure has translated a number of the objectives of the Metropolitan Strategy's "City of Cities" long-term planning blueprint to the local level. This has resulted in the development of 10 subregions of Sydney.

Those regions of interest to this particular study include:

- West Central Subregion (Auburn, Bankstown, Fairfield, Holroyd, Parramatta LGAs)
- North West Subregion (Baulkham Hills, Blacktown, Blue Mountains, Hawkesbury, Penrith LGAs)
- South West Subregion (Wollondilly, Camden, Campbelltown, Liverpool LGAs)

LGA basis

The LGA definition includes the LGA(s) that holds the proposed airport site, as well as potentially adjoining LGAs.

Table 92 presents a breakdown of the LGAs that are applicable to each of the airport sites.

Table 92: Airports and LGA's

Airport	LGA the site is in	Adjoining LGAs	Other potentially relevant LGAs
Badgerys Creek	Liverpool	Penrith Fairfield Bankstown Sutherland	Blacktown Holroyd Parramatta
Richmond	Hawkesbury	Gosford Blue Mountains The Hills Blacktown Penrith	
Wilton	Wollondilly	Blue mountains Camden Campbelltown Wollongong Wingecarribee	

Source: Ernst & Young analysis

As can be seen in Table 92, focusing on the LGA that holds the site would be the smallest definition of the region. Including those regions that adjoin the LGA that holds the proposed site provides a wider definition, and including those LGAs that incorporate major centres that are within the general vicinity provides an even wider definition.

Given the spread of impacts an airport generates, we believe that the definition of the region should be greater than just the airport LGA. In determining the area and relevant LGAs, a level of professional judgement is required. For example we do not believe that the LGA of Gosford or the Blue Mountains should be included within the regional definition of Richmond. Furthermore the relative sizes of regions can differ with regards to the different options being analysed – for example Richmond could have a smaller region when compared to the other two development options as the proposed development is of smaller scale.

Based on this approach, we believe that a sensible LGA approach would include the following LGAs:

- Badgerys Creek – Liverpool, Penrith, Fairfield, Bankstown
- Richmond – Hawkesbury, The Hills, Blacktown and Penrith
- Wilton – Wollondilly, Camden, Campbelltown and Wollongong

This definition of a region is wider than is normally included in such analysis – for example the previous EIS defined the Badgerys Creek region as Liverpool and Fairfield. We believe that a much broader definition should be included in this analysis because of the proposed scale of the developments (eg: an airport capable of 70m PAX throughput per annum) and the potential city shaping impact that would have.

Distance based

A third way to define the impact area is on a distance basis. There are two alternative distance based measures that could potentially be incorporated – radial distances and distances linked to airport access times. These are discussed in more detail below.

The radial measure is based on the theory that those that will be most impacted by an airport is determined on their geographical proximity to the airport, with no other factors taken into account. As such, it is assumed that the impact of the airport lies symmetrically around the airport. The different radii used in defining the region could vary from between 15km and 30km.

Defining the region based on time to access the airport provides a less symmetrical measure that is more difficult to estimate. This definition takes into account the differential road and/or public transport service provided to different areas – therefore major centres are more likely to be included within the definition. Access times of between 30 minutes and 45 minutes could be used to define the region.

Advantages and Disadvantages

As seen in Table 93 there are advantages and disadvantages of applying each of the options outlined above. Specifically the advantage and disadvantages of applying these techniques include:

Table 93: Advantages and disadvantages of each approach

Method	Advantages	Disadvantages
Badgerys Creek Sydney basin sub-regional basis as defined by the Department of Planning	Definition is widely accepted by government	The Sydney basin sub-region, South West Subregion includes both the Wilton and Badgerys Creek and therefore this analysis would not provide any differences in the statistics that would be included within the analysis for two of the three options being analysed. Furthermore both of these proposed airport sites are at the corners of the sub region and therefore do not include areas that will obviously be affected by its development (eg: Wollongong is outside the region but will be affected by an airport development in Wilton).
LGA basis	The boundaries are clearly defined and understood by government, and it also provides a level of flexibility to make judgement calls around what LGAs should be included within the definition whilst also maintaining some level of accepted statistical zoning	The definition of the area has no relationship to the potential impact of an airport. For example there are areas within an LGA that sit on the site that
Distance based	The development of the criteria for the distance based definition is the most subjective means of undertaking this analysis – for example the distance applied can be manipulated somewhat to take into account specific areas to meet a desired outcome (include/exclude particular areas)	Subjective definition that may not be as readily recognised as a 'region' when compared to the options outlined above.

Source: Ernst & Young analysis

Recommendation

It is our recommendation that the LGA approach, and therefore the following LGAs are included within the definition of the region:

- Badgerys Creek – Liverpool, Penrith, Fairfield, Bankstown
- Richmond – Hawkesbury, The Hills, Blacktown and Penrith
- Wilton – Wollondilly, Camden, Campbelltown and Wollongong

Appendix B Technical papers – calculation methodologies

B.1 Demand for land adjacent to an airport

B.1.1 Introduction

Airports not only generate additional economic activity but also play a significant role in the distribution of businesses within a region. Furthermore airports, and the infrastructure that supports them, as a core element in a range of supply chains, can significantly affect the location decisions of firms, leading to a clustering of firms near airports (including within a dedicated airport business park precinct) and associated agglomeration and efficiency benefits.

This paper will present our proposed methodology and process for forecasting the potential demand for industrial land around (mutually exclusive) secondary airports within the Sydney basin. The aim is to develop a methodology to translate these characteristics into a broad estimate of expected demand for industrial land in the region following the development of an airport. Clearly, in practice a large number of factors, including several that are unforeseeable at the present time, will affect the actual level of demand for land at any particular time. Our methodology is not designed to capture all of these factors – instead it designed to give a broad estimate of the likely demand based on historical benchmarks.

In this analysis, we refer for simplicity to the concept of a “business park”. In reality, the relevant land may or may not be grouped into one named “business park”; and it may or may not be directly contiguous with the airport footprint. Indeed, the relevant land may be one large contiguous plot owned by the airport itself; a large plot owned by an associated body, such as a public development corporation which may own land next to a publicly owned airport; a series of large plots owned by several large-scale private landowner; it may be made up of multiple small lots in the vicinity of the airport; or a mixture of the above.

B.1.2 Demand drivers

The demand for industrial land around the airport on an aggregate level will be the same as those factors that would drive a business decision on where to locate their operations. These factors have been broken down into aviation specific and generic regional factors and discussed in more detail below.

B.1.2.1 Airport Characteristics

The size and composition of a business park is expected to be strongly related to the characteristics of the nearby airport:

- **Passenger movement:** Larger airports would typically be expected to attract more businesses, due to greater prominence in the national economy and the number of services that are available. It can also be associated with a larger number of customers for businesses to serve in the immediate area.

- **Freight throughput:** An airport that is capable of moving large amounts of freight efficiently will attract firms that either require or send out significant quantities of goods through air transport, as closer proximity to a major freight service provider will reduce costs.

- **Network integration:** Even taking into account the number of passenger movements, the level of integration of an airport in the national and international market may affect the types and number of businesses seeking to locate in proximity to the airport. A well-integrated airport will allow for more efficient transportation over a wide range of destinations, more efficient freight delivery, and a more diverse profile of arrival and departure passengers.

B.1.2.2 Regional Characteristics

Importantly, it is not only the characteristics of the airport but also the surrounding region that will determine if and to what extent a business park cluster (or demand for industrial land in general) will result from the construction of an airport.

Each of these regional features are able to affect the attractiveness of a new airport for firms making location decisions:

- **Socio-economic status and labour market demographics:** The current profile of the region will affect the ability of firms to attract local labour, the price of land, and the demographics of potential customers.

- **Supporting infrastructure – transport:** The existence of strong transport infrastructure in the area will allow firms to more easily connect with the wider economy, reducing costs, preventing the need for the construction of additional infrastructure, thus increasing the attractiveness of the area.

- **Supporting infrastructure – utilities and social infrastructure:** Similarly, utilities and social infrastructure are also strongly desirable to reduce the barriers of entry for a firm seeking to operate in proximity to the airport.

- **Future population and employment growth:** Investment decisions made by firms usually involve a long period of commitment, and hence future projections on population and growth are key considerations for any firm considering a relocation or expansion in the area.

- **Availability of land:** While the previous features will impact the demand for industrial land surrounding an airport, any development is equally dependent on the supply of land. Along with potential geographical constraints, Local and State Governments have planning goals and arrangements that may influence the availability of land. This is important as typically business parks have relied on the availability of wide, open, plots of land.

B.1.3 Methodology for the estimation of demand for industrial land

The methodology is intended to provide a broad estimated range of potential demand for industrial land in the area surrounding each airport site.

The level of industrial development will be a function of supply and demand. Supply represents the availability of land, which forms a natural ceiling on the level of potential development as well as a determinant for the price of land in the area.

The demand for land will be a function of the airport and regional characteristics of each site. Since regional characteristics are difficult to quantify consistently, our methodology focuses on the airport characteristics (with the qualitative analysis of regional characteristics used to adjust the quantitative results).

Step 1: Constructing a variable to measure an airport's attractiveness to business

Demand for land in the area will partly be a function of the level of attractiveness of an airport to businesses. The attractiveness of the airport will be assumed to be related to the number of passenger movements per annum (representing customers and economic activity), the amount of freight throughput per annum (representing potential positive effects on input and delivery costs for businesses), and lastly the distance between the airport and the Central Business District in the city (the closer the airport the more attractive).

The equation for this level of attractiveness is as follows:

$$Attractiveness = \left(\left((PAX * F_{PAX}) + \left(Freight * F_{Freight}\right)\right) * \left(\frac{1}{D^{1.75}}\right)\right)$$

Where:

PAX = Passenger movements per annum

Freight = Freight throughput per annum

F_{PAX} = Relative weighting applied to passenger movements

$F_{Freight}$ = Relative weighting applied to freight tonnage

$D^{1.75}$ = Distance between the airport and the nearest Central Business District

Step 2: Estimating the relationship between land demand and an airport's attractiveness

The relationship between the demand for industrial/commercial land and an airport's attractiveness (as defined by the above variable) has been econometrically estimated using a regression with robust standard errors. A dataset of international airports developed by Ernst & Young was used which contained:

- Passenger movements and freight throughput.

- The area of the surrounding commercial and industrial land (in hectares).

- The distance from the airport to the nearest centre.

For the estimation, it was assumed that $F_{PAX} = 0.8$ and $F_{Freight} = 1$. The regression results showed that the level of attractiveness contained a statistically significant correlation with the size of commercial land, with a p-value below 0.01.

The result is as follows:

$$Business\ Land_{hectares} = 582 + 1354\ (\text{Attractiveness})$$

The 50% confidence interval around the constant and slope coefficient will be used to present the results as a range.

Step 3: Adjusting the results to consider the regional characteristics

Supply: Figures for the availability of land in the area of each airport site will be provided by WorleyParsons for each of the sites. These estimates will serve as a natural ceiling for the demand of commercial/industrial land around the airport.

Demand: Regional characteristics are able to have a strong influence on the level of demand on industrial land, beyond the inherent attractiveness of an airport. However, since these regional characteristics are not able to be quantified in such a way to be included in the regression, the qualitative analysis of each site has been used to adjust the quantitative results in the following ways:

- ► Adjusting the constant in the econometric regression, in order to accurately reflect the level of demand that could be expected from a newly constructed airport. This took into account the fact that industrial and commercial land can exist before an airport development or is otherwise not primarily motivated by the airport's existence. Adding a lengthy ramp up period to reflect the fact that it takes time to attract business clustering and develop the land.

- ► Using the strengths and weaknesses of each site to apply adjustments to the variables. These strengths and weaknesses include forecast airport activity, land prices, infrastructure and connectivity to possible suppliers and customers, as well as social and economic characteristics of surrounding regions

B.1.4 Results

The key inputs used to obtain an estimated range for industrial/commercial land demand is as follows:

- ► Forecasts developed by Booz for passenger movements and freight tonnage at each of the airport sites.

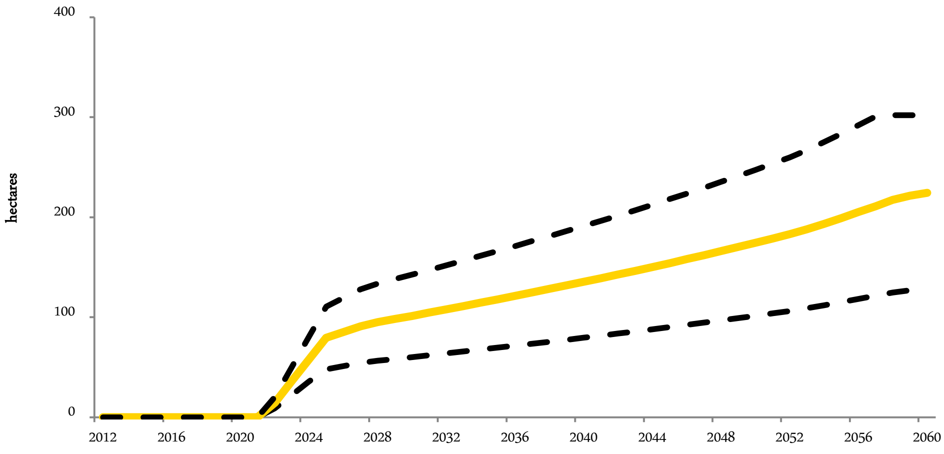
- ► The econometric results that were outlined in the previous section.

For each airport site the Booz forecasts, as well as Google map estimates of distance from the site to Sydney CBD, were used to construct the airport attractiveness variable for each year. This was then fed into the adjusted econometric results to obtain the range estimate of the demand for commercial/industrial land around the site.

B.1.4.1 Badgerys Creek

Figure 110 presents the results of applying the methodology for determining the demand for land around an airport at Badgerys Creek over the analysis period.

Figure 110: Forecast land use demand for Badgerys Creek



Source: Booz & Co data, Analysis by Ernst & Young

The results show that by 2035 the level of demand for industrial land is in the order of 118 and 166 hectares. With the anticipated increases in airport activity as well as urban growth in surrounding areas, this land use demand is forecast to grow to roughly between 225 and 302 hectares by 2060. Furthermore, demand has been improved due to its relative closeness to Sydney CBD and other business districts in Sydney.

The strengths of the region are:

- ► Good transport arterial links
- ► Cheaper industrial land
- ► Earmarked as a growth centre

The comparative weaknesses of the regions are:

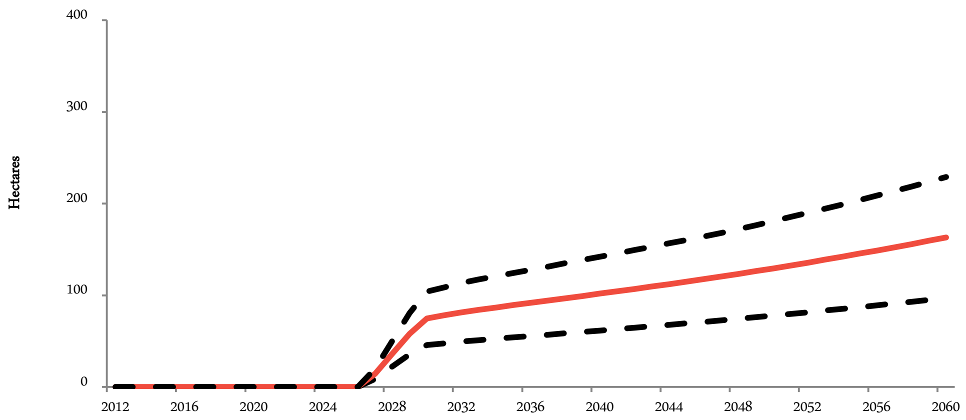
- ► Future management of the effective mix of residential and business population growth within the region

Accordingly, it is likely that the uptake of this potential range of demand would be on the higher side.

B.1.4.2 Wilton

Figure 111 presents the results of applying the methodology for determining the demand for land around an airport at Wilton over the analysis period.

Figure 111: Forecast land use demand for Wilton



Source: Booz & Co data, Analysis by Ernst & Young

The results show that by 2035 the level of demand for industrial land is in the order of 54-89 hectares. With the anticipated increases in airport activity, this land use demand is forecast to grow to roughly 97-163 hectares by 2060. Furthermore, demand has been improved due to its relative closeness to Sydney CBD and other business districts in Sydney.

Demand around Wilton has been adversely affected due to its distance to Sydney CBD being close to double that of Badgerys Creek or Richmond.

The strengths of the region are:

- ► Good north south transport links
- ► Forecast demand for aviation services

The comparative weaknesses of the regions are:

- ► Limited labour supply
- ► Distance from existing supply chain activity

► Relatively expensive land

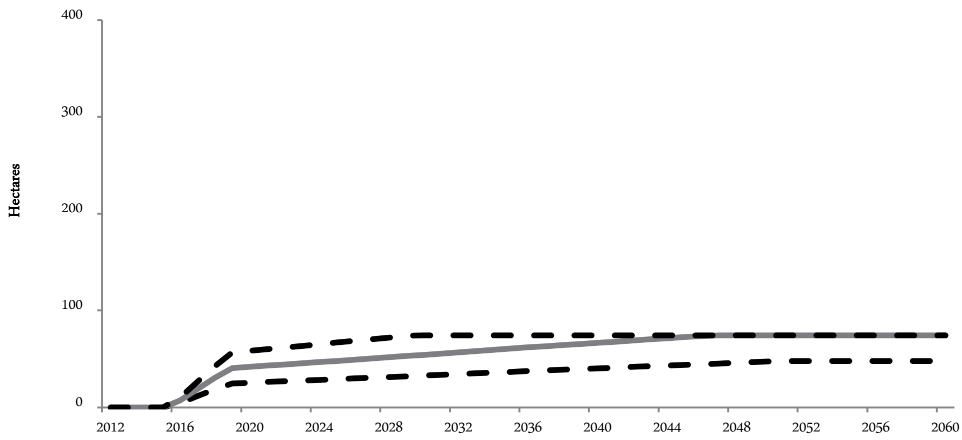
► Limited infrastructure provision

Accordingly, it is likely that the demand for industrial land would likely be in the lower half of the forecast as presented above

B.1.4.3 Richmond

Figure 112 presents the results of applying the methodology for determining the demand for land around an airport at Richmond over the analysis period.

Figure 112: Forecast land use demand for Richmond



Source: Booz & Co data, Analysis by Ernst & Young
Note that the medium and high scenarios merge as 74 hectares is the maximum footprint for Industrial commercial land around the airport site. Activity in both scenarios is high enough to reach this limit

The results show that by 2035 the level of demand for industrial land is in the order of 37-61 hectares. With the anticipated increases in airport activity, this land use demand is forecast to grow to roughly 47-74 hectares by 2050. Furthermore, demand has been improved due to its relative closeness to Sydney CBD and other business districts in Sydney. From 2050 onwards, land use demand is expected to remain static due to the forecast end to growth in airport activity.

The strengths of the region are:

► Good existing infrastructure network

► Large employment catchment within region

The comparative weaknesses of the regions are:

► Limited PAX and freight throughput

► Competing growth centres within the wider region

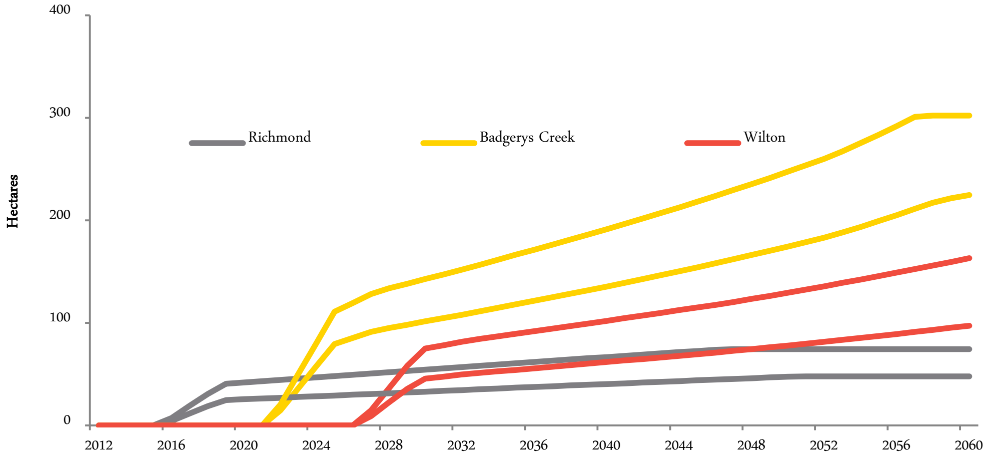
Accordingly, it is likely that the demand for industrial land would likely be around the centre of the forecast as presented above

B.1.4.4 Site Comparison

Comparing the midpoints for each of the site ranges reveals that Badgerys Creek may potentially possess higher demand for surrounding commercial land over the long term relative to Wilton, primarily due to its closer proximity to Sydney. Richmond significantly lags the two other sites due to lower forecast PAX and no freight throughput.

Figure 113 provides a comparison of the three sites.

Figure 113: Comparison of forecast demand for the three sites



Source: Booz & Co data, Analysis by Ernst & Young

B.2 Landside industrial/commercial development impacts on employment and gross value add

The methodology for translating industrial/commercial developable land into employment and economic output estimates is a three staged process:

- Area of business park over time (this was undertaken in the previous phase of the analysis)
- Employment density to employment land area
- Gross value add per employee

The assumptions applied to this analysis are outlined below

Calculations

Employment calculation

Total FTE = area * effective site area * weighted average floor space to site ratio * weighted average floor area per employee

Value add calculation

Value add = aggregate FTE * weighted average revenue per employee * profit margin

Assumptions

Area of industrial development

Total area

Total area was calculated in the previous phase of the analysis. Information regarding the assumed size of industrial/commercial development around the site can be seen in sections 10.2.5, 17.2.5 and 24.2.5.

Breakdown of use

Table 94: Breakdown of use

	Badgerys Creek	Wilton	Richmond
R&D	5.0%	5.0%	5.0%
Light industrial	20.0%	25.0%	35.0%
Warehousing	40.0%	40.0%	50.0%
General office	7.5%	5.0%	5.0%
Call centres	0.0%	0.0%	0.0%
Business park	11.5%	10.0%	0.0%
Retail (super stores)	10.0%	5.0%	0.0%
Hospitality	1.0%	1.0%	0.0%
Hotel (general)	2.5%	5.0%	0.0%
Hotel (budget)	2.5%	4.0%	5.0%

Source: Ernst & Young assumption

Basis for these assumptions include:

- R&D - Likely to go where land and grants are available – reasonably good connectivity to Universities with each of the sites
- Light industrial and warehousing - Good connections to each of the sites will mean that they all provide good options for warehousing and light industrial developments. Any development around the Richmond site would likely take into account a consolidation of any current activities within the region that currently support the RAAF
- General office and business park - The general office and business park developments close to the airport are going to be primarily for the aviation industry and therefore be related to the amount of aviation activity at each of the proposed mutually exclusive developments
- Retail super stores -Mostly serve local residents – therefore the development of such a retail centre at Badgerys Creek would likely have greater appeal
- Hotel - Likely to have more hotel developments near an airport at Wilton, given the distance to key tourist destinations. Furthermore, given the market share of an airport development at Richmond any hotel development would likely be of the low cost variety

Common areas

Area for internal roads and car parks, other commonly shared facilities and underutilised land

Table 95: Area associated with common facilities

Size of industrial park	Area associated with common facilities
<10	40%
10 - 25	25%
25 - 50	20%
50 - 75	18%
>75	15%

Source: Ernst & Young assumption

Floor space to sites ratios

Table 96: Floor space to sites ratios

Business Type	%
R&D	50%
Light industrial	50%
Warehousing	30%
General office	90%
Call centres	90%
Business park	90%
retail (super stores)	40%
Hospitality	40%
Hotel (general)	30%
Hotel (budget)	30%

Source: SGS Economics

Employment assumptions - Area (m2) per employee (FTE)

Table 97: Area per employee

Industry	SGS	ARUP	Deloitte	Applied value	Notes
R&D		29		30	
Light industrial			47	50	
Warehousing	220	50	80	100	
General office	25	19	12	20	
Call centres		12.8	8	10	
Business park	25	16	10	20	
Retail (super stores)	57	90	90	90	
Hospitality		29	13	20	
Hotel (general)			1	1	per 2 bedrooms
Hotel (budget)			1	1	per 6 bedrooms

Source: SGS Economics, Arup Economics and Deloitte

Gross value add

Revenue per employee ($m)

Table 98: Revenue per employee ($m)

Business Type	($m)
R&D	0.1675
Light industrial	0.241182
Warehousing	0.234157
General office	0.126712
Call centres	
Business park	0.126712
Retail (super stores)	0.149755
Hospitality	0.210858
Hotel (general)	0.061863
Hotel (budget)	0.085089

Source: IBISWorld

Profit per industry revenue

Table 99Profit per industry revenue

Business Type	
R&D	1.00%
Light industrial	7%
Warehousing	10.20%
General office	15%
Call centres	
Business park	15%
Retail (super stores)	4.80%
Hospitality	8.70%
Hotel (general)	10.90%
Hotel (budget)	10.80%

Source: IBISWorld

B.3 Direct Employment at a second Sydney airport

B.3.1 Introduction

Airports are widely recognised as having a considerable economic and social impact on their surrounding regions. The development of an airport presents a range of employment opportunities.

This paper was completed predominantly to evaluate the direct employment impacts from the development of a secondary airport within the Sydney basin. This paper will

- Review the domestic and international literature on employment created by airports
- Outline the airport and region specific factors that are likely to influence the size of an airport business park
- Seek to develop a methodology to translate these characteristics into a rough estimate of the expected number and type of employees that would be employed with the development of an airport at each site.

The characteristics of the new airport will influence the number and types of jobs that will result from the development of a new airport, as well as the spatial distribution of prospective employees.

These characteristics of the new airport include:

- Capacity for passenger movements per annum
- Capacity for the movement of freight

B.3.2 Literature Review / International Experience

B.3.2.1 Total Direct Employment

As part of this project, Ernst & Young were tasked with estimating the number of direct employees that would be employed at a second airport in Sydney. To undertake this task we completed research on the number of employees that are employed at airports globally. This analysis was undertaken to provide insights regarding how, and to what extent employment was affected by the number of passengers at a particular airport and whether this relationship between PAX and employment was consistent in different locations.

Table 100 presents the summary of the employment per PAX for airports of different PAX throughput ranges of major domestic and international airports in different continents.[452]

Table 100: PAX per direct employee in different world regions

PAX/Regions around the world	Australia	Asia & Middle East	USA	Europe	Europe - York Study (2004)
0-15 million	1,156	815	1,463	1,308	1,308
15-30 million	1,923	-	2,297	1,028	1,028
30-50 million	423	1,114	1,143	1,351	1,351
50+ million	-	852	1,409	942	942

Source: Collated by Ernst & Young from publicly available information and the York Aviation Study (2004)

In order to conduct this high level analysis we referred to publicly available economic impact statements and annual reports of respective airports as well as economic impact studies of the airport industry in specific regions/countries. Our analysis of European airports corresponded with the findings of the York Aviation Study in 2004.

[452] This was done by calculating the weighted average (based on PAX of each airport) of this ratio in each region.

Given the data that we were able to access, our analysis indicated that the amount of PAX at airports and the jurisdiction in which the airport was found had a limited impact - the number of PAX per direct employee tends to be consistent, fluctuating around 900 to 1,500 across different regions and levels of PAX. Furthermore this analysis found, at a high level, that positive economies of scales where realised with regards to airports with greater passenger throughput. Our analysis did identify some outliers however, including;[453]

► Sydney Airport was calculated to realise 423 PAX per direct employee.[454]

► LaGuardia International Airport in New York (3,015 PAX per direct employee), as the airport only has 8,000 direct employees serving its annual PAX of 24 million.[455] If this airport were to be removed from the analysis of airports within the 15 million to 30 million PAX estimates, the weighted average for airports in the USA with between 15 and 30 million passengers would fall to 1,421.

B.3.2.2 Type of employment

The composition of an airport's workforce will be closely related to the volume of air traffic, the design of the airport, and main customer base. Factors that affect the type of employment that is realised at airports include:

► The extent of on-airport retailing, which is important for local employment and also as a source of income.

► Different sizes of airport will encourage different forms of consumer behaviour.

► Airports that are significant enough to generate tourists (as opposed to being 'tourist receivers') will benefit from not being as significantly impacted by seasonal fluctuations or long term trends in the popularity of tourist routes.[456]

► Freight services that are available at the airport

► Maintenance facilities

► Types and sizes of airlines

In regards to direct employment, we have identified four broad categories of employees:

► Passenger dedicated Air Services – Includes airline staff; employees that service airlines and provide passenger air and general aviation services

► Freight dedicated – Includes staff that work in the freight industry of the airport, including customs, shipping, and logistics and distribution.

► Supporting Operations – These are employees that are dedicated to ensuring maintenance of the airport (e.g. administration, maintenance and security), as well as the additional commercial support for passengers (e.g. ground transport, car rental and parking, hotels and retail)

► Other – Includes employees within the wider business park; Government operations, construction, property and business services as well as manufacturing.

[453] A list of data on domestic and international airports and their passenger movements, freight throughput and direct employment is available in Appendix C.
[454] Sydney Airport Corporation Limited, *The Economic Impact of Growth at Sydney Airport*, URS, January 2008
[455] The Port Authority of New York and New Jersey, *Facts & information*, LaGuardia Airport, http://www.panynj.gov/airports/lga-facts-info.html, accessed 24 July 2012
[456] Andrew, R. (2006), "The contribution of Airports to Regional Economic Development", University of Luton, United Kingdom

An example breakdown of employment at an airport presented by York Aviation (2004) shows two thirds being sourced from airline staff, handling agents and aircraft maintenance. This corresponds to a mixture of passenger dedicated air services and supporting operations. The study also found that the remainder was split between in-flight catering, restaurants and bars and retailing (12%), air traffic control and control agencies (6%), freight (1 %) and other activities such as fuel companies and ground transport operators (3%).

As part of this analysis, Ernst & Young reviewed the breakdown of types of employment at a selection of Australian and international airports.[457] The average breakdown by Airport in the sample is 43% for Passenger dedicated air services, 26% for other services, 12% for freight, and 22% for supportive operations.

Other observations that were made include:

- We found that the composition of the workforce at an airport can vary significantly depending on the size, location, and specialisation of the airport. For example, the % of employment accruing to Retail or Freight can be very small or large depending on the competitive advantage and level of development of the airport.
- Between all the international airports for which we accumulated workforce composition data, there exists broad variability. However there are employment categories where many of the airports are somewhat consistent and there are only a few outliers.
- For many airports broadly 30% of direct employees are employed specifically for airlines servicing the airport.
- Freight and government operations tend to take up the second and third largest proportions of the airports workforce
- Employment categories such as construction, ground transportation/car rental and administration normally explain the majority of the workforce that remains.
- Employment dedicated to freight varies largely between airports, as some airports are more dedicated towards passenger services (Washington has less than 0.5% of its workforce dedicated to freight as its annual throughput is only 6,261 tonnes) compared with others such as Anchorage International Airport, which has 39% of its workforce dedicated to freight as its annual throughput is 2.6 million tonnes.

B.3.3 Methodology for the total level of employment at each airport site

This section of the paper presents the proposed methodology for calculating the number and type of employees that can be expected at a secondary airport.

Step 1: Estimate the number of direct employees at each airport site

We propose to calculate the number of direct employees through a regressed analysis of the activity levels of international airports using publicly available data. In total, we were able to compile data for 52 different airports.

Finding the activity variable for each of the airports, we regressed direct employment against airport ‘activity’. An activity variable:

- Is a variable that combines the two different types of activity into one
- To do this we used an equal weighting for each activity type.
- The activity variable was measured using a logarithmic function in order to reflect the fact that as the level of activity at an airport grows

Our regression provided us with the following conclusions:

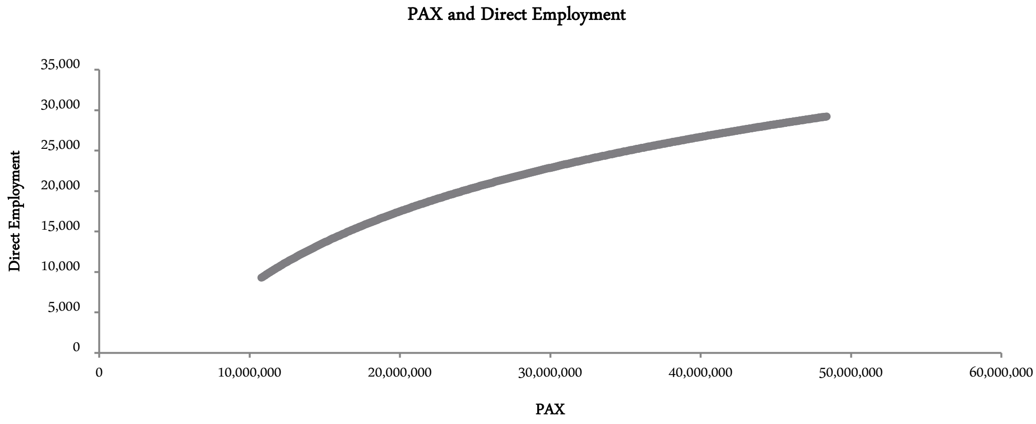
- There is a statistically significant relationship between the logarithm of ‘activity’ at an airport and the number of direct employees, indicating that economies of scale were exhibited within the data.
- The number of direct employees per million PAX falls over time for all three proposed airport sites, ranging between:
  - Badgery’s Creek - 683 in 2035 and 552 in 2060

[457] The tables can be found in Appendix C

- ► Wilton – 742 in 2035 and 572 in 2060
- ► Richmond – 1,138 in 2035 and 1,034 in 2060.

This logarithmic relationship is illustrated in Figure 114.

Figure 114: PAX and Direct Employment



Source: Data of Booz & Co, analysis by Ernst & Young

Step 2: Split direct employment by its composition

Once the number of direct employees has been estimated for each airport site over time using Booz and Co. forecast of passenger and freight demand, the next step is to estimate the likely proportion of employment by several categories. As discussed in B.3.2.2, we propose to divide employment into four categories:

- ► Passenger Employment: airlines, air services, and general aviation.
- ► Freight: this includes employment related to the movement of freight.
- ► Support Services: this includes ground transport, administration, maintenance, hotels, retail, car parking, car parking, and security.
- ► Other Services: this includes government operations, construction, and manufacturing.

Using a sample of direct employment composition from 24 international airports which is found in Appendix C, a relationship was estimated between the level of freight at an airport and the % of employment dedicated to freight, and also the number of passenger movements and the % of employment dedicated to passengers. The results were applied to the forecast Airport demand and freight numbers to estimate the percentage of employment that will result each year. The proportion of the other two categories, support services and other services, were estimated from their relative prominence in the sample.

B.3.4 Results

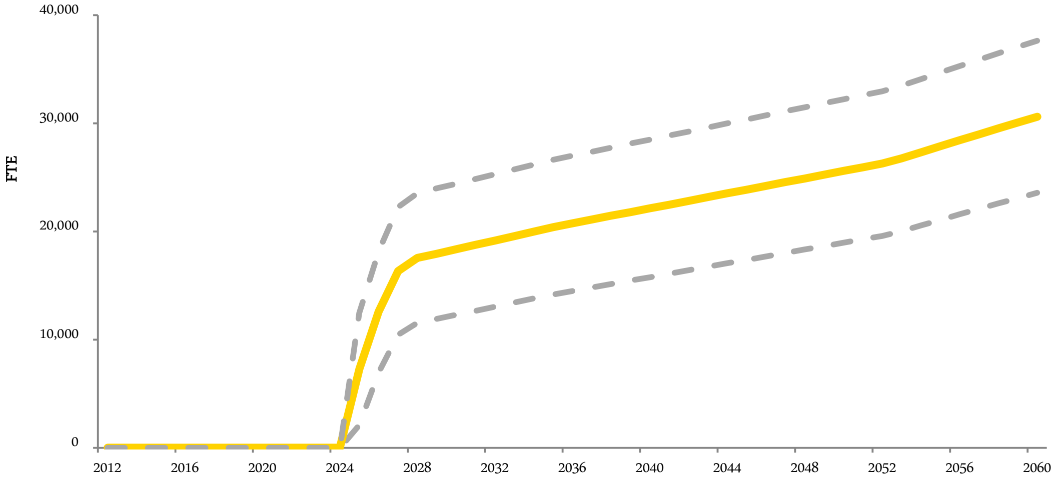
B.3.4.1 Total Direct Employment

Applying the above methodology, based on the forecast levels of activity for each airport we developed forecasts (and confidence intervals) to 2060 for the number of direct employees. The following section of this paper present the outcome of this analysis.

Badgerys Creek

The employment forecasts for Badgerys Creek are represented in Figure 115:

Figure 115: Employment forecasts for Badgerys Creek



Source: Data of Booz & Co, analysis by Emst & Young

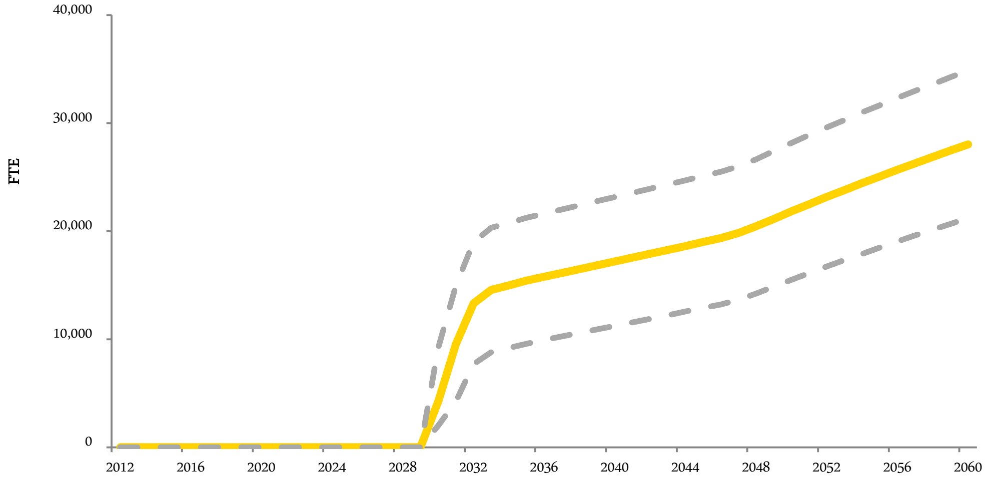
The number of direct full-time employees at Badgerys Creek airport is expected to increase from 20,391 in 2035 to 30,587 in 2060. This represents a 50% increase over 25 years which represents an average annual growth rate of 2%.

As airport activity increases, the airport will benefit from economies of scale whereby direct employment increases at a slower rate than growth in aviation activity. As such the number of passengers per full time employee is anticipated to grow from 1,228 in 2035 to 1,765 in 2060, representing a 44% increase in efficiency.

Wilton

The employment forecasts for Wilton are represented in Figure 116:

Figure 116: Employment forecasts for Wilton



Source: Booz & Co data, Analysis by Ernst & Young

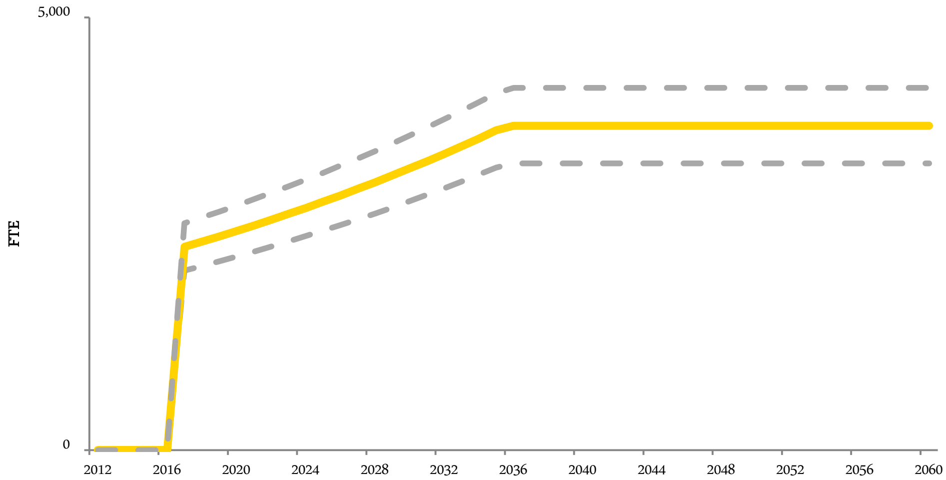
The number of direct full-time employees at Wilton airport is expected to increase from 15,403 in 2035 to 28,027 in 2060. This represents an 82% increase over 25 years which represents an average annual growth rate of 3.3%.

As airport activity increases, the airport will benefit from economies of scale whereby direct employment increases at a slower rate than growth in aviation activity. As such the number of passengers per full time employee is anticipated to grow from 1,110 in 2035 to 1,579 in 2060, representing a 42% increase in efficiency.

Richmond

The employment forecasts for Richmond are represented in Figure 117:

Figure 117: Employment forecasts for Richmond



Source: Booz & Co data, Analysis by Ernst & Young
Note: Traffic forecasts by Booz & Co indicate that a Richmond airport will reach its capacity in 2036. As such, direct employment levels will also reach their limit in the same year.

The number of direct full-time employees at Richmond airport is expected to increase from 3,693 in 2035 to 3,748 in 2060. This represents a 1% increase over 25 years which represents an average annual growth rate of 0.1%.

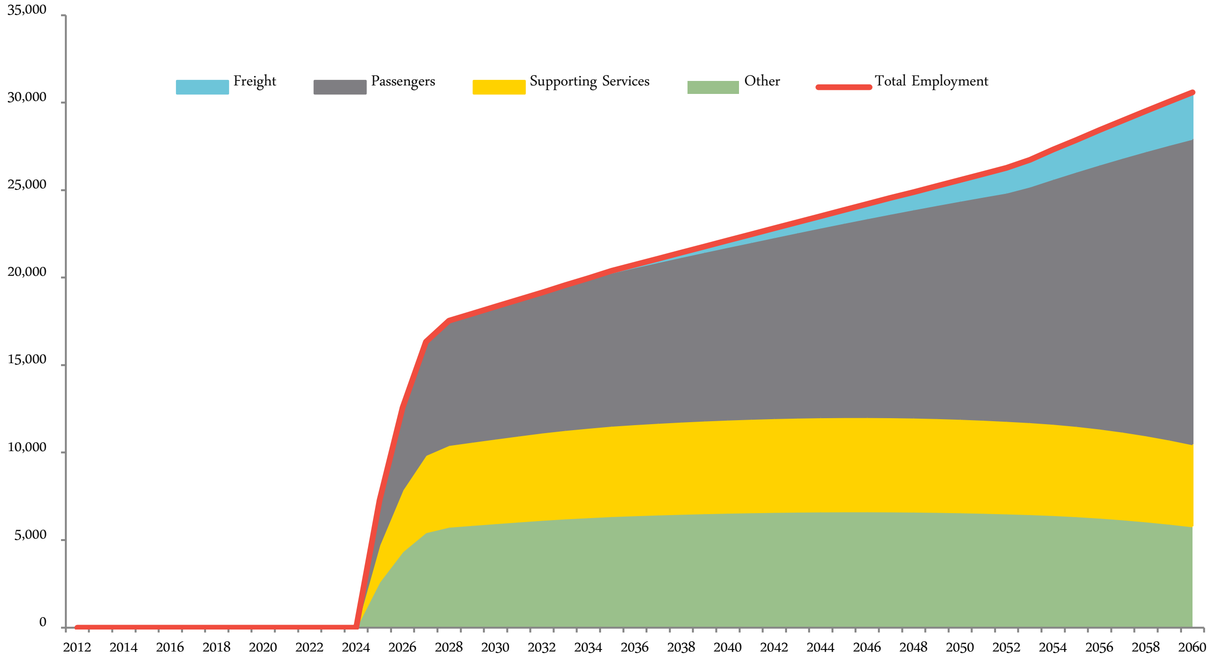
B.3.4.2 Employment Composition

This section of the paper presents the employment composition results that were found by applying the methodology.

Badgerys Creek

Figure 118 illustrates the estimated direct employment for each of the four categories at each point in time at Badgerys Creek. As direct employment increases from roughly 10,000 to 30,000 over the next 50 years, the relative number of employees in each category changes over time.

Figure 118: Forecast direct employment composition for Badgery's Creek



Source: Booz & Co data, Analysis by Ernst & Young

The information presented above indicates that as airport activity increases, the number and proportion of employees related to Passenger and Freight services increase. For example, employment in Passenger services at Badgerys Creek is forecast to increase from 43% of direct employees in 2035 to 57% in 2060.

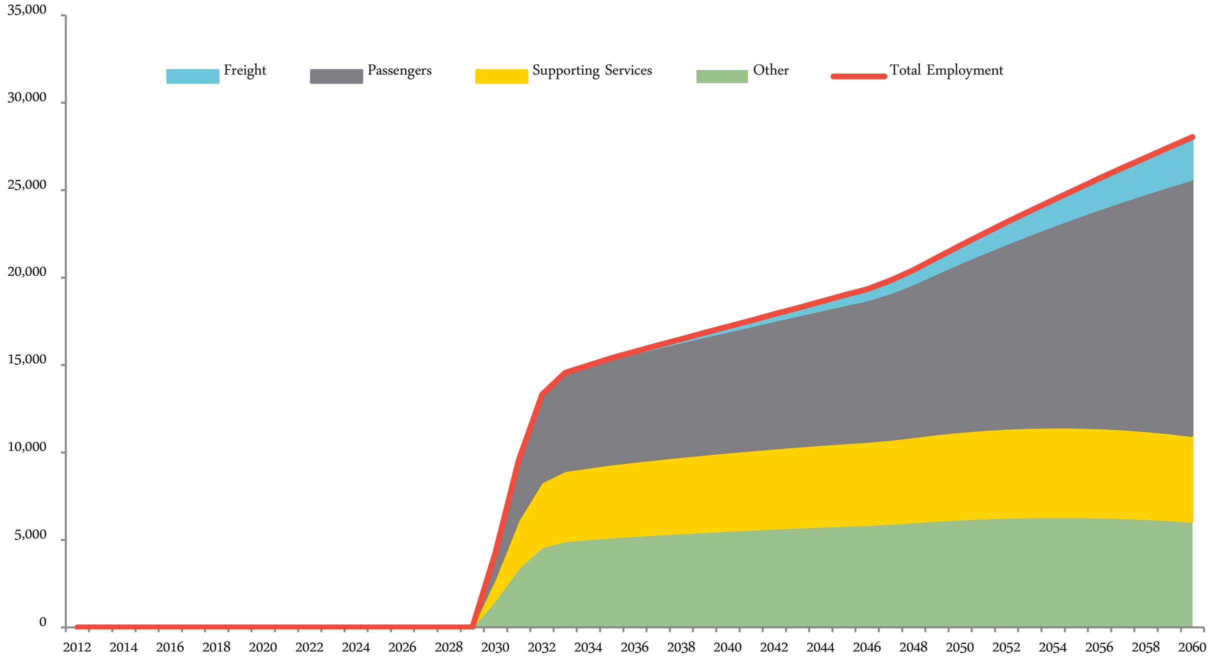
Based on our discussions with the department and according to the traffic forecasts from Booz & Co, Badgerys Creek is not expected to cater for freight activity until 2033, and our forecasts for freight related employment is consistent with that timing. However, as freight activity increases, so does the proportion of freight-related employment, to approximately 9% of direct employment by 2060.

Supporting and Other services represent a significant proportion of employment throughout the period. However, these employment categories are also more likely to experience economies of scale as aviation activity increases. Our forecasts for these employment categories shows a slowing rate of growth until 2055, where it peaks. The combined share of these categories decreases over time from 56% in 2035 to 34% in 2060.

Wilton

Figure 119 illustrates the estimated direct employment for each of the four categories at each point in time at Wilton. As direct employment increases from roughly 5,000 to 27,750 over the next 50 years, the relative number of employees in each category changes over time in a fashion broadly consistent to the results for Badgerys Creek.

Figure 119: Forecast employment composition for Wilton



Source: Booz & Co data, Analysis by Ernst & Young

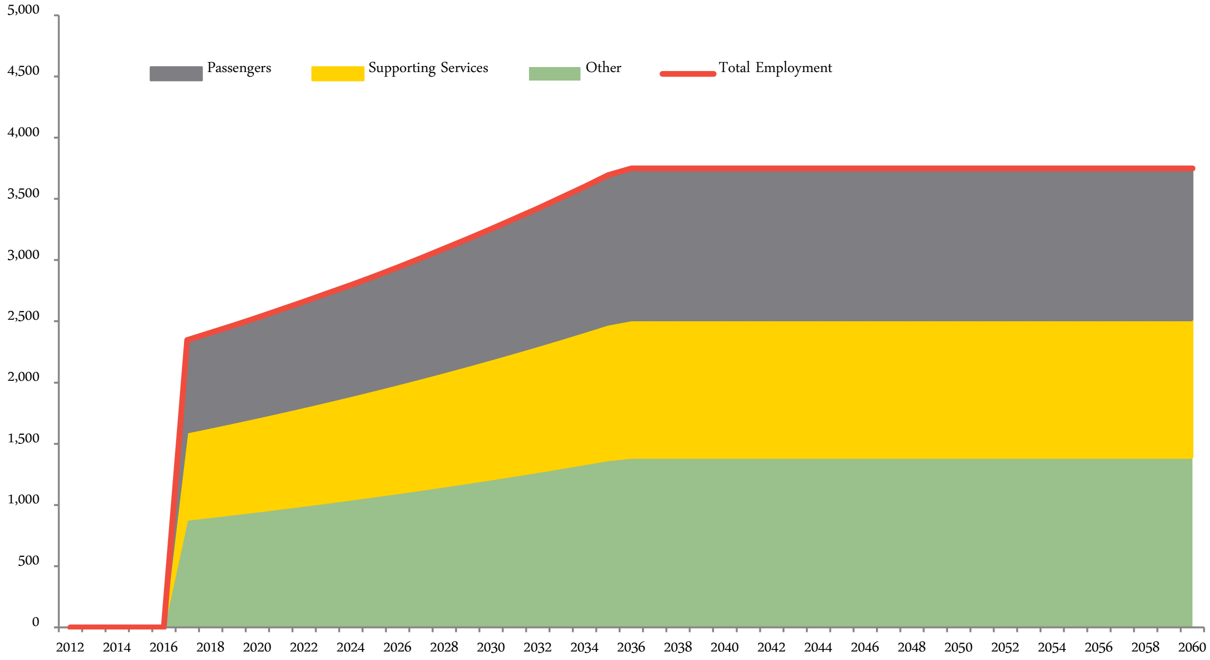
According to the traffic forecasts, Wilton is not expected to cater for freight activity until 2033, and our forecasts for freight related employment is consistent with that timing. However, as freight activity increases, so does the proportion of freight-related employment, approximately 9% of direct employment by 2060.

Supporting and Other services represent a significant proportion of employment throughout the period. However, these employment categories are also more likely to experience economies of scale as aviation activity increases. Our forecasts for these employment categories show a slowing rate of growth until 2040 where it peaks. As such the combined share of these categories decreases over time from 60% in 2035 to 39% in 2060.

Richmond

Figure 120 illustrates the estimated direct employment for each of the four categories at each point in time at Richmond. Unlike Badgerys Creek and Wilton, according to our discussions with the department and the traffic forecasts from Booz & Co, Richmond has a significantly different demand profile over time, and does not feature freight.

Figure 120: Forecast direct employment composition for Richmond



Source: Booz & Co data, Analysis by Ernst & Young

The information presented above indicates that un-like the growth profile at the other two airports as airport activity increases, the number and proportion of employees related to the different types of services will remain unchanged.

B.4 Source of employees

To project the source of employees to each of the proposed sites, the following assumptions and methodologies were used

Calculation

Potential labour pool = labour supply – assigned labour demand

Labour supply

Labour supply = current unemployed + underutilised persons + future labour supply (in that period)

Where:

- Current unemployed - difference between the current unemployment rate and the structural unemployment rate for the region
- Underutilised persons - the effective underutilised time of part time workers taking into account the percentage of part time workers that would be willing and able to work full time
- Future labour supply - labour supply portion of population increase (taking into account those that would be structurally unemployed and part time by choice)

Assigned labour demand

Labour demand is the forecast number of jobs that are anticipated to be realised within the region over a specified period that does not include

Assumptions

Current population information is shown in Table 101.

Table 101: Current population information

	Richmond	Wilton	Badgerys Creek	Source
Population statistics				
Current population	537,510	415,857	685,240	ABS
Current labour force				
Full Time	212,160	118,516	190,209	ABS
Part Time	91,119	58,955	79,666	ABS
Unemployed	17,353	13,258	22,864	ABS
Not in Labour Force	150,376	107,828	190,395	ABS
Employment				
Jobs in region	266,192	168,529	272,083	BTS
Type of Job				
Higher skilled	39%	39%	38%	BTS – Ernst & Young assumption
Lower skilled	61%	61%	62%	BTS – Ernst & Young assumption

Source: ABS & BTS

Forecast changes to the region are shown in Table 102.

Table 102: Forecast changes to the region

	Richmond	Wilton	Badgerys Creek	Source
Population statistics				
Population increase (2006 – 2030)	45%	65%	31%	BTS
Population increase (2030 – 2060)	23%	33%	15%	Ernst & Young assumption
Labour force				
Change in working age population (pa)	-0.220%	-0.294%	0.199%	NSW Department of planning
Employment				
Jobs in region (pa change - 2006 – 2030)	2%	2%	2%	BTS
Jobs in region (pa change - 2030 – 2060)	1%	1%	1%	Ernst & Young assumption

Future types of jobs				
Higher skilled	29%	32%	29%	BTS – Ernst & Young assumption
Lower skilled	71%	68%	71%	BTS – Ernst & Young assumption

Source: BTS, NSW Department of Planning and Ernst & Young assumptions

Ernst & Young assumptions are in Table 103.

Table 103: Ernst & Young assumptions

Assumption	Value
Structural unemployment rate	4.5%
Part time workers underutilised time	50%
Number of part time workers looking for additional work	50%
Skills mix of current underutilised labour force	
Higher skilled	
Current unemployed	10%
Current part time	25%
Future population	35%
Lower skilled	
Current unemployed	90%
Current part time	75%
Future population	65%

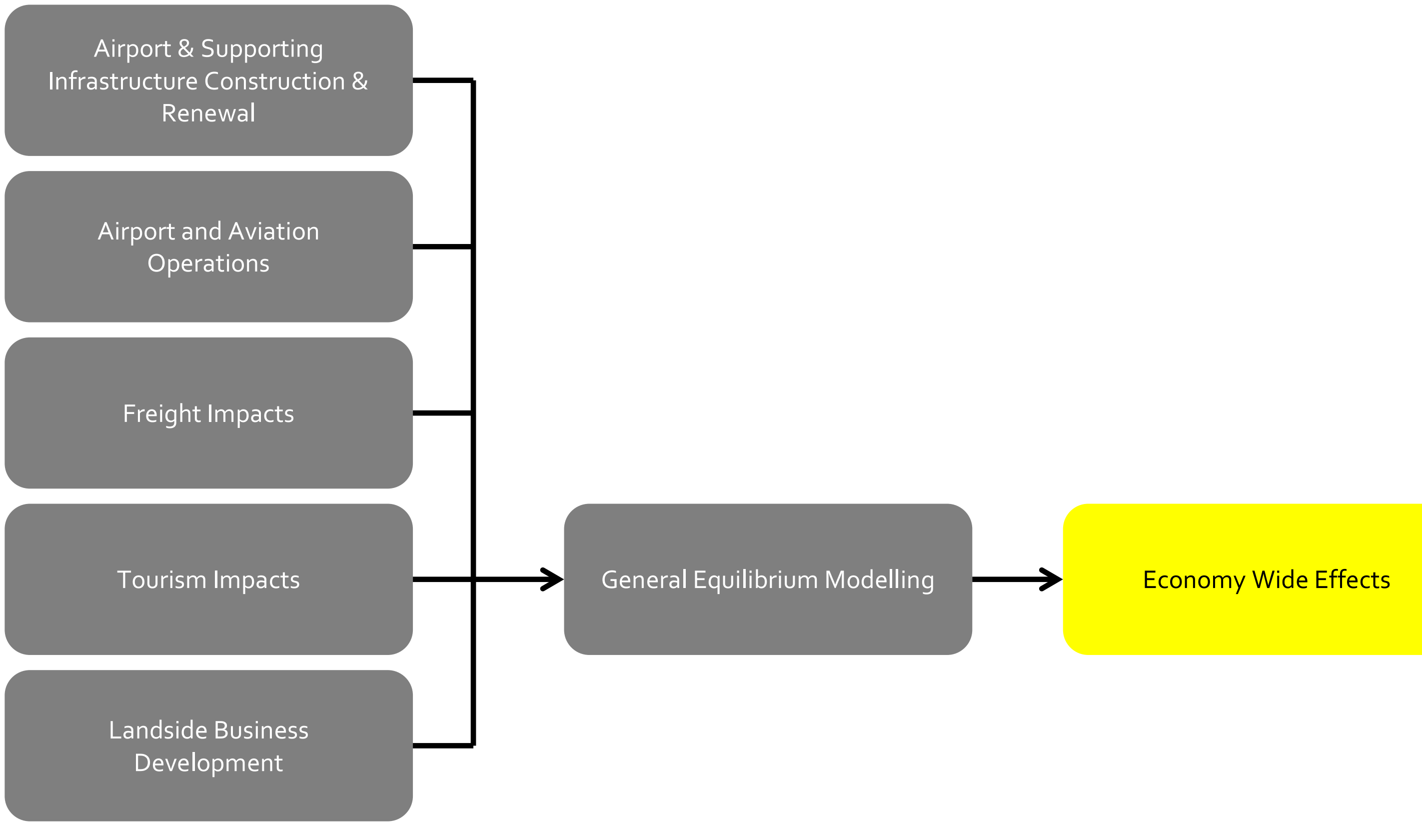
Source: Ernst & Young assumptions

B.5 General Equilibrium economic impact assessment methodology

The economy wide study was undertaken using a general equilibrium modelling approach. Under a general equilibrium approach, the direct expenditure benefits and costs identified in the previous chapters are used as inputs that drive the results for the entire NSW and the rest of Australia (ROA) economies. Full details of the general equilibrium modelling are contained in this chapter of the report.

The approach to capturing the economy wide effects of increasing the aviation capacity in the Sydney region is shown in the simplified figure below.

Figure 121: General Equilibrium Modelling Inputs



Based on the direct expenditure impacts identified above, a broad economic impact study was conducted on the NSW and Australian economies. The economic impact assessment was undertaken using the MMRF model, developed at the Centre of Policy Studies (CoPS).

The MMRF is a dynamic, multi-sectoral, multi-regional model of Australia. The current version of the model distinguishes 58 industries, 63 products produced by the 58 industries, 8 states/territories and 56 sub-state regions. At the state/territory level it is a fully-specified bottom-up system of interacting regional economies. To allow estimates of the effects of policy at the sub-state level, a top-down approach is added.

In effect, the MMRF model's treatment of production in the selected industries is turned off and replaced with Ernst & Young's estimates of the direct impacts (i.e. production becomes an exogenous, user-determined, variable and a variable allowing for a shift in unit cost becomes an endogenous, model-determined, variable. In effect, Ernst and Young changes in turnover for the affected industries are forced on the model via endogenous changes in unit costs).

Economic impact model and assumptions

This chapter outlines the economic modelling process used in this study and presents the economic impact results generated from the modelling. The detailed modelling was undertaken by CoPS.

The model - MMRF

The MMRF is a dynamic, multi-sectoral, multi-regional model of Australia. The current version of the model distinguishes 58 industries, 63 products produced by the 58 industries, 8 states/territories and 56 sub-state regions. At the state/territory level it is a fully-specified bottom-up system of interacting regional economies. To allow estimates of the effects of policy at the sub-state level, a top-down approach is added.

Of the 58 industries, three produce primary fuels (coal, oil and gas), one produces refined fuel (petroleum products), six generate electricity and one supplies electricity to final customers. The six generation industries are defined according to primary source of fuel: *Electricity-coal* includes all coal-fired generation technologies; *Electricity–gas* includes all plants using gas turbines, cogeneration and combined cycle technologies driven by burning gas; *Electricity-oil products* covers all liquid-fuel generators; *Electricity-hydro* covers hydro generation; while *Electricity-other* covers the remaining forms of renewable generation from biomass, biogas, wind etc. Nuclear power generation is not currently used in Australia but *Electricity–nuclear* is included and could be triggered, if desired, at a specified CO2 price.

Apart from *Grains* (industry 4) and *Petroleum products* (industry 20), each industry produces a single product. *Grains* produces grains for animal and human consumption and biofuel used as feedstock by *Petroleum products*. *Petroleum products* produces five products – gasoline (includes gasoline-based biofuel blends), diesel (includes diesel-based biofuel blends), LPG, aviation fuel, and other refinery products (mainly heating oil).

The nature of markets

MMRF determines regional supplies and demands of commodities through optimising behaviour of agents in competitive markets. Optimising behaviour also determines industry demands for labour and capital. Labour supply at the national level is determined by demographic factors, while national capital supply responds to rates of return. Labour and capital can cross regional borders in response to relative regional employment opportunities and relative rates of return.

The assumption of competitive markets implies equality between the basic price and marginal cost in each regional sector. Demand is assumed to equal supply in all markets other than the labour market (where excess supply conditions can hold). The government intervenes in markets by imposing ad valorem sales taxes on commodities. This places wedges between the prices paid by purchasers and basic prices received by producers. The model recognises margin commodities (e.g., retail trade and road transport freight) which are required for each market transaction (the movement of a commodity from the producer to the purchaser). The costs of the margins are included in purchasers' prices but not in basic prices of goods and services.

Demands for inputs to be used in the production of commodities

MMRF recognises two broad categories of inputs: intermediate inputs and primary factors. Firms in each regional sector are assumed to choose the mix of inputs that minimises the costs of production for their levels of output. They are constrained in their choice by a three-level nested production technology. At the first level, intermediate-input bundles, primary-factor bundles and other costs are used in fixed proportions to output. These bundles are formed at the second level. Intermediate-input bundles are combinations of goods imported from overseas and domestic goods. The primary-factor bundle is a combination of labour, capital and land. At the third level, inputs of domestic goods are formed as combinations of goods sourced from each of the eight domestic regions, and the input of labour is formed as a combination of inputs of labour from nine different occupational categories.

Household demands

In each region, the household buys bundles of goods to maximise a utility function subject to a household expenditure constraint. The bundles are combinations of imported and domestic goods, with domestic goods being combinations of goods from each domestic region. A Keynesian consumption function is usually used to determine aggregate household expenditure as a function of household disposable income.

Demands for inputs to capital creation and the determination of investment

Capital creators for each regional sector combine inputs to form units of capital. In choosing these inputs, they minimise costs subject to a technology similar to that used for current production; the only difference being that they do not use primary factors directly.

Governments' demands for commodities

Commodities are demanded from each region by regional governments and by the Federal government. In MMRF, there are several ways of handling these demands, including:

- By a rule such as moving government expenditures with household consumption expenditure or with domestic absorption or with GDP;
- As an instrument which varies to accommodate an exogenously determined target such as a required level of government deficit; and
- Exogenously.

Foreign demand (international exports)

MMRF adopts the ORANI specification of foreign demand. Each export-oriented sector in each state faces its own downward-sloping foreign demand curve. Thus, a shock that reduces the unit costs of an export sector will result in increased export volume, but a lower foreign-currency price. By assuming that the foreign demand schedules are specific to product and region of production, the model allows for differential movements in foreign-currency prices across domestic regions.

Regional labour markets

The response of regional labour markets to policy shocks depends on the treatment of three key variables – regional labour supplies, regional unemployment rates and regional wage differentials. The main alternative treatments are:

- To set regional labour supplies and unemployment rates exogenously and determine regional wage differentials endogenously;
- To set regional wage differentials and regional unemployment rates exogenously and determine regional labour supplies endogenously (*via* interstate migration or changes in regional participation rates); and
- Set regional labour supplies and wage differentials exogenously and determine regional unemployment rates endogenously.

The second treatment 2 is the one adopted for the current modelling, with regional participation rates exogenous. Under this treatment, workers move freely (and instantaneously) across state borders in response to changes in relative regional unemployment rates. With in regional wage rates indexed to the national wage rate, regional employment is demand determined.

Physical capital accumulation

Investment undertaken in year t is assumed to become operational at the start of year t+1. Under this assumption, capital accumulates according to (industry and region indexes dropped for convenience):

$$K(t+1) = (1 - DEP) \times K(t) + Y(t) \qquad (0)$$

where:

K(t) is the quantity of capital available in industry at the start of year t;

Y(t) is the quantity of new capital created during year t; and

DEP is the rate of depreciation, which is treated as a fixed parameter.

Given a starting point value for capital in t=0, and with a mechanism for explaining investment through time, equation (1) can be used to trace out the time paths of industry capital stocks.

Following the approach taken in the MONASH model, investment in year t is explained via a mechanism of the form

$$\frac{K(t+1)}{K(t)} - 1 = F^{t}\left[\frac{EROR(t)}{RROR(t)}\right] \qquad (0)$$

where

EROR(t) is the expected rate of return in year t;

RROR(t) is the required rate of return on investment; and

$F^{t}[\ ]$ is an increasing function of the ratio of expected to required rate of return with a finite slope.

In the current version of MMRF, it is assumed that investors take account only of current rentals and asset prices when forming current expectations about rates of return (static expectations).

Lagged adjustment process in the national labour market

The airport simulations are year-to-year recursive-dynamic simulations, not comparative-static simulations. In the year-to-year simulations it is assumed that deviations in the national real wage rate from its base-case level increase through time in proportion deviations in the national unemployment rate. The coefficient of adjustment is chosen so that effects of a shock on the unemployment rate are largely eliminated after about ten years. This is consistent with macroeconomic modelling in which the NAIRU is exogenous.

This treatment of the national labour market differs from the treatment of regional labour markets outlined in Section 2.2.7. If the national real wage rate rises in response to a fall in the national unemployment rate, then wage rates in all regions rise by the same percentage amount, and regional employment adjusts immediately, with regional labour supplies adjusting to stabilise relative regional unemployment rates.

Simulation Design

Introduction

The effects of Scenarios 1, 2 and 3 are reported as deviations away from values in the base case projection. The inputs to the MMRF policy simulations are sourced from Ernst and Young.

Assumptions for the macro-economy in the policy scenarios

The following assumptions are made for key aspects of the macro-economy in the deviations simulations.

Labour markets

At the national level, it is assumed that there are no employment consequences associated with restrictions on Sydney airport capacity. This means that the costs of capacity restrictions are realised almost entirely as a fall in the national real wage rate, rather than as a fall in national employment.

At the regional level, labour is assumed to be mobile between state economies. Labour moves between regions so as to maintain inter-state unemployment-rate differentials at their levels in the base case projection. Accordingly, regions that are relatively unfavourably affected by Sydney airport restrictions will experience relative reductions in their labour forces as well as in employment.

Private consumption and investment

Private consumption expenditure is determined via a Keynesian consumption function which links nominal consumption to Household Disposable Income (HDI). HDI is the sum of payments to domestic labour and capital and government transfer payments net of direct taxation.

Investment in all but a few industries is allowed to deviate from values in the base case scenario in line with deviations in expected rates of return. Investors are assumed to be myopic, implying that expected rates of return move with contemporaneously observed rates of return. The exceptions to this rule are the electricity generators, for which changes in capital (generation capacity) are imposed exogenously using information from the detailed electricity modelling. The changes are imposed by allowing the required rates of return on investment to shift endogenously.

Rates of return on capital

In the policy scenarios, MMRF allows for short-run divergences in rates of return on industry capital stocks from their levels in the base case. Such divergences cause divergences in investment and hence capital stocks. The divergences in capital stocks gradually erode the initial divergences in rates of return, so that, provided there are no further shocks to the system, in the long run rates of return revert to their base case levels.

Government consumption and fiscal balances

MMRF contains no theory to explain changes in real public consumption. In these simulations, public consumption is simply indexed to nominal GDP. The fiscal balances of each jurisdiction (federal, state and territory) as a share of nominal GDP are fixed at their values in the base case. Budget-balances constraints are accommodated by endogenous movements in lump-sum payments to households.

Production technologies and household tastes

MMRF contains many types of technical-change and household-preference-change variables. Under the policy scenarios, it is assumed that most technology and preference variables are exogenous and have the same values as in the base case projection.

Imposing inputs from Ernst and Young

Ernst and Young provides data used as input for:

1. Reductions in turnover of certain industries in NSW due to restrictions on Sydney airport capacity; and
2. At the national level, additions in total inbound tourism spending due to additional tourist expenditure in Sydney.

Item-1 data are input to MMRF via closure changes[458] that in effect turn off MMRF's treatment of production (turnover) in the selected NSW industries and replaces it with the story from Ernst and Young. Production becomes an exogenous (user-determined) variable and a variable allowing for a shift in unit cost becomes an endogenous (model-determined) variables. In effect, the Ernst and Young changes in turnover for the affected industries are forced on the model via endogenous changes in unit costs.

Item-2 data are input to MMRF via exogenous shifts in foreign tourist demand for Australian tourist services. An exogenously specified reduction in foreign tourist expenditure is forced on the model via an endogenous shift in the position of the foreign tourist demand schedule.

Table 104: Industries in MMRF[459]

Name	Description of major activity
1. Sheep & beef cattle	Primary agricultural activities related to sheep and cattle production
2. Dairy cattle	Primary agricultural activities associated with dairy cattle
3. Other livestock	Primary agricultural activities associated with other animals
4. Grains	Grains production
5. Other agriculture	Other primary agricultural production
6. Agricultural services, fishing and hunting	Provision of agricultural services, fishing and hunting
7. Forestry	Logging and forestry services
8. Coal mining	Mining of coal
9. Oil mining	Mining of oil
10. Gas mining	Production of natural gas at well
11. Iron ore mining	Mining of iron ore
12. Non-ferrous ore mining	Mining of ore other than iron
13. Other mining	Other mining activity
14. Meat & meat products	Processed food related to animal
15. Other food, beverages & tobacco	Other food and drink products
16. Textiles, clothing & footwear	Textiles, clothing and footwear
17. Wood products	Manufacture of wood (including pulp) products
18. Paper products	Manufacture of paper products
19. Printing and publishing	Printing and publishing
20. Petroleum products	Manufacture of petroleum (refinery) products
21. Basic chemicals	Manufacture of basic chemicals and paints
22. Rubber & plastic products	Manufacture of plastic and rubber products
23. Non-metal construction products	Manufacture of non-metallic building products excl. cement
24. Cement	Manufacture of cement
25. Iron & steel	Manufacture of primary iron and steel.
26. Alumina	Manufacture of alumina
27. Aluminum	Manufacture of aluminium
28. Other non-ferrous metals	Manufacture of other non-ferrous metals
29. Metal products	Manufacture of metal products
30. Motor vehicles and parts	Manufacture of motor vehicles and parts
31. Other manufacturing	Manufacturing non elsewhere classified
32. Electricity generation - coal	Electricity generation from coal (black and brown) thermal plants
33. Electricity generation - gas	Electricity generation from natural gas thermal plants
34. Electricity generation – oil products	Electricity generation from oil products thermal plants
35. Electricity generation - nuclear	Electricity generation from nuclear plants
36. Electricity generation – hydro	Electricity generation from renewable sources – hydro
37. Electricity generation – other	Electricity generation from all other renewable sources
38. Electricity supply	Distribution of electricity from generator to user
39. Gas supply	Urban distribution of natural gas

[458] "Closure" is a modelling MMRF used to describe the choice of exogenous and endogenous variables underlying a simulation. MMRF contains more variables than equations. Thus in conducting a simulation a specific number of variables (equal to the number of equations) must be declared to be endogenous. The remainder are exogenous and their values are set by the model user.
[459] For most of the industries identified in this table there is an obvious correspondence to one or more standard categories in the Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006 version. The exceptions are: industries 32 to 38, which together comprise ANZSIC 26 *Electricity Supply*, industry 53, which is equivalent to the *Ownership of dwellings* industry in the industrial classification of the official Input/output statistics; and industries 56 to 58 which relate to the provision of services from the private stocks of motor vehicles, electrical equipment (not heating) and heating equipment.

Name	Description of major activity
40. Water supply	Provision of water and sewerage services
41. Construction services	Residential building and other construction services
42. Trade services	Provision of wholesale and retail trade services
43. Accommodation, hotels & cafes	Provisions of services relating to accommodation, meals and drinks
44. Road passenger transport	Provision of road transport services – passenger
45. Road freight transport	Provision of road transport services - freight
46. Rail passenger transport	Provision of rail transport services – passenger
47. Rail freight transport	Provision of rail transport services - freight
48. Water, pipeline & transport services	Provision of water transport services
49. Air transport	Provision of air transport services
50. Communication services	Provision of communication services
51. Financial services	Provision of financial services
52. Business services	Provision of business services
53. Dwelling services	Provision of dwelling services
54. Public services	Provision of government and community services
55. Other services	Provision of services not elsewhere classified
56. Private transport services	Provision of services to households from the stock of motor vehicles
57. Private electricity equipment services	Provision of services to households from the stock of electrical equipment
58. Private heating services	Provision of services to households from the stock of heating equipment

B.6 General Equilibrium economic impact assumptions

To calculate the direct impacts (i.e. turnover and subsequently the value-add) over the evaluation period of each respective airport, the following was calculated:

- Project capital costs – This includes the costs of land acquisition, site restoration, airport construction and supporting infrastructure construction
- Project recurrent costs – Including airport infrastructure operations and maintenance (O&M) costs, airport infrastructure renewal, supporting infrastructure O&M and supporting infrastructure renewal
- Positive impacts of aviation – The positive impacts have been divided into five categories, airlines (pilots, air hostess' etc.), airports (i.e. operations o the airport corporation), airport retail, freight and tourism
- Other developments – This includes business park impacts such as R&D, Light industrial, logistics, general business, retail (super stores and hospitality

The direct impacts calculated by Ernst & Young were used as foundations to estimate the wider economic impacts of an airport. However, to be incorporated into the CoPS modelling structure, these direct impacts were allocated into the following industries:

- Manufacturing
- Transport equipment
- Other equipment
- Construction
- Trade
- Hotels and Cafes
- Road transport
- Business services
- Government - other
- Services - other

The following section describes in greater detail the assumptions used to:

- Calculate the direct impacts (i.e. turnover and value-add) of an airport, over the evaluation period; i.e. project capital costs, project recurrent costs, positive impacts of aviation and other development

- Allocate the direct impacts between industries in order to be incorporated into the CoPS modelling

B.6.1 Airport and supporting infrastructure construction operations and renewal costs

Impact values

The costs to construct the airport and the supporting infrastructure were sourced from the site specific phase of the Joint Study. With respect to the Wilton development some minor changes were made to those values presented in the Joint Study to take into account the updated analysis that was undertaken by WorleyParsons as part of this phase of the analysis.

Note that the airport operational turnover was taken into account within Aviation impacts as outlined in section 1.2.2.

Profit

In order to calculate the value-added by construction of the airport and supporting infrastructure, a percentage is applied to total turnover expected from land acquisition, site restoration airport and supporting infrastructure construction, operation and maintenance as well as renewal.

Table 105: Profit factors

Factor	Factor	Source
Profit factors	22%	Commercial & industrial building in Australia - E4114

Source: Commercial & industrial building in Australia - E4114

This indicates that 22% of the turnover expected from each proposed airport site is assumed to be profit (and hence value add) from airport and supporting infrastructure construction.

Inputs to CoPS model

The costs incurred to construct the airport and supporting infrastructure can be broken down into three categories:

- Site works – This includes land acquisition costs and site restoration
- Construction – This includes airport construction costs, supporting infrastructure construction costs, airport infrastructure renewal and supporting infrastructure renewal costs
- Supporting infrastructure Operations and Maintenance (O&M) costs

The table below indicates how site works costs should be divided between relevant CoPS model industries:

Table 106: Site works distributions

CoPS indicators	Factor
Construction	60%
Government	20%
Services Other	20%

Source: Ernst & Young assumption

This indicates that the majority of costs incurred for the site works required for each of the respective airports and supporting infrastructure is allocated to the construction industries direct impacts.

The table below indicates how construction costs are divided between relevant CoPS model industries:

Table 107: Construction distributions

CoPS indicators	Factor
Construction	90%
Business services	5%
Transport and other	5%

Source: Ernst & Young assumption

This indicates that the majority of direct impacts during the construction phase of the respective airports and supporting infrastructure is allocated to the construction industry direct impacts.

The table below indicates how supporting infrastructure O&M costs is divided between relevant CoPS model industries:

Table 108: Supporting infrastructure O&M distributions

CoPS indicator	Factor
Construction	60%
Government	20%
Transport and other	20%

Source: Ernst & Young assumption

This indicates that the majority of direct impacts during the supporting infrastructure O&M phase of the respective airports and supporting infrastructure is allocated to the construction industries direct impacts.

B.6.2 Aviation impacts

Aviation impacts can be divided into airlines, airports, airport retail, freight related and tourism.

B.6.2.1 Airlines

Impact values

The revenue retained in Australia from both domestic and international passengers is a key impact of an airline, and an important impact from introducing a new airport.

The table below indicates the assumed revenue per passenger that is retained in Australia from domestic and international flights.

It is then assumed that 35% of domestic airline passenger revenue and 15% of international airline passenger revenue is retained in Australia.

Table 109: Airline revenue retained in Australia

Factor	Factor	Source
Revenue per domestic airline flight retained in Aust	79	IBIS World - **I6402**
Revenue per international airline flight retained in Aust	74	IBIS World - **I6401**

Source: IBISWorld

To calculate these inputs, Ernst & Young uses statistics from IBISWorld on the total number of international airline and domestic airline passengers, as well as the total revenue that airlines accrue from each.

These inputs can then be applied to expected passenger throughput at each respective airport (as provided by Booz & Co.), in order to find airline turnover over the evaluation period.

Profit

To calculate the value-add from airlines at each respective airport site, a profit factor is applied to expected turnover each year.

The table below provides the profit factors for each type of airline:

Table 110: Domestic and international airline profit factors

Factor	Factor	Source
Domestic airline profit factor	22.7%	IBIS World - **I6402**
International airline profit factor	15.9%	IBIS World - **I6401**

Source: IBISWorld

The profit factors for domestic airlines are higher than the profit factors applied for international airlines.

Inputs to CoPS model

To divide the direct impacts of airlines between the relevant CoPS model industries, the following allocations were applied:

Table 111: Airlines distributions

CoPS indicator	Factor
Air transport	50%
Business services	50%

Source: Ernst & Young assumption

As such, the impacts generated by airlines have been evenly split between the air transport and business services industries.

B.6.2.2 Airports

Impact values

Ernst & Young estimated the turnover specifically from airport operations; i.e. turnover that is accrued due to the airport's corporate authority. To do this, the revenue per passenger that accrues to the Sydney Airport Corporation is estimated as a well as a growth rate per annum.

These are listed in the table below:

Table 112: Positive impact of airport corporations

Factor	Factor	Source
SACL 2010 revenue (minus commercial)	731	IBIS World - **I6630**
SACL PAX (2010)	28	IBIS World - **I6630**
Revenue per passenger	26	IBIS World – **I6630**
Real growth per annum	1.69%	IBIS World – **I6630**

Source: IBISWorld

Revenue per passenger is estimated by finding (via IBISWorld) the total revenue accrued by the Sydney Corporate Authority and dividing it by the total number of passengers through Sydney airport in a given year.

Ernst & Young uses revenue per passenger and expected passenger throughput at each airport (as provided by Booz & Co.) to then estimate airport turnover.

Profit

To calculate the value-add from the operations of an airport corporation at each respective airport site, a profit factor was applied to expected turnover each year.

The table below provides the profit factors for an airport corporation:

Table 113: Airport corporation profit factors

Factor	Factor	Source
Airport corporation profit factor	15%	IBIS World - **I6630**

Source: IBISWorld

As such, 15% of the turnover estimated for the airport corporation is assumed to be profit and hence the value-add associated with the operations of the airport corporation.

Inputs to CoPS model

To divide the direct impacts of the airport corporation between relevant CoPS modelling industries, the following distribution is used:

Table 114: Airport distributions

CoPS indicator	Factor
Business services	50%
Trade	35%
Air transport	15%

Source: Ernst & Young assumption

As such, the majority of the direct impacts caused by the operations of the relevant airport corporation accrue to the business services industry.

B.6.2.3 Airport retail

Impact values

To calculate the contribution to total airport direct impacts from airport retail, the estimated domestic and international passenger throughput (as provided by Booz & Co.) is applied to the average airport retail revenue per domestic and international passenger.

Revenue per passenger is in the table below:

Table 115: Retail revenue per passenger

Factor	Factor	Source
Airport retail revenue per domestic passenger	7.47	**URS retail study 2003**
Airport retail revenue per international passenger	30.72	**URS retail study 2003**

Source: URS retail study 2003

This indicates that an international passenger is expected to contribute approximately four times the amount of revenue to airport retail relative to a domestic passenger.

Profit

A profit factor is applied to the estimated airport retail related turnover of each respective proposed airport site over the evaluation period in order to estimate the value-add from airport retail.

Different factors are applied to airport retail turnover from domestic and international passengers:

Table 116: Airport retail profit factors

Factor	Factor	Source
Domestic aviation profit factor	22.4%	IBIS World - G5125
International aviation profit factor	22.3%	IBIS World - G5256

Source: IBISWorld

Inputs to CoPS model

The direct impacts that are estimated by Ernst & Young are divided into relevant CoPS model industries in the following proportions:

Table 117: Airport retail distributions

CoPS indicator	Factor
Trade	70%
Hotels and Cafes	30%

Source: Ernst & Young assumption

The majority of the direct impacts are allocated to the Trade sector and the remainder to hotels and cafes.

B.6.2.4 Freight related

Impact values

To estimate the turnover contribution from freight related activities of each airport, estimated freight throughput (as provided by Booz & Co.) is applied to an average rate per tonne of outbound freight.

The rate per tonne that was applied in the calculation is:

Table 118: Freight rate per tonne

Factor	Factor
Average rate of outbound freight	$8,000

Source: Ernst & Young calculation based on information from the Department of Infrastructure and Transport

Note, as it is anticipated that no freight throughput would occur at Richmond, no freight related turnover is calculated.

Profit

The profit factor applied to calculate the value-add from freight related airport activities is in the table below:

Table 119: Profit factor for freight related activity

Factor	Factor	Source
Freight related activity profit factor	18%	IBIS World

Source: IBIS World

As such, this indicates that 18% of turnover from freight related activity is the value-add assigned to that airport operation.

Inputs to CoPS model

The direct impacts from freight related activities are allocated to the following relevant CoPS model industries:

Table 120: Freight related distributions

CoPS indicator	Factor
Air transport	60%
Transport other	40%

Source: Ernst & Young assumption

The majority of direct impacts are allocated to the air transport sector and the remainder to other transport.

B.6.2.5 Tourism

Impact values

To estimate the turnover attributable to tourism, Ernst & Young calculate the average expenditure per domestic and international tourist.

This involves multiplying the average amount of tourist days and average tourist expenditure per day (both domestic and international), whilst subtracting hospitality expenditure per tourist in order to avoid double-counting.

Table 121: Tourist spending assumptions

Tourist type	Days	$ per day	Aggregate expenditure	Average tourist expenditure
International	25	$94	$2,350.00	$2,319.30
Domestic	3.4	$157	$538.00	$401.30

Source: Tourism Australia

The average expenditure per domestic and international tourist is then applied to the expected non Australian resident passenger throughput (as provided by Booz & Co.) of each respective airport.

Note that the total tourism throughput value excludes spending on retail and hospitality to avoid double counting as well as ½ of domestic and international airfares to account for movements in and out of the respective airport site.

Profit

To calculate the value-add from tourism incurred by each respective airport, the following profit factor is applied:

Table 122: Profit factor for tourism

Factor	Factor	Source
Tourism activity profit factor	9.2%	IBIS World - **I6402**

Source: IBISWorld

As such, this indicates that 9.2% of turnover from tourism related activity is the value-add assigned to that airport operation.

Business line categories

To calculate the wider economic impacts Ernst & Young allocate the direct impacts of tourism to the flowing industries based on the CoPS modelling framework:

Table 123: Freight related distributions

CoPS indicator	Factor
Hotels and cafes	35%
Other services	30%
Trade	35%

Source: Ernst & Young assumption

As such the three above business lines have been allocated an approximately even share of the turnover and value-add from tourism.

B.6.3Linked industries

The linked industries that are analysed in order to calculate the turnover and value-add of each of the proposed airport sites over the evaluation period are R&D, light industry, logistics, general business, retail (super stores) and hospitality.

B.6.3.1 R&D

Impact values

Ernst & Young calculate the increase in R&D turnover that is attributable to the construction of an airport based on a number of high level assumptions.

A figure of 10% is applied to the total estimated R&D turnover at each respective business park.

Refer to Appendix B for more information regarding the total R&D turnover that is expected at each respective airport business park.

Profit

Ernst & Young apply the profit factors discussed in Appendix B to estimate the value-add from the increased R&D turnover caused by the construction of the airport. This is seen in the table below:

Table 124: Profit factor

Factor	Factor	Source
R&D profit factor	1%	**IBIS World L7810**

Source: IBISWorld

Inputs to CoPS model

The direct impacts from R&D is allocated to the following relevant CoPS model industries:

Table 125: R&D distributions

CoPS indicator	Factor
Government	20%
Other services	80%

Source: Ernst & Young assumption

As such the majority of R&D direct impacts is allocated to other services.

B.6.3.2 Light industrial

Ernst & Young calculate the increase in light industrial turnover that is attributable to the construction of an airport based on a number of high level assumptions.

A figure of 10% is applied to the total estimated light industrial turnover at each respective business park.

Refer to Appendix B for more information regarding the total light industrial turnover that is expected at each respective airport business park.

Profit

Ernst & Young apply the profit factors discussed in Appendix B to estimate the value-add from the increased light industry turnover caused by the construction of the airport. This is seen in the table below:

Table 126: Profit factor

Factor	Factor	Source
Light industry profit factor	7%	**IBIS World C2869**

Source: IBISWorld

Inputs to CoPS model

The direct impacts from light industry is allocated to the following relevant CoPS model industries:

Table 127: Light industry distributions

CoPS indicator	Factor
Manufacturing	40%
Other equipment	40%
Trade	20%

Source: Ernst & Young assumption

As such the majority of light industrial direct impacts are allocated to manufacturing and other equipment.

B.6.3.3 Logistics

Ernst & Young calculate the increase in logistics turnover that is attributable to the construction of an airport based on a number of high level assumptions.

A figure of 75% is applied to the total estimated light industrial turnover at each respective business park.

Refer to Appendix B for more information regarding the total logistics turnover that is expected at each respective airport business park.

Profit

Ernst & Young apply the profit factors discussed in Appendix B to estimate the value-add from the increased logistics turnover caused by the construction of the airport. This is seen in the table below:

Table 128: Profit factor

Factor	Factor	Source
Logistics profit factor	10.2%	**IBIS World I6709**

Source: IBISWorld

Inputs to CoPS model

The direct impacts from logistics is allocated to the following relevant CoPS model industries:

Table 129: Logistics distributions

CoPS indicator	Factor
Transport equipment	25%
Road transport	37.5%
Other transport	37.5%

Source: Ernst & Young assumption

As such the majority of calculated direct impacts are allocated to road and other transport.

B.6.3.4 Business

Ernst & Young calculate the increase in 'business'[460] turnover that is attributable to the construction of an airport based on a number of high level assumptions.

A figure of 25% is applied to the total estimated 'business' turnover at each respective business park.

Refer to Appendix B for more information regarding the total 'business' turnover that is expected at each respective airport business park.

Profit

Ernst & Young apply the profit factors discussed in Appendix B to estimate the value-add from the increased 'business' turnover caused by the construction of the airport. This is seen in the table below:

Table 130: Profit factor

Factor	Factor	Source
'Business' profit factor	15%	**IBIS World L7800**

Source: IBISWorld

Inputs to CoPS model

The direct impacts from 'business' is allocated to the following relevant CoPS model industries:

Table 131: Business distributions

CoPS indicator	Factor
General Business	100%

Source: Ernst & Young assumption

As such the entirety of direct impacts from 'business' are allocated to the general business line.

[460] Note that Business includes both General Office and Business Park operations

B.6.3.5 Retail

Ernst & Young calculate the increase in retail[461] turnover that is attributable to the construction of an airport based on a number of high level assumptions.

A figure of 15% is applied to the total estimated retail turnover at each respective business park.

Refer to Appendix B for more information regarding the total retail turnover that is expected at each respective airport business park.

Profit

Ernst & Young apply the profit factors discussed in Appendix B to estimate the value-add from the increased retail turnover caused by the construction of the airport. This is seen in the table below:

Table 132: Profit factor

Factor	Factor	Source
Retail profit factor	4.8%	**IBIS World G5221**

Source: IBISWorld

Inputs to CoPS model

The direct impacts from retail is allocated to the following relevant CoPS model industries:

Table 133: Business distributions

CoPS indicator	Factor
Trade	80%
Hotels / cafes	10%
Business services	10%

Source: Ernst & Young assumption

As such the majority of direct impacts from retail are allocated to trade.

B.6.3.6 Hospitality

Ernst & Young calculate the increase in hospitality[462] turnover that is attributable to the construction of an airport based on a number of high level assumptions.

A figure of 25% is applied to the total estimated hospitality turnover at each respective business park.

Refer to Appendix B for more information regarding the total retail turnover that is expected at each respective airport business park.

Profit

Ernst & Young apply the profit factors discussed in Appendix B to estimate the value-add from the increased hospitality turnover caused by the construction of the airport. This is seen in the table below:

Table 134: Profit factor

Factor	Factor	Source
Hospitality factor	8.7%	**IBIS World H5731a**
General hotel factor	10.9%	**IBIS World H5711**
Budget hotel factor	10.8%	**IBIS World H5712**

Source: IBISWorld

Inputs to CoPS model

The direct impacts from hospitality is allocated to the following relevant CoPS model industries:

[461] This applies specifically to super stores in the adjoining business park
[462] Hospitality includes general hospitality as well as general hotels and budget hotels

Table 135: Business distributions

CoPS indicator	Factor
Hotels/cafes	95%
Business services	5%

Source: Ernst & Young assumption

As such the majority of direct impacts from hospitality are allocated to the hotels and cafes.

B.7 Land value impacts

B.7.1 Purpose

The Department is considering three sites for the development of a proposed airport. The three sites are outlined above. To assist the Department in selecting their preferred site, we have been requested to provide commentary on how the surrounding land values may change in line with the proposed uses and development of an airport. The proposed uses are outlined in the zoning maps prepared by Worley Parsons and provided in sections three to six.

B.7.2 Scope

To assist the Department in understanding how the surrounding land values may change in line with the proposed uses we have undertaken the following scope of services:

- ► Identified the airport related attributes that are likely to impact land/property values both positively and negatively for areas within proximity to each of the proposed airport sites.
- ► Using published research, provided commentary on the impact of each airport related attribute on land/property values for properties in proximity to each site.
- ► Using the information prepared by Worley Parsons on the likely changes in land use before and after development of the proposed airport and the anticipated noise contour line diagrams, we provided commentary on the likely change in land values for different zonings.

B.7.3 Methodology

To undertake the above scope we undertook the following:

- ► Based on our knowledge and the published research, available using desktop searches, we identified airport related attributes that were likely to have a positive or negative effect on land values.
- ► Based on the change in land zoning maps and projected noise contour lines prepared by Worley Parsons, we provided commentary on the likely land value changes for areas within proximity to the airport.
- ► Where possible using desk top analysis and published research, we quantified the estimated change in land/property values.
- ► Compiled a brief report to outline our findings

B.7.4 Key Constraints

Some of the key constraints and limitations experienced when undertaking this engagement include:

- ► Our research was limited to desk top analysis. We have taken the results at face value and have not tried to replicate the studies or determine their applicability to any of the proposed sites.
- ► Our research does not take into account road and rail alignments. This may have an impact on properties within proximity to a proposed airport site.
- ► Our findings are general and do not necessary apply to each specific property.

B.7.5 Critical Assumptions

Our analysis relies on a number of critical assumptions which are outlined below:

- ► We have relied on selected diagrams prepared by Worley Parsons. We have assumed them to be accurate and to have identified all the land that is likely to be rezoned on completion of the proposed airport.
- ► Our analysis assumes the proposed airport is operational. There is likely to be various impacts on property values during construction of the airport and development of the required infrastructure, which this study has not taken into consideration.
- ► Our analysis and findings are based on information from a general area and may not be applicable to an individual property.
- ► We have relied on published research. We assume that these studies were undertaken to a high standard and produced results that can be replicated if required and are applicable to each of the sites.
- ► We have assumed that all the sites are free of adverse contamination including asbestos, are geotechnically sound, are not encroached upon, are free of any flora or fauna that may impact on a proposed development, heritage issues and aboriginal land claims etc. As we do not have a detailed knowledge of each property we have had to make this assumption. If any of the properties within the sites have any of the above then our analysis may need revision.
- ► The report is believed to be accurate as at the date it was undertaken. No responsibility is taken for changes in market conditions and no obligation is assumed to revise this report to reflect events or conditions which occur subsequent to the date hereof. Due to the volatility sometimes experienced in the property market, this report should not be relied upon more than three months after it is dated as there is a risk that the market conditions impacting on the assumed uses may have changed.

B.7.6 Information reviewed

Summary of reviewed information

Name	Title	Date
Ahlfeldt, Gabriel & Maennig, Wolfgang	Assessing External Effects of City Airports: Land Values in Berlin	April 2008
Airport Noise Law	Airport Noise and Residential Property Value	November 2004
Archerfield Airport	Preliminary Draft Master Plan 2011 – Fact Sheet	Unknown
Aviation Environment Federation, UK	What are an Airport's Impacts?	Unknown
Brockway, David A	The Impact of a General Aviation Airport on Surrounding Land Use Patterns: Richard Lloyd Jones JR. Airport	May 2008
Burns, Michael	Measuring the Changing Effects of Aircraft Noise – A Case Study of Adelaide Airport	January 2001
Cidell, Julie	Scales of Airport Expansion: Globalization, Regionalization, and Local land Use	July 2004
Crowley, Ronald W	A Case Study of the Effects of an Airport on Land Values	May 1973
Densmore, Karley & Mulley, Corinne	Accessibility and residual land value uplift: Identifying spatial variations in the accessibility impacts of a bus transitway	March 2012
Genevieve, Giuliano & Gordon, Peter & Pan, Qisheng & Park, JiYoung	Accessibility and Residential Land Values: Some Tests with New Measures	August 2009
Kaufman, Hilary & Espey, Molly	No Plane, Big Gain: Airport Noise and Residential Property Values in the Reno-Sparks Area	July 1997
Kranser, L	The Impact of Airports on Home Values	July 1997
Lazic, Aleksandra & Golaszewski, Richard	A Technical Note on Aircraft Noise and its Cost to Society	April 2006
Neelawala, Prasad	Impacts of major roads on property values: A case study with special reference to the Western Brisbane Transport Network scheme	
Nelson, Jon	Meta-Analysis of Airport Noise and Hedonic Property Values: Problems and Prospects	July 2003
OECD & International Transport Forum	Impacts of Airports on Airline Competition: Focus on Airport Performance and Airport Vertical Relations	September 2008
Pennington, G. & Topham, N, & Ward, R	Aircraft Noise and Residential Property Values Adjacent to Manchester International Airport	1990
Reed, Richard & Pettit, Christopher	Investigating Residential Property Markets using Employment Data	January 2004
Romkaew, Naruson	Evaluating the contribution of infrastructure effects on residential property	
Sidiropoulos, Elias	The Impact of the New Airport of Athens on the Land Values of Eastern Attica	August 1998

Name	Title	Date
SKM	The Impact of Melbourne Airport	April 2008
Stone, S	Alternative Aircraft Noise Metrics	July 2012
Sydney Morning Herald	Flight Path Property Fear	December 2011
Transportation Research Board	Developing a Framework for the Economic Assessment of the Costs of Airport Land Use Incompatibility	Unknown
Uyeno, Dean & Hamilton, Stanley W & Biggs J G	Density of Residential Land Use and the Impact of Airport Noise	January 1993

B.8 Travel time savings

Ernst & Young undertook a high level analysis to determine the potential travel time savings that would be realised by those that realise working opportunities at the airport, including at the airport site and surrounding/supporting businesses.

This analysis incorporated high level assumptions developed by Ernst & Young based on the level of analysis of where those that will work at the airport will likely reside within the region, and some high level assumptions based on Bureau of Transport Statistics information regarding high level employment centres where these workers could have worked if it had not been for the development of the airport.

The specific assumptions used within this analysis are outlined below.

Number of persons employed at the airport

The number of persons employed at airport (on site or accompanying business parks), and thus can benefit from travel time savings can be found within sections 11, 18 and 25 of this report.

Assumed place of residents of future airport workforce

The breakdown of where those persons reside that work at the airport (on site or accompanying business parks) can be seen in the table below.

Table 136: Assumed place of residents of future airport workforce (proportion)

Residents	Badgerys Creek	Wilton	Richmond
Bankstown	10%		
Blacktown			10%
Camden	10%	30%	
Campbelltown	20%	30%	
Liverpool	35%		
Parramatta	10%		10%
Penrith	15%		45%
Richmond			25%
Rosehill			10%
Wilton		10%	
Wollongong		30%	

Source: Ernst & Young assumption

Note that it is assumed that the relative proportion of where residents reside is assumed to remain constant over the operational life of the airport (in other words the workers at the airport will not change their preference for where they reside over time).

Distance to the airport site

The assumed distance to the airport site was determined from Google maps and can be seen in the table below.

Table 137: Distance to the airport site (km)

Residents	Badgerys Creek	Wilton	Richmond
Bankstown	38		
Blacktown			26
Camden	22	30	
Campbelltown	28	30	
Liverpool	20		
Parramatta	36		22
Penrith	24		23
Richmond			5
Rosehill			20
Wilton		5	
Wollongong		35	

Source: Ernst & Young assumption based on Google maps

Alternative work location

The tables below present the assumptions underlying the analysis of where those persons that work at the airport would have otherwise been employed. These assumptions are based on a high level analysis of BTS data of where persons from different residential areas are likely to be employed.

Table 138: Alternative work location (proportion of airport workers)

Residents/ Employment centre	Liverpool	Parramatta	Penrith	Strathfield	City	Wollongong	Norwest
Bankstown	5%	15%		40%	40%		
Blacktown	5%	15%		40%	40%		
Camden	20%	20%		40%	20%		
Campbelltown	20%	20%		40%	20%		
Liverpool	40%	10%		30%	20%		
Parramatta		40%		15%	35%		10%
Penrith		30%	40%	10%	15%		5%
Richmond		40%	20%	15%	20%		5%
Rosehill		20%			20%		60%
Wilton						100%	
Wollongong					5%	95%	

Source: Ernst & Young assumption based on BTS data

The assumed distance between residential and employment centres, that were determined using Google maps, can be seen in the table below.

Table 139: Distance to alternative place of employment (km)

Residents/ Employment centre	Liverpool	Parramatta	Penrith	Strathfield	City	Wollongong	Norwest
Bankstown	17	15		10	30		
Blacktown	25	15		26	38		
Camden	32	60		54	68		
Campbelltown	22	50		42	58		
Liverpool	10	10		22	41		
Parramatta		5		13	24		12
Penrith		36	5	47	57		40
Richmond		40	23	50	58		31
Rosehill		21			50		15
Wilton						30	
Wollongong					100	20	

Source: Ernst & Young assumption based on Google maps

Assumed travel speed

It is assumed that the average travel speed to access both the Badgerys Creek and Richmond site will be 45 km/hour in 2030 which will decrease to 40 km/hour in 2060. The analysis assumes that the average travel speed to access the Wilton site, given that it is in a more rural setting will be 60 km/hour in 2030 decreasing to 55 km/hour in 2060. Furthermore it is assumed that there is no change in travel speed between accessing the airport and other major employment centres within the Sydney basin within a given period. These assumptions are based on a high level analysis of BTS information.

Appendix C Background research

This section of the appendix provides a greater amount of detail regarding the data that Ernst & Young was able to collate in order to undertake this analysis.

C.1 Size & employment

As part of this analysis Ernst & Young undertook an study of:

- Size of the workforce for relevant airports
- Composition of the workforce for relevant airports

C.1.1 Australian airports

The size and employment levels of Australian airports are found in Table 140:

Table 140: Employment at Australian airports

Airport Details		Size		Employment		
City of Airport	Year of Study	Current passenger throughput per annum (millions)	Current freight throughput per annum ('000 tonnes)	Direct	Indirect	Total
Sydney	2009	32	634	75,580	130,553	206,133
Melbourne	2009	25	350	12,542	-	-
Perth	2009	9	50	8,700	10,000	18,700
Adelaide	2008	7	21	6,800	9,751	16,551
Bankstown	2010	N/A	N/A	2,479	3,513	5,992
Cairns	2009	4	N/A	2,400	27,600	30,000

Source: Publically available papers

C.1.2 International Airports

The size and employment levels of international airports are found in Table 141:

Table 141: Employment at international airports

AIRPORT DETAILS		Size		Employment		
City of airport	Year of study	Current passenger throughput per annum (millions)	Current freight throughput per annum ('000 tonnes)	Direct	Indirect	Total
DALLAS/FORT WORTH TX, US (DFW)	2011	58	653	61,775	-	305,000
DUBAI, AE (DXB)	2011	51	2190	58,000	43,000	101,000
MADRID, ES (MAD)	2010	50	370	11,688	1,597	13,285
PHOENIX AZ, US (PHX)	2011	41	302	33,639	103,793	137,432
MINNEAPOLIS MN, US (MSP)	2005	38	355	28,545	11,264	39,809
SEATTLE WA, US (SEA)	2011	33	280	18,773	4,723	23,496
PHILADELPHIA PA, US (PHL)	2011	31	433	118,529	77,978	196,507
COPENHAGEN, DK (CPH)	2011	23	312	2,000	20,000	22,000
VIENNA, AT (VIE)	2011	21	278	18,000	52,500	70,500
MANCHESTER, GB (MAN)	2011	19	107	19,000	42,500	-
BRUSSELS, BE (BRU)	2011	19	475	21,000	40,000	-
TAMPA FL, US (TPA)	2011	17	82	535	6,965	7,500
WASHINGTON, DC, US (DCA)	2011	19	6	7,006	12,583	-
CAIRO, EGYPT (CAI)	2011	13	40	4,000	16,000	-
PORTLAND, US (PDX)	2011	14	206	10,574	2,147	17,499

AIRPORT DETAILS		Size		Employment		
City of airport	Year of study	Current passenger throughput per annum (millions)	Current freight throughput per annum ('000 tonnes)	Direct	Indirect	Total
HOUSTON, US (HOU)	2011	10	54	7,172	14,629	52,069
MILWAUKEE, US (MKE)	2011	10	77	25,296	13,299	38,595
JOHN WAYNE, US (SNA)	2011	9	16	3,305	24,858	42,162

Source: Publicly available papers

In undertaking this analysis, Ernst & Young analysed the amount of PAX per direct employee. This ratio is divided by region in Table 142.

Table 142: PAX per Direct Employee for different regions

PAX	Australia	Asia & Middle East	USA	Europe
0-15 million	1,156	815	1,463	1,308
15-30 million	1,923	-	2,297	1,028
30-50 million	423	1,114	1,143	1,351
50+ million	-	852	1,409	942

Source: Publicly available papers

C.2 Composition of Workforce

The composition of Australian and International airports was used in our analysis to project the composition of airport employment at each site.

C.2.1 Australian Airports

Workforce composition of Australian airports is found in Table 143.

Table 143: Composition of Australian airport workforces

Employment by Sector / Airport	Sydney	Melbourne	Perth
	2009	2009	2009
Airlines	74.4%	44.0%	20.0%
Air Services	0.6%		
General Aviation	0.4%	2.0%	
Freight	7.6%	5.0%	20.0%
Government Operations	2.2%		
Ground Transport	3.2%		
Administration and operation of the airport			9.0%
Hotels	2.1%		
Construction			
Manufacturing			
Retail	8.2%	5.0%	
Car Parking	0.1%		
Security		7.0%	
Mail Processing and Distribution		2.0%	
Car Rental	0.9%		
Property and Business Services			
Other Commercial	0.3%	7.0%	41.0%

Source: Publically availably papers

C.2.2 International Airports

Workforce composition of International airports is found in Table 144 and Table 145:

Table 144: Workforce composition of international airports

Employment by Sector	Phoenix AZ, US (PHX)	NEWARK NJ, US (EWR)	SEATTLE WA, US (SEA)	PHILADELPHIA PA, US (PHL)	Washington, DC, US (DCA)	Houston, US (HOU)	Milwaukee, US (MKE)	Sacramento, US (SMF)	Louis Armstrong, US (MSY)	Miami, US (FLO)	Anchorage, US (ALA)	San Francisco, US (CAL)
Year of Study	2011	2011	2011	2011	2011	2011	2011	2011	2011	2008	2011	2009
PAX (millions)	40.6	33.7	32.8	30.8	18.8	40.2	9.5	8.7	8.5	38.3	5.1	40.8
Freight (tonnes)	302,146	896,592	279,625	432,641	6,261	423,777	76,629	64,302	48,464	2,000,042	2,600,000	382,018
Airlines	39%	33%	37%	22%	21%	41%	82%	0%	19%	29%	32%	45%
Air Services	3%	7%	7%	0%	0%	6%	0%	21%	17%	2%	0%	4%
General Aviation	2%	4%	7%	0%	5%	0%	0%	0%	0%	1%	0%	0%
Freight	18%	0%	6%	0%	0%	0%	9%	3%	0%	15%	39%	7%
Government Operations	7%	29%	7%	0%	17%	15%	0%	28%	0%	9%	13%	3%
Ground Transport	2%	3%	6%	0%	0%	31%	6%	12%	0%	0%	0%	4%
Administration	0%	0%	12%	0%	5%	4%	0%	13%	35%	5%	0%	6%
Maintenance	0%	0%	0%	0%	0%	0%	0%	0%	0%	12%	0%	9%
Hotels	0%	0%	0%	0%	0%	0%	0%	0%	19%	0%	0%	0%
Construction	10%	8%	8%	0%	0%	0%	3%	0%	0%	8%	6%	8%
Manufacturing	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Retail	0%	0%	8%	0%	12%	0%	0%	0%	0%	6%	5%	5%
Car Parking	0%	0%	1%	0%	0%	0%	0%	10%	0%	0%	1%	1%
Car Rental	0%	0%	0%	0%	5%	0%	0%	11%	0%	7%	2%	4%
Security	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%	4%
Processing and Distribution	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Property and Business Services	0%	1%	0%	3%	0%	0%	0%	0%	11%	0%	1%	0%
Other Commercial	10%	15%	0%	75%	35%	3%	0%	3%	0%	1%	2%	0%

Source: Ernst & Young Analysis

Table 145: Composition of workforce of International airports

Employment by Sector	Washington DC, US (IAD)	Bradley Connecticut, US (BIA)	Pasadena South Cal, US (BUR)	Denver CO, US (DEN)	Kansas City, US (KCI)	Munich, DE (MUC)	Oakland, US (OAK)	Richmond, Virginia, US (RIC)	Calgary, Ca (YYC)	Schiphol, NL (AMS)	Heathrow, GB, (HEA)	Minneapolis, US (MIN)
Year of Study	2009	2005	2008	2008	2011	2011	2007	2007	2004	1996	2011	2011
PAX (millions)	23.2	6.7	2.8	52.7	10.2	37.8	9.3	3.6	9.2	49.8	69.4	33,1
Freight (tonnes)	641,990	154,825			83,686	286,000	499,475	520,000	120,000		1,480,000	208,650
Airlines	21%	22%	35%	59%	0%	35%	34%	40%	38%	55%	62%	63%
Air Services	21%	0%	0%	0%	0%	0%	0%	0%	9%	0%	0%	0%
General Aviation	0%	0%	0%	0%	12%	10%	0%	0%	8%	3%	9%	0%
Freight	0%	16%	4%	0%	4%	0%	28%	17%	8%	4%	1%	11%
Government Operations	8%	18%	15%	8%	23%	0%	7%	24%	4%	10%	3%	8%
Ground Transport	0%	21%	9%	0%	0%	0%	4%	1%	3%	1%	10%	0%
Administration	4%	0%	0%	0%	26%	26%	3%	5%	0%	8%	0%	0%
Maintenance	0%	4%	0%	0%	0%	0%	8%	0%	0%	4%	0%	0%
Hotels	0%	0%	0%	8%	0%	8%	0%	0%	0%	3%	0%	0%
Construction	0%	0%	0%	5%	0%	0%	1%	0%	3%	2%	3%	0%
Manufacturing	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%
Retail	8%	6%	5%	10%	5%	0%	5%	10%	2%	2%	7%	4%
Car Parking	0%	0%	8%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Car Rental	2%	0%	15%	0%	8%	0%	4%	2%	0%	0%	0%	0%
Security	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%
Processing and Distribution	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Property and Business Services		12%	5%	5%	13%	0%	0%	0%	0%	0%	0%	0%
Other Commercial	36%	1%	4%	0%	8%	21%	2%	1%	25%	7%	5%	14%

Source: Ernst & Young Analysis

C.3 Size & economic contribution

As part of this analysis Ernst & Young undertook a study of both the size and economic impacts of domestic and international airports.

C.3.1 Australian airports

As part of this analysis, Ernst & Young undertook an analysis of the total economic impacts of Australian airports. Table 146 presents a summary of the findings of this analysis.

Table 146: Total economic impact of domestic airports

Airport	PAX (millions)	Freight (tonnes)	Total Economic Impact per annum ($ billions)
Australia			
SYDNEY, AU (SYD)	32.2	634,000	16.5
BRISBANE, AU (BNE)	20.4	81,678	5.4
PERTH, AU (PIA)	9.4	49,542	2.9
ADELAIDE, AU (ADE)	6.8	20,736	1.6
CAIRNS, AU (CAI)	3.7		2.5
DARWIN, AU (DAW)	1.7		0.3
GOLD COAST, AU (GCA)	4.2		0.3

Source: Compiled by Ernst & Young from publicly available documents

C.3.2 International airports

As part of this analysis, Ernst & Young undertook an analysis of the total economic impacts of international airports. Table 147 presents a summary of the findings of this analysis.

Table 147: Total economic impact of International Airports

Airport	PAX (millions)	Freight (tonnes)	Total Economic Impact per annum ($ billions)
NORTH AMERICA			
DALLAS/FORT WORTH TX, US (DFW)	57.8	652,655	16.6
DENVER CO, US (DEN)	52.7		22.0
NEW YORK NY, US (JFK)	47.7	1,400,000	31.0
PHOENIX AZ, US (PHX)	40.6	302,146	33.0
HOUSTON TX, US (IAH)	40.2	423,777	22.4
CHARLOTTE NC, US (CLT)	39.0	137,943	10.0
ORLANDO FL, US (MCO)	35.4		26.4
NEWARK NJ, US (EWR)	33.7	896,592	19.0
SEATTLE WA, US (SEA)	32.8	279,625	4.5
DETROIT MI, US (DTW)	32.4	206,461	7.6
PHILADELPHIA PA, US (PHL)	30.8	432,641	13.9
BOSTON MA, US (BOS)	28.9	529,213	7.0
NEW YORK NY, US (LGA)	24.1	7,292	11.6
FORT LAUDERDALE, FL, US (FLL)	23.3		2.6
WASHINGTON, DC, US (IAD)	23.2	641,990	7.9
BALTIMORE MD, US (BWI)	22.4	107,760	5.6
CHICAGO IL, US (MDW)	18.9	26,091	7.0
VANCOUVER BC, CA (YVR)	17.0	223,900	6.8
SAN DIEGO CA, US (SAN)	16.9	110,824	10.0
PORTLAND, US (PDX)	13.7	205,946	5.4
MISSOURI, US (STL)	12.5		5.1
KANSAS, US (MCI)	10.2	83,686	5.5
HOUSTON, US (HOU)	9.8	53,681	4.5
CLEVELAND, US (CLE)	9.2		3.5
RALEIGH-DURHAM, US (RDU)	9.2	79,670	12.6
AUSTIN, US (AUS)	9.1	138,259	2.4
MEMPHIS, US (MEM)	8.7	3,917,209	28.6
SACRAMENTO, US (SMF)	8.7	64,302	3.2
JOHN WAYNE, US (SNA)	8.6	15,569	5.6
LOUIS ARMSTRONG, US (MSY)	8.5	48,464	2.6
SAN JOSE, US (SJC)	8.4	39,953	4.0
PITTSBURGH, PA (PIT)	8.3	67,135	6.1
SAN ANTONIO, US (SAT)	8.2	121,516	3.8
FLORIDA, US (RSW)	7.5	14,760	3.8
INDIANAPOLIS, US (IND)	7.5	1,001,400	3.3
CINCINNATI/NTH KENTUCKY, US (CVG)	7.0	537,136	4.5
EUROPE			
MANCHESTER, GB (MAN)	19.3	106,916	1.3
BRUSSELS, BE (BRU)	18.8	475,124	1.9

Airport	PAX (millions)	Freight (tonnes)	Total Economic Impact per annum ($ billions)
LONDON, GB (STN)	18.0	203,830	4.0
ATHENS, GR (ATH)	15.4	96,700	5.3
NICE, FR, (NCE)	10.4	17,168	1.4
BUDAPEST (BUD)	8.9	106,595	1.7
ASIA & MIDDLE EAST			
DUBAI, AE (DXB)	51.0	2,190,000	22.0
NEW DELHI, IN (DEL)	35.0	600,000	9.1
FUKUOKA, JP (FUK)	17.3	260,000	10.2

Source: Compiled by Ernst & Young from publicly available documents

C.4 Business parks

As part of this analysis Ernst & Young analysed:

- The size of business parks
- The composition of business parks

C.4.1 Size of business parks

As part of this analysis, Ernst & Young undertook an analysis of the area of land that is generally put aside for the development of business parks with respect to the passenger and freight throughput of the adjacent airport. Table 148 presents a summary of the findings of this analysis.

Table 148: Size of airport business parks

Airport	PAX per annum (millions)	Tonnes of freight per annum	Size of business park (ha)
Frankfurt	56	2,170,000	367
Hong Kong	54	3,900,000	157
Denver CO	53		115
Jakarta	51	699,257	420
Dubai	51	2,190,000	1954
Amsterdam	50		179
Madrid	50	370,000	1039
Bangkok	45	3,000,000	334
New York NY	48	1,400,000	260
Singapore	47	1,870,000	492
Las Vegas NV	41	85,507	3974
San Francisco CA	41	382,018	1076
Phoenix AZ	41	302,146	3209
Charlotte NC	39	137,943	722
Miami FL	38	2,000,042	6250
Munich	38	286,000	130
Rome	38	161,678	63
Orlando FL	35		564
Barcelona	34	96,572	488
London	34	88,111	50
Boston MA	29	529,213	106
Tokyo	33	2,068,382	138
Paris	27	105,558	742
Mexico City	26	411,456	130
Washington	23	641,990	1725
Copenhagen	23	312,179	66
Brisbane	20	81,678	936
Salt Lake City UT	20	330,962	4901
Dublin	19		337
Brasilia	15	60,975	212
Helsinki	15	170,408	759
Lisbon	15	105,341	955
Washington	19	6,261	520
Portland	14	205,946	7060
Missouri	13		3066
Juanda	14	95,146	1053
Bengaluru	13	224,949	20
Kansas	10	83,686	570
Houston	10	53,681	7413
Nice	10	17,168	54
Milwaukee	10	76,629	1324
Cleveland	9		1333
Oakland	9	499,475	1635
Raleigh-Durham	9	79,670	1719
Austin	9	138,259	1604
Tokoname City	9	143,134	25
Pulkovo	10		941
Memphis	9	3,917,209	5359
John Wayne	9	15,569	4675
Louis Armstrong	9	48,464	2675
San Jose	8	39,953	4947
Pittsburgh	8	67,135	2161
Budapest	9	106,595	791

Airport	PAX per annum (millions)	Tonnes of freight per annum	Size of business park (ha)
San Antonio	8	121,516	526
Hurghada	6		1090
Cape Town	9		1166
Florida	8	14,760	2190
Adnan			1011
Indianapolis	7	1,001,400	2774
Tenerife	9	4,879	388
Phuket	7		34
Cincinnati/Northern Kentucky	7	537,136	1392

Source: Publically available information

C.4.2 Business Parks in Greater Western Sydney

In 2006, WSROC recorded that Greater Western Sydney had 69 business parks ranging in sizes of 3 to 700 hectares. More details are provided in Table 149.

Table 149: Business Parks in Greater Western Sydney

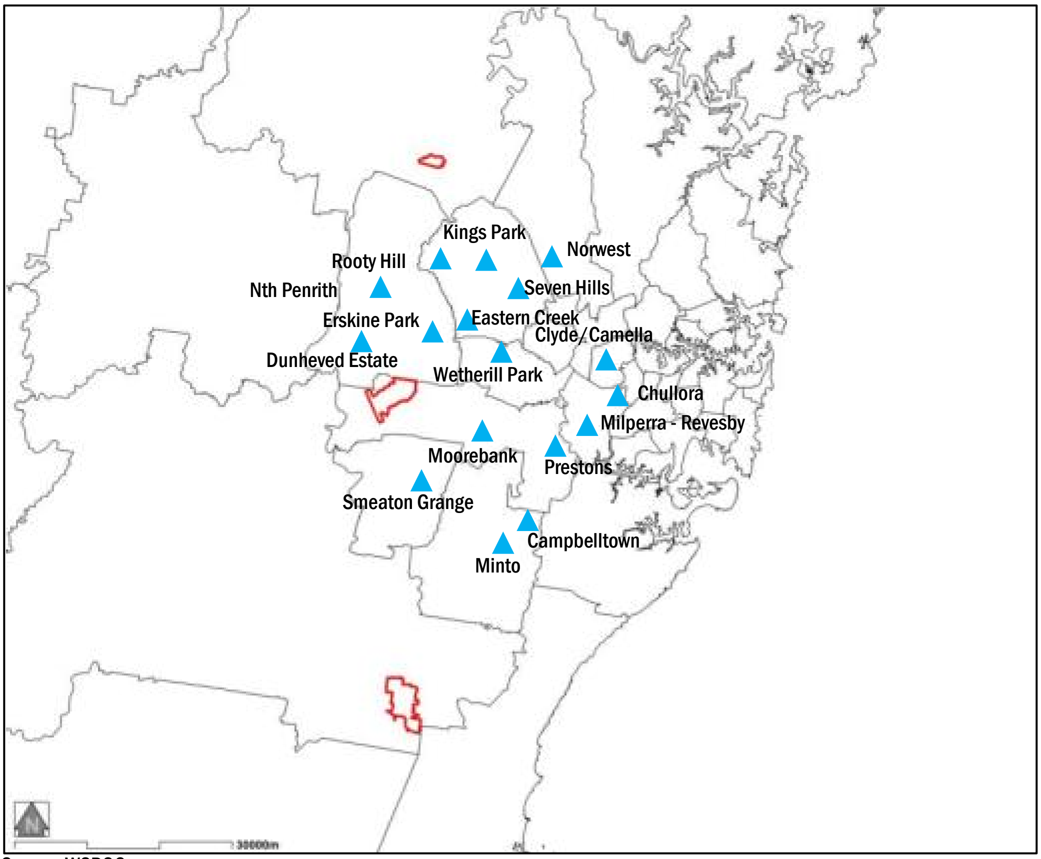
Location (LGA)	Business Park Name	Business Park Size (ha)
Auburn	Carter Street Precinct	50
	Homebush Bay Business Park	8
	Australian Centre Business Park	29
	Silverwater Industrial Park	109
	Slough Business Park	10
	Newington Business Park	3
	Millennium Court Business Park	5
	Lidcombe Industrial Area	7
	Lidcombe Business Park	30
	Parramatta Road Industrial Area	143
	Clyde Marshalling Yards	57
	Regents Park Industrial Estate	51
	Regents Park Industrial Area	28
Bankstown	Chullora Technology Park	240
	Bankstown Airport Business Park	130
	Villawood Industrial Estate	160
	Milperra – Revesby Industrial Precinct	230
	Selton Industrial Precinct	30
	Padstow Industrial Estate	130
Baulkham Hills	Castle Hill Industrial Area	125
	Norwest Business Park	200
	North Rocks Industrial Area	45
	Rouse Hill	80
Blacktown	Arndell Park	160
	Blacktown / Kings Park	210
	Eastern Creek	700
	Glendenning / Rooty Hill	210
	Huntingwood	130
	Huntingwood East	65
	Minchinbury	130
	Mt Druitt	40
	Prospect	35
	Riverstone	84
	Seven Hills	210
Camden	Graham Hill Road, Narellan	42
	Narellan Business Park	11
	Smeaton Grange	200
Campbelltown	Campbelltown / Leumeah	160
	Ingleburn	321
	Minto	257

Location (LGA)	Business Park Name	Business Park Size (ha)
Fairfield	Lansvale	50
	Smithfield	50
	Wetherill Park	650
	Yennora / Villawood	100
Hawkesbury	North Richmond	19
	Mulgrave	103
	Richmond	6
	South Windsor	165
	Woodlands Estate	9
Liverpool	Chipping Norton	108
	Crossroads	46
	Moorebank	216
	Orange Grove	41
	Prestons Industrial Stage 1	242
	Warwick Farm / Sappho Road	43
Parramatta	Clyde / Camella	300
	Eastwood	10
	Ermington (wharf Road)	47
	Guildford	11
	North Parramatta / Northmead	57
	Rydalmere	117
	Rydalmere (Victoria Road)	51
	South Granville	55
	Toongabbie (Ballandella Road)	27
Penrith	Dunheved Estate	266
	Emu Plains	125
	Erskine Park	300
	North Penrith	247
	South Penrith	52

Source: WSROC, Greater Western Sydney Regional Economic Profile

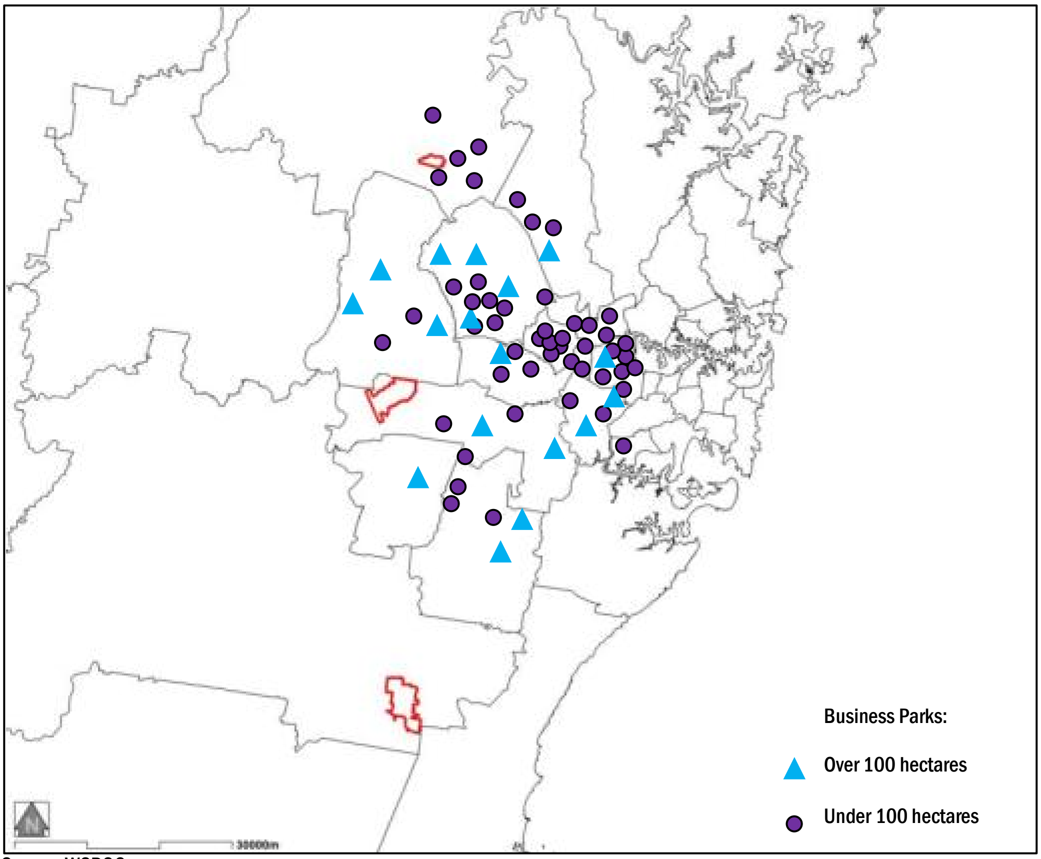
These business parks are indicated in the figure below:

Figure 122: major business parks in Sydney



Source: WSROC

Figure 123: All business parks in western Sydney



Source: WSROC

C.4.3 Composition of Business parks

As part of this analysis, Ernst & Young undertook an analysis of the land uses within business parks adjacent airports. Table 150 presents a summary of the findings of this analysis

Table 150: Businesses of airports

Airport	Area (ha)	Logistics	Manufacturing	Retail	Accommodation	Recreation	Parking	Restaurant	Petrol Station	Call Centre	School	Church	Car Rental	Post Office	Health Care
Frankfurt	367	3	3		3		3	3	3				3		3
Hong Kong	157	3		3	3	3	3	3	3				3	3	
Denver CO	115	3	3		3		3	3			3		3		3
Jakarta	420	3			3		3	3					3		
Dubai	1954	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Amsterdam	179	3			3								3		3
Madrid	1039	3	3		3		3	3					3		
Bangkok	334	3	3		3		3								
New York NY	260	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Singapore	492	3	3	3	3		3	3							
Las Vegas NV	3974	3	3	3	3	3	3	3	3		3	3	3		
Beijing															
San Francisco CA	1076	3	3	3	3	3	3	3	3	3	3	3	3		3
Phoenix AZ	3209	3	3	3	3	3	3	3	3	3			3		3
Houston TX															
Charlotte NC	722	3	3		3		3	3	3	3			3		
Miami FL	6250	3	3	3	3	3	3	3	3	3			3		
Munich	130	3			3		3						3		3
Rome	63				3		3	3					3		
Orlando FL	564														
Barcelona	488	3	3	3	3		3	3					3		
London	50			3	3	3	3		3						3
Boston MA	106	3		3	3		3	3					3	3	3
Tokyo	138	3	3	3	3		3	3					3		3
Kuala Lumpur	742	3	3	3			3	3	3						
Rome	130	3	3				3	3	3						
London	1725	3	3	3	3	3	3	3	3		3		3	3	3
Toronto ON	66	3		3	3		3	3	3				3		
Manila	936	3	3	3	3		3	3	3				3		
Chengdu	4901	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Barcelona	337	3	3		3		3	3							
Sao Paulo	212		3	3	3		3	3							
Helsinki	759	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Lisbon	955	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Washington	520	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Portland	7060	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Missouri	3066	3	3	3	3	3	3	3	3		3	3	3	3	3

Airport	Area (ha)	Logistics	Manufacturing	Retail	Accommodation	Recreation	Parking	Restaurant	Petrol Station	Call Centre	School	Church	Car Rental	Post Office	Health Care
Juanda	1053	3	3	3			3	3							
Bengaluru	20	3	3												
Kansas	570	3	3	3	3			3						3	
Houston	7413	3	3	3	3	3	3	3	3		3		3	3	
Nice	54	3		3	3		3	3	3		3		3		
Milwaukee	1324	3	3	3	3		3	3	3		3	3	3		3
Cleveland	1333	3	3	3	3	3	3	3	3		3	3	3	3	3
Oakland	1635	3	3	3	3	3	3	3	3		3	3	3	3	3
Raleigh-Durham	1719	3	3	3	3	3	3	3	3		3	3	3	3	3
Austin	1604	3		3	3	3	3	3	3						3
Kolkata				3	3		3	3					3		
Tokoname City	25														
Pulkovo	941	3	3		3		3	3	3				3		3
Vnukovo		3	3				3						3		
Memphis	5359	3	3	3	3		3	3	3		3	3	3		3
Warsaw													3		
John Wayne	4675	3	3	3	3	3	3	3	3		3	3	3	3	3
Louis Armstrong	2675	3	3	3	3	3	3	3	3		3	3	3	3	3
San Jose	4947	3	3	3	3	3		3	3		3	3	3	3	3
Pittsburgh	2161	3	3	3	3		3	3	3			3	3		3
Budapest	791	3	3	3	3		3	3					3		
San Antonio	526	3	3	3	3	3		3			3	3	3	3	3
Hurghada	1090		3	3	3		3	3	3						
Cape Town	1166	3	3				3								
Florida	2190	3	3	3	3	3	3	3	3	3	3	3	3		
Adnan	1011	3	3		3	3					3	3	3		
Indianapolis	2774	3	3	3	3	3	3	3	3		3	3	3	3	3
Tenerife	388	3	3	3	3		3	3	3		3	3	3		
Phuket	34	3		3	3		3						3		
Cincinnati/Northern Kentucky	1392	3	3	3	3	3	3	3	3	3	3	3	3		

*This table is for demonstration purposes only

Source: Ernst & Young analysis

Table 151: Businesses on each airport

Airport	New York NY	London	Missouri	Florida

Area (ha)	260	50	1,053	2,774
Logistics				
Manufacturing			Glideaway Bed Carriage Manufacturer	
Retail	Creators Co-op, Barnes and Noble Clg Book Store, JBC Astoria Sounds, Myotcstore, Trade Fair, J&G Marble and Tile Corporation, Ditmars Lumber & Milwork Inc, Home Dept, Bed Bath and Beyond, Schaller and Webber, Three Way Plumbing Supply, Rite Aid, LaGuardia Shopping Center, Tony's Bicycles, Astoria Boulevard Grocery, New York and Company, Lens Lab Express, Key Food,Franky Fashion	Hamley's of London, WHSmith, High House Farm, Chapel End Nursery,	Shop, Family Dollar, Dollar General, Classic Flooring Solutions, Cathie Lee Doll Hospital, Fastsigns, Game Stop, John's Butcher Shoppe, Carol's Comer Florist and Gifts, Save A-Lot, Irwin Products, Metro Pawn, Graybar, Vi-Jon Inc, Shirts on Steroids, Weekends Only Furniature Outlet, Schnucks, Gap Outlet, Babies R Us, Fanous Footwear, Old Time Pottery, Home Depot	HD Supply Electrical - Fort Myers, Party City, Books-A-Million, A.C. Moore, Sweetbay Supermarket, Ron Jon Surf Shop, Signature florals, Bames and Nobles, Computer Me Tutor,
Accommodation	New York LaGuardia Airport Marriott, Crown Plaza LaGuardia Hotel, Hampton Inn, Xpresspa, Comfort Inn, Airway Inn, Kamway Lodge and Traveller Inc,	Stansted Hotels and Parking, Radisson Blu Hotel London Standsted Airport, De Salis Hotel Stansted, AJ Bed and Breafast, Days Inn Bishops Stortford, Hilton London Stansted Airport, Travel Lodge Hotel, The Cottage, The Old Bell Hotel	Motel 6, Holiday Inn, Quality Inn, Drury Inn, Hampton Inn, Pear Tree Inn, Happy Tails IncNorthwest Airport Inn, Congress Inn, Super 8, The Lodge Hotel and Banquets, Holiday Inn, Candlewood Suites Extended Stay Hotel, Budget Inn, Extended Stay American Hotel, Knights Inn,	La Quinta Inn & Suites, Fort Myers, Quality Suites, Hampton Inn, Best Western Airport Inn, Courtyard by Mariott, Best Western Plus Fort Myers Innand Suites, Crown Plaza Hotel for Fort Myers
Recreational	Rudar Soccer Club, Fair Theatre	Grand Paddocks Pool and Gym		Golf Club at Renaissance, Volleyfrog Florida Club,
Parking	LaGuardia Airport Parking, Avistar Airport Parking	DriveFly, Stansted Car Parking, Ardent Parking,	E Z Parking, Sky Parking, Park Express	
Restaurant	Dunkin Donuts, Redd Light Fish and Chips, Great Wall Chinese Resturant, Tikka Grill Resturant, Starlight Grill Resturant and Sweet, Choppstick Chinese Resturant, Gyro Express Souvlaki Resturant, Nicks Gourmet Deli, Jacksons Hole, Sergio's, Full Expresso Repair Inc, Porto Bella Pizza and Resturant, Y J Coffee Shop, Sabry's Seafood, King's Chef, Piccola Venezia, Jerusalem Nights, Pita Pan, Grand Cafe		Yesterday's, Hustler Hollywood, Waffle House, Domino's Pizza, Imo's Pizza, Ahmegetties Cafe,	Colonial Country Club,
Petrol Station	Grand Central East Mobil	Birchanger Green Motorway Services,	Huck's Food and Fuel	
Call Centre				

Source: Ernst & Young analysis

C.5 Staging the development

C.5.1 Staging the development and the construction of the airport

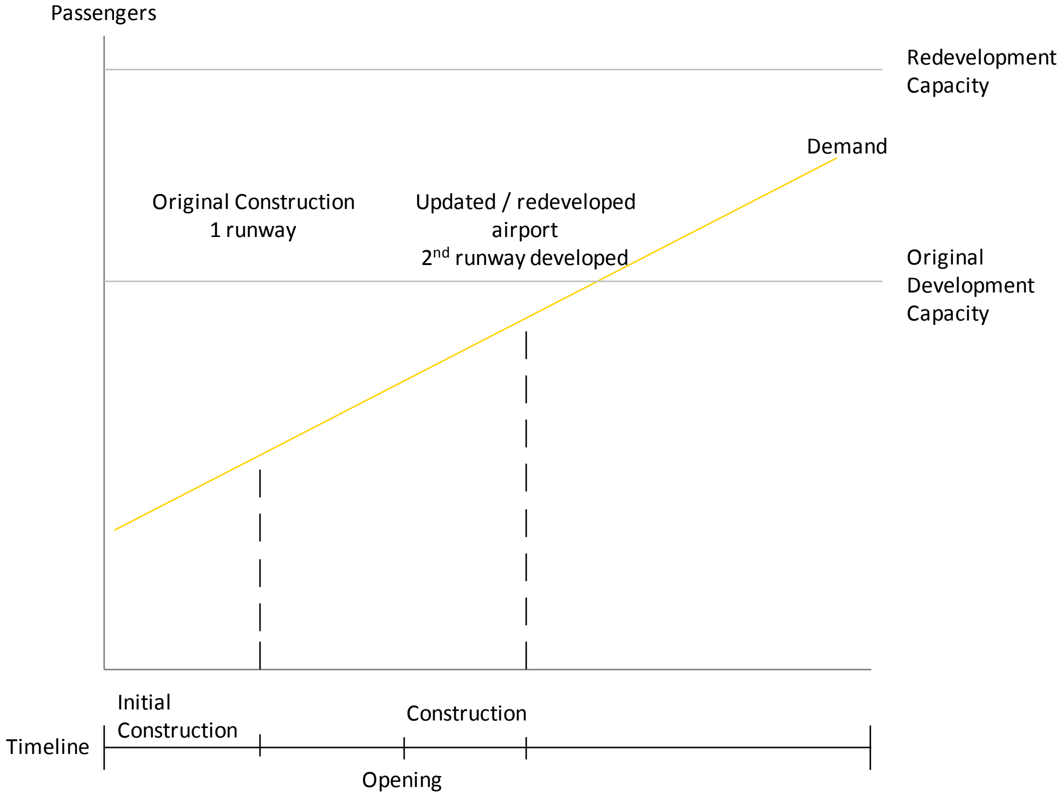
This analysis has assumed that the development of an airport at Badgerys Creek would be undertaken in a manner which the ultimate asset and requisite supporting infrastructure would be constructed prior to the opening of the airport and no further development would be undertaken from then.

In reality the airport and supporting infrastructure would be developed in multiple stages to more precisely match demand for its services. A number of alternative development profiles would include:

- Initial development
    - One, 4000 metre runway and associated taxiways and aprons
    - Proportion of the terminal facilities
    - Minimal road access upgrades
    - Minimal utility asset upgrades
- Subsequent developments (these would not necessarily be undertaken at the same time but in an optimal manner when and if they are required)
    - The other 4,000 metre runway and associated taxiways and aprons
    - Cross runway and associated taxiways and aprons
    - Further required terminal facilities
    - Road upgrades
    - Rail services to the site
    - Further utility infrastructure upgrades

The figure below presents a simplistic representation of the potential timings for when certain aspects of the airport could be constructed based on the aggregated demand for aviation services.

Figure 124: potential staging of airport development



Source: Ernst & Young

A number of factors would have to be undertaken when determining the optimal timing for the staged development of this asset including:

- Associated brownfield cost
- Impact on demand and services
- Associated planning

Each of these impacts is discussed in more detail below.

Associated brownfield cost

The construction of an asset in an established environment has an impact on the cost and impact on others over and above that realised with the development of an asset in a Greenfield environment.

This cost is even more prevalent in the upgrading of airports due to the range of safety and other measures undertaken to ensure that the upgrading of the asset does not materially impact on its operations. For example because of this impact all construction work on runways, taxiways and aprons have to be undertaken when the airport is not operating (predominantly between the hours of 12am and 5 am) which has a range of associated additional costs.

Both the design and proposed planned upgrading schedule can both be developed to ensure that any future construction costs to upgrade the airport to its future capacity can be done so in both an optimal and cost effective manner.

Impact on demand and services

The phasing of the development of the airport and supporting infrastructure would have an impact on the overall demand for aviation services from the airport, both in terms of the services that would be provided and the overall demand – ease of access of the airport. For example failing to provide rail services to the airport would impact on the generalised cost to access the airport and might have an impact on a person's decision to use its services. Furthermore the scale of operations, and who else is operating at the airport, could also impact on the appetite for airlines to operate from the airport. This would impact on the range of services being provided from the airport and ultimately the number of passengers that would use the airport.

Associated planning

Even thought the airport is developed in a phased manner it would be important that the relevant government's maintained sufficient corridors for the inevitable future development of the airport and supporting infrastructure. Examples of these corridors would include:

- ► Airspace – work will have to be continually undertaken (predominantly from Air Services Australia) to determine how the airspace can be divided to support the operations of this and other airports within the region (including KSA, Bankstown, Richmond, Canberra and Newcastle) as all of these airports continue to grow

- ► Infrastructure corridors – areas (or room) for future infrastructure provision that is planned to be developed to meet the forecast future demand at the airport should be maintained to ensure that they can be developed in the future in an optimal manner. For example planning for and maintaining a corridor for the development of a rail line to the airport will be paramount for its future viability

- ► Surrounding land use – the local government planning and associated developments around the airport should be undertaken in a manner that will be within the laws and regulations associated with airports in the case when the airport does reach its capacity in some future period. For example that no houses are constructed within the ANEF contour of the 70 million capacity airport – even though the airport will not reach that level of throughput within the medium to longer term. This planning provision will ensure that the future impact of the airport will be as minimal as possible as the airport develops into its full design capability.

It must be noted that this is a simplistic representation and that further analysis would have to be undertaken to determine the optimal makeup and timing of the development.

C.5.2 Staging the development of the industrial/commercial developments

Like that of the airport development, the construction and uptake of the industrial and commercial precinct will most definitely be developed in a phased manner.

International experience, both with the development of lands near an airport and the general release of large parcels of land, suggests that the phased development of such an area, to optimise the profitability of the project for the developer that this phased development would occur. Examples of the phased development of commercial and industrial lands surrounding an airport include Canberra Airport, Brisbane Airport and Hobart Airport.

With regards to the development of the business park precinct, while it is likely that the whole or a major proportion of the area will be zoned, with relevant planning approvals, and subdivided accordingly it is likely that only a proportion of the land will be released and developed.

The timing of the release and development of this land will likely be linked closely with a range of general economic and factors affecting the nearby airport, including:

- ► General economic conditions – in good economic times, when businesses are generally expanding their operations, would likely increase the demand for the release of such land which will positively impact on the decision to release the land

- ► The perceived regional market demand – like that of the general market conditions, there may be regional specific factors that impact on the demand for such land including, the up-scaling of local businesses, change in land use within the region etc.

- ► Availability of alternative land – if land is abundant within a region then this would result in less competition of demand for the proposed site, impacting the attractiveness and ultimately the price one would be willing to pay

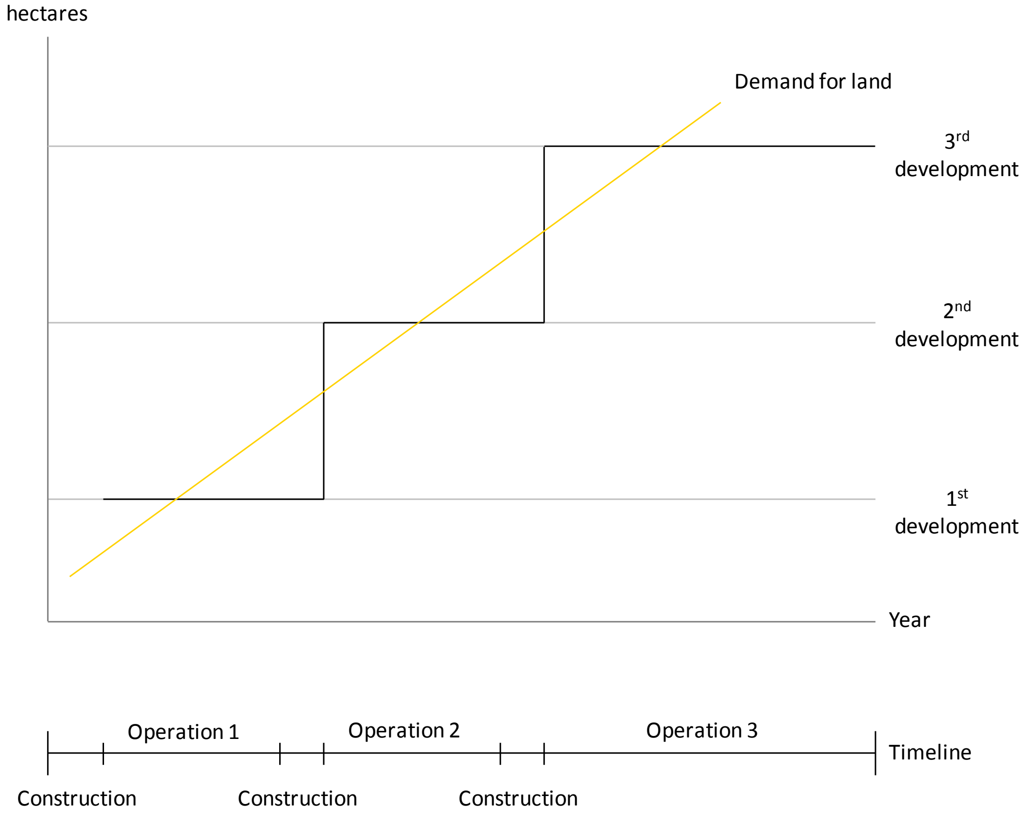
- ► The ownership of the land – who owns the land will also play a role in the likely timing of its release, for example there maybe some specific circumstances that they face in particular that would result in the timing of the release of the land

- The size and scope of services provided by the airport – the services provided at the airport will impact on the range and aggregate number of businesses that will support its operations and therefore will likely want to locate their business operations in close proximity

- The range and type of other businesses that locate in the precinct – the mix of the businesses that will want to move to the airport site will impact on the range of variables as outlined above and the relative impact on demand for such land. For aeronautical businesses the demand for land is more likely to be impacted by the size and scope of services at the airport, whereas a general retail business would be more likely impacted on the general and regional economic market conditions.

As such there are multiple ways of releasing and developing the land in a feasible manner, the figure below presents a graphical representation of how this could be developed around the Badgerys Creek airport with respects to demand and over the development timeline.

Figure 125: Potential upscalling of commercial/industrial development



Source: Ernst & Young

As can be seen in the figure above in this business park example the area is developed over a three staged process. The aggregate demand for the land (as estimated in sections 10.2.5, 17.2.5 and □24.2.5) would always lead the next stage of release to ensure that the developer optimised the value of the development. This assumption is based on the optimal release of land from the developers' point of view – where demand for land being greater than supply, to maximise the price whilst taking into account the financial benefits of developing sooner (time value of money).

The likely businesses that will demand the area provided at the business park in the initial development is likely to be aviation specific business such as airport cleaning and maintenance, airline engineers and catering businesses. As the airport increases in size those businesses that will likely demand further lands includes hospitality and general business. Finally as the regional population increases, the site is well established and there is a scale of development general retail and further businesses industries are likely to uptake the land available.

It must be noted that this is a simplistic representation and that further analysis would have to be undertaken to determine the optimal makeup and timing of the development.

C.5.3 Airport and Business park development timelines

Sydney Airport[463]

- 1911: The first aircraft lands on the former Ascot Racecourse (now part of the airport site)
- 1920's: 'Mascot Aerodrome' officially opened and Commonwealth Government acquires the aerodrome
- 1930's: Additional land is purchased, the main runway is surfaced with gravel and two ancillary grass runways are laid out
- 1940 – 1945: New passenger terminal opened and Airport is further developed during World War II to enhance its civilian and military facilities
- 1945: Cooks River is diverted and two new runways are built
- 1963: 11pm to 6am curfew is adopted
- 1968: Main north-south runway (16R/34L) is extended by land reclamation into Botany Bay to cater for long-haul international jets
- 1970: First stage of international terminal opens on current site
- 1970's: Further expansion of the international and domestic terminals. In 1972 Runway 16/34 is extended into Botany Bay to its present length of 3,962m
- 1992: Major expansion of International terminal adds eight gates for B747-400 aircraft
- 1994: The parallel runway (16L/34R) opens at its current length of 2,438m. New flight paths added
- 2000: International and domestic terminals significantly upgraded and expanded. Significant ground access infrastructure developed – the Airport Rail Link, the Eastern Distributor and M5 East Motorway.

[463] To be drawn on a timeline

History of Manchester Airport

- 1938: Opened
- 1940's: Expansion of car parks and service buildings north of Yewtree Lane
- 1958: More car parks built and auxiliary buildings
- 1958: Main runway extension from 5,900 feet to 7,000 feet permitting regular non-stop scheduled flights to North America
- 1962: First purpose-built post-war terminal was completed after 4 years of construction
- 1968: Construction started on the M56 Motorway (connects Manchester to the wider road network), and it opened to Manchester Airport in 1972
- 1982: Opening of the main runway extension to its current length of 10,000 feet to attract long haul flights from worldwide destinations
- 1986: The World Freight Terminal (Manchester Airport Goods Area) opened. It serves cargo-only freighter services and cargo carried on regular passenger flights. There is now 550,000 sq ft (51,000 m^2) of warehouse and office space on site, including a chiller unit for frozen products and a border inspection post.
- 1989: Terminal 3 is opened
- Early 1990's: The Western and Eastern long-term car parking areas were expanded and the aircraft standing area enlarged
- 1993: Terminal 2 is opened
- 1993: Manchester Airport Railway station is opened, connecting the airport to the national rail network
- 2004: The new integrated public transport interchange was opened bringing bus, rail and coach passengers under one roof
- 2011: Start on work on building an airport terminus for the Manchester Metrolink within the station

Waterford Regional Airport – business park development

- The airport business park is located on Light Industrial zoned lands to the immediate south of Waterford Airport. The 138 acre park has seen rapid development over the last decade and it now provides developers with the option of either serviced sites or purpose built office units.
- Wireless broadband services and Voice over IP technologies are now available at the business park
- Waterford Airport opened in December 1981 with a 1,200 metre runway that could accommodate single and twin-engine light aircraft. The Airport now has a runway that is 1,433 metres long and 30 metres wide, and is classed as a Code 2 facility in terms of the International Civil Aviation Organisation (ICAO) Annex 14 standards.
- There are 2 aprons at the Airport, one serving the Sea Air Rescue Facility and one adjacent to the Terminal building. There are 200 car parking spaces directly adjacent to the Terminal building.
- The genesis of the Business Park was due to its location adjacent to the Airport. It was proposed to channel development into the Park which would benefit from the close proximity of the airport.
- To acknowledge the existing development, the area was zoned for Light Industrial use in the 2005 County Development Plan.
- The Business Park area has since been increased with a number of permissions granted in the last Plan period. The total area of the Business Park is 138.6 hectares.
- To date, a variety of uses have been permitted within the industrial park. These uses include manufacturing, warehousing, office, light industry and heavy industry. These uses are primarily of a low added value and have little, if any, connection with the Airport.

- The type of development which has taken place to date in the Business Park has been quite mixed. There has been a gradual shift away from airport dependent enterprises to a more general industrial use.
- The Regional Planning Guidelines recognise that the types of industries that now offer long-term prospects for generating revenues are in the new technologies and knowledge based areas such as Information and Communications Technology, Medical Devices, Biotechnology, Pharmaceuticals, the Green Economy and Renewable Energy.
- There is also a need to refocus on channelling airport-related industries and those with specific locational requirements to be close to the Airport into the Business Park.
- However activities which would cause atmospheric obscuration, attract bird concentrations, or cause other nuisance or hazards so as to obstruct the safe and effective operation of the Airport function shall be excluded.
- The Council will encourage the development of industries which engaged in activities that are complementary to the role of the Airport.
- To allow for the future expansion of both the Airport and Business Park, 3 distinct Land Use zones have been identified: the Airport Area, the Airfield Reserve Area and the Light Industrial Area.

Appendix D Technical appendix - technical (engineering) analysis of sites

This appendix provides all of the background technical analysis that has been undertaken by WorleyParsons as part of this analysis. The content was developed by Worley Parsons and Ernst & Young has not attempted to verify or test the data therein.

D.1 Air Quality

D.1.1 Applicable Legislation

D.1.1.1 The Airports Act 1996 and the Airports (Environment Protection) Regulations 1997

Air quality within the boundary of an airport and surrounding areas needs to be in compliance with the air quality goals established in Schedule 1 of Airports Act 1996 and the Airports (Environment Protection) Regulations 1997. This legislation lists the acceptable limits for a variety of substances in air emissions. The relevant pollutant limits for *stationary* sources at an airport as set out in the Regulations are listed in Table 152.

Table 152: Accepted Limits of contamination (refer Schedule 1 of the Airports Act)

Substance	Source	Limit
Solid particles	Boiler Incinerator (consumes < 300 kg/h of material) Incinerator (consumes ≥ 300 kg/h of material) Other sources	0.25 g/m3 0.5 g/m3 0.25 g/m3 0.25 g/m3
Sulphuric acid mist	Any source	0.1 g/m3
Acid gases	Any process including aircraft maintenance	0.4 g/m3 as HCl
Nitrogen oxides	Gas turbines (< 10 MW) burning gas Gas turbines (> 10 MW) burning gas Gas turbines (< 10 MW) burning fuel other than gas Gas turbines (> 10 MW) burning fuel other than gas	0.09 g/m3 0.07 g/m3 0.09 g/m3 0.15 g/m3
Vapour from volatile organic liquids – from liquids stored in tanks	Incinerated vapour	1.5 g/m3 of unburnt vapour
	Recovered vapour	110 mg of vapour per litre of liquid passing into tank over 4 hours
Vapour from volatile organic liquids – transfer into a delivery tank of 12 kL or more in capacity, exceeding 30 ML per year	Incinerated vapour	1.5 g/m3 of unburnt vapour
	Recovered vapour	110 mg of vapour per litre of liquid passing into tank over 4 hours
Fluorine compounds	Any source	0.05 g/m3 as HF
Chlorine and chlorine compounds	Any source	0.2 g/m3
Carbon monoxide	Any source except a stationary diesel vehicle or a standby generator	1.0 g/m3
Lead	Any source	10.0 mg/m3 either as a pure substance or a compound

Source: WorleyParsons

Regulation 2.01 states that air pollution has occurred when a pollutant is present in air in a quantity, way, or condition, or under a circumstance, in which harm is likely to be caused to the environment; or unreasonable inconvenience is likely to be caused to a person. In addition, Regulation 4.01 requires operators at the airport (including airport tenants) to take all reasonable and practicable measures to prevent the generation of pollution.

D.1.1.2 National Environment Protection (Ambient Air Quality) Measure (gazetted in 1998)

This instrument formulates national standards or goals for ambient air quality for six criteria pollutants. This NEPM required compliance to the standards by all states and territories by 2008. The relevant ambient air quality goals, as set out in the NEPM, are indicated in Table 153.

Table 153: Air quality goals

Substance	Averaging period	Maximum concentration (ppm) unless otherwise stated	Maximum allowable exceedances
Lead	1 year	0.50 $\mu g/m^3$	none
Photochemical oxidants (as ozone)	1 hour	0.10	1 day per annum
	4 hours	0.08	1 day per annum
Sulphur dioxide	1 hour	0.20	1 day per annum
	1 day	0.08	1 day per annum
	1 year	0.02	none
Particles as PM_{10}	1 day	50 $\mu g/m^3$	5 days per annum
Nitrogen oxides	1 hour	0.12	1 day per annum
	1 year	0.03	none
Carbon monoxide	8 hours	9.0	1 day per annum

Source: WorleyParsons

Monitoring of the criteria pollutants is mandatory.

In 2003 the Air NEPM was varied to include advisory reporting standards for particles as $PM_{2.5}$ (these are particles with diameters smaller than 2.5 microns). The advisory reporting standards and goals are:

- 1 day averaging period: 25 $\mu g/m^3$
- 1 year averaging period: 8 $\mu g/m^3$

D.1.1.3 National Environment Protection (National Pollutant Inventory) Measure (gazetted in 1998)

This instrument establishes an internet database designed to provide publicly available information on the types and amounts of certain chemicals being emitted to the air, land, and water. All air emissions including air toxics are captured under this NEPM.

D.1.1.4 National Environment Protection (Diesel Vehicle Emissions) Measure 2009

Motor vehicles, particularly those with diesel engines, are significantly disproportionate contributors of fine particle pollution and nitrogen oxides. This NEPM has been developed to reduce the impact of emissions from diesel vehicles.

D.1.1.5 Air Navigation (Aircraft Engine Emissions) Regulations 1997

These regulations ensure that aircraft within Australia comply with the emission standards contained within the *Convention on International Civil Aviation* (*refer* Volume II, Annex 16). The standards are aimed at reducing ground level emissions and establish limits for relevant parameters including nitrogen oxides, carbon monoxide, hydrocarbons and smoke.

D.1.1.6 National Environment Protection (Air Toxics) Measure 1994

Pollutants included in the Air Toxics NEPM are benzene, formaldehyde, toluene and polycyclic aromatic hydrocarbons. Note that air toxics have not been assessed in this study.

D.1.1.7 Protection of the Environment Operations (Clean Air) Regulation 2002 (NSW)

Protection of the Environment Operations Act 1997, Part 5.8; and the Protection of the Environment Operations (Clean Air) Regulation 2002 - Part 3. These regulations cover measures for domestic solid fuel heaters, control of burning, motor vehicles and motor vehicle fuels, and emissions from industry. The criteria pollutants for the proposed airports would be covered by the Airports (Environment Protection) Regulations 1997 and the National Environment Protection (Ambient Air Quality) Measure.

D.1.2 Existing air pollution levels

This section analyses the potential impact of an airport on existing and predicted air quality levels within the Sydney basin. Note that lead levels in NSW were consistently below NEPM goals, hence monitoring was discontinued. Air emissions of lead were not considered further in this study.

Present levels of major pollutants affecting air quality in the Sydney Region include:

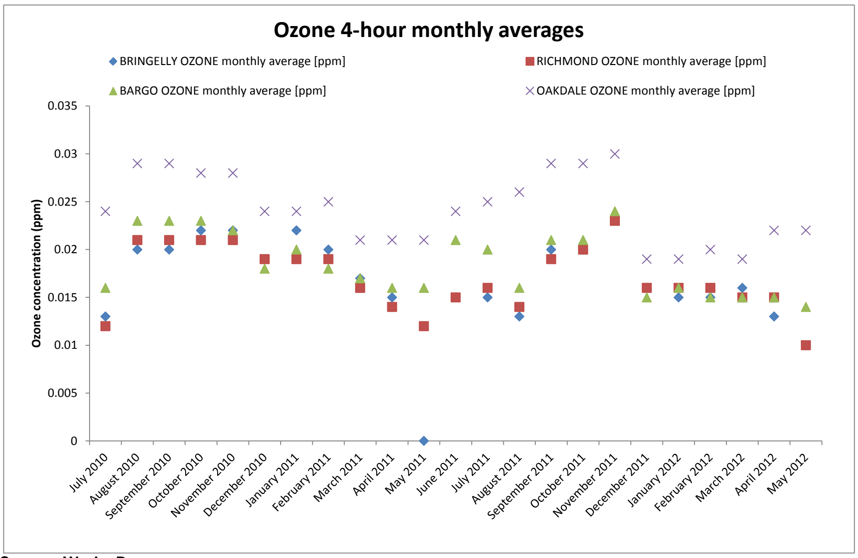
- ► Ozone;
- ► Nitrogen oxides;
- ► Particulates as PM_{10};
- ► Sulphur dioxides;
- ► Carbon monoxide;

Air quality data averaged on a monthly basis was obtained from the NSW Environment and Heritage website for the period 01/07/2010 to 01/06/2012. Data was obtained from Bringelly (as a proxy for Badgerys Creek).

D.1.2.1 Ozone data for each site

The data in Figure 126 shows the monthly averages of the 4-hourly ozone data recorded at the Bringelly monitoring sites. There is a clear seasonal trend at each site with the ozone levels dipping in the winter months and peaking in the summer months. The photochemical production of ozone is dependent on the amount of available solar radiation, hydrocarbons and nitrogen dioxide present. In addition, the site is affected to various extents by the afternoon sea breezes which transport pollutants out of the inner Sydney regions to western and south-western Sydney.

Figure 126: Ozone 4-hour monthly averages



Source: WorleyParsons

Table 154 shows the number 1-hour and 4-hour exceedences of the NEPM limit for ozone in 2010 and 2011 for the four sites. Again, this shows that the Bringelly site was impacted by consistently higher ozone level.

Table 154: Exceedences of the NEPM limit

Year	BRINGELLY	
	1-hr	4-hr
2010	2	7

2011	5	8

Source: WorleyParsons

Table 155 shows the historical number of exceedence-days at each site over the period 1994-2004, which confirms the higher ozone concentrations at Bringelly.

Table 155: Exceedence days

Year	BRINGELLY	
	1-hr	4-hr
1994-2004	42	64

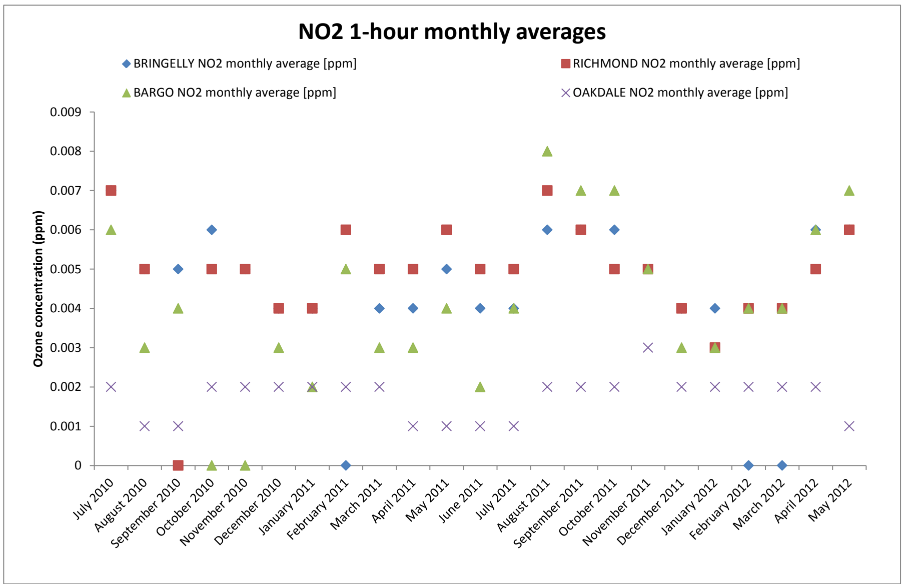
Source: WorleyParsons

Clearly, the west and south-west regions of Sydney as represented by observations at Bringelly are impacted by high ozone concentrations. In contrast, an inner city site like Rozelle only experienced one exceedence of the 1-hour limit and three exceedences of the 4-hour standard over the same time period.

D.1.2.2 Nitrogen dioxide data for each site

Data in Figure 127 shows the monthly averages of the 1-hour nitrogen dioxide data recorded at the monitoring site. There is an indistinct seasonal trend at the site with the nitrogen dioxide levels dipping in the summer months and peaking in the winter months. This is because nitrogen dioxide is consumed in the production of ozone through photochemical processes.

Figure 127: Nitrous oxide 1-hour monthly averages



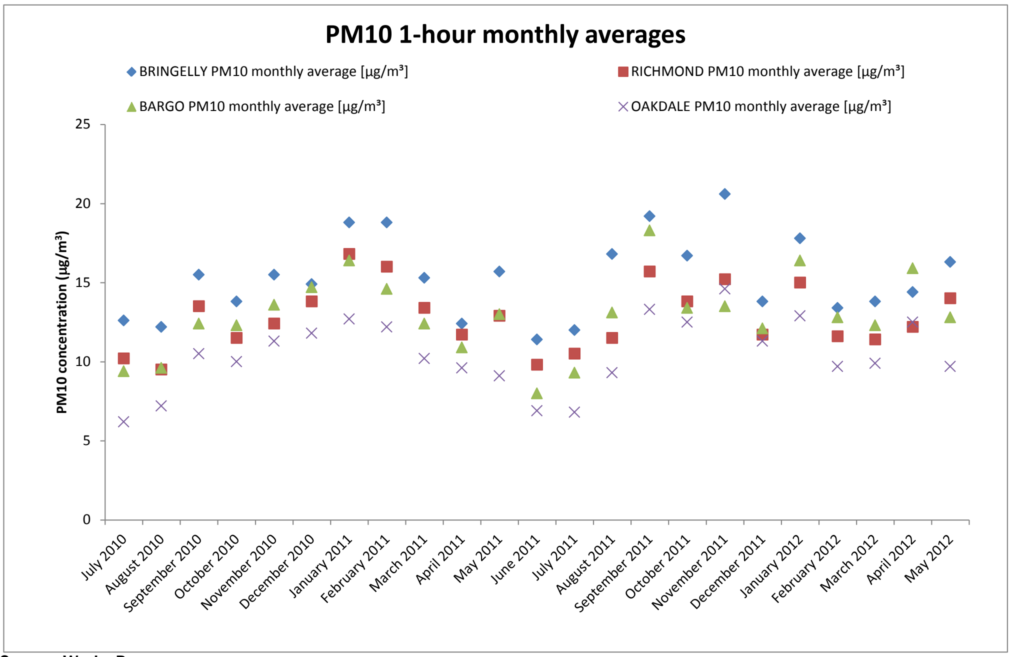
Source: WorleyParsons

An analysis of the 1-hour nitrogen dioxide exceedences for NO_2 in 2010 and 2011 for the site showed the site did not exceed the NEPM limit.

D.1.2.3 PM10 data for each site

Fine particulates are an issue because of their health impacts. The figure below shows the fine particulate concentrations measured at the monitoring sites. As found with the ozone concentration, there is a distinct seasonal trend with the particulate concentration peaking in summer and dropping in winter.

Figure 128: PM10 1-hour monthly averages



Source: WorleyParsons

The table below indicates that in terms of the number of exceedences of the 24-hour PM_{10} limit for the site, observations at the Bringelly site revealed two exceedences in 2011.

Table 156: Numbers of 24-hour PM10 exceedences at each monitoring site

Year	BRINGELLY
2010	0
2011	2

Source: WorleyParsons

D.1.2.4 Sulphur dioxide data for each site

Ambient levels of sulphur dioxide at the site tended to be below the detection limits of the instruments. No exceedences of the NEPM limit were recorded in 2010-11.

D.1.2.5 Carbon monoxide data for each site

This pollutant was not measured at the sites as the NEPM standard for carbon monoxide levels is being consistently met. No exceedences were reported.

D.1.3 Present air emission levels in the Sydney basin

The present and future trends in air quality for the greater Sydney, Newcastle and Wollongong regions have been reported in detail in the Air Emissions Inventory for the Greater Metropolitan Region in New South Wales, Criteria Pollutant Emissions for all Sectors: Results (DECC; 2007). Table 157 indicates the total levels of each pollutant within the Sydney Basin as at 2007.

Table 157: Present air emission levels in the Sydney basin

Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM10	Total hydrocarbons
555,357	94,353	13,833	24,004	164,822

Source: WorleyParsons

D.1.4 Forecast air pollution levels in the Sydney basin without an airport

It is not possible within this study to provide quantitative predictions for the five criteria pollutants at each of the sites. Rather, a general observation of future trends in the Sydney Basin is given.

The Action for Air report (NSW State Government, Department of Environment, Climate Change, and Water, Nov. 2009) states that over the next 10 to 15 years the projected performance for four of the air NEPM pollutants is for stable levels or continuing reductions in concentrations. Carbon monoxide concentrations have continued to fall with the turnover of the vehicle fleet and older vehicles being replaced with newer vehicles with more stringent emission limits. Emissions of nitrogen oxides from motor vehicles are predicted to fall due to the progressive introduction of stricter standards for fuel quality and vehicle emissions, despite forecast increases in vehicle kilometres travelled. The regulation of emissions from industrial sources has helped to ensure that sulphur dioxide concentrations remain well below the NEPM standard.

Further emission reductions are needed to achieve ozone NEPM standards well into the next decade, emphasising the need for ongoing reductions from all major sources of ozone precursors.

Motor vehicles will remain the most significant source of ozone and particulate-forming pollutants in the Sydney region. Gains from tighter fuel and vehicle emission standards are likely to be partially offset by growth in vehicle numbers and travel, both private and commercial, and use of heavier vehicles. This will require a continuing focus on motor vehicle emissions, including emphasis on integrated land-use and transport planning and public transport planning.

Particulate emissions in the Sydney region also need to be addressed as concentrations approach the national standard for PM_{10} even in the absence of bushfires and dust storms. In some rural and regional areas, exceedences of the national standard for PM_{10} highlight the need for better management of anthropogenic sources, particularly agricultural burning and emissions from solid-fuel heaters.

The impacts of climate change may lead to increased temperatures, resulting in a longer season for elevated concentrations of summertime ozone with predicted increases in the average number of days over the 1-hour and 4-hour ozone standard. The geographical extent of ozone impacts is also expected to increase under these climate change scenarios.

D.1.5 Potential environmental impacts of a second airport

This section provides a high-level quantitative analysis of the additional air pollutants would both be released through the operational phases of the airport development. Airport construction related emissions, e.g. from land clearances, earthworks and dispersal of dust were ignored as these emissions are likely to be immaterial.

Emissions of five of the six NEPM (Ambient Air) pollutants were assessed for airport operations. Assessment of ozone levels as a result of the operation of a second airport is beyond the scope of this study. Ozone is a secondary pollutant with its concentrations at a particular site being governed by a combination of complex photochemical processes and prevailing meteorological conditions. Lead levels were not assessed as they are presently well below the NEPM standards and they are currently not monitored in NSW.

The pollutants assessed were:

- Nitrogen oxides;
- Particulate matter as PM_{10};
- Sulphur dioxide;
- Carbon monoxide; and
- Total hydrocarbons.

The air emissions were divided into three categories:

- Aircraft emissions;
- Ground-based aircraft handling emissions; and
- Increased road traffic emissions.

The methodology and results of calculating these air emission impacts of an airport within the Sydney basin are discussed below.

D.1.5.1 Aircraft Emissions

The emissions from aircraft are based on the number of landings and take-off (LTOs) at each airport, which in turn are based on the maximum number of passenger movements. The passenger movement data are the projected numbers in 2060 provided by Booz & Co.

To calculate the aircraft emission factors per LTO the emission factors per mode are used (NPI Estimation Technique Manual for Aggregated Emissions from Aircraft, Table 3).

The calculation method is:

$$E_m = \sum_o I_o \, E_{m,o}$$

Where E_m is the emissions per mode, I_o is the annual number of LTOs for international and domestic aircraft, and $E_{m,o}$ is the emission factor for mode m and aircraft fleet o, in kg/LTO. The flight modes are:

- Approach;
- Taxi/idle;
- Take-off; and
- Climb-out.

The air emissions from the assessed aircraft activities is summarised (in tonnes per annum) for each airport in Table 158.

Table 158: Air emissions for each site

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM10	Hydrocarbons
Badgerys Creek	3,277	4,587	306	149	473
Wilton	3,034	4,247	283	138	438
Richmond	411	321	31	15	47

Source: WorleyParsons

D.1.5.2 Aircraft Handling Emissions

Given the absence of data on aircraft handling infrastructure, only an estimate of air emissions can be made here. The basis of the estimate is the 2014 air quality data from the Sydney Airport Environment Strategy, Table 4.3. This table features air emissions for the five criteria pollutants for each of the eight sources listed in Table 159. These emissions are then scaled up to approximate the emissions from each of the proposed airports as detailed in Table 158.

Badgerys Creek

Table 159 provides an overview of the source of emissions from the Badgerys Creek site.

The scale factor used here is the ratio of annual passenger movements. For Sydney Airport, the estimated number of passenger movements in 2014 was 45.6 million.

Table 159: Badgerys Creek source of emissions

Source	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Ground Support Equipment	1,104	137	3	6	39
Auxiliary Power Units	67	71	10	-	6
Aircraft Maintenance	2	235	5	-	2
Refueling and fuel storage	-	-	-	-	0.2
Other fuel storage	-	-	-	-	78
Boilers	3	3	-	1	-
Generators	1	3	1	-	-
Surface Prep and Coating	-	-	-	-	12
Totals	1,177	449	20	7	137

Source: WorleyParsons

Wilton

Table 160 provides an overview of the source of emissions from the Wilton site.

The scale factor used here is the ratio of annual passenger movements. For Sydney Airport, the estimated number of passenger movements in 2014 was 45.6 million.

Table 160: Wilton source of emissions

Source	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Ground Support Equipment	982	122	3	5	35
Auxiliary Power Units	60	63	9	-	5
Aircraft Maintenance	2	209	5	-	1
Refueling and fuel storage	-	-	-	-	0.1
Other fuel storage	-	-	-	-	70
Boilers	3	3	-	1	-
Generators	1	3	1	0.5	-
Surface Prep and Coating	-	-	-	-	10
Totals	*1,047*	*399*	*17*	*6*	*122*

Source: WorleyParsons

Richmond

Table 161 provides an overview of the source of emissions from the Richmond site.

The scale factor used here is the ratio of annual passenger movements. For Sydney Airport, the estimated number of passenger movements in 2014 was 5 million. (Richmond airport)

Table 161: Richmond source of emissions

Source	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Ground Support Equipment	114	14	0.4	0.6	4.1
Auxiliary Power Units	7	7	1.0	-	0.6
Aircraft Maintenance	-	24	0.6	-	0.2
Refueling and fuel storage	-	-	-	-	0.0
Other fuel storage	-	-	-	-	8.1
Boilers	-	-	-	0.1	-
Generators	-	-	-	0.0	-
Surface Prep and Coating	-	-	-	-	1.2
Totals	*122*	*46*	*2.0*	*0.7*	*14.1*

Source: WorleyParsons

D.1.5.3 Motor Vehicle Emissions

Motor vehicles travelling to and from each airport will produce emissions throughout the Sydney metropolitan area. Although there will be additional electric rail services, the air emissions associated with the generation of electricity will likely occur in the Hunter Valley or west of the Blue Mountains. Air emissions from these sources will have a minor effect on Sydney's air quality and are therefore not considered any further.

The analysis presented here is conservative and is based on the maximum number of passenger movements projected for 2060. Assumptions are based on data supplied by Colin Henson. Estimates were based on 30 million passengers per annum generating 3,400 million vehicle kilometres travelled (VKT) per annum and 70 million passengers generating 5,660 million VKTs per annum. Emission factors for petrol cars were sourced from the NPI Estimation Technique Manual for Combustion Engines, Table 10. The results are presented in Table 162.

Table 162: Forecast vehicle emissions

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Badgerys Creek	21,053	3,793	55	38	1,385
Wilton	19,578	3,528	52	35	1,288
Richmond	2,978	537	8	5	196

Source: WorleyParsons

It is clear from data presented in Table 162 that the bulk of the air emissions from each of the airport options arise from the additional vehicle kilometres travelled.

Note that there is considerable uncertainty surrounding the vehicle emissions. The present study does not differentiate between additional VKTs in the context of the airport and additional VKTs due to e.g. new housing developments and business parks in the vicinity of the airport site. However, by assuming the maximum VKTs are entirely due to the proposed airports, useful upper limits are established for vehicle impacts.

D.1.6 Summary of air quality impacts

The air emissions from all sources in relation to the proposed airports at Badgerys Creek are summarized in Table 163.

Table 163: Badgerys Creek air emissions summary

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Total Sydney Basin emissions (tonnes/year)	555,357	94,353	13,833	24,004	164,822
All Badgerys Creek airport related emissions (tonnes/year)	25,507	8,830	381	194	1,994
Percentage increase due to proposed airport	4.4%	8.6%	2.7%	0.8%	1.2%

Source: WorleyParsons

The air emissions from all sources in relation to the proposed airports at Wilton are summarized in Table 164.

Table 164: Wilton air emissions summary

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Total Sydney Basin emissions (tonnes/year)	555,357	94,353	13,833	24,004	164,822
All Badgerys Creek airport related emissions (tonnes/year)	23,659	8,174	352	179	1,847
Percentage increase due to proposed airport	4.1%	8.0%	2.5%	0.7%	1.1%

Source: WorleyParsons

The air emissions from all sources in relation to the proposed airports at Richmond are summarized Table 165.

Table 165: Richmond air emissions summary

	Carbon monoxide	Nitrogen oxides	Sulphur dioxide	PM_{10}	Hydrocarbons
Total Sydney Basin emissions (tonnes/year)	555,357	94,353	13,833	24,004	164,822
All Badgerys Creek airport related emissions (tonnes/year)	3,511	904	41	21	257
Percentage increase due to proposed airport	0.6%	0.9%	0.3%	0.1%	0.2%

Source: WorleyParsons

From this analysis the air emission impacts from all aspects of the proposed airports are small to moderate except for the increase in NOx levels (particularly in Wilton and Badgerys Creek). The bulk of the increase in NOx will arise from additional vehicle travel throughout the Sydney metropolitan area to reach the various airports. Given that NOx is a precursor for photochemical smog, producing more NOx could lead to additional photochemical smog formation (fine particles and ozone) around the proposed airport and in the Sydney Basin. This is exacerbated by the increase in VOC which also arises from vehicle usage. The increase in air emissions could be especially problematic in the west and south-west of Sydney where ozone exceedences are relatively frequent in the Bringelly.

D.1.7 Regional factors that affect the rate of dispersal of air pollutants

The specific factors affecting dispersal of air pollutants throughout the Sydney Basin are:

- Climatic influences - rainfall, solar radiation, summer and winter diurnal and nocturnal temperatures, wind speed;
- Temperature inversions;
- Topographic influences on air.

D.1.7.1 Badgerys Creek

The Badgerys Creek site experiences lower rainfall, more sunshine, higher summer temperatures and lower winter temperatures. The site would also experience a higher frequency of calm conditions compared with Sydney. The site is affected by four significant drainage flows:

- The local southerly flow: this flows across the site towards Richmond and was the most prevalent flow;
- A westerly regional drainage flow that originates from the Blue Mountains;
- The south-westerly drainage flow as described for the Wilton site; and
- A spill-over flow caused by the Hawkesbury Basin filling up as a result of cold air drainage and overflow into the Parramatta River Valley at Blacktown.

The key receptor areas for pollution from the proposed airport are the Hawkesbury Basin and the Parramatta River Valley. The local and spill-over flows are stable and tend to inhibit vertical dispersion of air emissions. The Hawkesbury Basin is a receiving area for smog and winter haze formed locally and throughout the Sydney Basin. An increase in local emissions due to the airport will reduce air quality in the Hawkesbury Basin. A significant proportion of air emissions are transported into the area by afternoon sea breezes, especially in summer months when temperature and solar radiation intensity rises favouring photochemical smog formation.

D.1.7.2 Wilton

Compared with Sydney, Wilton has lower rainfall, more sunshine, higher summer temperatures and lower winter temperatures. Based on data obtained from Camden Aerodrome, it is expected that Wilton would experience a higher frequency of calmer conditions compared with Sydney. This makes photochemical smog production more likely in Wilton than in Sydney.

Temperature inversions at Wilton have not been measured, but they were thought to be more frequent, stronger and deeper than at Sydney Airport. This means that all pollutants emitted near the ground remain close to the ground, leading to high local levels of pollution.

Topography can affect the transport and dilution of air pollutants by inducing local flow patterns (1985 EIS). This includes the channelling flows through valleys, temperature inversions in valleys, circulation between land and water areas, urban-rural differences in surface roughness and thermal characteristics, and wind intensification on hills and ridges.

Cold-air drainage from escarpments is a particular issue. The most significant flow is the south-west regional drainage flow that is channelled by the Illawarra Escarpment to the east, the Mittagong ridge to the south and Lake Burragorang to the west. The flow occurred at Wilton on 26 nights during a 45 day observation period (*refer* 1985 EIS). A key issue is the potential for the south-west regional drainage flow to transport air pollutants from the proposed airport at Wilton east into various parts of the Sydney Basin or north into the Hawkesbury Basin. It is not known how frequently this airflow presently operates and to what extent it could transport air pollutants. This question can only be resolved with monitoring of ambient meteorological and air quality conditions, and accurate pollution dispersion modelling.

D.1.7.3 Richmond

It is expected that the trends in rainfall, sunshine, wind and summer/winter temperatures will be the same as for Wilton and Badgerys Creek.

Dispersion in the Richmond region is affected by a steep escarpment several kilometres to the west and by elevated ground to the north. These topographic features are responsible for the development of local drainage flows, and surface-based inversions. When there is a southerly component to the sea breeze or the occurrence of weak, shallow south-easterly changes, the urban plume can be carried into the Richmond area, with elevated levels of ozone observed. Under north-easterly sea breezes, the area may also be influenced by emissions from the central coast. Again, any increase in local emissions will reduce air quality in the Hawkesbury Basin.

D.1.8 Mitigation methods and strategies

There are a number of methods and strategies that can be implemented to mitigate the air pollution impact of an airport development, these include:

- Develop an Air Quality Monitoring program, perform an annual review of this program to re-evaluate testing parameters and determine the future direction for monitoring. Perform dispersion modelling and assess local air quality. Sampling of emission sources within the airport boundary may be required.
- Develop an air emissions inventory and review the inventory at least annually. Include ground based emissions.
- Consider fixed electrical ground power units (FEGPU), reducing the need for diesel/petrol/gas powered APUs (auxiliary power units) or GPUs (ground power units).
- Consider spray painting operations and ensure compliance with applicable regulatory requirements.
- Consider more advanced ground transport using cleaner/alternative fuels (ie. hybrid vehicles and/or emission reduction devices).
- Ensure all vehicles/plant undergo a regular maintenance program.
- Investigate alternative fuels for fire training, in conjunction with Air Services Australia (e.g. natural gas). Restrict fuel burning for fire training to appropriate days in accordance with NSW EPA guidelines.
- Reporting: carry out annual NPI reporting and submit to the NSW EPA; the Airport Environment Officer will need to be updated on air emissions issues on a monthly basis; and report on air quality issues to the Federal Department of Infrastructure and Transport as part of the Annual Environment Report.
- The Air Navigation (Aircraft Engine Emissions) Regulations ensures that aircraft within Australia comply with air emissions standards. The adoption of fuel efficient aircraft should be encouraged. This is demonstrated by the A380 aircraft and will soon be demonstrated by the B787 and A350 XWB aircraft.
- Ensure airfield and terminal infrastructure can manage A380 aircraft and B787 aircraft.
- Liaise with Air Services Australia and other key stakeholders on ways to minimise aircraft taxiing times and unnecessary aircraft engine usage.
- Explore the use of a Kerosene Vapour Capture and Processing Systems as a means of reducing VOC emissions.
- Encourage the increased use of sustainable transport modes (including public transport and cycling). This will help to minimise airport traffic-related air and noise emissions.
- Implement dust suppression measures during airport construction projects.

D.1.9 Conclusion

This analysis has found that the additional air emissions that result from a second airport will make a small contribution to four of the NEPM pollutants and total hydrocarbons in the Sydney region. The analysis presented here is conservative and is based on the maximum number of passenger movements and aircraft LTOs forecast for 2060. One of the key uncertainties surrounds how much of the additional vehicle traffic will be generated by the various airports or by e.g. housing and other developments near the proposed airports. It is also unclear to what extent VKTs will increase due to population increases in the Sydney region and how the additional VKTs due to travel to each of the airports compare.

In each case, although the net increase in Sydney's air emissions from each airport is small to moderate, it is difficult to assess the impacts on air quality (through photochemical smog production or ozone and fine particulates) in the near vicinity of each airport and throughout the Sydney region. The largest impact is expected from the 8-9% increase in NOx emissions for the Badgerys Creek option due to the rise in motor vehicle usage for passengers and employees. As NOx is a precursor for the formation of photochemical smog, such an increase will likely lead to a reduction in air quality. However, the precise nature of the impacts on local and regional air quality cannot be addressed here. One of the complexities is the movement of clean and polluted air parcels over the sites and the potential for these to produce additional air pollution. The flow of pollution out of the each airport into the Sydney and Hawkesbury Basins is governed by a number of drainage flows. The present frequencies at which these drainage flows operate are not known. The present frequency of temperature inversions in Badgerys Creek is also not precisely known – inversions tend to isolate the air emissions near the point of origin. The air quality issue is of concern to NSW policy makers as relatively high ozone levels are currently measured in semi-rural areas near Badgerys Creek, such as Bringelly.

To resolve the complexities of air pollution formation in the vicinity of each airport site, it is recommended that monitoring of ambient meteorological conditions and sampling of pollutants over a 12-month period be carried out. Detailed dispersion modeling should also be carried out to determine the temporal and geographical extent that air emissions from each site will impact on the Sydney basin.

D.2 Noise impacts

D.2.1 ANEF Contours

The traditional system of aircraft noise assessment has been based around the Australian Noise Exposure Contour (ANEF) metric, which was a modification of the US Noise Exposure Forecast system. The ANEF is a generic name for three types of equal energy aircraft noise contours:

- ► The Australian Noise Exposure Forecast (ANEF) is the only metric approved and promoted by the Federal Government for use in determining the suitability of land use in regards to aircraft noise. The ANEF is generally provided for a 20-year time frame, is updated regularly and there can be only one approved set of ANEF contours at a given time. The technical accuracy approval is by Airservices Australia. An ANEF is approved by the Minister with a Master Plan approval;

- ► The Australian Noise Exposure Index (ANEI) provides historical data on aircraft noise exposure. Normally one year's actual traffic at an airport is used to generate the ANEI and the approval process is the same as that for the ANEF; and

- ► The Australian Noise Exposure Concept (ANEC) is used as a planning tool to investigate likely changes to aircraft noise exposure resulting from proposed changes to conditions at an airport. Those changes include, among other things, changes to aircraft types or numbers.

The ANEF system is described in the *Australian Standard AS2021* and is the only method of controlling land use planning at all but two minor Australian aerodromes. It is not used to regulate aircraft operations, but rather to report on the effects of those activities. This system takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location. While ANEF contour charts are often misunderstood by the public at large, various expert committees that have considered the regulation of aircraft noise around Australian aerodromes have concluded that they are the most appropriate measure available. In the last few years there have been supplementary indices developed to help better describe aircraft noise in terms that are more readily understood by the public. These indices include N70 and Flight Track Frequency charts.

The only method of calculating ANEF contours is by use of the Integrated Noise Model (INM) developed by the Federal Aviation Agency of the USA. It cannot be directly measured. The INM calculates the aircraft noise exposure for an average day (averaged over a year) activity at an airport and for an ANEF, this day is an average day of a complete year at the forecast date.

The *Australian Standard AS2021* provides guidance to regional, local authorities and others associated with urban and regional planning and building construction on the acceptable location of new buildings in relation to aircraft noise. Zones that are described as "conditionally acceptable" may be approved as building sites provided that any new construction incorporates sound proofing measures. Section 2 of the Standard gives guidelines for determining the acoustic acceptability of a particular site. Conversely, the standard can be used to assess the noise impact of a new aerodrome or of altering an existing one, by the production of an ANEC.

The INM model itself contains a detailed database of aircraft performance and noise characteristics that have been determined from actual detailed measurements of the required parameters. In fact a part of the certification process for new aircraft types is that the manufacturer is required to undertake the required measurements to support the model. The user of the INM is required to supply all other required data, typically covering aircraft operations over an average day with this day representing the average aviation activities for a whole year. The data required includes:

Physical data; descriptions of runways and flight tracks and location of any sites that specific results are required for;

- ► Detailed flight characteristics for any non-standard aircraft operations to be modelled;

- ► A detailed description of all aircraft flights for the typical, or average, day being modelled; and

- ► Any variations to the standard output metrics that is required.

Table 166 provides an overview of different ANEF zones.

Table 166: ANEF zones

Building Type	ANEF zone of Site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 20 ANEF	25 to 30 ANEF	Greater than 30 ANEF

School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial		Acceptable in all ANEF zones	

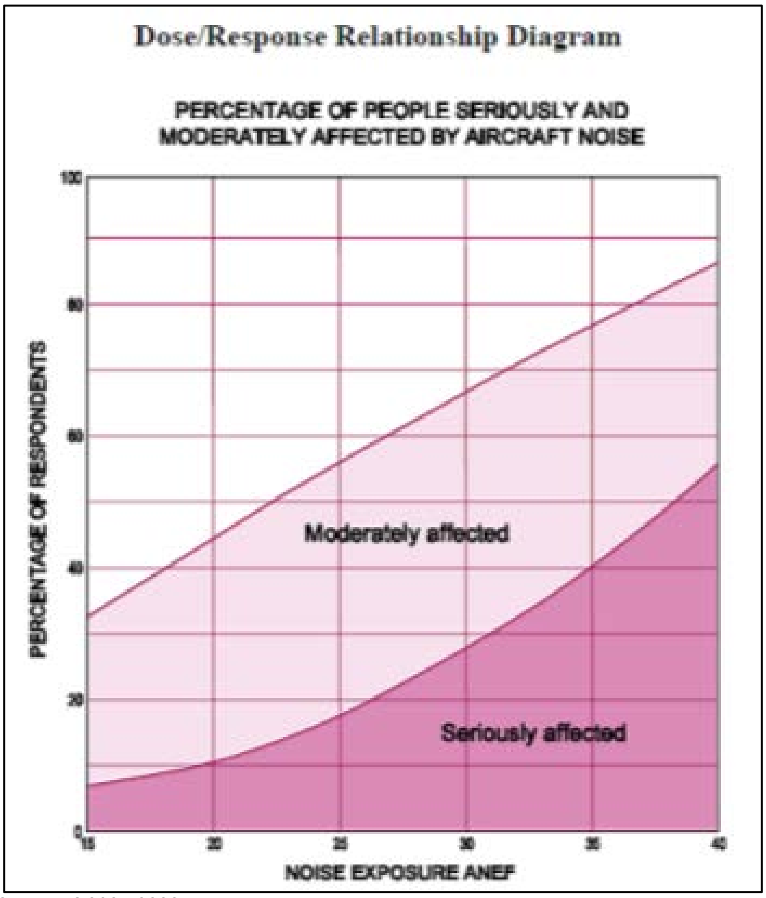
Source : Table 2.1 AS 2021-2000

D.2.2 Noise and vulnerable users

A number of other facilities would be affected by the development of an airport within the area.

Under the Airports Act, for federally leased airports, a master plan must demonstrate plans for managing aircraft noise intrusion in areas forecast to be subject to exposure above the significant ANEF levels – currently taken to be 30 ANEF. At this level of noise approximately 65% of people are expected to be seriously or moderately affected by aircraft noise, based on the advice in Figure 129, subject to the limitations in Appendix A of AS 2021-2000.

Figure 129: People affected by aircraft noise



Source: AS 2021-2000

Insulation and Compensation Program

The Federal Government has noise insulation programs for reducing the impacts of aircraft noise on homes and public buildings (Schools, Churches, Day Care Centres and Hospitals) under flight paths near Sydney and Adelaide Airports. These programs have been by legislated levy on airlines and have included voluntary acquisition of residential properties over 40 ANEF and insulation and mechanical ventilation of public buildings over 25 ANEF and for residential properties over 30 ANEF.

At a combined cost in excess of $470 million, the Adelaide and Sydney Airport noise insulation programs have been labelled by the Government as an outstanding success with 4,083 homes and 99 public buildings insulated in Sydney; while in Adelaide, a further 648 homes and 7 public buildings have been insulated. [464]

[464] http://www.infrastructure.gov.au/aviation/environmental/insulation/index.aspx

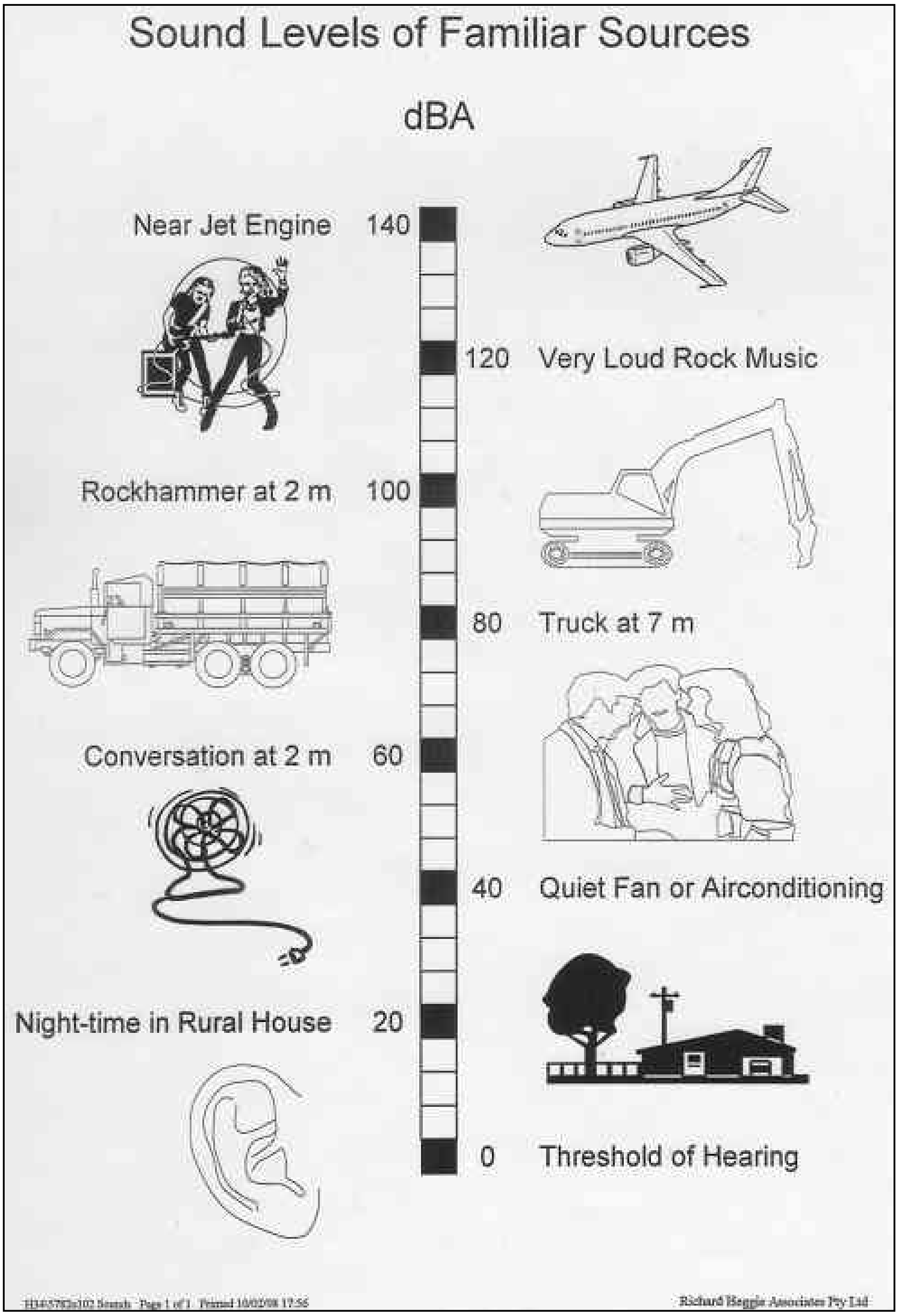
There is no Federal Government policy or legislation covering compensation for noise mitigation or for valuation of off-airport properties impacted by significant ANEF levels at this time, other than those outlined above. The Government's *White Paper 2009* does, however, propose to develop a framework in consultation with stakeholders for an industry funded noise amelioration program where future major civil airport operations and air traffic changes place residences into high-noise exposure zones.

As part of the Joint Study, WorleyParsons undertook an analysis to determine the range of facilities that would likely be so adversely affected by the noise from an airport at Badgerys Creek that it would affect its operations.

D.2.3 Sound levels of familiar sources

For reference Table 167 and Figure 130 show sound levels which are typically associated with certain activities.

Figure 130: Sound levels of familiar sources



Source: a guide to understanding aviation noise and noise forecasts – Camden airport preliminary draft master plan. http://www.camdenairport.com.au/assets/documents/Noise_Brochure_CAL.pdf

Table 167: Sound Levels of example activities

Activity	Typical Noise Level dBA
Quiet Room	28 – 33
Background Music/Radio	50
Rainfall	50
Microwave Oven	55 – 60
Washing Machine	65 – 70
Inside Car, Windows Closed, 50km/h	68 – 73
Main Road	70
Vacuum Cleaner	85 – 90
Circular Saw	100 – 104

Source: a guide to understanding aviation noise and noise forecasts – Camden airport preliminary draft master plan. http://www.camdenairport.com.au/assets/documents/Noise_Brochure_CAL.pdf

D.2.4 Noise impact results

D.2.4.1 Badgerys Creek

Table 168 shows the number of N70 events that are likely to be realised in the local area at the time which would be affected by the development of an airport

Table 168: N70 noise events with projected population statistics

N70 events	>10	>20	>50	>100	>200
Current population[465]	69,660	32,310	2,664	1,536	440

Source: WorleyParsons analysis of AMPC data

D.2.4.2 Richmond

Table 169 shows the number of N70 events that are likely to be realised in the local area at the time which would be affected by the development of an airport.

Table 169: N70 events

N70 events	>10	>20	>30	>40	>50
Current population[466]	24131	12356	9194	6963	5086

Source: WorleyParsons analysis of AMPC data

D.4.2.3 Wilton

Table 170 shows the number of N70 events that are likely to be realised in the local area at the time which would be affected by the development of an airport

Table 170: N70 noise events

N70 events	>10	>20	>50	>100	>200
Current population[467]	817	483	264	181	4

Source: WorleyParsons

[465] WorleyParsons analysis of ABS data, Census 2006
[466] WorleyParsons analysis of ABS data, Census 2006
[467] WorleyParsons analysis of ABS data, Census 2006

D.2.5 Legislation and regulations

The *Land Acquisition Act 1989* provides specific powers to the Commonwealth Government to acquire interest in land. The Commonwealth can acquire land through on the three ways:

- ► Compulsory acquisition;
- ► Negotiated agreement; or
- ► Urgent acquisition.

The Department of Transport and Regional Services has prepared a Discussion Paper that provides a Comparison of Aircraft Noise Based Land Use Planning Controls for a number of countries. In relation to Australia, the table indicates the following:

- ► >40 ANEC - no housing;
- ► 30 -40 ANEC - no new housing;
- ► 25-30 ANEC- insulation of existing housing and no new housing;
- ► 20 – 25 ANEC– new housing with insulation;
- ► <20 ANEC – no restrictions.

In line with the Australian Standard AS2021-2000, properties located within ANEC contours 40, 35 and 30 should be acquired by the Commonwealth Government. Furthermore this legislation states that that no new housing is developed within the ANEF ranges 25-30, and that all houses developed within the ANEF ranges 20-25 must be constructed with insulation.

D.3 Heritage

The presence of nationally significant aboriginal and/or European heritage artefacts could result in the site being determined to not be appropriate for the development of an airport.

This study has built on the analysis Aboriginal and European heritage items that was undertaken within the Joint Study.

This Joint Study reported that only one aboriginal archaeological site was located during a field survey performed during the previous EIS study. Five silcrete flakes and flaked pieces were found in a devegetated area beside Badgerys Creek. However, it is probable that there are other artefact scatters obscured by vegetation along the banks of other creeks.

Table 171 identifies other heritage sites in the region.

Table 171: Heritage sites in the region

Suburb	Item Name	Address	Property Description	Significance
Badgerys Creek	St John's Anglican Church Group, including church and cemetery (former Badgerys Creek Anglican Church Group)	Pitt Street	Lot1, DP 838361	Local
Badgerys Creek	Badgerys Creek public School	Corner of Pitt Street and Badgerys Creek Road	Lot 1, DP 838361	Local
Luddenham	Vicary's Winery Group, including woolshed, slab horse shed, land area and main house and garden	The Northern Road	Lot 1, DP 838361 (former Lots 10 and11, DP 251656)	Local
Luddenham	Lawson's Inn site (former "The Thistle" site)	2155 The Northern Road	Lots 1 and 2, DP 851626	Local

Source: WorleyParsons analysis

D.4 Threatened Flora and Fauna

The EPBC search revealed the likely presence of endangered flora and fauna in each of the three study areas.

D.4.1 Badgerys Creek

The EPBC search found that there could be 5 bird, 2 fish, 2 frog, 7 mammal, 7 plant and 1 reptile threatened species that may exist within the footprint of the Badgerys Creek site.[468]

These species are shown in Table 172:

Table 172: Threatened species in the airport footprint

Name	Conservation Status EPBC Act	Conservation Status TSC Act
BIRDS		
Anthochaera phrygiaRegent Honeyeater [82338]	Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
FISH		
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
FROGS		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANTS		

[468] A full flora and fauna impact assessment and species impact statement (SIS) would be required as part of a potential Environmental Impact Statement conducted to address Commonwealth and NSW legislation would require the significance of potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance to be assessed.

Name	Conservation Status EPBC Act	Conservation Status TSC Act
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat likely to occur within area
Pimelea spicata [20834]	Vulnerable	Species or species habitat likely to occur within area
Pomaderris brunnea Rufous Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat may occur within area
Pultenaea parviflora [19380]	Vulnerable	Species or species habitat likely to occur within area
Streblus pendulinus Siah's Backbone, Sia's Backbone, Isaac Wood [21618]	Endangered	Species or species habitat may occur within area
REPTILES		
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Source: EPBC search

D.4.2 Richmond

The EPBC search found that there could be 5 bird, 2 fish, 3 frog, 7 mammal, 3 plant and 1 reptile threatened species that may exist within the footprint of the site.[469]

These species are shown in Table 173.

Table 173: flora and fauna impacts

Name	Conservation Status EPBC Act	Conservation Status TSC Act
BIRDS		
Anthochaera phrygiaRegent Honeyeater [82338]	Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat likely to occur within area

[469] A full flora and fauna impact assessment and species impact statement (SIS) would be required as part of a potential Environmental Impact Statement conducted to address Commonwealth and NSW legislation would require the significance of potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance to be assessed.

Name	Conservation Status EPBC Act	Conservation Status TSC Act
FISH		
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
FROGS		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat likely to occur within area
MAMMALS		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANTS		
Pimelea spicata [20834]	Endangered	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat may occur within area
REPTILES		
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Source: EPBC search

D.4.3 Wilton

The EPBC search found that there could be 24 bird, 2 fish, 6 frog, 16 mammal, and 2 reptile threatened species that may exist within the footprint of the site.[470]

These species are shown in Table 174:

[470] A full flora and fauna impact assessment and species impact statement (SIS) would be required as part of a potential Environmental Impact Statement conducted to address Commonwealth and NSW legislation would require the significance of potential impacts to endangered ecological communities and threatened species of national and NSW conservation significance to be assessed.

Table 174: Threatened bird, fish, frog, mammal and reptile species that may exist within site

Scientific Name	Common Name	Conservation Status EPBC Act
Birds		
Anthochaera phrygia	Regent Honeyeater	Endangered
Botaurus poiciloptilus	Australasian Bittern	Endangered
Burhinus grallarius	Bush Stone-curlew	-
Callocephalon fimbriatum	Gang-gang Cockatoo	-
Calyptorhynchus lathami	Glossy Black Cockatoo	-
Chthonicola sagittata	Speckled Warbler	-
Climacteris picumnus victoriae	Brown Treecreeper	-
Dasyornis brachypterus	Eastern Bristlebird	Endangered
Erythrotriorchis radiatus	Red Goshawk	Vulnerable
Ixobrychus flavicollis	Black Bittern	-
Lathamus discolor	Swift Parrot	Endangered
Lophoictinia isura	Square-tailed Kite	-
Melanodryas cucullata cucullata	Hooded Robin	-
Melithreptus gularis gularis	Black-chinned Honeyeater	-
Neophema pulchella	Turquoise Parrot	-
Ninox strenua	Powerful Owl	-
Pachycephala olivacea	Olive Whistler	-
Pezoporus wallicus wallicus	Ground Parrot	-
Ptilinopus superbus	Superb Fruit-Dove	-
Rostratula australis	Australian Painted Snipe	Vulnerable
Stagonopleura guttata	Diamond Firetail	-
Stictonetta naevosa	Freckled Duck	-
Tyto novaehollandiae	Masked Owl	-
Tyto tenebricosa	Sooty Owl	-
Mammals		
Cercartetus nanus	Eastern Pygmy-possum	-
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	Vulnerable
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered
Falsistrellus tasmaniensis	Eastern False Pipistrelle	-
Isoodon obesulus obesulus	Southern Brown Bandicoot (Eastern)	Endangered
Macropus parma	Parma Wallaby	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	-
Mormopterus norfolkensis	Eastern Freetail-bat	-
Petaurus australis	Yellow-bellied Glider	-
Petaurus norfolcensis	Squirrel Glider	-
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)	Koala	Vulnerable
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Vulnerable
Pseudomys novaehollandiae	New Holland Mouse	Vulnerable
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Scoteanax rueppellii	Greater Broad-nosed Bat	-
Reptiles		
Hoplocephalus bungaroides	Broad-headed Snake	Vulnerable
Varanus rosenbergi	Rosenberg's Goanna	-
Fish		
Maccullochella macquariensis	Trout Cod	Endangered
Macquaria australasica	Macquarie Perch	Endangered
Frog		
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable
Litoria aurea	Green and Golden Bell Frog	Vulnerable
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	Vulnerable
Litoria raniformis	Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog	Vulnerable
Mixophyes balbus	Stuttering Frog	Vulnerable
Pseudophryne australis	Red-crowned Toadlet	N/A

Source: EPBC search

Appendix E : Underlying regional information

E.1 Richmond

E.1.1 Major businesses within region

The major businesses that reside within the region include:

- Mongolia Mall
- Pitt town village shopping centre
- Richmond Marketplace
- Norwest Business Park
- Rousehill Village Centre
- Hills Homemaker Centre
- Castle Towers
- Castle Mall
- Kellyville Plaza
- Kellyville court
- Seven Hills Shopping Centre
- Stockland Baulkham Hills
- Alfred Davis Shopping Centre
- Baulkham Hills Shopping Centre
- Crestwood Shopping Centre
- The Hills Shoping Centre
- Mt Druitt Hospital
- Minchinbury Community Hospital
- Parklea markets
- Minchinbury home Town
- Quakers court shopping centre
- Quakers Hill Plaza
- Blacktown Drive in
- Blacktown Mall
- Central Plaza Shoping Centre
- ShopSmart, Mt Druitt
- Westfield Mount Druitt
- Westfield Blacktown
- Plumpton Market Place
- Kingslangley Shopping Centre
- Penrith City Library
- Sydney International Regatta Centre
- Castlereagh Equestrian Centre:
- Robrick Lodge Horse Farm
- Castlereagh Village Service Station & General Store
- Gipps Street Landfill
- Claremont Meadows Shopping Centre
- Colyton Hotel/Motel
- Colyton Shopping Centre
- Penrith Whitewater Venue
- Emu and Leonay Gazette
- Edinglassie Retirement Village
- Emu Plains industrial area
- BHP House Framing
- Boral Concrete & Quarries Ltd
- Boral Montoro Pty Ltd
- Rocla Pipeline Products
- Lennox Centro
- Sheppard Road street Shops
- Emu Plains Centre
- Emu Plains Correctional Centre
- Erskine Park Employment Area
- Erskine Park Shopping Centre
- St. Clair Shopping Centre
- Pacific Waste
- Kari & Ghossayn
- Nepean District Hospital
- Nepean Private Hospital
- Kingswood industrial area
- Richmond Grove Greyhound Complex
- Market gardens, rural hobby farms, poultry farms
- Mulgoa Shopping Centre
- Grape Growing
- Westfield Penrith
- St Marys Water Recycling Plant
- Cobham Juvenile Justice Centre
- Homemaker Centre Penrith
- Kingswood Park Shopping Centre
- Marketland Shopping Centre Kingswood
- Penrith Centre Shopping Mall
- St Marys Village Shopping Centre
- Werrington County Shopping Village
- Penrith Showground Markets
- Station Street Plaza
- Panther Leagues Club
- University of Western Sydney (Nepean) campuses at Kemps Creek, Kingswood, and Werrington
- Jamison Private Hospital, Penrith

E.1.2 Major planned projects within the region

Table 175 lists some of the Major Projects (2010-current) in the Hawkesbury, The Hills, Blacktown and Penrith LGAs defined as the 'region that supports Richmond.

Table 175: Some of the Major Projects in the region that supports Richmond (2010- current)

LGA	MAJOR PROJECT	STATUS
Hawkesbury	North West Growth Centre – Modification to Water Related Services for Stage One Precincts	Currently being assessed by the Department of Planning and Infrastructure
Hawkesbury	North West Growth Centre – Water Related Services for the North West Growth centre – second release precincts	Currently being assessed by the Department of Planning and Infrastructure
Hawkesbury	Windsor Bridge Replacement	DGRs issued
The Hills	North West Rail Link – Major Civil Construction Works	Currently being assessed by the Department of Planning and Infrastructure
The Hills	North West Rail Link – Staged State Significant Infrastructure Modification	Currently being assessed by the Department of Planning and Infrastructure
The Hills	North West Rail Link – Stations, Rail Infrastructure and Systems	DGRs being prepared
The Hills	Seniors Living Development	Approved by the Minister for Planning 16/02/2011
Blacktown	North West Rail Link – Major Civil Construction Works	Currently being assessed by the Department of Planning and Infrastructure
Blacktown	North West Growth Centre – Water Related Services for the North West Growth centre – second release precincts	Currently being assessed by the Department of Planning and Infrastructure
Blacktown	Blacktown Waste Resource Transfer Station	DGRs issued
Blacktown	Blacktown Hospital Redevelopment	DGRs issued
Blacktown	Rooty Hill Precinct, Western Sydney Parklands – Eastern Creek Business Hub	DGRs issued
Blacktown	Parklea Markets-Concept Plan for Special Uses Precinct	DGRs issued
Blacktown	Kings Park Waste Metal Recovery, Processing recycling Facility – increase in handling capacity	DGRs issued
Penrith	North Penrith Defence Site – Stage 2A infrastructure, landscaping and subdivision works	Currently on public exhibition
Penrith	North West Growth Centre – Modification to Water Related Services for Stage One Precincts	Currently being assessed by the Department of Planning and Infrastructure
Penrith	Penrith Lakes Scheme	Proponent Reviewing Submissions
Penrith	North West Growth Centre – Water Related Services for the North West Growth centre – second release precincts	Currently being assessed by the Department of Planning and Infrastructure
Penrith	Jacfin Horsley Park Project – Concept Plan	Proponent Reviewing Submissions
Penrith	Oil Waste Water Treatment Facility	Currently being assessed by the Department of Planning and Infrastructure
Penrith	North Penrith Defence Site – Stage 2B and 2C infrastructure, landscaping and subdivision works	DGRs issued
Penrith	North Penrith Defence Site – Stage 2D infrastructure, landscaping and subdivision works	DGRs issued
Penrith	North Penrith Defence Site – Stage 3A infrastructure, landscaping and subdivision works	DGRs issued
Penrith	North Penrith Defence Site – Stage 3B infrastructure, landscaping and subdivision works	DGRs issued
Penrith	Expansion of Kemps Creek SAWT Facility	DGRs issued
Penrith	Penrith Lakes Scheme	DGRs issued
Penrith	Mamre Road Building Waste Recovery and Reuse Facility	DGRs issued
Penrith	164 Station Street – Mixed Use Development	DGRs issued
Penrith	Orchard Hills Waste Project	Approved by the Land and Environment Court 13 July 2012
Penrith	Kemps Creek Logistics Project	Refused 05/06/2012
Penrith	Erskine Park Chemical Warehouse and Distribution Facility	Approved by the Minister for Planning 21/05/2012
Penrith	Elf Mushroom Farm and substrate Plant – Concept Plan and Project Application	Approved by the Minister for Planning 11/01/2012
Penrith	Nepean Hospital – Integrated Mental Health Unit	Approved by the Minister for Planning 23/01/2011

Source: Department of Planning and infrastructure

E.1.3 Supply and Demand for employment lands

E.1.3.1Supply

As at January 2011, there were 15,584 hectares of existing zoned employment lands in the Sydney Region, including both developed and undeveloped lands. Of this total amount approximately 29% (4,697 hectares) was located in North West Sydney, making it the largest contributor of Employment Lands in the Sydney Region. Additionally this subregion provides 2,140 hectares of undeveloped land (47% of Sydney Region's undeveloped land) making it the contributor of the largest amount of undeveloped land to support new industrial development.[471]
However less than a quarter of this land (500 hectares) is serviced to support industrial uses (serviced by water and sewer connections).

There are 712 hectares of identified potential future employment lands in this subregion, the second highest in the Sydney Region.[472]

The Hawkesbury Council area, where Richmond is located holds 200 hectares of employment lands (4.2% of North West subregion) of which 39 hectares (almost 20% of zoned lands) are undeveloped employment lands (2% of North West subregion).[473]

Table 176 provides an overview of the lands available.

Table 176: Developed and undeveloped land in North West Sydney in 2011

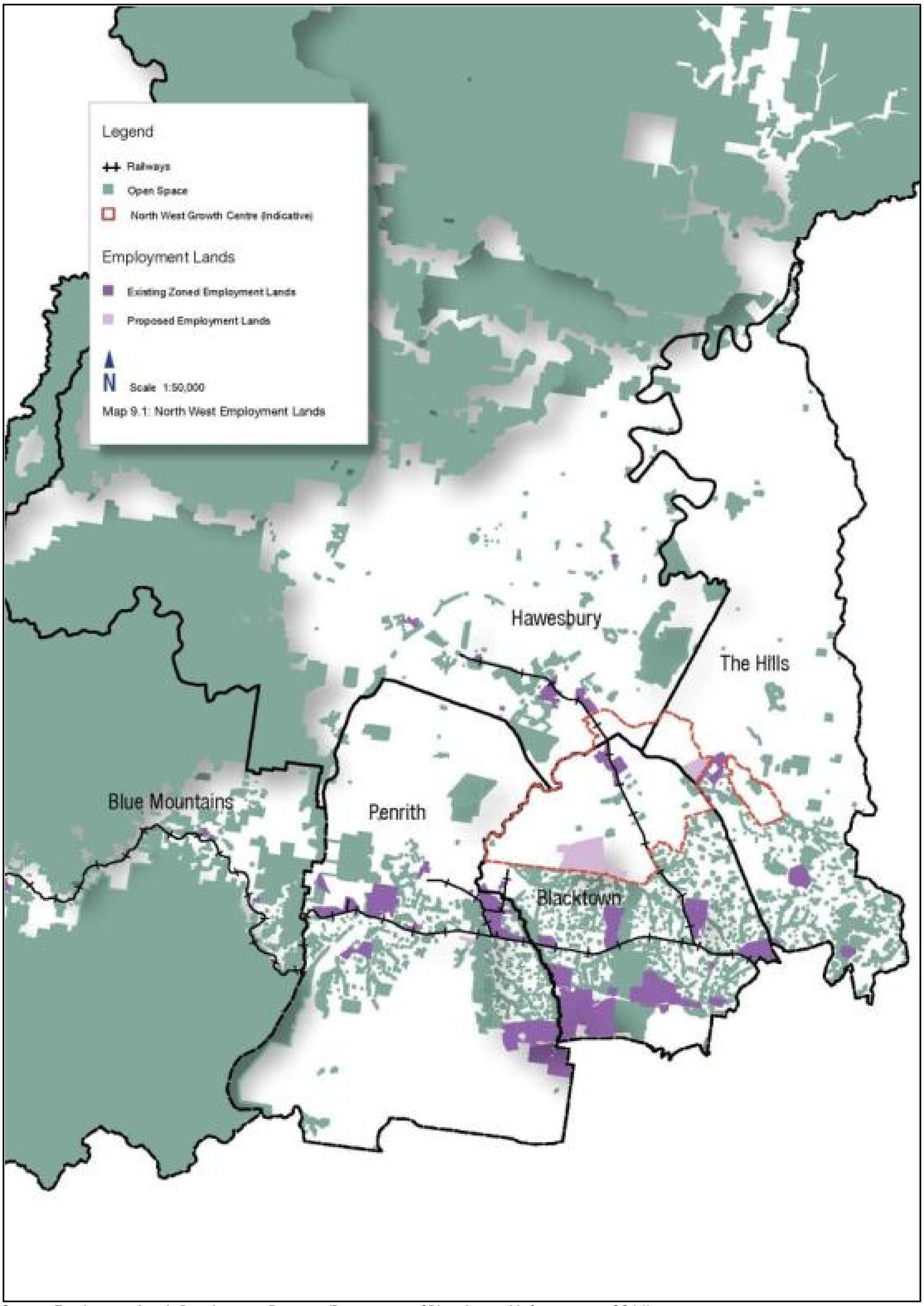
	Undeveloped	Developed	Total
Richmond	0.7	4.0	4.7
Hawkesbury	38.5	161.5	199.9
North West Sydney	2,140.1	2,557.8	4,697.9
Sydney Region	**4,542.5**	**11,041.0**	**15,583.5**

Source: Employment Lands Taskforce Report (2011)

Figure 131 shows us the employment lands that exist or have been proposed for the regions of the three sites that have been analysed.

[471] Department of Planning and Infrastructure, *ELDP 2010: Report 9 – North West Subregion*, Employment Lands Development Program, May 2011
[472] Department of Planning and Infrastructure, Employment Lands Task Force Report, February 2012
[473] Department of Planning and Infrastructure, *ELDP 2010: Report 9 – North West Subregion*, Employment Lands Development Program, May 2011

Figure 131: North West Employment Lands – existing and proposed



Source: Employment Lands Development Program (Department of Planning and Infrastructure, 2011)

E.1.3.2 Demand

There has been a continual drop in the value of Development Approvals for industrial buildings, especially for factories in the Sydney Region with $400 million of industrial building activity being approved in 2009/10 (153 hectares of land taken up). North West Sydney has experienced the greatest amount of recent industrial building activity with $100 million in approvals in 2009/10 (25% of the region), and 34 hectares taken up (22%).

In 2006, there were 78.900 jobs in employment lands (30% of subregions total workforce) having grown by 8,500 in the previous 5 years.
Manufacturing is the main industry sector located in within the North West subregion's Employment Lands, accounting for 29% of all jobs in Employment Lands in the subregion

In the Hawkesbury Council Area there have been almost $100 million in Industrial Building Approvals from 2001/02 to 2008/09. In 2006 there were 6,550 jobs in Employment Lands within the LGA (accounting for 26% of the LGA's workforce), with 1,100 jobs being created in the previous 5 years (22% growth).

E.2 Badgerys Creek

E.2.1 Major businesses in the region

The major businesses that reside within the region include:

- Liverpool Hospital
- Westfield Liverpool
- Liverpool Plaza
- Megacenta Liverpool
- Car sales
- Sydney South West Private Hospital, Liverpool
- Casula Shopping Centre
- Bringelly, Village Shopping Centre
- Crossroads homemaker Centre
- Carnes Hill Marketplace
- University of Sydney Farm and Research Units at Cobbitty and Greendale (half in half out)
- Preston
- Bernard Austin Lodge (age Care)
- Blue Hills Manor (age care)
- Scalabrini Village Hostel (aged care)
- Penrith City Library
- Sydney International Regatta Centre
- Castlereagh Equestrian Centre:
- Robrick Lodge Horse Farm
- Castlereagh Village Service Station & General Store
- Gipps Street Landfill
- Claremont Meadows Shopping Centre
- Colyton Hotel/Motel
- Colyton Shopping Centre
- Penrith Whitewater Venue
- Emu and Leonay Gazette
- Edinglassie Retirement Village
- Emu Plains industrial area
- BHP House Framing
- Boral Concrete & Quarries Ltd
- Boral Montoro Pty Ltd
- Rocla Pipeline Products
- Lennox Centro
- Sheppard Road street Shops
- Emu Plains Centre
- Emu Plains Correctional Centre
- Erskine Park Employment Area
- Erskine Park Shopping Centre
- St. Clair Shopping Centre
- Pacific Waste
- Kari & Ghossayn
- Nepean District Hospital
- Nepean Private Hospital
- Kingswood industrial area
- Richmond Grove Greyhound Complex
- Market gardens, rural hobby farms, poultry farms
- Mulgoa Shopping Centre
- Grape Growing
- Westfield Penrith
- St Marys Water Recycling Plant
- Cobham Juvenile Justice Centre
- Homemaker Centre Penrith
- Kingswood Park Shopping Centre
- Marketland Shopping Centre Kingswood
- Penrith Centre Shopping Mall
- St Marys Village Shopping Centre
- Werrington County Shopping Village
- Penrith Showground Markets
- Station Street Plaza
- Panther Leagues Club
- University of Western Sydney (Nepean) campuses at Kemps Creek, Kingswood, and Werrington
- Jamison Private Hospital, Penrith
- Bonnyrigg Plaza
- Edensor Park Plaza
- Fairfield Chase
- Fairfield Forum
- Greenfield Shopping Village
- Stockland Wetherill Park
- Wakeley Shopping Centre
- Wetherill Market Town
- Abbotsbury Shopping Centre
- Cecil Hills Shopping Centre
- Fairfield West Shopping Centre
- Greenway Plaza
- Lucky Plaza, Cabramatta West
- Cabramatta Commercial Centre
- Bankstown Centro
- Canterbury Leagues Club
- Bankstown Private Hospital
- Bankstown Airport
- South terrace place

E.2.2 Major projects within the region

Table 177 lists some of the Major Projects (2010-current) in the Liverpool, Fairfield, Penrith and Bankstown LGAs defined as the 'region that supports Badgerys Creek'.

Table 177: Some of the Major Projects in the region that supports Badgerys Creek (2010- current)

LGA	MAJOR PROJECT	STATUS
Liverpool	SIMTA Moorebank Intermodal Terminal Facility	Proponent Reviewing submissions
Liverpool	Moorebank Intermodal Facility	DGRs issued
Liverpool	Moorebank Waste Facility	DGRs issued
Liverpool	M5 South West Motorway – M5 West Widening Project	Approved by the Minister for Planning 9/11/2011
Liverpool	Badgerys Creek Quarry Project	Approved by the Minister for Planning 27/09/2011
Liverpool	Edmonson Park Concept Plan	Approved by the Minister for Planning 18/08/2011
Liverpool	Liverpool Hospital - Cancer, Pathology and Clinical Training	Approved by the Minister for Planning 4/07/2011
Liverpool	South West Rail Link Stage B2	Approved by the Minister for Planning 18/11/2010
Liverpool	Hoxton Park Industrial Project – Concept Plan	Approved by the Minister for Planning 3/06/2010
Fairfield	Western Sydney Parklands – Precinct 9 Horsley Park	Currently on public exhibition
Fairfield	North West Growth Centre – Modification to Water Related Services for Stage One Precincts	Currently being assessed by the Department of Planning and Infrastructure
Fairfield	North West Growth Centre – Water Related Services for the North West Growth centre – second release precincts	Currently being assessed by the Department of Planning and Infrastructure
Fairfield	Proposed Gazcorp Industrial Estate	DGRs issued
Fairfield	ABC Paper and Paper Mill Expansion Project	DGRs issued
Fairfield	Market Gardens – Horsley Park	Approved by the Minister for Planning 21/12/2010
Fairfield	Junior Motorcycle Training, Education and Riding Complex	Approved by the Minister for Planning 24/09/2010
Penrith	North Penrith Defence Site – Stage 2A infrastructure, landscaping and subdivision works	Currently on public exhibition
Penrith	North West Growth Centre – Modification to Water Related Services for Stage One Precincts	Currently being assessed by the Department of Planning and Infrastructure
Penrith	Penrith Lakes Scheme	Proponent Reviewing Submissions
Penrith	North West Growth Centre – Water Related Services for the North West Growth centre – second release precincts	Currently being assessed by the Department of Planning and Infrastructure
Penrith	Jacfin Horsley Park Project – Concept Plan	Proponent Reviewing Submissions
Penrith	Oil Waste Water Treatment Facility	Currently being assessed by the Department of Planning and Infrastructure
Penrith	North Penrith Defence Site – Stage 2B and 2C infrastructure, landscaping and subdivision works	DGRs issued
Penrith	North Penrith Defence Site – Stage 2D infrastructure, landscaping and subdivision works	DGRs issued
Penrith	North Penrith Defence Site – Stage 3A infrastructure, landscaping and subdivision works	DGRs issued
Penrith	North Penrith Defence Site – Stage 3B infrastructure, landscaping and subdivision works	DGRs issued
Penrith	Expansion of Kemps Creek SAWT Facility	DGRs issued
Penrith	Penrith Lakes Scheme	DGRs issued
Penrith	Mamre Road Building Waste Recovery and Reuse Facility	DGRs issued
Penrith	164 Station Street – Mixed Use Development	DGRs issued
Penrith	Orchard Hills Waste Project	Approved by the Land and Environment Court 13 July 2012
Penrith	Kemps Creek Logistics Project	Refused 05/06/2012
Penrith	Erskine Park Chemical Warehouse and Distribution Facility	Approved by the Minister for Planning 21/05/2012
Penrith	Elf Mushroom Farm and substrate Plant – Concept Plan and Project Application	Approved by the Minister for Planning 11/01/2012
Penrith	Nepean Hospital – Integrated Mental Health Unit	Approved by the Minister for Planning 23/01/2011
Bankstown	Orica Villawood Remediation Project	Approved by the Minister for Planning 18/05/2011

Source: WorleyParsons

E.2.3 Supply and demand of employment lands

E.2.3.1 Supply

As at January 2011, there were 15,584 hectares of existing zoned employment lands in the Sydney Region, including both developed and undeveloped lands. Of this total amount approximately 14% was located in South West Sydney, making it the third largest contributor of Employment Lands in the Sydney Region. Additionally this subregion provides 521 hectares of undeveloped zoned (11% of Sydney Region's total undeveloped land) representing 24% of total Employment Lands in the subregion.

Additionally South West Sydney has the greatest amount of potential future Employment Lands identified across the Sydney Region. Around 2,600 hectares of potential unzoned Employment Lands have been identified in this subregion. This accounts for 74% of all potential future Employment Lands supply for the Sydney Region.

The Liverpool Council Area, where Badgerys Creek is located supplies 44% of total Employment Lands (961.1 hectares) in the South West Subregion and offers the greatest amount of undeveloped stocks, providing 143.6 hectares (28% of South West Subregions undeveloped Employment Lands). Additionally 1,800 hectares of potential future Employment Lands have been identified within Liverpool.
Table 178 provides an overview of the lands available.

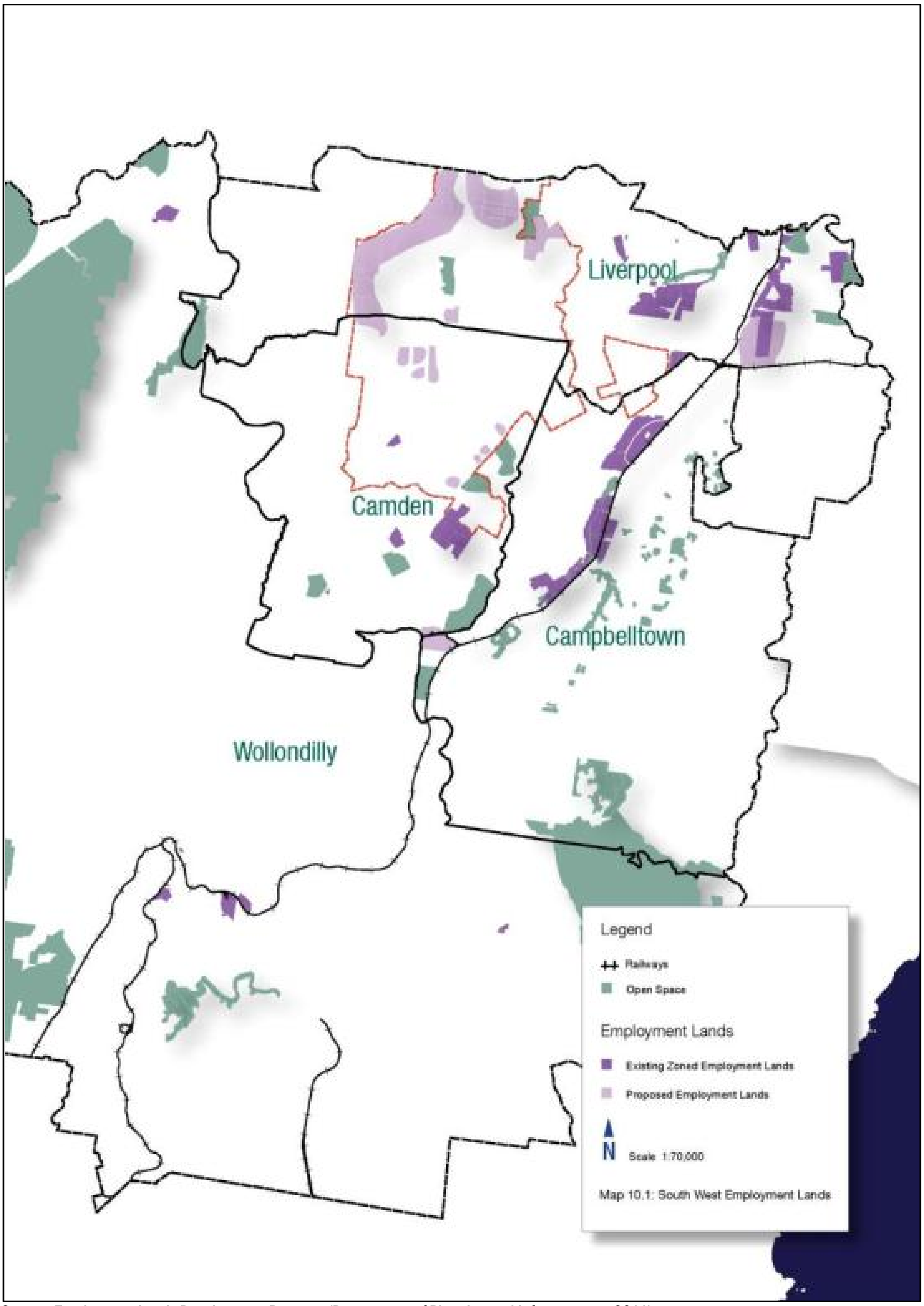
Table 178: Developed and undeveloped land in South West Sydney in 2011

	Undeveloped	Developed	Total
Badgerys Creek			
Liverpool	143.6	817.6	961.1
South West Sydney	521.3	1,681.8	2,203.1
Sydney Region	**4,542.5**	**11,041.0**	**15,583.5**

Source: Employment Lands Taskforce Report (2011)

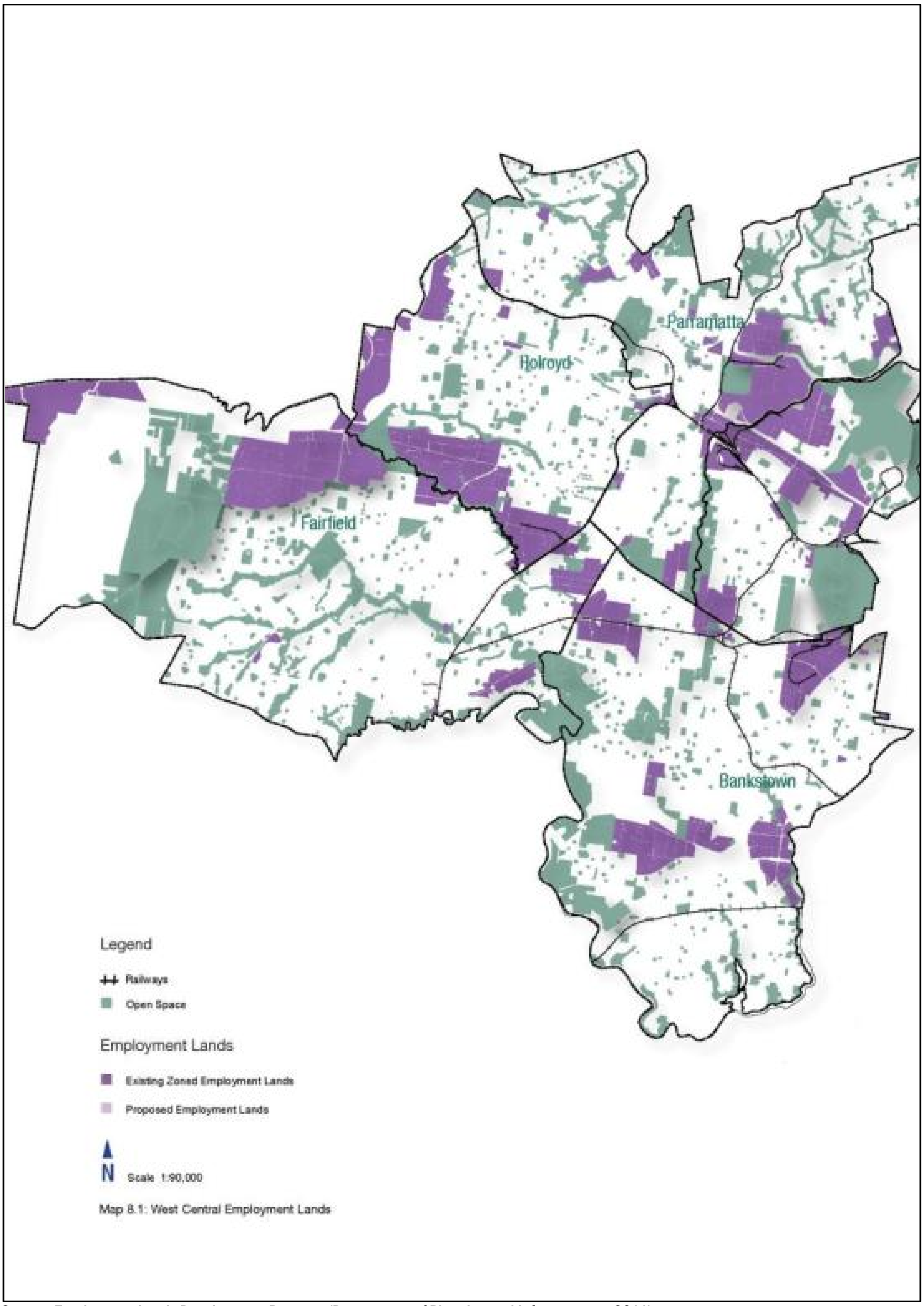
Figure 132 and Figure 133 show the existing and proposed employment growth centres for the region.

Figure 132: South West Employment Lands – existing and proposed



Source: Employment Lands Development Program (Department of Planning and Infrastructure, 2011)

Figure 133: West Central Employment Lands – existing and proposed



Source: Employment Lands Development Program (Department of Planning and Infrastructure, 2011)

E.2.3.2 Demand

There has been a continual drop in the value of Development Approvals for industrial buildings, especially for factories. In 2009/10 $400 million of industrial building activity was approved in the Sydney Region and 153 hectares of land was taken up by industrial development. Of this amount South West Sydney had $150 million worth of approvals (37.5% of total for Subregion) and 61 hectares of land were taken up (40% of total for Subregion).

In South West Sydney there were 40,000 jobs in Employment Lands (30% of all jobs within the subregion) in 2006 with 4,400 new jobs being created in Employment Lands within the previous 5 years.
Manufacturing is the main industry sector located in within the South West subregion's Employment Lands, accounting for 37% of all jobs in Employment Lands in the subregion.

Liverpool LGA has the highest value of total industrial building approvals between 2001/02 and 2008/09 within the South West subregion with $489 million.

In 2006 the Employment Lands in Liverpool provided for a 14,950 jobs, representing 25% of the LGA's total workforce. This figure had grown by 330 in the previous 5 years.

Manufacturing is the main industry sector located in within Liverpool's Employment Lands, accounting for 45% of all jobs in Employment Lands in the LGA

E.3 Wilton

E.3.1 Major businesses that reside within the region include:

- Dept of Primary Industries PROfarm
- NSW Department of Primary Industries
- Wollondilly Abattoir
- Blue circle cement
- Lowan wholefoods
- Interflor carpets
- Allied mills
- Nepean conveyors
- Picton power lines
- Campbelltown Mall
- Harvey Norman Centre Campbelltown
- Campbelltown Market Place
- Macathur Square
- Marketfair
- Narellan Town Centre
- Skygardens Plaza
- Manufacturing - in Port Kembla, Berkeley and Mangerton/Coniston
- Mining - Kembla Grange, Helensburgh
- Transport and Storage - Port Kembla, Wollongong City, Warrawong
- Construction - Berkeley, Wollongong City, Warrawong
- Retail Trade - Wollongong City, Warrawong, Dapto
- Accommodation, Cafes and Restaurants etc - Wollongong City
- Finance and Insurance - Wollongong City
- Property and Business Services - Wollongong City, Warrawong
- Government Administration and Defence - Wollongong City
- Education - North Wollongong, Wollongong City, Dapto
- Health and Community Services - Wollongong City, Warrawong, Figtree, Dapto
- Cultural and Recreational Services - Wollongong City, West Wollongong, Berkeley
- Australian Steel mill Services
- Incitec Pivot
- Port Kembla Steelworks
- Westfield Warrawong
- Warrawong Sewage Treatment Works
- Narellan Town Centre
- Leppinton Shopping Centre
- Camden Hospital
- Busways Depot
- Belgenny Farm
- Camden Valley Golf Resort
- Camden lakeside Country Club
- Coles Myer logistics
- Industrial Estate Smeaton Grange
- Sydney Water West Camden STP
- Carrington Centennila Hospital
- Carrington Centennial Care
- Harrington Grove Country Club
- Harrington Park medical practice
- Mt Annan Market Place
- Flower Power Garden Centres
- Jack Gully Water Management Facility
- Bunnings Warehouse
- Camden Golf Club
- Neapean Substation
- Camden Airport

E.3.2 Supply and demand of employment lands

E.3.2.1 Supply

As at January 2011, there were 15,584 hectares of existing zoned employment lands in the Sydney Region, including both developed and undeveloped lands. Of this total amount approximately 14% was located in South West Sydney, making it the third largest contributor of Employment Lands in the Sydney Region. Additionally this subregion provides 521 hectares of undeveloped zoned (11% of Sydney Region's total undeveloped land) representing 24% of total Employment Lands in the subregion.
Additionally South West Sydney has the greatest amount of potential future Employment Lands identified across the Sydney Region. Around 2,600 hectares of potential unzoned Employment Lands have been identified in this subregion. This accounts for 74% of all potential future Employment Lands supply for the Sydney Region.

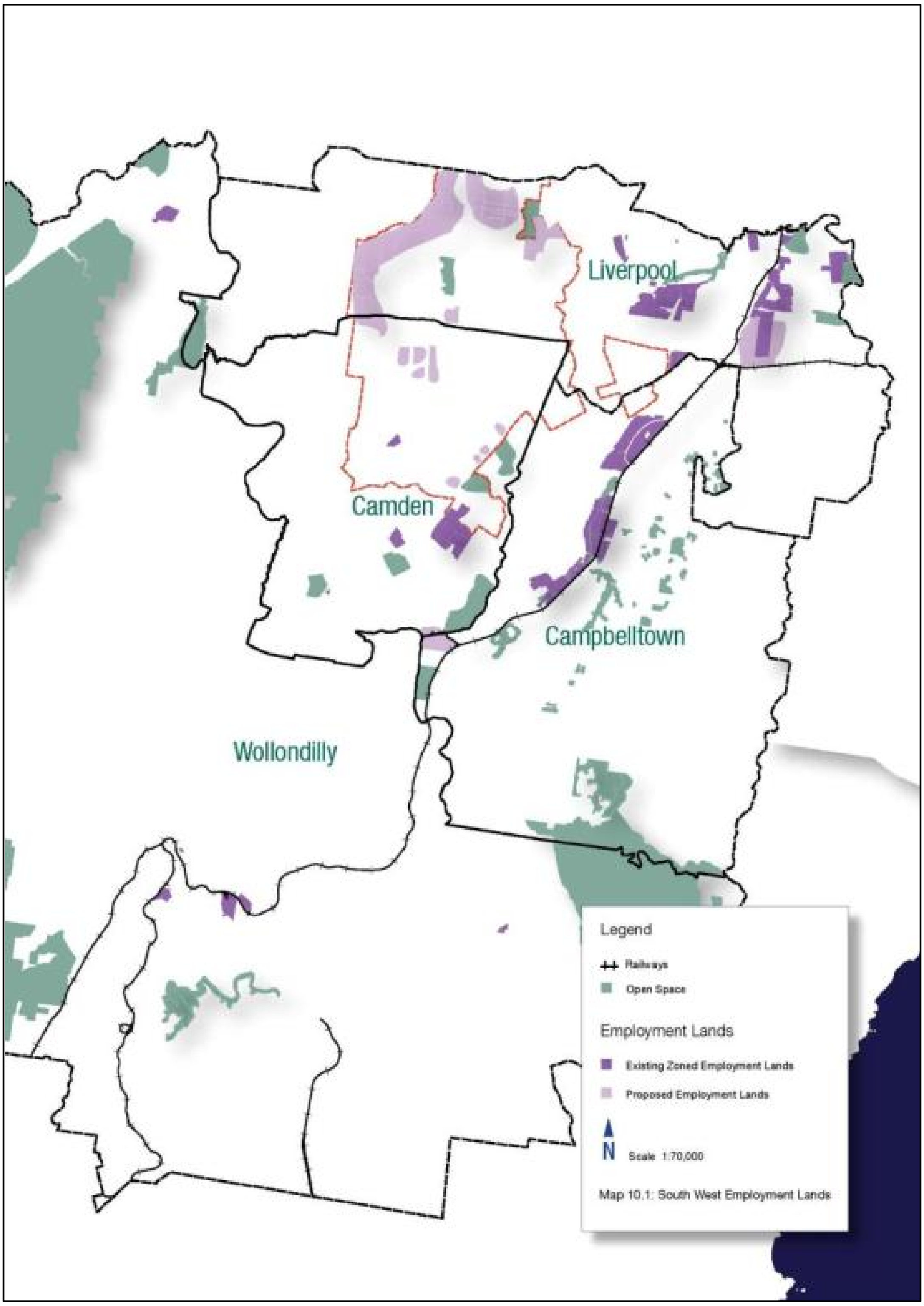
Wollondilly supplies 9% of total Employment Lands (205.0 hectares) in the South West Subregion and offers 93.3 hectares of undeveloped Employment Lands (18% of South West Sydney's total undeveloped Employment Lands). Table 179 and Figure 134 provide an overview of the lands available.

Table 179: Developed and undeveloped land in South West Sydney in 2011

	Undeveloped	Developed	Total
Wilton			
Wollondilly	93.3	111.7	205.0
South West Sydney	521.3	1,681.8	2,203.1
Sydney Region	**4,542.5**	**11,041.0**	**15,583.5**

Source: Employment Lands Taskforce Report (2011)

Figure 134: South West Growth Centres and employment lands



Source: Employment Lands Development Program (Department of Planning and Infrastructure, 2011)

E.3.2.1 Demand

There has been a continual drop in the value of Development Approvals for industrial buildings, especially for factories. In 2009/10 $400 million of industrial building activity was approved in the Sydney Region and 153 hectares of land was taken up by industrial development. Of this amount South West Sydney had $150 million worth of approvals (37.5% of total for Subregion) and 61 hectares of land were taken up (40% of total for Subregion).

In South West Sydney there were 40,000 jobs in Employment Lands (30% of all jobs within the subregion) in 2006 with 4,400 new jobs being created in Employment Lands within the previous 5 years.
Manufacturing is the main industry sector located in within the South West subregion's Employment Lands, accounting for 37% of all jobs in Employment Lands in the subregion.

Between 2001/02 and 2008/09, there were approximately $50 million in industrial building approvals in Wollondilly. In 2006 Employment Lands in Wollondilly provided 3,280 jobs (33% of the LGA's workforce) however this represented a fall of 100 jobs within the previous 5 years.
Wollondilly has a high proportion of its Employment Lands jobs located in mining industries (19%)

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