

# WESTERN SYDNEY AEROTROPOLIS

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Market Analysis and  
Economic Feasibility

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## EXECUTIVE SUMMARY

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### BACKGROUND

The Western Sydney Aerotropolis (the Aerotropolis) is a 11,200ha precinct surrounding the future Western Sydney International (Nancy-Bird Walton) Airport (WSA). To leverage the catalytic impact of WSA, the Aerotropolis is being planned as a highly connected, innovative new city and major employment centre to accommodate up to 139,000 jobs.

The planning package for the Aerotropolis has been finalised and includes - the WSAP and finalisation report, Aerotropolis SEPP and Stage 1 of the Western Sydney Aerotropolis Development Control Plan 2020. The WSAP defines the Aerotropolis as 10 precincts with six initial precincts, and five the focus of precinct planning:

- **Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek**

The Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek precincts forms the eastern boundary of the Western Sydney Airport, extending from Bringelly Road and The Northern Road in the south/south-west, South Creek to the east and Elizabeth Drive/South Creek in the north.

- **Northern Gateway**

The Northern Gateway encompasses the northernmost section of the Aerotropolis immediately north of the WSA and Elizabeth Drive and is broadly bounded by the North Luddenham precinct to the west, the Warragamba pipeline in the north and the Twin Creeks Golf Course in the east. The Sydney Science Park is located in the Northern Gateway precinct.

- **Agribusiness Precinct**

The Agribusiness Precinct forms the western edge of the Aerotropolis. The precinct is bounded by the Outer Sydney Orbital corridor to the west, the Dwyer Road precinct in the south, the Western Sydney Airport immediately east and the Northern Gateway and North Luddenham precincts to the north. The Northern Road bisects the precinct with the existing Luddenham Village located within its north-western corner.

- **Mamre Road precinct** while falling within the Aerotropolis is subject to a different planning instrument - State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP).

The WSAP outlines visions for five of the initial precincts, including the envisaged quantum and type of employment and housing (if any) being planned. The land use zones for each precinct have been designated with these visions in mind.

The initial precincts comprise a mix of land use zones. The objectives of these zones are diverse and their application to individual precincts is complemented by individual precinct visions.

- **Enterprise zone** permits land uses complementary to the city and the WSA as a 24-hour transport hub. It will support a range of commercial and industrial uses as well as a mix of retail and educational uses. Residential uses are not permitted.
- **Mixed Use zone** enables delivery of employment and higher density residential uses. The zone will apply to local centres and include a mix of commercial uses including retail, office medical and social services and places of entertainment. The zone will be applied to ensure residential land uses are located outside the ANEC contours.
- **Agribusiness zone** applies in the Agribusiness precinct on the western edge of the WSA to support long-term retention of existing agricultural lands and the growth of new agriculture and agribusiness opportunities.
- **Environment and Recreation zone** will be applied to Wianamatta-South Creek precinct to protect key landscape features and high value areas to achieve amenity, recreation and liveability outcomes.

The Aerotropolis SEPP nominates prohibited uses; permissible uses are those that 'achieve the objectives of the zone' with individual precinct plans to identify the location of specific land uses. This approach to permitted uses is intended to mitigate the 'crowding out' of desirable land uses by more financially valuable uses.

Atlas Urban Economics (Atlas) is engaged to provide economic and market feasibility advice to inform precinct planning for the initial precincts of the Aerotropolis (the Study Area).

The Study examines the feasibility of different land uses across the Aerotropolis to understand the pre-requisites and economic conditions for viable development. The Study also estimates development take-up based on analysis of investment requirements and commercial viability considerations.

### VIABILITY OF LAND USES

The economic and market drivers that influence the future land use context in the Aerotropolis are diverse. Some land uses will immediately respond to rezoning of land, other uses have pre-requisite conditions before they can be viably delivered.

The work programme of the Investment Attraction Office (IAO, in association with WPCA) in engaging and securing occupier interest will be **critical** in securing investment by businesses who would not otherwise consider locating in the Aerotropolis. Early business investment should be strategically placed to enable clustering of occupiers and business/retail services alike.

Planning for land use opportunities within the Western Sydney Airport (on land owned by the Commonwealth) is unknown, however it is conceivable they will compete to some extent with lands in the Aerotropolis for investment.

#### Early Movers

Early movers are expected to include large format industrial and medium density residential uses.

Whilst early movers will play an important role in facilitating initial investment, it will be important that precinct planning allows large industrial uses to transition over time to accommodate more intensive activity and/ or densification of built form. There will be demand for locally based services (e.g. cafés, dry cleaning, etc.) and village nodes may emerge over time. Ensuring the road network can transition to be sufficiently fine grain and permeable will be important in the long term.

#### Followers

In contrast to early movers, land uses such as retail and hospitality, local and service commercial/ industrial, require trade catchments from which they can draw custom and operate viably.

- **Retail** development will occur 'as of course' as local worker/ resident catchments in the Aerotropolis establish and grow.
- **Hospitality** uses such as cafés, restaurants, pubs and hotels will be driven by a diverse trade catchment, requiring different sources of clientele (workers, residents, visitors and tourists) to be viable.
- **Service commercial** (e.g. tax agents and local accountants, health and wellness clinics) and service industrial (e.g. garage and home alarm supplies, smash repairers, coffee roasters) require sufficient customer mass within commuting access.

As far as possible, retail, hospitality and service commercial uses should be allowed to cluster for viability.

#### Incubators

Knowledge-based commercial and office uses generally have higher amenity expectations of retail and hospitality services. Consequently, not many businesses (unless of significant scale) are likely to want to be 'the first mover' in a commercial precinct. The IAO will play a critical role in mobilising investment from these uses.

It will be important for secured commercial investment to be co-located and clustered with future Metro stations to enable 'early seeding' of critical retail, hospitality and leisure facilities. Development and take-up of land use opportunities are self-perpetuating. The location of more businesses in a precinct will enable the provision of more local retail and business services, and therefore enabling development momentum to grow.

Realising the vision of the Agribusiness precinct in particular will require a curatorial and supportive approach. Precinct planning for various agribusiness uses should be cognisant of the different threshold capacities to pay for land. Analysis of a sample of agribusiness enterprise types affirms the critical nature of land cost to business viability.

#### The Role of Residential Communities

The role of local residents (not just within the Aerotropolis but in the region) to the employment function of the Aerotropolis should not be overlooked. Local residents from nearby catchment areas support viable retail and local services. Local residents also contribute to the labour pool from which businesses can hire and recruit.

Resident population catchments (inside and outside the Aerotropolis) will be essential to ensuring the viability of retail and hospitality uses in the early years of the Aerotropolis. As the precincts develop and grow (from both a worker, resident and visitor perspective), demand for these uses will grow commensurate.

## DEVELOPMENT FEASIBILITY

In simple terms, a site will be feasible for development if the following pre-requisites are met:

- There is underlying market demand for the subject land use and development typology.
- There is market willingness to pay an economic price for the completed floorspace. **This is effective market demand.**
- The site can be economically acquired/ consolidated to enable a commercial return on investment.

The depth of market demand is the key issue for development feasibility in the Study Area. The Study presumes the critical role of the Investment Attraction Office (part of WPCA, IAO) in attracting investment. The analysis assumes that investment momentum will ultimately be self-perpetuating, with early movers and early government investment setting the scene for future investment.

Table ES-1 suggests a feasibility horizon based on the findings of generic feasibility testing.

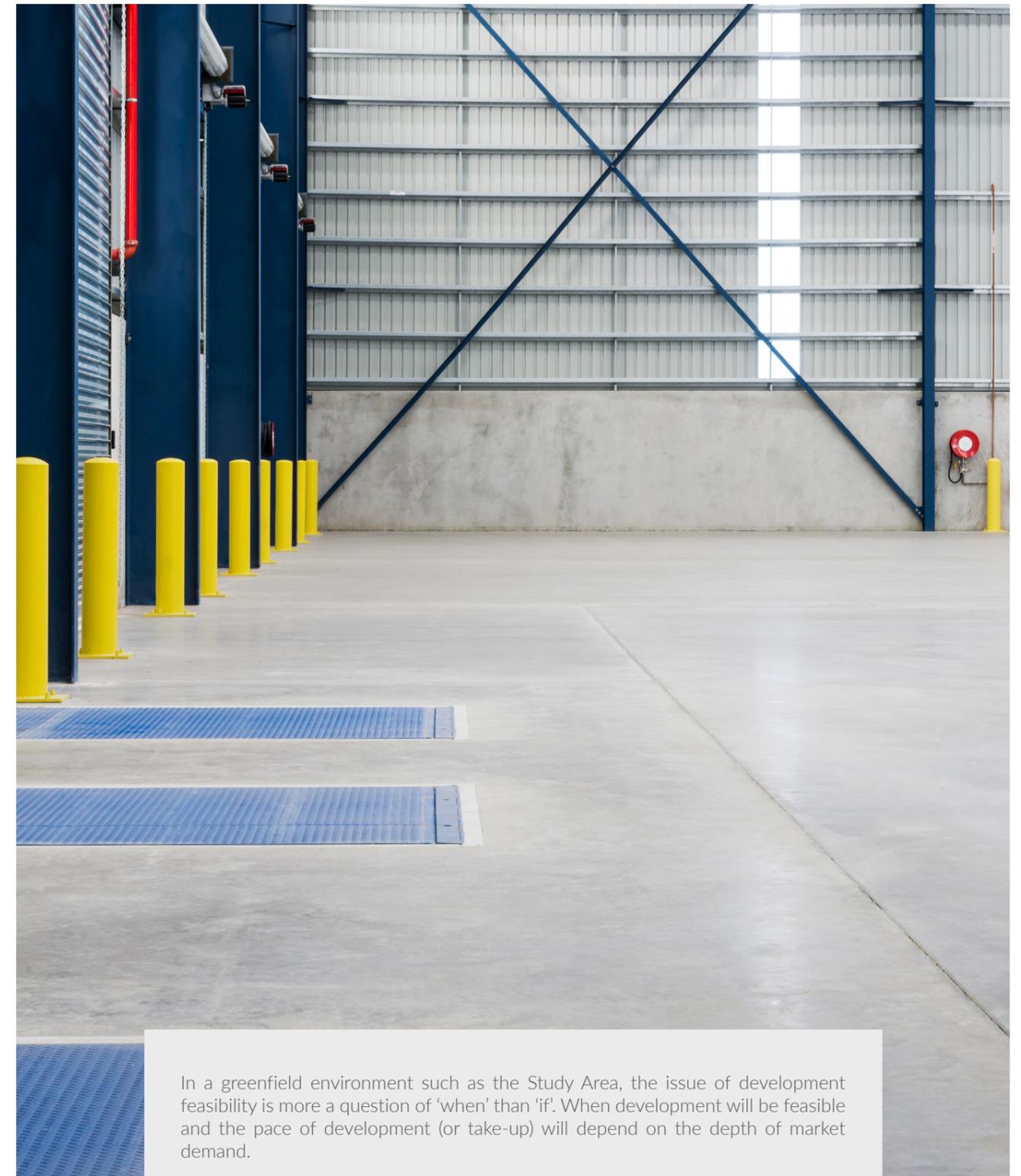
**Table ES-1: Feasibility Analysis of Potential Development Typologies**

Land Use	Potential Development Typology	FSR	Feasible on Opening?*	Commencing Delivery Horizon^
<b>Commercial</b>				
Low rise	Commercial/ warehouses	1.0:1 to 1.3:1	Y*	0-5 years
Low to mid rise	Commercial buildings	1.3:1 to 1.5:1	Y*	0-5 years
	Commercial buildings	2.0:1 to 2.5:1	Y*	5-10 years
Mid to high rise	Office buildings	2.5:1 to 3.6:1	N	15 years+
<b>Industrial</b>				
Transport and Logistics	High clearance warehouses and distribution centres	0.6:1 to 0.8:1	Y	0-5 years
General industrial	High clearance warehouses Manufacturing facilities	0.6:1 to 0.8:1	Y	0-5 years
Light Industrial/Service Industrial	Freestanding workshops	0.6:1 to 0.8:1	N	5-10 years
	Strata-titled industrial suites	1.0:1	N	5-10 years
<b>Residential</b>				
Medium density	'Walk up' multi-dwellings	1.0:1 to 1.3:1	Y	0-5 years
High-density	Residential flat buildings	2.0:1 to 3.0:1	N	5-15 years
	Mixed use development	2.0:1 to 3.0:1	N	5-15 years
<b>Retail and Hospitality</b>				
Supermarket and Speciality Retail	Strip retail	1.0:1	N	5-15 years
	Shopping centres	1.5:1 to 2.5:1	N	5-15 years
Hotels, Pubs, Serviced Apartments	Mixed use commercial buildings	2.5:1 to 3.6:1	N	5-15 years
<b>Institutional and Special Use</b>				
Education and Health Facilities	Standalone buildings	1.5:1 to 2.5:1	Y*	5-15 years
	Mixed use commercial buildings	1.5:1 to 2.5:1	Y*	5-15 years
Arts and Cultural Centres	Standalone buildings	1.5:1 to 2.5:1	Y*	5-15 years
	Mixed use commercial buildings	1.5:1 to 2.5:1	Y*	5-15 years

Y= Yes, N = No, Y\* = Yes subject to investment partner commitments

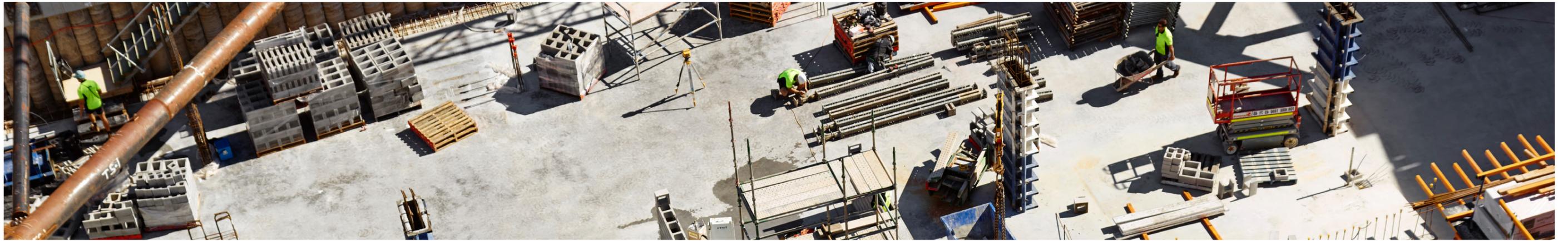
\*Opening assumed at 2026 (coinciding with opening of Western Sydney Airport) ^Commencing delivery horizon timeframes quoted from opening year 2026

Source: Atlas



In a greenfield environment such as the Study Area, the issue of development feasibility is more a question of 'when' than 'if'. When development will be feasible and the pace of development (or take-up) will depend on the depth of market demand.

While the IAO will play a critical role in attracting investment and occupier interest to the Aerotropolis, the Study recognises that investment capital is mobile. Capital will gravitate to the investment that provides the most return for the assumed risk. Capital will be invested by having regard to investment opportunities elsewhere and their corresponding risk/ return.



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## GLOSSARY OF TERMS

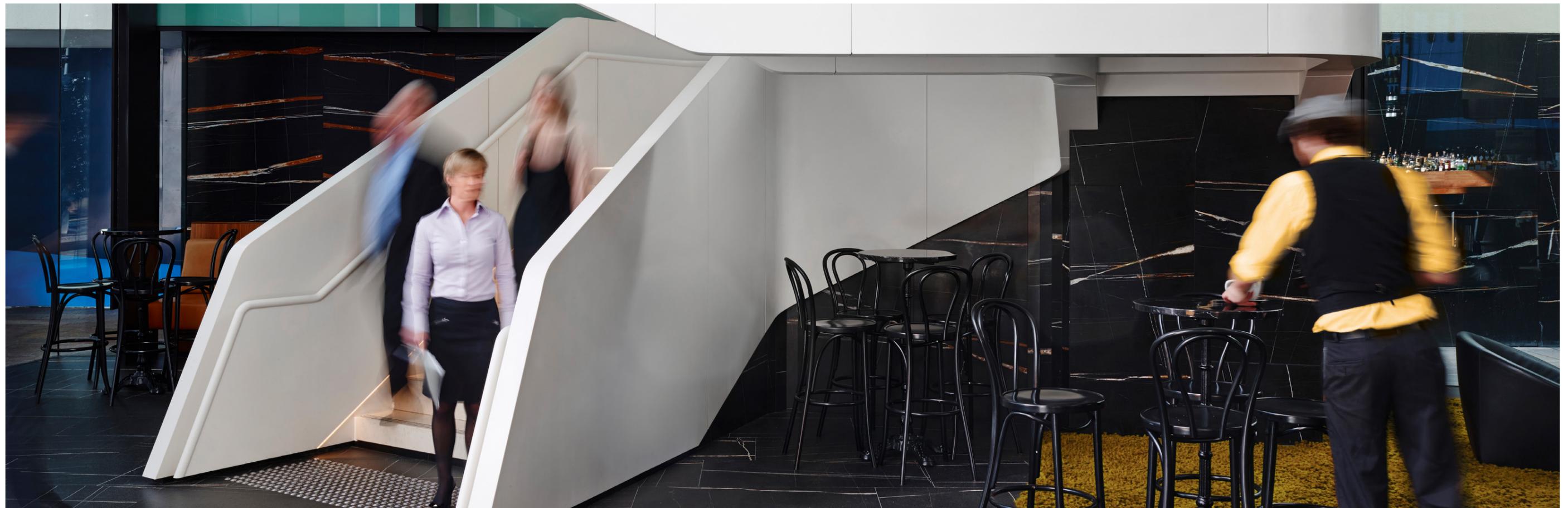
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<b>Active street frontage</b>	A ground floor business or retail building street frontage that has direct and level entry and openings allowing physical and visual access that encourages interaction between the inside of the building and the adjoining external areas, including footpaths, road reserves or public spaces. Active street frontages support pedestrian safety and amenity and provide an interface between the public and private domain	<b>Greater Sydney</b>	The local government areas within the boundary shown on the map in the Greater Sydney Region Plan and Schedule 1 of the Greater Sydney Commission Act 2015.
<b>Aerospace</b>	The branch of technology and industry concerned with the research, design, manufacture, operation and maintenance of aircraft, space craft, and their components and supporting services.	<b>Greenfield Area</b>	An undeveloped area typically used for agricultural and/or non-urban uses. Greenfield areas are typically not serviced by essential infrastructure such as water, sewerage, gas and electricity.
<b>Aerotropolis</b>	A metropolitan area where infrastructure, land uses and economy are centred on an airport and includes the outlying corridors, and aviation orientated business and residential development that benefit from each other and their accessibility to the airport.	<b>Growth Area</b>	Identified by the NSW Government as major greenfield development or urban renewal areas.
<b>Aerotropolis Core</b>	This is the central city at the core of the Aerotropolis activity associated with the Airport. The combination of uses, activities, development and places are reliant on and complementary to the operation of a global airport.	<b>Investigation Area</b>	An area in the early stages of investigation for future urban development. This could be in a greenfield or existing urban or infill area.
<b>Agribusiness</b>	Businesses associated with the production, processing, marketing and distribution of agricultural products, especially at a large and integrated scale.	<b>Local Centre</b>	Smaller-scale places that vary from a few shops on a corner to a vibrant main street and generally serve a local population.
<b>Agriculture</b>	Generally associated with traditional primary production. It includes the cultivation of land for the growing of crops and breeding of animals.	<b>Local Environmental Plan</b>	Defined in the EP&A Act. Guides planning decisions in local government areas through zoning and development controls.
<b>Amenity</b>	The 'liveability' of a place that makes it pleasant and agreeable for individuals and the community. Amenity includes, but is not limited to, the enjoyment of sunlight, views, privacy and quiet	<b>Master Plan</b>	An optional plan created under the Aerotropolis SEPP for large sites or landholdings of 100 hectares or more.
<b>Business incubator</b>	A company that helps new and start-up companies to develop by providing services such as management training or office space.	<b>Obstacle Limitation Surface</b>	Designed to protect aircraft flying in visual conditions close to an airport by defining a volume of airspace to be protected from development, primarily modelled on the layout and configuration of proposed runways.
<b>Central City</b>	The Central City District as defined in the Greater Sydney Region Plan comprising the Blacktown, Cumberland, Hills Shire and Parramatta local government areas.	<b>Peri-urban lands</b>	Land for agriculture undertaken in places on the fringes of urban areas.
<b>Defence</b>	The branch of industry concerned with the research, design, manufacture, operation and maintenance of military equipment, supplies and services.	<b>Precinct planning</b>	Identifies the development intent and development capacity across a precinct by allocating land uses, densities, housing types, built form, infrastructure and environmental and open space.
<b>Development</b>	As per the EP&A Act, development includes any of the following: the use of land; the subdivision of land; the erection of a building; the carrying out of a work; the demolition of a building or work; or any other act, matter or thing that may be controlled by an environmental planning instrument.	<b>Public domain</b>	Any publicly or privately owned space that can be accessed and used by the public and/or is publicly visible.
<b>Development Control Plan</b>	Provides detailed planning and design guidelines to support established planning controls.	<b>Public space</b>	Includes parks, green spaces, plazas, libraries, streets, landscapes, museums, and public transport.
<b>Eastern City</b>	The Eastern City District as defined in the Greater Sydney Region Plan comprising the Bayside, Burwood, City of Canada Bay, City of Sydney, Inner West, Randwick, Strathfield, Waverly and Woollahra local government areas.	<b>State Environmental Planning Policy (SEPP)</b>	Environmental planning instruments that address planning issues of State significance.
		<b>Strategic Centre</b>	Characterised by a high proportion of knowledge- intensive jobs, existing or proposed major transport gateways and increased economic activity.
		<b>Streetscape</b>	The character of a street and its close surrounds defined by the spatial arrangement and visual appearance of built and landscape features when viewed from the street.
		<b>Western Parkland City</b>	Broadly, Penrith, Liverpool, Campbelltown, Hawkesbury, Wollondilly, Camden, Fairfield and Blue Mountains LGAs, anchored around Liverpool, Greater Penrith and Campbelltown–Macarthur, with the new Airport and Aerotropolis geographically at its centre.

<b>Western Parkland City Authority (WPCA)</b>	A NSW Government body (formerly the Western City & Aerotropolis Authority) established to facilitate the delivery of the Western Parkland City. The WPCA works across all three levels of Government to jointly plan, design and deliver the best possible outcomes in infrastructure, liveability, investment attraction, job growth and sustainability.
<b>Western Sydney Aerotropolis Orbital</b>	Encompasses 11,200 hectares of land roughly bounded by the Warragamba pipeline to the north, Kemps Creek to the east, Bringelly Road to the south and the future Outer Sydney Road to the west.
<b>Western Sydney Aerotropolis Plan (WSAP)</b>	A strategic plan that provides the vision, principles and planning framework for the Western Sydney Aerotropolis.
<b>Western Sydney Airport</b>	A Commonwealth business enterprise established in August 2017 to build the new Airport.
<b>Western Sydney International (Nancy-Bird Airport)</b>	The declared airport site located on approximately 1,780 hectares of land at Badgerys Creek. The airport will be developed in stages and will ultimately comprise two parallel runways (Walton) serving approximately 82 million passengers annually. The Airport will operate 24/7 without a curfew.
<b>Western Sydney Planning Partnership</b>	A local government-led initiative comprising of representatives of all eight Western Parkland City councils as well as Blacktown Council, and representatives from the NSW Department of Planning, Industry and Environment, Transport for NSW, Sydney Water and the Greater Sydney Commission.
<b>Wianamatta-South Creek Catchment</b>	Includes most of the Cumberland Plain of Western Sydney and is a defining central element of the Western Parkland City and the Aerotropolis.

## ABBREVIATIONS

<b>Aerotropolis SEPP</b>	Western Sydney Aerotropolis (Aerotropolis) State Environmental Planning Policy	<b>GRP</b>	Gross Regional Product
<b>ANEC</b>	Australian Noise Exposure Concept	<b>GSC</b>	Greater Sydney Commission
<b>ANZSIC</b>	Australian and New Zealand Standard Industry Classification	<b>GVAP</b>	Gross Value of Agriculture Production
<b>BIC</b>	Broad Industry Classification	<b>IAO</b>	Investment Attraction Office (part of WPCA)
<b>CapEx</b>	Capital Expenditure	<b>LGA</b>	Local Government Area
<b>DCP</b>	Development Control Plan	<b>NDA</b>	Net Developable Area
<b>DPIE</b>	Department of Planning, Infrastructure and Environment	<b>WPCA</b>	Western Parkland City Authority
<b>EBIT</b>	Earnings before Interest and Tax	<b>WSA</b>	Western Sydney Airport
		<b>WSAP</b>	Western Sydney Aerotropolis Plan



# 1. INTRODUCTION

## 1.1 BACKGROUND AND OVERVIEW

The Western Sydney Aerotropolis (the Aerotropolis) is a 11,200ha precinct surrounding the future Western Sydney International (Nancy-Bird Walton) Airport (WSA). To leverage the catalytic impact of the WSA, the Aerotropolis is planned as a highly connected, innovative new city and major employment centre to accommodate up to 139,000 jobs.

Planning for the Aerotropolis is underway and is coordinated by the Western Sydney Planning Partnership (the WSPP) as established by the cross-Government Western City Deal. The draft Western Sydney Aerotropolis Plan (draft WSAP) was prepared by the WSPP in late-2019 and outlines the land use framework for the Aerotropolis.

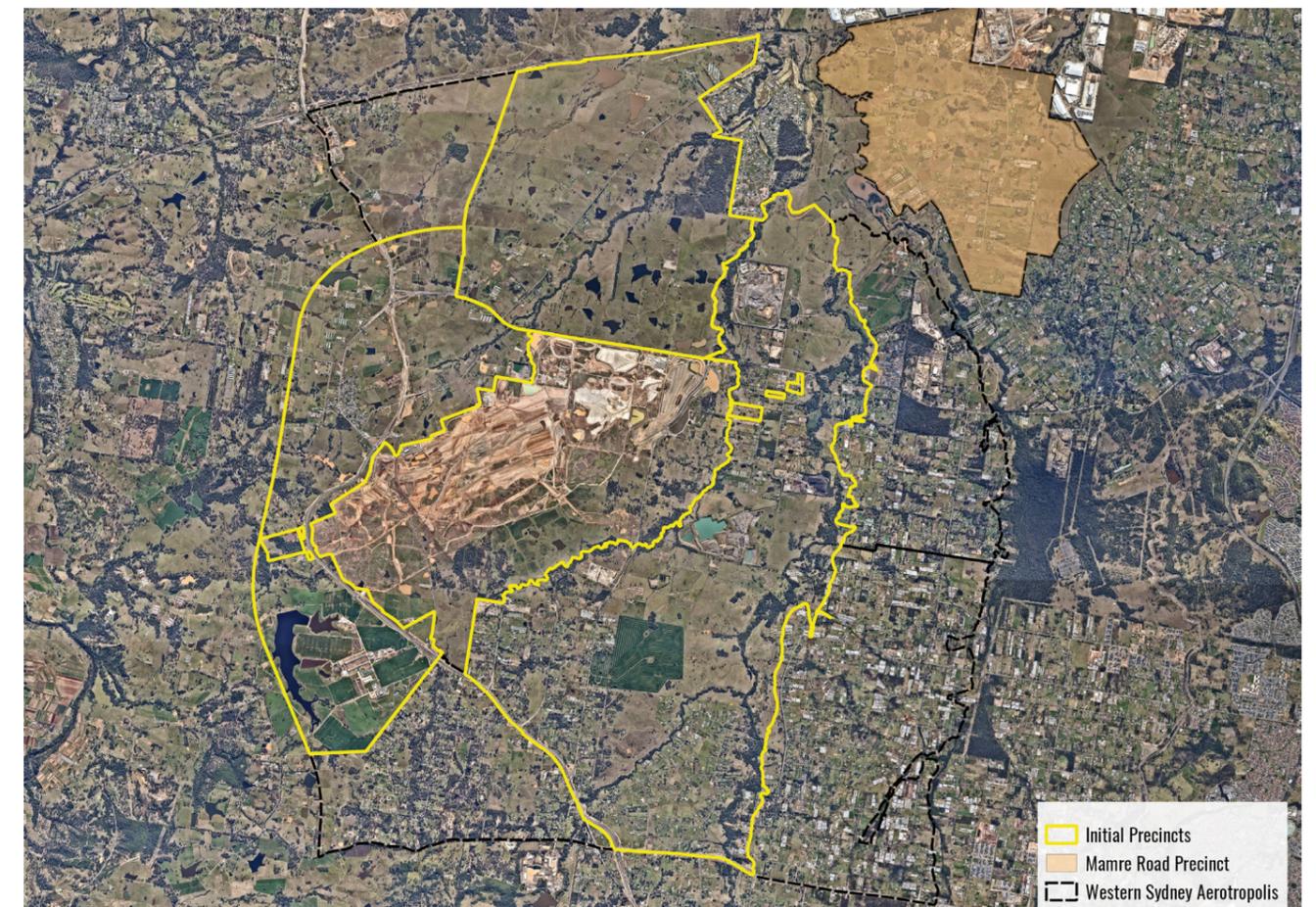
The planning package for the Aerotropolis was finalised in September 2020 and includes - the WSAP and finalisation report, Aerotropolis SEPP and Stage 1 of the Western Sydney Aerotropolis Development Control Plan 2020 (the DCP).

The WSAP defines the Aerotropolis by 10 precincts with six initially rezoned and the focus of precinct planning, namely the Mamre Road, Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek, Northern Gateway and Agribusiness Precinct. Precinct planning for the initial precincts is currently underway with precinct plans expected to be finalised by late-2020.

These initial precincts and the broader Aerotropolis precinct are illustrated in **Figure 1.1**.

Atlas Urban Economics (Atlas) has been engaged by the WSPP to provide market and feasibility advice to assist precinct planning for the Aerotropolis Core and Badgerys Creek, Northern Gateway and Agribusiness Precinct (referred to as 'the Study Area'). This advice also examines the viability of a Special Infrastructure Contribution (SIC) and affordable housing contributions.

**Figure 1.1: The Western Sydney Aerotropolis**



Source: Atlas

## 1.2 SCOPE AND APPROACH

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Atlas has been engaged by the WSPP to provide economic and market feasibility advice to inform precinct planning for the initial precincts of the Aerotropolis (the Study Area). This advice is provided in several parts.

- **Part 1: Market and Opportunities Discussion Paper** (the Discussion Paper) carries out property market and land use research in the Aerotropolis and broader Western City to understand the opportunity for the Study Area to accommodate various land uses. The Paper also reports on the findings of stakeholder engagement carried out.
- **Part 2: Market and Economic Feasibility Analysis** (this report and the Study) examines the feasibility of different land uses across the Aerotropolis to understand the pre-requisites and economic conditions for viable development. The Study also carries out generic take-up forecasts based on known constraints and factors.

### Approach to Market and Economic Feasibility Analysis

This Study covers **Part 2 (Market and Economic Feasibility Report)** of the brief with remaining parts to be reported under separate cover as the precinct planning process progresses. This Study builds upon much of the baseline research undertaken in **Part 1** to consider development feasibility and take-up implications for different land uses.

The objective of the Study is to consider the market viability of different land uses and development typologies in the Study Area and how their take-up may occur over time as the Aerotropolis grows.

The following key tasks are undertaken to complete the Market and Economic Feasibility Analysis.

- Analysis of economic and market factors that influence employment and population growth.
- Review of the Aerotropolis' planning framework and future employment and population expectations.
- Consideration of investment requirements and expectations of various market participants.
- Economic and financial feasibility analysis to assess the viability of various development typologies.
- Estimate of development take-up by precinct having regard to the role and work of the Western Parkland City Authority's Investment Attraction Office (IAO) as well as investment requirements of market participants.

The Study also plays a role in providing input to Department of Planning, Infrastructure and Environment (DPIE) regarding the implementation of a Special Infrastructure Contribution (SIC) in the Aerotropolis.

## 1.3 ASSUMPTIONS AND LIMITATIONS

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Atlas acknowledges several assumptions and limitations associated with this Study.

### Benchmarking of Population and Employment Densities

Benchmarking of population and employment densities is carried out using Census (2016) data at the Destination Zone (DZ) and Statistical Area 1 (SA1) levels - these being the smallest geographies at which to analyse employment and population density over a time series.

The most recent data available is from the 2016 Census – over four years ago. Accordingly, recent development activity in the Western City is not captured in the benchmarking exercise.

### Presumption of Market Demand

A base presumption of market demand is premised on the success of the Investment Attraction Office's work program and initiatives. This presumption underpins generic feasibility testing of development and estimates of development take-up.

### Generic Feasibility Testing

Generic development options are assumed for feasibility testing based on floor space ratios (FSRs) in the draft precinct plans. Development schemes tested are notional only; they have not been capacity, urban design or engineering tested.

Generic feasibility testing is based on high-level revenue and cost assumptions and does not consider the nuances of a site typically considered in detailed feasibility analysis.

A desktop appraisal of 'as is' property values (i.e. existing-use values) is carried out without the benefit of site inspections.

### Affordable Housing Contributions

As a part of the precinct planning process, Atlas has investigated the viability of implementing affordable housing contributions in the Aerotropolis.

Given the level of contributions proposed for the Aerotropolis, including Section 7.12 contributions and a Special Infrastructure Contribution, market feasibility testing indicates it is unlikely there will be capacity for development to contribute to affordable housing.

While feasibility testing has established affordable housing as not currently viable in the Aerotropolis, it is understood that Precinct Plans will include a requirement that a minimum of 5% affordable housing is delivered for mixed use development, subject to feasibility testing. This will enable proponents and the planning authority to test at the time applications are made whether market conditions have changed in a way that improves the viability of delivering affordable housing in conjunction with other development contributions.

## 2. ECONOMIC AND MARKET CONTEXT

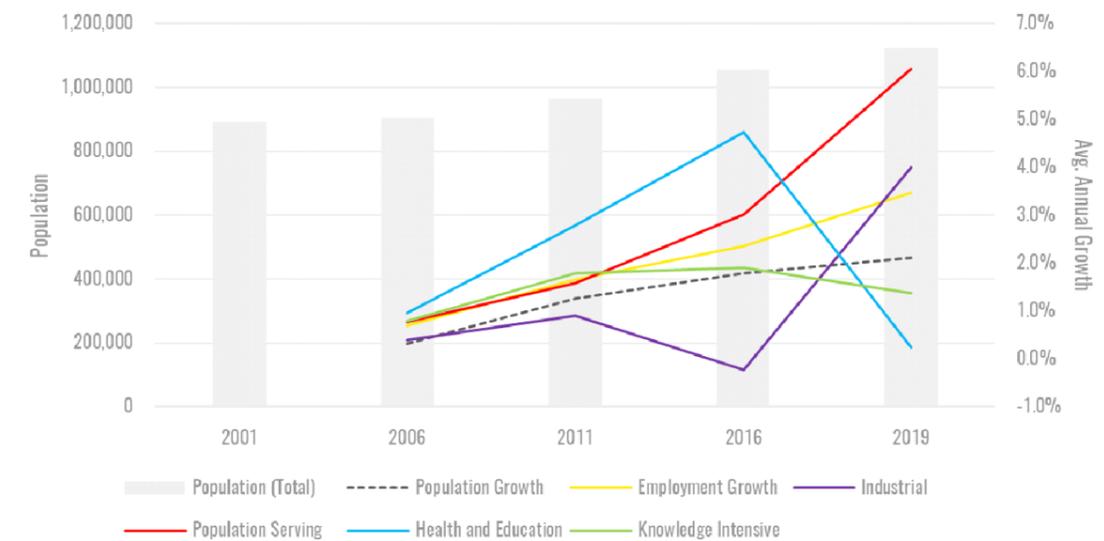
This Chapter examines the key economic and market factors which will drive the take-up of development opportunities in the Aerotropolis over the coming decades.

### 2.1 EMPLOYMENT AND POPULATION GROWTH

To understand the historic relationship of employment and population growth, analysis of historic employment against population growth in the Western City is carried out.

Figure 2.1 shows the growth trajectory of residents in the Western City against employment over the 2001 to 2019 period.

Figure 2.1: Historic Employment (BIC) and Population Growth (2001-2019), Western City



Source: ABS/NIEIR (2020)

The historic relationship between population and employment growth across the Western City is telling.

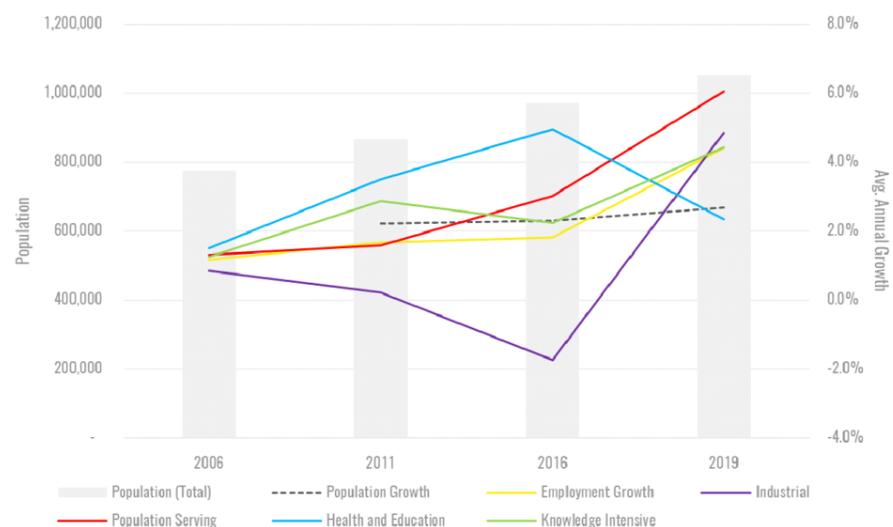
- Employment and population growth generally trended in line over the 2001-2011 period with nominal variance.
- Strong increase in health and education employment was observed over 2011-2016, driven by the public health system.
- Following 2011 however, employment growth has diverged from population growth, increasing at a markedly faster rate. This 'inflection point' coincided with a total resident population approaching 1 million residents in 2011.
- The Western City's job per resident rate has risen since 2011, rising from 34% (2006 and 2011) to 37% (2019).

This analysis shows the Western City is largely in a state of 'catch up' - employment growth in most industries outpacing population growth, reflective of the much lower employment base historically observed in the Western City compared to the more developed regions of Greater Sydney. The inflection point for employment growth in 2011 is telling - employment growth trending well above historic rates as the resident population approached a critical mass of 1 million residents in 2011.

Comparison of historic employment and population growth in the neighbouring Central City provides a gauge for the rate of growth which can be expected in the Western City moving forward. Similar analysis undertaken for the Central City shows:

- Employment growth exceeded population growth post-2016 as the population edged towards 1 million residents.
- The Central City historically recorded growth in the knowledge-intensive and health and education sectors at much faster rates compared to population growth. This is in contrast to the Western City and is a reflection of its larger and more established centres (e.g. Parramatta, Norwest) and significant health and education sector (e.g. Westmead).
- The Central City has a much higher job per resident rate compared to the Western City (48% compared to 37%).

**Figure 2.2: Historic Employment (BIC) and Population Growth (2006-2019), Central City**



Source: ABS/NIEIR (2020)

### Structure of Employment

The nature and trajectory of employment growth in the Central City is instructive in understanding the potential of future employment growth in the Western City. Employment (by BIC) per resident over 2006-2019 is outlined in Table 2.1.

**Table 2.1: BIC per Resident Ratios (2006-2019), Western and Central City**

Population and Employment	2006	2011	2016	2019
<b>Western City</b>				
Resident Population	910,000	970,000	1,060,000	1,120,000
Population-serving	0.117	0.118	0.126	0.141
Knowledge-intensive	0.056	0.058	0.058	0.057
Health and Education	0.067	0.072	0.083	0.079
Industrial	0.096	0.095	0.086	0.09
<b>Total</b>	<b>0.336</b>	<b>0.343</b>	<b>0.352</b>	<b>0.366</b>
<b>Central City</b>				
Resident Population	780,000	870,000	970,000	1,050,000
Population-serving	0.148	0.141	0.145	0.157
Knowledge-intensive	0.103	0.106	0.106	0.111
Health and Education	0.076	0.08	0.091	0.091
Industrial	0.158	0.143	0.117	0.124
<b>Total</b>	<b>0.484</b>	<b>0.471</b>	<b>0.459</b>	<b>0.483</b>

Source: ABS/NIEIR (2020)

The composition and growth of local jobs is different in the Western and Central City. Several observations are drawn.

- Employment per capita has been steadily rising in the Western City. A more variable trend is seen in the Central City. That said, for every 100 residents in the Western City there are 37 jobs while in the Central City there are 50 jobs.
- Population-serving jobs generally track population growth and are observed to have rapidly increased over 2006-2019 as a share of total jobs as the resident population in the Western City accelerated in growth.
- Knowledge-intensive employment is low in the Western City and has the smallest share of total employment. For every 100 residents there are 5.7 knowledge-intensive jobs in the Western City (compared to 11 jobs in the Central City). The rate of growth is also modest in the Western City (102% over the 2006-2019 period). Employment that is population-serving is expected to remain strong in line with population growth in the Western City.

Figure 2.3 shows that as a proportion of total employment, knowledge-intensive jobs declined over the 2001-2019 in the Western City (17% in 2001 to 15% in 2019). In contrast, population-serving jobs as a proportion of employment strengthened over the period (35% in 2001 and 38% in 2019).

**Figure 2.3: Employment Structure and Population Growth (2001-2019), Western City**



Source: ABS/NIEIR (2020)

### Implications for Precinct Planning

Employment growth is 'lumpy'. While businesses that are population-serving are most responsive to population growth, there are still thresholds for business viability. For example, a supermarket may only establish in a location once there are 10,000 residents within its catchment.

As the analysis in Figure 2.1 shows, the rate of employment growth in the Western City in 2011-2019 exceeded that of population growth, notwithstanding the modest growth in knowledge-intensive employment. This is because the Western City is relatively 'young' as a city compared to the Central City and the much more established Eastern Harbour City.

The resident population of the Western City exceeding 1 million residents provides the base critical mass for improving employment productivity. Agglomeration economies tend to make larger cities more productive. This is an important fundamental for the acceleration of employment in the Aerotropolis.

The role of local residents (not just within the Aerotropolis but in the region) to the employment function of the Aerotropolis should not be understated. Local residents form catchment areas that support viable retail and local services. Local residents also contribute to the labour pool from which businesses can hire and recruit.

A worker *and* a resident population are critical to sustaining vibrant urban centres. We illustrate this principle with the examples of Sydney and North Sydney CBDs and Sydney Olympic Park.

- **Sydney CBD** (322,000 workers and 15,600 residents in 2016) - following large scale residential growth in the 1990's and 2000's, the CBD is a vibrant city with workers and residents supporting a day and night economy.
- **Sydney Olympic Park** (12,000 workers and 1,700 residents in 2016) - public transport connectivity is poor and has led to 'patchy' employment growth. While it offers excellent recreational amenity, there is poor retail amenity in the centre with the critical mass of workers and residents insufficient to support viable retail facilities.
- **North Sydney CBD** (50,000 workers and 4,300 residents in 2016) is arguably in between the Sydney CBD and Sydney Olympic Park in terms of vibrancy. The lack of vibrancy in the North Sydney CBD has been widely commented upon. In terms of job numbers, it is similar to the planning aspirations for the Aerotropolis, however as a CBD, it has a much tighter footprint and therefore enabling the concentration of its retail and urban amenity.

The review of the above urban centres illustrates the importance of facilitating and encouraging resident growth both within and outside the Aerotropolis. A resident population is critical in supporting retail and business services in a 24-hour economy.

Compared to the Central City, the land mass in the Western City is expansive. This makes the issue of spatial distribution of capacity an important one. In the formative years of establishing employment density, ensuring employment and economic activity is focused in important nodes will be important to avoid dispersing early activity and investment. This will then help support retail and local services that are necessary for overall viability of employment centres.

## 2.2 TRENDS AND INFLUENCING FACTORS

### 2.2.1 Impact of COVID-19

The economic impact of the COVID-19 outbreak on the Australian economy cannot be understated. The COVID-19 pandemic is causing the largest contraction in domestic economic activity since the Great Depression, with the Australian economy experiencing its largest quarterly fall on record in Q2 2020 by 7% (Commonwealth of Australia, 2020).

Unlike recessions of previous decades where economic impacts were widespread and affected all industries, the COVID-19-induced recession is unique in that its impact is being felt differently across sectors. Whilst some industries have been significantly impacted due to operating restrictions (i.e. aviation, hospitality), others have experienced a marked uptick in demand (freight and logistics, grocery retailing, health care, etc).

Forecasts by the Commonwealth Treasury indicate Australia's domestic economy is expected to face historically soft conditions over the coming two years to 2021/22. Key forecasts include:

- **Population growth** is expected to slow considerably, falling from 1.4% in 2018-19 to 1.2% in 2019-20 and just 0.6% in 2020-2021, reflecting the lowest rate of annual growth since 1916-17. This is expected to be driven by a fall in fertility rates and a dramatic decline in net overseas migration. Future migration levels remain uncertain over the short-term.
- **Unemployment** is forecast to continue to rise, reaching 9.25% in Q4 2020 before declining to around 8.75% over the course of 2020/21. Unemployment is expected to remain stubbornly high over the short to medium term as has historically been observed in previous recessions.
- **Household consumption** will fall by 1.25% in 2020/21, with significant declines in the incomes earned, wealth and consumer confidence and fewer opportunities to spend as a result of the enforced business shutdowns.
- **New business investment (non-mining)** is forecasted to decline by 25.5% in 2020-21 as businesses seek to preserve cash in times of high uncertainty. Business solvency is also identified as a key risk given around two thirds of businesses have reported falls in revenue. **Dwelling investment** is also forecasted to decline significantly, falling by 16% in 2020-21 following cancellations and delays in residential development.

A full list of these forecasts carried out by the Commonwealth Treasury are appended to this report at Appendix 1.

### Implications for Precinct Planning

Population growth is a key issue for demand and take-up of development in the Aerotropolis. Over the last decade, 70% of Greater Sydney's population growth has been driven by net overseas migration. Should there be a sustained reduction in overseas migration, there will be significant demand implications for development and growth in Greater Sydney.

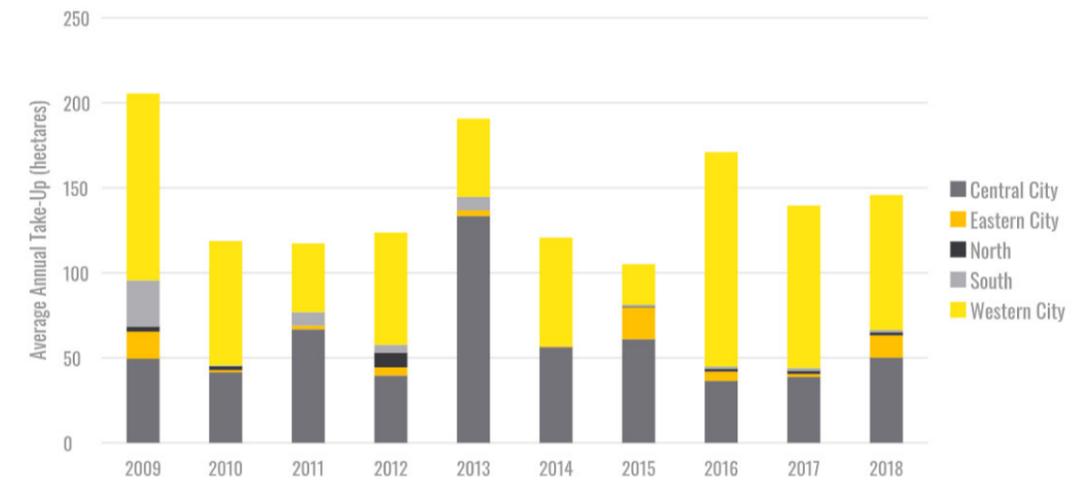
It is clear the onset of COVID-19 will bring about lasting structural impacts on various land uses. The uptake of online shopping and other e-commerce platforms presents obvious implications for demand of industrial land as operators require more warehousing and logistics space. The impact to other land uses such as offices and recreational/leisure uses remains more uncertain and will play out over the coming 3-5 years as the economy readjusts upon containment of the virus.

The degree to which demand and take-up of land use opportunities in the Aerotropolis will be impacted by the COVID-19 induced recession in the short-term will be dependent on the ability of the Australian economy to 'bounce out' of the downturn. This will be influenced by, inter alia, the ability to contain the spread of COVID-19 domestically and internationally, the financial and operational capacity of businesses to maintain operations and the effectiveness of stimulus measures.

### 2.2.2 Historic Take-up of Industrial Land

Demand for industrial land across Greater Sydney has historically trended at around 155ha per annum over the 2008-2018 period (DPIE, 2020). This has fluctuated over the past decade, as demonstrated in **Figure 2.4**.

**Figure 2.4: Historic Industrial Land Take-Up (2008-2019), Greater Sydney**



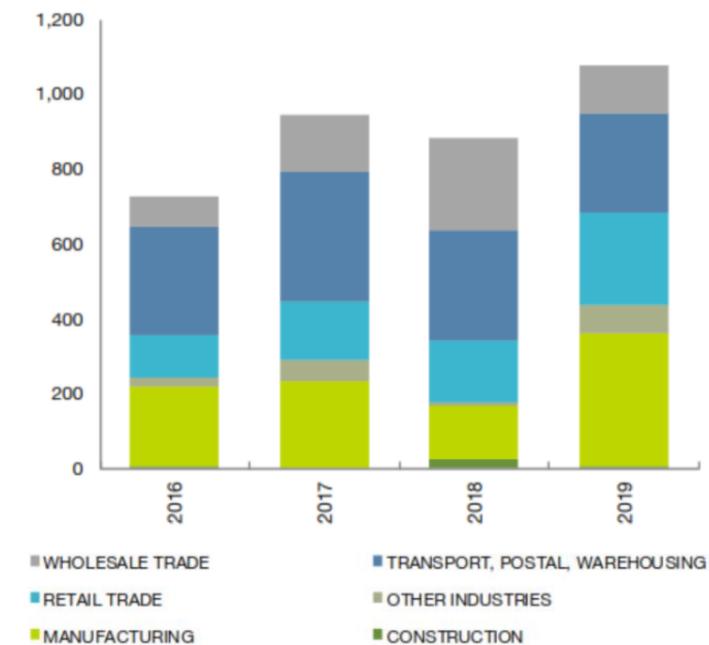
Source: DPIE (2020)

The Western City historically accounted for around half of industrial land take-up across Greater Sydney over the decade to 2018, averaging around 72ha per annum. Take-up across the Western City has quickened since 2016, largely driven by strong growth in the logistics sector coupled with constrained supply of serviced industrial land elsewhere in Greater Sydney.

Over the 12 months to Q1 2019, the manufacturing sector has taken up the greatest quantum of industrial floorspace, followed by transport, postal and warehousing and retail trade (Knight Frank, 2020). Over 2016-2019, the retail trade sector has proven the largest growing sector for industrial floorspace demand.

**Figure 2.5** illustrates the take-up of industrial floorspace by business sector over 2016-2019 across Greater Sydney.

**Figure 2.5: Industrial Floorspace ('000sqm) Take-up by Business Sector (2016-2019), Greater Sydney**



Source: Knight Frank (2020)

## Implications for Precinct Planning

Notwithstanding the impact of COVID-19 on business investment and development activity, the outlook for take-up of industrial land across the Western City remains positive and is driven by:

- Large scale transport infrastructure projects underway and in the pipeline stimulating industrial activity.
- Stable population growth across Greater Sydney driving demand for urban services which meet local population needs (e.g. waste recycling, automotive services, utilities, small scale manufacturing).
- Further growth in internet penetration rates driving demand for data storage in large, purpose-built facilities (i.e. data centres).
- Major new industrial land releases across Western Sydney (particularly in and around the Aerotropolis).
- Increasing rollout of large distribution/fulfillment centres and a network of smaller distribution centres located closer to population hubs to meet growing consumer demands for 'next day' delivery services (i.e. the Amazon model).
- Further uptake in the use of e-commerce and online shopping platforms (discussed in detail below).

### 2.2.3 Impact of Information Technology

The ongoing development of the internet and information technology will change the way land and floorspace is used across the commercial and industrial sectors. These technologies are driving the automation of traditional manufacturing, retailing and other industry practices and has been termed the 'fourth industrial revolution' (World Economic Forum, 2018).

There are a number of key technologies and sectors emerging from the fourth industrial revolution which could influence land use and development across the Aerotropolis.

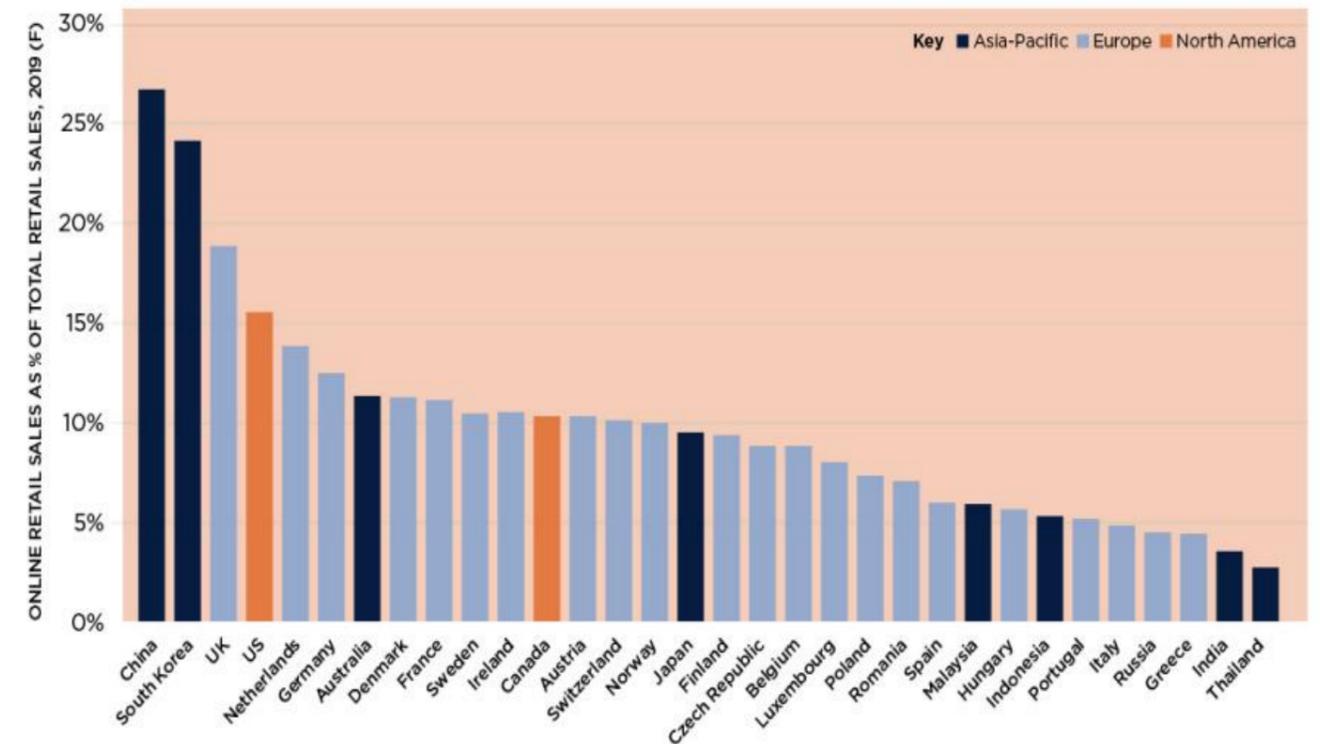
- The **Internet of Things (IoT)** allows a variety of mechanical and digital devices to be connected through the internet. Any number of processes, such as manufacturing or logistic warehousing, can be automated and monitored in real time. IoT infrastructure is already commonly used in large scale warehouse and distribution centres.
- The rollout of **3D Printing** remains limited given its high capital costs, though its application to the industrial sector is significant. Its use in complex and timely manufacturing processes is expected in the coming decades.
- Analysis of **big data** to understand consumer demand in real time, or predict demand, has had significant implications for supply chains with an even greater focus on speed and efficiency.
- Whilst **robotics and robotic systems** have been used on production lines for decades, smarter, more complex robots are now carrying out many tasks previously undertaken by human labour in several industrial sectors. The most recent example of this is the use of electronic pickers in modern freight and logistic warehouses.
- The use of **autonomous vehicles** remains in its infantile stages in the Australian economy. Autonomous vehicles represent a major step change in the freight and logistics sector, increasing speed and efficiency.
- **E-commerce** is arguably the largest and most advanced sector benefiting from the fourth industrial revolution. Retailing and the provision of services through the internet has been evolving over the past two decades, with Australia still with low market penetration compared to other advanced economies.

Online retailing has experienced phenomenal growth across Australia over the past five years, driven by changing consumer attitudes and an increase in internet and broadband penetration. Industry revenue is anticipated to average at 15.4% over the five years to 2019-20, well above average growth observed in the broader retail sector (IBISWorld, 2020). This includes anticipated revenue growth of just over 11% in 2020 as the COVID-19 pandemic accelerates the shift to online retailing.

The significant growth experienced in the online retail sector can be in many respects attributed to the current low base of online retail penetration. Online sales accounted for between 7%-11% of total retail sales across Australia the course of 2019 (ABS, 2020; NAB, 2020; Savills, 2019).

This is well below levels observed in other advanced economies in excess of 15% (as illustrated in **Figure 2.6**), suggesting there remains significant scope for further online retail penetration in Australia. Australia Post estimates online retail penetration to reach 16% to 18% by 2025 (Australia Post, 2019).

Figure 2.6: Online Retail Turnover Penetration (2019), Australia v Rest of World



Source: Savills (2019)

## Implications for Precinct Planning

Whilst the rollout of advanced automation systems remains limited given their high capital costs, there are important implications for industrial floorspace. Advanced robotics could see manufacturing activity revert to Western economies and reduce the need for workers on-site. Production output would increase concurrent with decreases in employment densities.

E-commerce and logistics are one of the key drivers of demand for industrial floorspace across Greater Sydney in recent years; retail uses typically accounting for around 20% of industrial floorspace take-up over 2016-2019 (Knight Frank, 2020).

Looking forward, online retail is expected to grow exponentially with revenue forecast to increase by 5.0% per annum over the coming years to 2025 (IBISWorld, 2020). This equates to average additional revenue of some \$1.25 billion per annum and additional floorspace demand of 80,000sqm warehouse floorspace per annum (JLL in Commercial Real Estate, 2019).

## 2.3 LAND USE OPPORTUNITIES

### 2.3.1 AGRIBUSINESS

Agribusiness uses are likely to require the most initial support to viably establish. Whilst the term ‘agribusiness’ refers to a broad range of land uses (many of which are more akin to industrial uses and can be relatively valuable), many forms of agribusiness uses can be of lower value and therefore have lower capacity to pay for land and accommodation costs. This presents challenges in the Aerotropolis, where land values have been rising for several years.

#### Primary Production Enterprise and Rent Affordability

The relationship between operating income and capacity to pay for land/ accommodation costs is investigated (by Agrology) through an analysis of production revenue, operating costs and their ability to pay occupancy costs.

Three primary production categories are analysed for their capacity to pay occupancy costs. These categories are selected as they represent primary production enterprises of varying intensities. These are:

- Intensive high-tech horticulture - glasshouse truss tomato production;
- Intensive low-tech horticulture - polyhouse blueberry production; and
- Intensive livestock - broiler chicken production.

Figure 2.7, Figure 2.8 and Figure 2.9 provide pictorial examples of the production categories considered.

Figure 2.7: Glasshouse Truss Tomato Production



Figure 2.8: Polyhouse Blueberry Production in High Tunnel



Figure 2.9: Broiler Production inside Grow Out Shed

The analysis assumes that once a ground lease on land is secured (>20 years), capital will then be invested to develop the production facility. Industry cost structures indicate rent in the agribusiness sector ranges from 3% to 4% (IBISWorld, 2020).

The production types are assumed to occupy a total land area of 25ha with production areas ranging from 7ha to 20ha after allowing for access, efficiency and ancillary requirements. Land values and lease costs are assumed at 7% gross yield.

Revenue generation potential, capital expenditure requirements and operating costs together affect the capacity of primary production enterprise to pay for occupancy costs.

By modelling the operating income (EBIT), an indicative range of land affordability emerges for the different enterprise types. We note the generic nature of the modelling exercise, however, it is considered appropriate to assess the broad tolerance and affordability of these primary production enterprise categories to pay to lease land.

Table 2.2 summarises financial modelling results that investigate the implications of a 3.5% occupancy cost on rent affordability and enterprise return on investment.

Table 2.2: Capacity to Afford Commercial Rent based on Occupancy Cost of 3.5%, Select Agricultural Enterprises

Category	Poultry: Broiler	Blueberry	Truss Tomato
Total Land Area	25 hectares	25 hectares	25 hectares
Production Area	26 sheds at 2,736sqm per shed	20 hectares	20 hectares
CapEx	\$21,550,000	\$10,471,500	\$70,000,000
Depreciation Period	25	10	20
Annual Net Revenue	\$5,093,088	\$12,486,760	\$37,619,400
Total Operating Cost	\$2,126,113	\$9,617,355	\$21,835,683
Occupancy at 3.5% Revenue	\$178,258	\$437,037	\$1,316,679
Total Operating Cost	\$2,304,371	\$10,054,392	\$23,152,362
EBITDA	\$2,788,717	\$2,432,368	\$14,467,038
Annual Depreciation	\$862,000	\$1,047,150	\$3,500,000
EBIT	\$1,926,717	\$1,385,218	\$10,967,038
ROI (EBIT/CapEx)	8.90%	13.20%	15.70%
Land based on 7% gross return	\$101,862/ha	\$249,735/ha	\$752,388/ha

Source: Agrology (2020)

Table 2.2 demonstrates that rent affordability of production activity varies.

Truss tomato glasshouse production has the most capacity to pay for occupancy costs., that is, 3.5% of revenue could pay for lease costs on lands valued at \$750,000/ha, resulting in an acceptable return on investment of 15.7%.

Broiler production has the lowest capacity to pay for occupancy costs, affording rents on lands valued at \$100,000/ha.

Mid-tech blueberry production has better affordability, affording rents on lands valued around \$250,000/ha.

### Sensitivity of Rent Affordability

The capacity of production enterprise to pay for occupancy costs is affected by market and pricing conditions, as well as on scale of the enterprise.

There is a scarcity of large contiguous landholdings in the Agribusiness precinct which could affect the opportunity of large-scale enterprise opportunities. The smaller economies of scale associated with smaller production have implications for rental affordability due to:

- Lower site efficiencies, likely closer to 50% depending on layouts, egress, water storage etc.
- Increase in CapEx per sqm due to reduced scale and various fixed costs associated.
- Proportionally higher fixed operating costs such as management salaries.
- Reduction in overall operating profit.

This section examines the sensitivity of high-tech conventional greenhouse tomato production to variances in market/pricing metrics as well as to operations size.

- **Market/ pricing variances**

Should pricing levels fall by 10%, high-tech conventional greenhouse tomato production could afford to lease land worth around \$680,000/ha. Conversely, if prices rose by some 10%, the rental affordability threshold would increase to lands worth around \$830,000/ha.

- **Enterprise size**

If the block production area was 2ha (rather than 20ha), land utilisation and operating cost efficiencies fall and could approach 50%, thereby requiring total land area of 4ha.

Rental affordability falls, with a smaller enterprise able to pay no more than \$470,000/ha. Should pricing levels fall by 10%, rental affordability falls further to \$420,000/ha.

- **Land Values in the Study Area**

Land values in the Aerotropolis are observed to have been increasing over the least 24 months. In the Agribusiness precinct they range from **\$400,000/ha to \$1,000,000/ha** depending on, inter alia, size and minimum lot size controls.

This indicates that of the three enterprises modelled, only high-tech conventional greenhouse tomato production could likely afford to operate in the Aerotropolis. Smaller operators (i.e. 2ha of production area) would unlikely be viable.

### Implications for Precinct Planning

While tomatoes are the clear market leader in high-tech production in Australia, the production of alternate fruiting crop species (such as pepper, cucumber, eggplant and strawberries) could be viable in similar structures and with similar site establishment and CapEx costs. Total revenue and costs associated with these alternate species would vary, but the underlying returns in an optimised production system could result in comparable rental affordability.

The rental affordability of production enterprise types varies significantly. Enterprise types with low capacity to pay occupancy costs will expectedly gravitate to rural and regional areas where land is sub-\$50,000/ha.

Whilst the analysis does show some capacity for such high-tech enterprises, given land values in the Aerotropolis are in some instances 10x higher than those observed in regional NSW and Victoria, there would have to be significant additional benefits to attract producers to the Agribusiness Precinct (such as access and cost of labour, lower energy prices, low cost of CO2).

The analysis of enterprise affordability and land costs in the Agribusiness precinct highlights the importance of precinct and master planning by the WSPP and WPCA for achieving the vision of the Agribusiness precinct.

Furthermore, the analysis also shows the important role of the IAO in attracting other key industries- integrated logistics, food and pharmaceutical manufacturing and fresh food wholesaling - in securing synergies and employment in the precinct.

This indicates that of the three enterprises modelled, only high-tech conventional greenhouse tomato production could likely afford to operate in the Aerotropolis. Smaller operators (i.e. 2ha of production area) would unlikely be viable.

## COVID-19 IMPACT

The impact of the COVID-19-induced recession on the agribusiness sector is difficult to quantify at this stage with a range of impacts currently playing out across the agricultural sector. Many producers are experiencing an uptick in demand from supermarkets, though disrupted supply chains are impacting export capacity.

Looking forward, many commentators expect the Australian agricultural sector to experience an uptick in demand from Asia as consumers begin avoiding traditional wet markets in favour of online businesses and supermarkets. This trend is already playing out in China. This could have major implications for the broader Australian agribusiness sector.

### 2.3.2 INDUSTRIAL

Industrial uses, specifically larger-scale uses such as freight and logistics, are identified as the likely 'first movers' in the Aerotropolis. The synergistic benefits between the future airport, availability of large landholdings and direct accessibility to the orbital network makes the Aerotropolis an ideal location for such uses.

A more targeted approach however will be required to attract knowledge-based industries and higher order manufacturing enterprise (e.g. pharmaceutical manufacturing, advanced manufacturing) to the Aerotropolis. Delivery of planned research establishments such as the Advanced Manufacturing Training Facility by the WPCA in partnership with tertiary education providers will play an important part in facilitating industry collaboration and the skilling of the workforce.

Industrial enterprise that relies on a highly skilled and educated workforce will have amenity expectations that are in line with those of their employees. Access to public transport (train), good quality urban and retail amenity as well as a proximity to local business services are among key location selection factors of importance.

Smaller scale industrial uses are unlikely to be early movers in the Aerotropolis. Until a critical mass of residents is established within the Aerotropolis or its surrounds, service industrial/ commercial uses will not be viable. Proximity to population catchments are vital to these uses and attracting such businesses without a local resident catchment will be challenging.

### Implications for Precinct Planning

The likely take-up of development will be subject to supply opportunities elsewhere in Western Sydney. The availability and supply of serviced industrial land will influence the timing of when large scale industrial uses are pursued.

Section 2.2 identified average historic consumption of industrial land at 155ha over the 2008-2018 period. As at Q1 2019 there was a total of some 645ha of undeveloped and serviced industrial land across Greater Sydney, equivalent to 4.2 years remaining supply assuming long-term consumption trends continue (DPIE, 2019).

A much greater quantum of undeveloped supply is observed when unserviced industrial land is added to the tally. This increases the total of 645ha to some 2,838ha of land. The latter can be considered a theoretical supply of industrial land.

Transport and logistics businesses (large scale industrial buildings) will likely be first movers into the Aerotropolis. While they will contribute to the worker population, due to their large footprint requirements, these uses are likely to be dispersed across precincts, potentially diluting their support for local services within centres.

Whilst this will be the crucial first step in facilitating initial investment, it will be important that precinct planning allows these large industrial uses to transition over time to accommodate more intensive activity and/ or densification of built form. Examples of such transitions are observed in both Macquarie Park and the Southern Sydney Employment Lands (Alexandria, Rosebery). In these precincts, industrial buildings have become more intensively occupied (i.e. more workers per floor area) and/or altered to include other forms of floorspace (i.e. retail showroom, office).

When uses become more intensive or buildings become more dense, it will be important to ensure the road network can also transition to be sufficiently fine grain and importantly, be permeable. As industrial uses intensify, there will be corresponding demand for locally based services (e.g. cafés, dry cleaning, etc.) and village nodes (outside of the main centres) may emerge.

### COVID-19 IMPACT

Many industrial sectors have benefitted tremendously from the shift in consumer patterns brought about by COVID-19. Unprecedented demand in the supermarket sector coupled with a significant uptake in online retailing is driving sustained demand for industrial floorspace from the freight and logistics sector.

The outlook for manufacturing across Australia and other Western economies is unclear in the post COVID-19 economy. The COVID-19 outbreak has highlighted much of the world's dependence on Chinese and Indian supply chains, with many industries now reassessing their supply chain networks. How this will play out in the Australian context remains unclear.



### 2.3.3 COMMERCIAL AND BUSINESS PARK

There are challenges to initial take-up of commercial and business park development opportunities in the Aerotropolis. Competition from neighbouring centres, commercial office market dynamics in Western Sydney and a lack of established retail amenity and critical mass will collectively make the viability of large scale commercial development challenging.

The work programme of the Investment Attraction Office (IAO, in association with WPCA) in engaging and securing occupier interest will be **critical** in securing investment by businesses who would not otherwise consider locating in the Aerotropolis.

The importance of a resident population to support a range of services in urban centres was highlighted in section 2.1. A worker population is as critical to sustaining vibrant commercial centres.

While centres with small resident populations struggle to support retail, hospitality and leisure uses and a viable night time economy, centres with a small quantum of business floorspace and small catchment of workers also have limited ability to support retail, hospitality and leisure uses.

We illustrate this principle with the examples of Sydney Olympic Park, Macquarie Park and Chatswood office markets.

- **Sydney Olympic Park** (12,000 workers and 1,700 residents in 2016) - public transport connectivity is poor and has led to 'patchy' employment growth. While it offers excellent recreational amenity, there is poor retail amenity in the centre with the critical mass of workers and residents insufficient to support viable retail facilities.
- **Macquarie Park** (46,500 workers and 8,500 residents in broader Macquarie Park area at 2016) – progressive intensification of employment activity has led to significant employment growth with residential growth more limited.
- **Chatswood** (21,500 workers and 26,000 residents in broader Chatswood area at 2016) – much greater focus on residential and mixed-use development has resulted in a vibrant CBD; though swift take-up of development opportunities by residential developers has made future commercial development challenging.

The experience of these centres illustrates the importance of early 'focusing' of the worker population in designated centres in the Aerotropolis. This will ensure retail, hospitality and leisure uses can viably emerge.

Early commercial development in the Aerotropolis is expected to be similar to that in Macquarie Park and Norwest/Bella Vista - low rise, campus-style office buildings. Many of these occupiers may require both an office and warehouse/factory component. More intense forms of development will occur over time as the precincts mature, achieve critical mass and offer a diversity of retail and urban amenity.

### COVID-19 IMPACT

The COVID-19 pandemic has the potential to make a lasting impact on the commercial office sector. Forced working from home (WFH) and remote working practices may see significantly increased acceptance and use in a post-COVID economy. This could alter floorspace requirements for office users. Equally relevant are additional floorspace requirements which may be needed in post COVID-19 workspaces in order to meet physical distance expectations. The net impacts to floorspace requirements resulting from COVID-19 are yet to fully materialise.

There are many enterprise types where collaboration and on-site working are required. The Aerotropolis is expected to cater to these needs.

### Implications for Precinct Planning

A *laissez faire* 'zone it and they will come' approach is unlikely to result in large scale development and take-up until opportunities in the established and growing centres of Liverpool and Parramatta are exhausted. Success of the Investment Attraction Office's work will be critical to set the tone and pace for development of commercial and business park uses.

Industrial uses and their buildings are likely to be self-sufficient with inclusion of facilities such as on-site cafeteria and recreational spaces; their workers are likely to be car-based commuters. In contrast, commercial uses and their workers are generally more reliant on externally provided retail and hospitality services. Consequently, not many businesses (unless they are of significant scale) are likely to want to be 'the first mover' in a commercial precinct.

It is therefore important for secured commercial investment to be co-located and clustered around future Metro stations to enable 'early seeding' of critical retail, hospitality and leisure facilities. Development and take-up of land use opportunities are self-perpetuating. The location of more businesses in a precinct will enable the provision of more local retail and business services, and therefore enabling development momentum to grow.

### 2.3.4. RETAIL AND HOSPITALITY

Retail, hospitality and leisure facilities are critical ingredients for market expectations and demand. These uses are 'followers'; they do not establish or locate in a precinct unless there is a trade catchment from which they can draw custom and operate viably. This presents a conundrum for the Aerotropolis.

Large format retailers (e.g. home centres, hardware and garden suppliers, auto showrooms) and fast food 'drive thru' restaurants are heavily reliant on their proximity to large population catchments and exposure along busy arterial roads. Many such operators rely on industry demand metrics when selecting locations. i.e. resident population catchment of >20,000 capita and/or average daily traffic volumes of >50,000 vehicles. The larger and more established operators with sufficient capital will often position themselves in future growth areas in expectation of this growth.

Retail development is largely expected to occur 'as of course' as local worker and resident catchments in the Aerotropolis establish and grow. Hospitality uses such as cafés, restaurants, pubs and hotels will be driven by a diverse trade catchment, requiring different sources of clientele (workers, residents, visitors and tourists) in order to viably operate.

Upon opening in 2026, Stage 1 of the WSA is expected to accommodate a total of 10 million passengers (8 million domestic and 2 million international), rising to a total of 37 million in 2050 and 82 million by 2063 (Commonwealth of Australia, 2016). For contextual purposes, Perth Airport accommodated a total of 11.2 million passengers (7.9 million domestic and 3.3 million international visitors) over 2018-19 (Perth Airport, 2020).

The viability of hospitality and accommodation uses (hotels, pubs and serviced apartments) will be dependent on the eventual passenger throughput and the volume of daily visitation (workers, tourists and business visitors) to the Aerotropolis.

### COVID-19 IMPACT

The contrasting economic impacts of COVID-19 are no better observed than in the retail sector. Some retailers such as supermarkets, hardware and garden supply retailers experienced historic levels of demand during lockdown restrictions, whereas hospitality and accommodation uses (cafes and restaurants, hotels and pubs) saw marked declines in revenue.

COVID-19 has the potential to dramatically change the future trajectory of demand for retail floorspace in Australia. Increased penetration rates of online retail during recent forced lockdowns has accelerated the take-up of e-commerce in Australia which lagged other developed economies pre-COVID-19.

Post-COVID-19, a shift in the way floorspace is required for retail uses will be inevitable. More 'dark warehouses' and 'dark kitchens', fulfilment and containment centres will be required. This will likely see the re-purpose of retail floorspace in centres and outside of centres.

### Implications for Precinct Planning

Resident population catchments (inside and outside the Aerotropolis) will be essential to ensuring the viability of retail uses in the initial years of the Aerotropolis. As the precincts develop and grow (from both a worker, resident and visitor perspective), demand for retail will grow commensurate.

Until there is a cluster of retail, hospitality and leisure facilities, market demand for commercial and residential uses in the Aerotropolis will be constrained. It is therefore critical that early investment in the Aerotropolis is clustered to 'seed' the viable formation of retail and hospitality uses.

### 2.3.5 RESIDENTIAL

The viability of residential uses in the Aerotropolis in the initial years will vary by typology. Low-density residential product in the greenfield precincts surrounding the Study Area remain in high demand and are at present the most appealing form of housing. Whilst growing, the market for medium and higher-density typologies in Sydney's outer west is relatively smaller.

Market demand for medium density typologies (townhouses and low rise apartments) is deepening, particularly around train stations and in high retail/ urban amenity areas. Comparatively, market demand for higher-density housing in Sydney's outer west remains soft given the availability and relative affordability of low and medium-density housing options.

As the profile of the Aerotropolis as an employment precinct grows, demand (and market willingness to pay) for higher-density housing is expected to grow to reach a point where development becomes a viable proposition. It is unclear how long this may take.

The permissibility of residential typologies will therefore have implications for how quickly the Aerotropolis can generate a critical mass of residents, which is itself an important pre-requisite for the viability of other land uses (i.e. retail, local and service commercial).

#### Implications for Precinct Planning

While the Aerotropolis presents valuable opportunity to grow and accommodate a base of employment opportunities for the Western City, the role of residential uses should not be overlooked. Residential uses are important for the viability of service businesses and population-serving sectors (e.g. retail, non-retail and service industrial/ commercial).

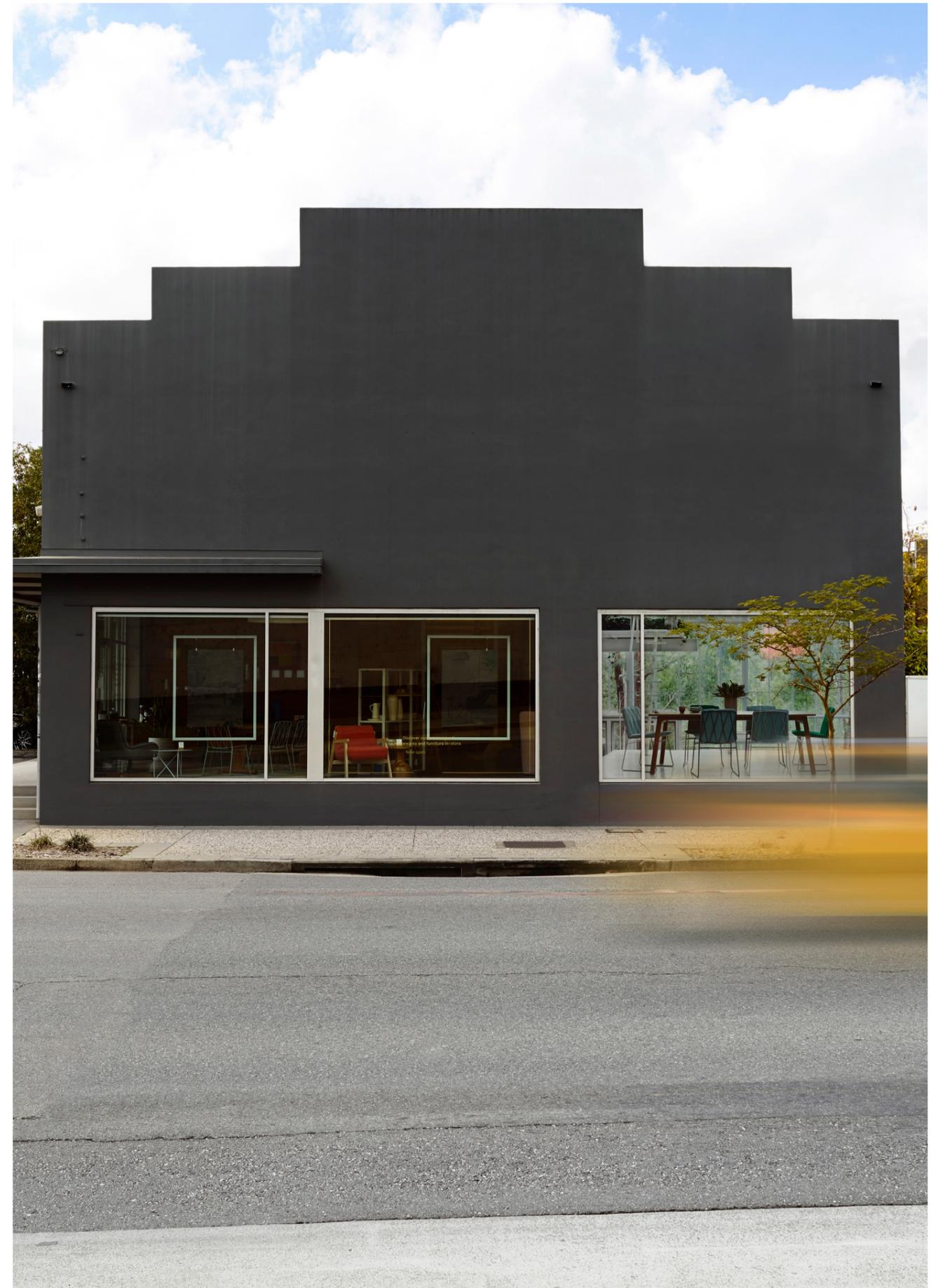
The distance of the Aerotropolis from labour pools (skilled, unskilled and executives) is acknowledged by industry and stakeholders as arguably the greatest challenge facing the viability of non-industrial employment uses in the Aerotropolis.

Whilst the Western City is witnessing solid growth in residents who are skilled workers, it is a reality that most C-suite executives reside in the more affluent areas of the Central and Eastern City Districts.

Businesses need access to all skill levels - from unskilled and skilled workers to executive positions. Opportunities for residential communities inside and outside the Aerotropolis will be important to establishing a resident population critical mass to 'feed' business access to required skills.

The permissibility of residential typologies in the Aerotropolis has important implications for how rapidly a critical mass of residents could develop. The progress and take-up of residential communities outside the Aerotropolis plays an equally important role for the formation of resident critical mass.

The potential for future residential development in the Aerotropolis to include affordable housing is expected to materialise upon the viability of higher density residential formats. The potential for an affordable housing contribution scheme in the Aerotropolis is to be examined in greater detail under separate cover.



## 2.4 IMPLICATIONS FOR PRECINCT PLANNING

The economic and market context of future land uses in the Aerotropolis is nuanced. Some land uses will immediately respond to the rezoning of land, other land uses have pre-requisite conditions before they are viable in a location.

It is important to highlight the likely land use opportunities that will exist within the Western Sydney Airport (on land owned by the Commonwealth). As the Western Sydney Airport site will include a business park it is conceivable they will compete to some extent with lands in the Aerotropolis for investment.

### Early Movers

Early movers are expected to include large format industrial and lower density residential uses. A laissez faire 'zone it and they will come' approach will conceivably be sufficient for these uses to invest.

Whilst early movers will play an important role in facilitating initial investment, it will be important that precinct planning allows large industrial uses to transition over time to accommodate more intensive activity and/ or densification of built form.

When uses become more intensive or buildings assume more dense formats, it will be important to ensure the road network can transition to be sufficiently fine grain and permeable.

As industrial uses intensify, there will be corresponding demand for locally based services (e.g. cafés, dry cleaning, etc.) and village nodes (outside of the main centres) may emerge over time. The importance of ensuring permeability in the internal road network cannot be understated.

### Followers

In contrast to early movers, land uses such as retail and hospitality, local and service commercial/ industrial, require trade catchments from which they can draw custom and operate viably.

Retail development will occur 'as of course' as local worker/ resident catchments in the Aerotropolis establish and grow.

Hospitality uses such as cafés, restaurants, pubs and hotels will be driven by a diverse trade catchment, requiring different sources of clientele (workers, residents, visitors and tourists) to be viable.

Service commercial (e.g. tax agents and local accountants, health and wellness clinics) and service industrial (e.g. garage and home alarm supplies, smash repairers, coffee roasters) require sufficient customer mass within commuting access.

As far as possible, retail, hospitality and service commercial uses should be allowed to cluster for viability.

### Incubators

Knowledge-based commercial and office uses generally have higher amenity expectations of retail and hospitality services. Consequently, not many businesses (unless of significant scale) are likely to want to be 'the first mover' in a commercial precinct. The IAO plays a critical role in mobilising investment from these uses.

It will be important for secured commercial investment to be co-located and clustered with future Metro stations to enable 'early seeding' of critical retail, hospitality and leisure facilities. Development and take-up of land use opportunities are self-perpetuating. The location of more businesses in a precinct will enable the provision of more local retail and business services, and therefore enabling development momentum to grow.

Realising the vision of the Agribusiness precinct will in particular require a curatorial and supportive approach. Precinct planning for various agribusiness uses should be cognisant of the different threshold capacities to pay for land. The analysis in section 2.3.1 affirms the importance of land cost considerations for spatial and precinct planning.

### The Role of Residential Communities

The resident population of the Western City exceeding 1 million residents provides the base critical mass for improving employment productivity. This is an important fundamental for the acceleration of employment in the Aerotropolis.

The role of local residents (not just within the Aerotropolis but in the region) to the employment function of the Aerotropolis should not be overlooked. Local residents from nearby catchment areas support viable retail and local services. Local residents also contribute to the labour pool from which businesses can hire and recruit.

Resident population catchments (inside and outside the Aerotropolis) will be essential to ensuring the viability of retail and hospitality uses in the initial years of the Aerotropolis. As the precincts develop and grow (from both a worker, resident and visitor perspective), demand for these uses will grow commensurate.

Quickly establishing a critical mass of residents in the Aerotropolis (and outside) will be crucial in providing the necessary catchment base for land uses that are 'followers', notably retail, hospitality and service commercial/ industrial. In the early years of the Aerotropolis, medium-density residential uses would be important in establishing this critical mass of residents.

The next Chapter considers the planning framework of the Aerotropolis and future employment and population densities being planned for in the coming decades.





# 3. PRECINCT PLANNING AND LAND USES

This Chapter reviews the planning framework that applies to the Study Area and the draft precinct plans developed. The chapter identifies issues for consideration in the Study Area and in particular those that are relevant to achieving planning aspirations.

## 3.1 PLANNING FRAMEWORK

The planning package for the Aerotropolis has been finalised and includes - the WSAP and finalisation report, Aerotropolis SEPP and Stage 1 of the Western Sydney Aerotropolis Development Control Plan 2020 (the DCP).

The WSAP defines the Aerotropolis as 10 precincts with six initial precincts and give the focus of precinct planning, including Mamre Road, Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek, Northern Gateway and Agribusiness Precinct. These initial precincts are detailed below.

### Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek

The Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek precincts forms the eastern boundary of the Western Sydney Airport, extending from Bringelly Road and The Northern Road in the south/south-west, South Creek to the east and Elizabeth Drive/South Creek in the north.

### Northern Gateway

The Northern Gateway encompasses the northernmost section of the Aerotropolis immediately north of the Western Sydney Airport and Elizabeth Drive and is broadly bounded by the North Luddenham precinct to the west, the Warragamba pipeline in the north and the Twin Creeks Golf Course in the east. The proposed Sydney Science Park is located within the Northern Gateway precinct.

### Agribusiness Precinct

The Agribusiness Precinct forms the western edge of the Aerotropolis. The precinct is bounded by the Outer Sydney Orbital corridor to the west, the Dwyer Road precinct in the south, the Western Sydney Airport immediately east and the Northern Gateway and North Luddenham precincts to the north. The Northern Road bisects the precinct with the existing Luddenham Village located within its north-western corner.

The WSAP outlines distinct visions for each of the initial precincts, including the envisaged quantum and type of employment and housing (if any) being planned. The land use zones for each precinct have been designated with these visions in mind.

The Mamre Road precinct while falling within the Aerotropolis is subject to a different planning instrument State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP).

### Land Use Zones

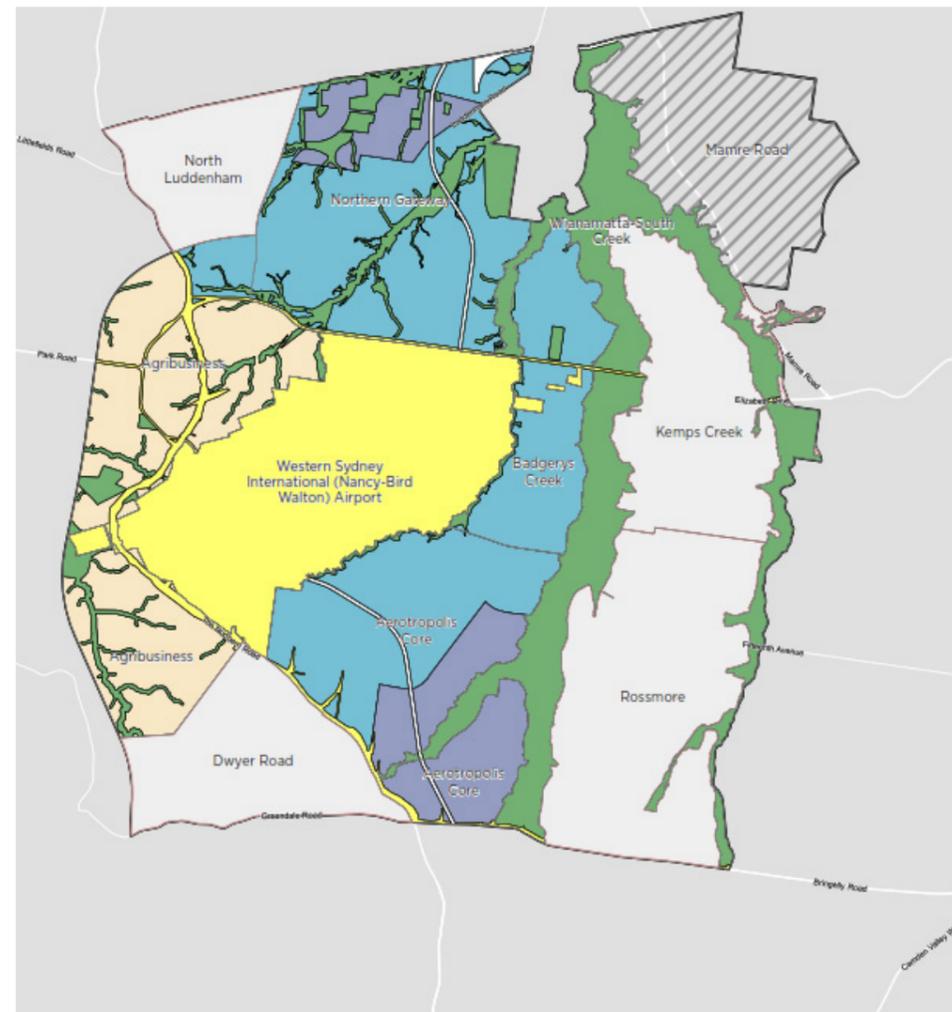
The WSAP outlines the structure and distribution of land uses across the Aerotropolis. The four land use zones are:

- Mixed Use;
- Enterprise
- Agribusiness; and
- Environment and Recreation.

These land uses are unique having not been previously defined in the NSW planning system (i.e. Agribusiness) or have a greater range of permitted uses to comparable zones under existing local planning instruments.

Figure 3.1 illustrates the 10 defined precincts of the Aerotropolis and the spatial distribution of land use zones as per the WSAP.

Figure 3.1: Land Use Zones (Western Sydney Aerotropolis Plan), Aerotropolis



Source: WSPP (2020a)

As observed from Figure 3.1, the initial precincts comprise a mix of land use zones. The objectives of these zones are diverse and their application to individual precincts is complemented by individual precinct visions.

- **Enterprise zone** permits land uses complementary to the city and the WSA as a 24-hour transport hub. It will support a range of commercial and industrial uses as well as a mix of retail and educational uses. Residential uses are not permitted.
- **Mixed Use zone** enables delivery of employment and higher density residential uses. The zone will apply to local centres and include a mix of commercial uses including retail, office medical and social services and places of entertainment. The zone will be applied to ensure residential land uses are located outside the ANEC contours.
- **Agribusiness zone** applies in the Agribusiness precinct on the western edge of the Airport to support long-term retention of existing agricultural lands and the growth of new agriculture and agribusiness opportunities. Residential uses are generally not permitted in the Agribusiness zone.
- **Environment and Recreation zone** will be applied to Wianamatta-South Creek precinct to protect key landscape features and high value areas to achieve amenity, recreation and liveability outcomes.

### Permitted Uses

The Aerotropolis SEPP nominates prohibited uses; permissible uses are those that 'achieve the objectives of the zone' with individual precinct plans to identify the location of specific land uses. This approach to permitted uses is intended to mitigate the 'crowding out' of desirable land uses by more financially valuable uses.

Accordingly, land use permissibility in each zone will be guided by the Aerotropolis SEPP (which outlines prohibited uses) and development control plans (DCPs) for each precinct (which will outline the preferred location of specific land uses). Precinct plans for the initial precincts are currently being finalised and are summarised in next section.

### 3.2 STUDY AREA PRECINCTS

The Study Area comprises the initial precincts of the Aerotropolis – Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek, Northern Gateway and the Agribusiness Precinct. These precincts immediately adjoin the Western Sydney Airport and are set to benefit from new transport infrastructure, including two new Metro Stations as part of WSA Metro.

#### Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek

The Aerotropolis Core and Badgerys Creek are the largest precincts in the Aerotropolis - accounting for some 1,382ha and 612ha of gross land area respectively.

The Aerotropolis Core is envisaged to form the metropolitan centre of the Aerotropolis, accommodating a diverse range of employment with a focus on advanced manufacturing, defence and aerospace, research and development (R&D) and industry led educational facilities. As a Metropolitan Centre, the Aerotropolis Core will over time develop a significant retail and services offering with a mix of high-density residential uses.

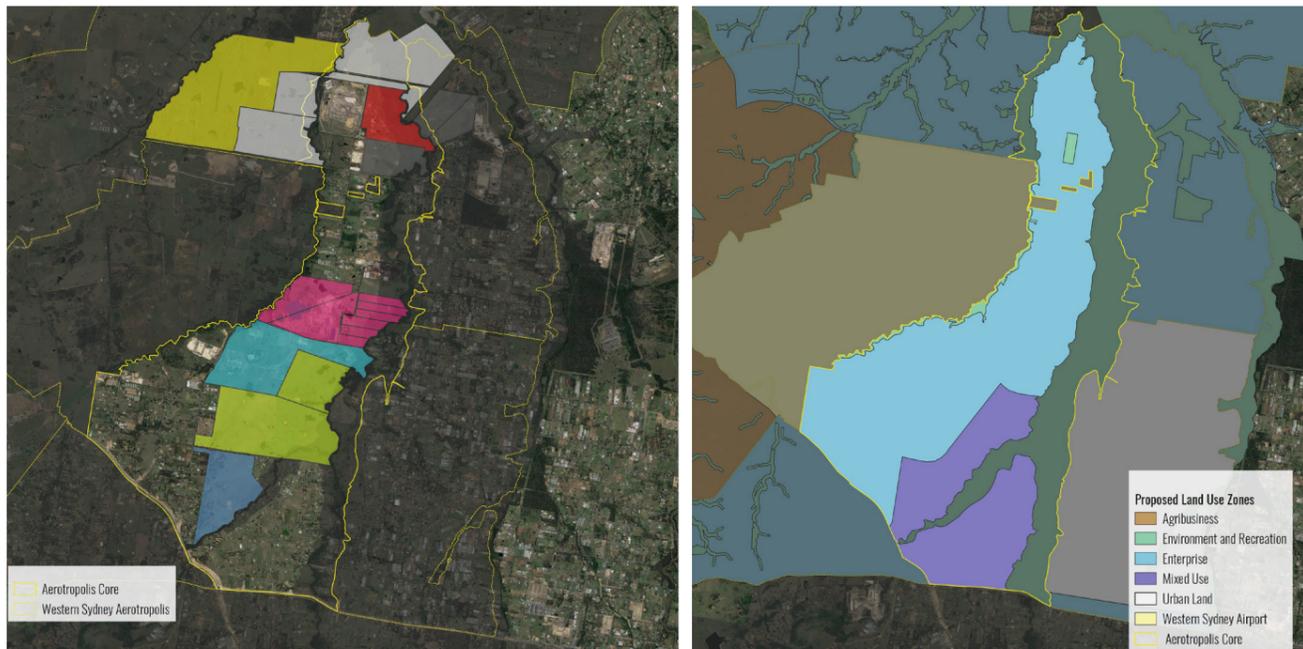
The precinct is mostly zoned Enterprise, with a Mixed Use zone situated in the south around the future Metro station.

The adjoining Badgerys Creek precinct is situated immediately east of the Western Sydney Airport and north of the Aerotropolis Core. The precinct is expected to primarily play an industrial and employment focused role, with uses such as defence and aerospace and manufacturing encouraged. The Enterprise zone applies to the entirety of the precinct.

The Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek precincts are highly fragmented - there are some 612 allotments across the three precincts with a median lot size of just over 2ha. There are seven major landowners across the precincts who control some 1,688ha of gross land area with sites ranging from 114ha to 340ha.

**Figure 3.2** depicts the precinct boundaries of the Aerotropolis Core, major land ownership patterns and the spatial distribution of land uses as per the WSAP.

**Figure 3.2: Precinct Boundaries, Major Landowners and Land Use Zones, Aerotropolis Core and Badgerys Creek**



Source: WSPP (2020a)

### 3.2.2 NORTHERN GATEWAY

The Northern Gateway precinct is located to the north of the Western Sydney Airport and totals 1,616ha of gross land area.

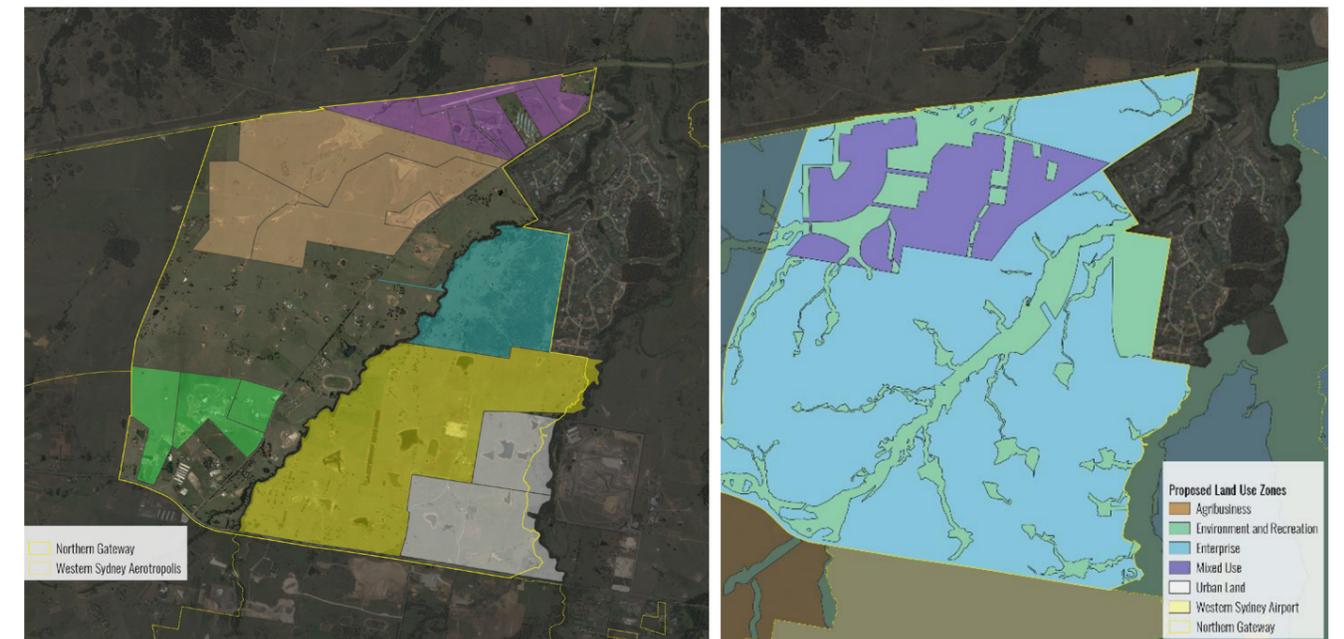
The Northern Gateway will serve as the second primary centre within the Aerotropolis Core, playing a supporting role to the Aerotropolis Core. The precinct encompasses the approved Sydney Science Park which is proposed for a mix of employment and industry with a focus on health and education, warehousing and logistics and R&D. The precinct is also set to benefit from the proposed Luddenham Metro station which will be located within the precinct, linking St Marys to the WSA.

The precinct is predominantly zoned Enterprise, with a Mixed Use zone situated in the north around the Sydney Science Park and future metro station.

The Northern Gateway is less fragmented compared to the Aerotropolis Core with just 72 allotments and a median lot size of just over 10ha. There are six major landowners across the precinct who control around 1,100ha of gross land - sites ranging from 90ha to 343ha in gross land area.

**Figure 3.3** illustrates the precinct boundaries of the Northern Gateway, major land ownership patterns and the spatial distribution of proposed land uses as per the WSAP.

**Figure 3.3: Precinct Boundaries, Major Landowners and Land Use Zones, Northern Gateway**



Source: WSPP (2020a)

### 3.2.3 AGRIBUSINESS PRECINCT

The Agribusiness Precinct is situated immediately west of the WSA and comprises some 1,384ha of gross land area. The precinct encompasses the existing Luddenham Village along with surrounding rural and agricultural land.

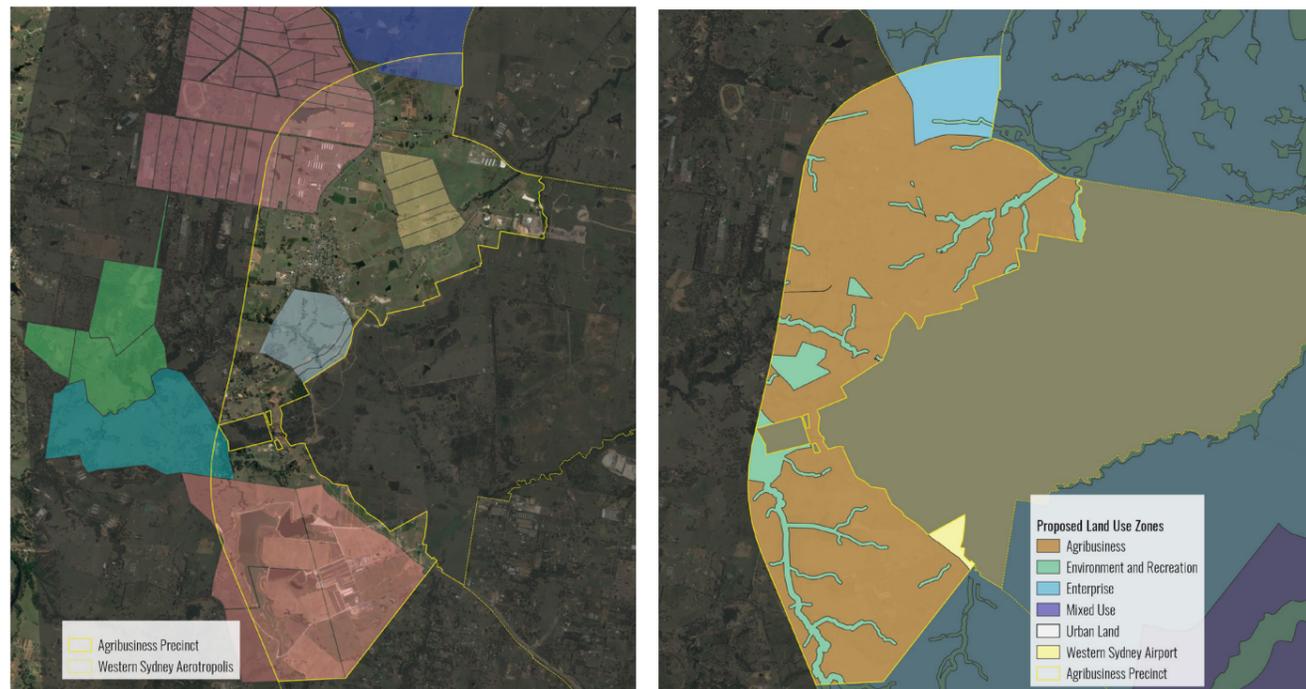
The Agribusiness Precinct is envisaged to support agricultural uses which will underpin the emergence of agribusiness uses in the Aerotropolis. Access to the 24/7 operations of the WSA will provide access to global supply chain networks. The precinct is envisaged to accommodate a wide variety of agribusiness uses, such as high tech agriculture, food processing, pharmaceutical manufacturing, integrated logistics, fresh food wholesaling and retailing and research and development.

The Agribusiness Precinct is to be primarily zoned Agribusiness with a small pocket zoned Enterprise in the north. Beyond existing housing that is present, residential land uses are not permitted.

The Agribusiness Precinct is characterised by a mix large rural lots and smaller, denser lots within the Luddenham Village. There are some 359 allotments and a median lot size of 0.2ha (though there are numerous lots in excess of 8ha). There are under a dozen major landowners within the precinct who control over 2,000ha of gross land area, with sites ranging from 82ha to over 600ha in gross land area.

Figure 3.4 shows the precinct boundaries of the Agribusiness Precinct, major land ownership patterns and the spatial distribution of land uses as per the WSAP.

Figure 3.4: Precinct Boundaries, Major Landowners and Land Use Zones, Agribusiness Precinct



Source: WSPP (2020a)

### 3.3 AEROTROPOLIS CORE AND BADGERYS CREEK

Precinct planning for the Aerotropolis Core and Badgerys Creek precincts takes a 'hub and spoke' approach to land use and development, with a major centre supported by several ancillary centres/nodes. A primary centre is envisioned in the Mixed Use zone around the future Aerotropolis metro station. Numerous smaller 'Employment Zone Centres' are envisaged throughout the Study Area in a hierarchy of centres to accommodate demand for local services from future employment uses.

The Wianamatta-South Creek precinct forms the eastern boundary of the Aerotropolis Core and Badgerys Creek precinct and will include a major regional park and source of significant amenity.

The role of Badgerys Creek Road as the primary connector road between Elizabeth Drive and The Northern Road is to be strengthened, forming the spine of the precinct. Land alongside this future arterial road corridor is to be zoned for employment uses, aligning with the Enterprise zoning.

The draft Precinct Plan includes sub-precincts to represent future land uses including Mixed Use Centres, Employment Centres, Business and Enterprise, Mixed Use Residential, Enterprise and Light Industry, Education and Special Uses.

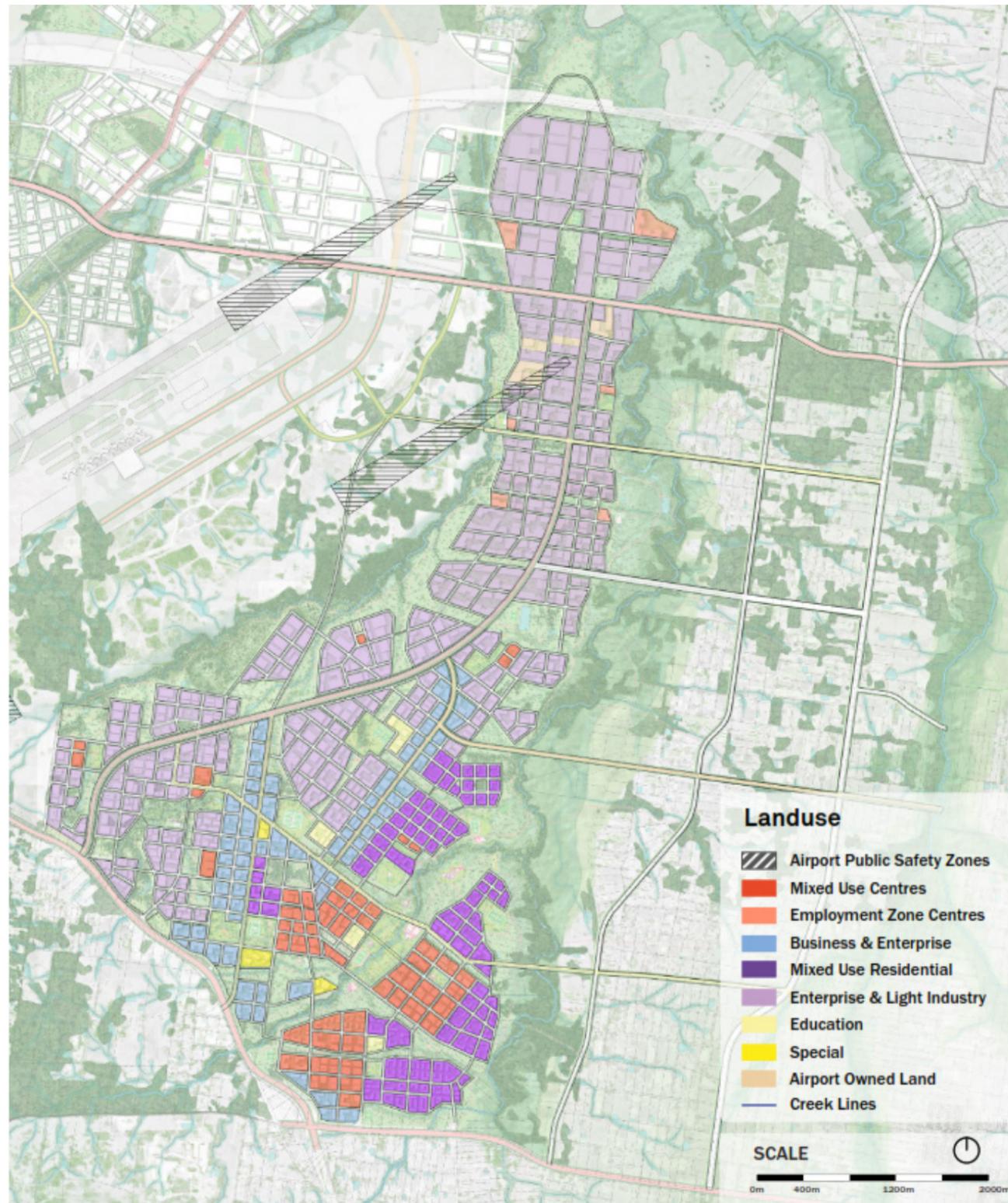
- Land uses in the **Mixed Use Centre** immediately surrounding the new Aerotropolis metro station is expected to be the most dense, accommodating a mix of high rise office buildings, shop top housing and retail uses.
- The **Employment Centres** precinct will be more focused on retail and commercial uses – namely mid-rise commercial buildings and ground floor retail.
- The **Mixed Use Residential** precinct will permit a range of medium and high rise shop top housing and residential flat buildings. Residential-only developments will be permitted subject to the achievement of 2036 employment targets.
- The **Business and Enterprise** precinct will be a commercial precinct with a primary focus on mid-rise office buildings.
- The **Enterprise and Light Industry** precinct will focus on low density industrial typologies (warehouses, industrial parks).

Figure 3.5 illustrates the draft Precinct Plan for the Aerotropolis Core and Badgerys Creek precincts.

A significant portion of land in both the Aerotropolis Core and Badgerys Creek precincts is unable to be developed in the given environmental and physical constraints. Some 37% of gross land area in the Aerotropolis Core and 26% in the Badgerys Creek precinct is identified for local roads and public open space.

The lot developable area of the Aerotropolis Core and Badgerys Creek precincts is 872ha and 452ha respectively.

Figure 3.5: Draft Precinct Plan (Land Use), Aerotropolis Core and Badgerys Creek



Source: Hassell

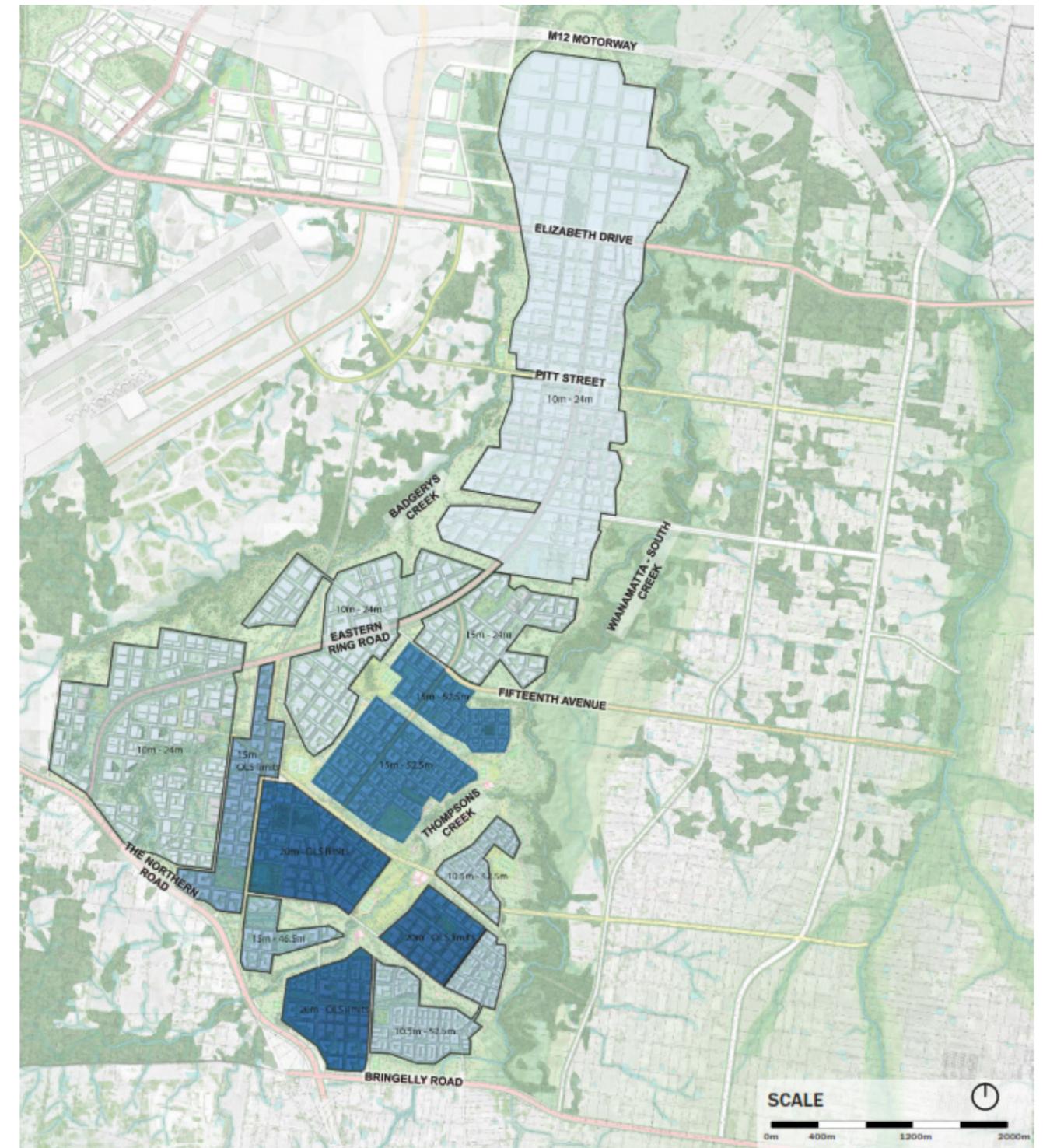
### Proposed Density Controls

Development density in the Aerotropolis Core and Badgerys Creek precincts is to be guided by both height controls and floor space ratios (FSRs). Greatest densities are expected in the Mixed Use Centre precinct immediately around the metro station.

FSRs are only intended to apply to the Mixed Use zone with a height control the primary control in the Enterprise zone.

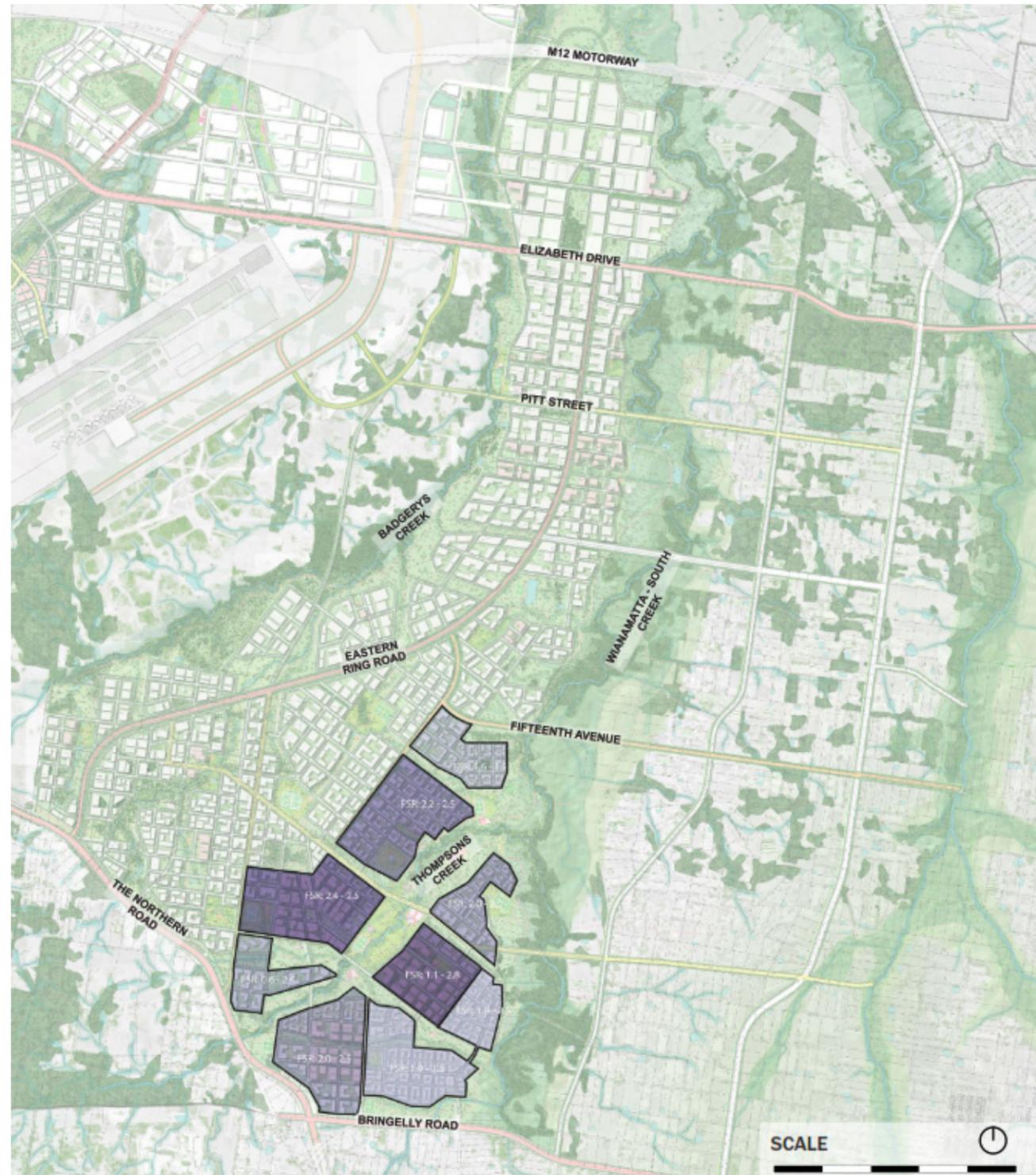
Figure 3.6 and Figure 3.7 illustrate the proposed height of building and FSR controls to apply to the Aerotropolis Core and Badgerys Creek precincts.

Figure 3.6: Maximum Height of Building Controls, Aerotropolis Core and Badgerys Creek



Source: Hassell (September 2020)

Figure 3.7: Floor Space Ratio Controls, Aerotropolis Core



Source: Hassell (September 2020)

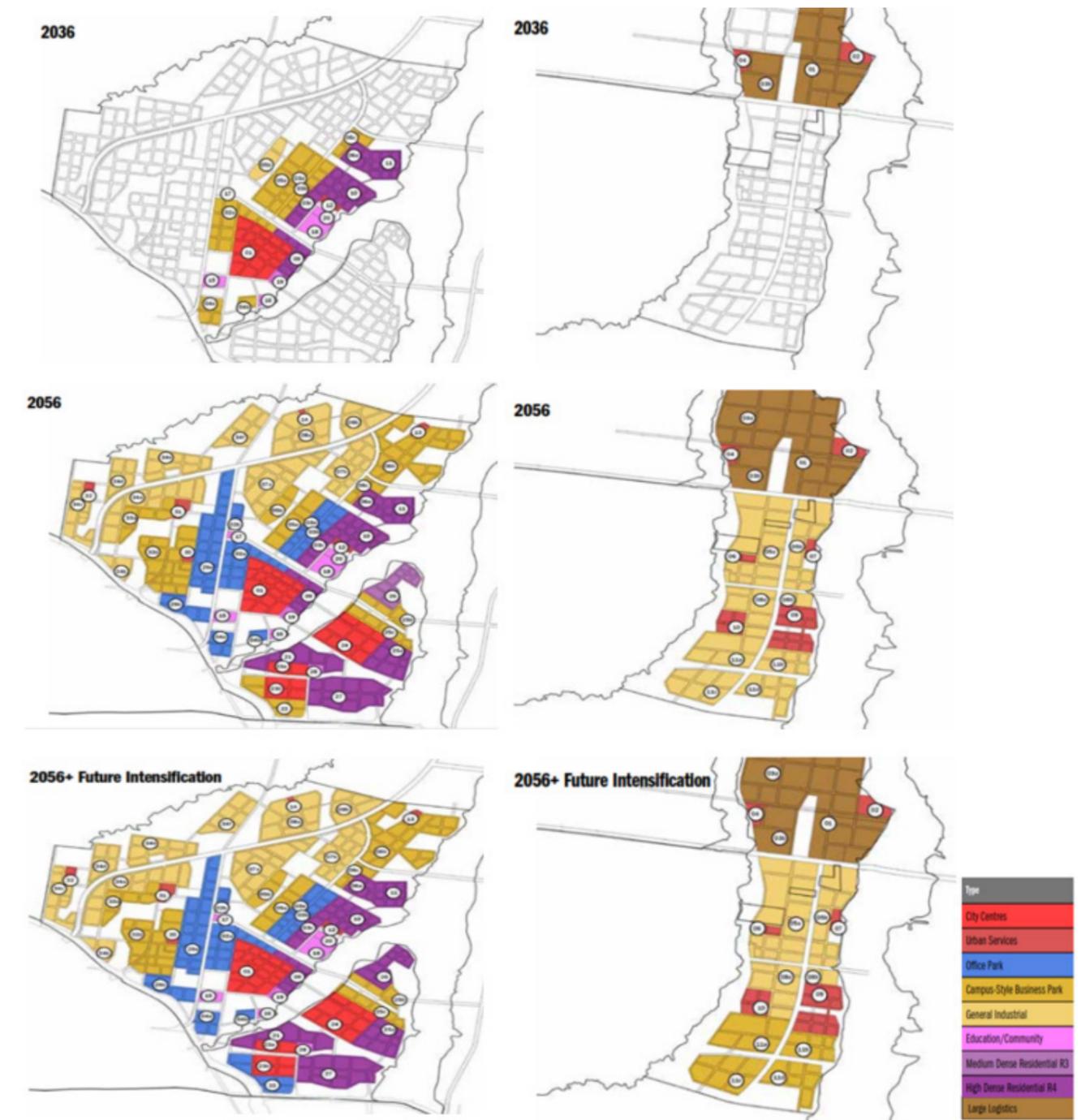
### Employment and Population Densities

The draft Precinct Plan anticipates that the intensity of development and land use across the Aerotropolis Core and Badgerys Creek precincts will grow as the Aerotropolis establishes a market profile.

In 2036, average employment yield capacity in the Aerotropolis Core is anticipated to equate to just under 15 jobs/ha and thereafter increasing to just under 60 jobs/ha by 2056. Expectedly, a lower average employment yield capacity is expected in Badgerys Creek – 5 jobs/ha in 2036 and up to 22 jobs/ha in 2056.

The expected employment and population densities expected across the Aerotropolis Core and Badgerys Creek precincts over the 2036, 2056 and 2056+ periods are illustrated and outlined in **Figure 3.8** and **Table 3.1**.

Figure 3.8: Land Use Mix and Distribution (2036, 2056, 2056+), Aerotropolis Core and Badgerys Creek



Source: Hassell

Table 3.1: Employment and Population Density Capacities (2036, 2056, 2056+), Aerotropolis Core and Badgerys Creek

Sub-Precinct	Area (ha)*	Employment Density (Jobs/ha)			Population Density (Persons/ha)		
		2036	2056	2056+	2036	2056	2056+
<b>Aerotropolis Core</b>							
1	40	130	150	300	-	-	-
02a	25	75	130	190	-	-	-
02b	5	-	130	190	-	-	-
03a	11	75	130	190	-	-	-
03b	15	75	130	190	-	-	-
03c	19	-	-	-	150	150	150
04a	9	75	130	190	-	-	-
04b	4	75	130	190	-	-	-
05a	20	75	75	100	-	-	-
05b	10	25	75	100	-	-	-
06a	9	-	-	-	150	150	150
06b	53	-	75	100	-	-	-
06c	7	75	75	100	-	-	-
07a	42	-	25	30	-	-	-
07b	29	-	25	30	-	-	-
08a	36	-	25	30	-	-	-
08b	19	-	25	30	-	-	-
9	12	-	-	-	150	150	150
10	13	-	-	-	150	150	150
11	14	-	-	-	150	150	150
12	2	25	25	25	-	-	-
13	3	-	25	25	-	-	-
14	2	-	25	25	-	-	-
15	4	30	30	30	-	-	-
16	2	30	30	30	-	-	-
17	1	30	30	30	-	-	-
18	8	5	5	5	-	-	-
19	3	30	30	30	-	-	-
20	3	-	-	-	150	150	150
21	24	-	-	-	-	150	150
22	16	-	75	190	-	-	-
23a	7	-	130	200	-	-	-
23b	15	-	130	200	-	-	-
24	33	-	130	200	-	-	-
25a	21	-	-	-	-	150	150
25b	10	-	75	100	-	-	-
25c	14	-	75	100	-	-	-

Sub-Precinct	Area (ha)*	Employment Density (Jobs/ha)			Population Density (Persons/ha)		
		2036	2056	2056+	2036	2056	2056+
<b>Aerotropolis Core</b>							
26	19	-	-	-	-	85	85
27	38	-	-	-	-	150	150
28	3	-	30	30	-	-	-
29a	42	-	130	150	-	-	-
29b	13	-	130	150	-	-	-
30	2	-	25	25	-	-	-
31	5	-	25	25	-	-	-
32	3	-	25	25	-	-	-
33a	17	-	75	100	-	-	-
33b	46	-	75	100	-	-	-
34a	37	-	25	25	-	-	-
34b	8	-	25	25	-	-	-
34c	19	-	25	25	-	-	-
34d	15	-	25	25	-	-	-
34e	24	-	25	25	-	-	-
34f	21	-	25	25	-	-	-
<b>Sub-total</b>	<b>872</b>	<b>15</b>	<b>58</b>	<b>84</b>	<b>12</b>	<b>28</b>	<b>28</b>
<b>Badgerys Creek</b>							
1	84	18	18	25	-	-	-
2	6	25	25	35	-	-	-
03a	67	-	18	25	-	-	-
03b	23	18	18	25	-	-	-
4	4	25	25	35	-	-	-
05a	67	25	25	30	-	-	-
05b	34	25	25	30	-	-	-
6	3	25	25	35	-	-	-
7	3	25	25	35	-	-	-
08a	26	25	25	30	-	-	-
08b	6	25	25	30	-	-	-
9	24	-	25	35	-	-	-
10	9	-	25	35	-	-	-
11a	30	-	25	75	-	-	-
11b	17	-	25	75	-	-	-
11c	28	-	25	75	-	-	-
11d	21	-	25	75	-	-	-
<b>Sub-total</b>	<b>452</b>	<b>5</b>	<b>22</b>	<b>38</b>	<b>-</b>	<b>-</b>	<b>-</b>

Source: Hassell

## Issues for Consideration

The following key issues are pertinent for consideration in the Aerotropolis Core and Badgerys Creek precincts.

### • The flexibility of the Mixed Use zone

Permissible uses (by virtue of a range of prohibited uses) in the Aerotropolis SEPP necessitates development control guidance that designates how residential and non-residential uses are to be distributed in the zone. It will be important that the Precinct Plans clearly define the envisaged distribution of land use and development.

The experience of mixed use CBDs (such as Chatswood and parts of Sydney CBD) shows the need to provide adequate separation of residential and commercial uses. Inadequate separation could lead to land use conflicts (e.g. views of laundry drying on residential balconies) that undermine the corporate image and prestige of a commercial centre.

Additionally, while active street fronts are important, it is equally important to ensure activity is focused in key nodes. Requiring non-residential ground floor uses throughout the Mixed Use zone could result in vacant shopfronts, especially when the resident population is insufficient to support large scale ground plane activity.

### • The importance of facilitating residential uses

Medium density typologies will be the 'early residential movers' compared to higher density residential formats. They will play an important role to 'seed' an early resident community in the Aerotropolis. It would be prudent to have regard to lot and ownership patterns as the viability of residential communities is underpinned by the ability to deliver at scale.

The draft Precinct Plan notes that residential-only development will only be permitted once 50% of the 2036 Mixed Use employment target has been achieved. Planning controls which effectively 'cap' forms of development have historically been implemented across other parts of Greater Sydney to effect land use change. Such controls can produce both positive and perverse economic outcomes.

In a greenfield precinct such as the Aerotropolis, establishing a resident population early will be vital. These residents are critical to supporting retail and local services.

Medium density residential typologies on the fringe of the Mixed Use zone would assist to establish a local resident population in the early years, particularly before higher density formats are viable.

### • Strategic placement of early investment

Early business investment in new development secured by the IAO should be strategically placed in the precinct to enable the clustering of occupiers and business/ retail services alike.

### • Development capacity

The capacity for employment in the Aerotropolis Core is expected to be taken-up over the longer term. At 130 jobs/ha by 2036 in the area immediately adjacent the new metro station, the station precinct would resemble the employment density of the Liverpool CBD or Macquarie Park. Neighbouring sub-precincts (at densities of 75 jobs/ha) would resemble observed densities in Marrickville and South Sydney.

An increase to the envisaged 300 jobs/ha by 2056 will see the station precinct resemble employment densities observed in the Parramatta CBD.

In Badgerys Creek, the draft Precinct Plan anticipates a jobs capacity of 18-25 jobs/ha in 2036, increasing to 25-75 jobs/ha in the years after 2056. This would replicate the natural intensification of uses observed in South Sydney.

The Mixed Use zone is designed and intended to be flexible, however could yield unintended outcomes unless appropriate development control guidance is provided. Floorspace or yield trigger mechanisms could be considered to incentivise and 'balance' uses within the zone.

The viability of service based centres throughout the Enterprise zone will increase over time as employment uses intensive and there are a greater number of workers within the catchment.

When well-designed and delivered, residential uses at the ground plane can enhance mixed use communities. Examples such as Central Park (Chippendale) and Harold Park (Forest Lodge) are representative of such outcomes.

## 3.4 NORTHERN GATEWAY

Similar to the Aerotropolis Core, precinct planning for the Northern Gateway has focused on development of a large centre with a number of smaller centres dispersed throughout the precinct.

The Northern Gateway is impacted by several major infrastructure corridors. The precinct is bisected east-west by the future M12 Motorway, whilst the future metro rail corridor traverses north-south through the centre of the precinct. Luddenham Road is to serve as the primary spine of the precinct, providing a north-south connection and linking within the M12 Motorway and Elizabeth Drive.

An extensive open space network is proposed throughout the Precinct, providing a high level of green amenity whilst responding to significant environmental constraints (mainly flooding).

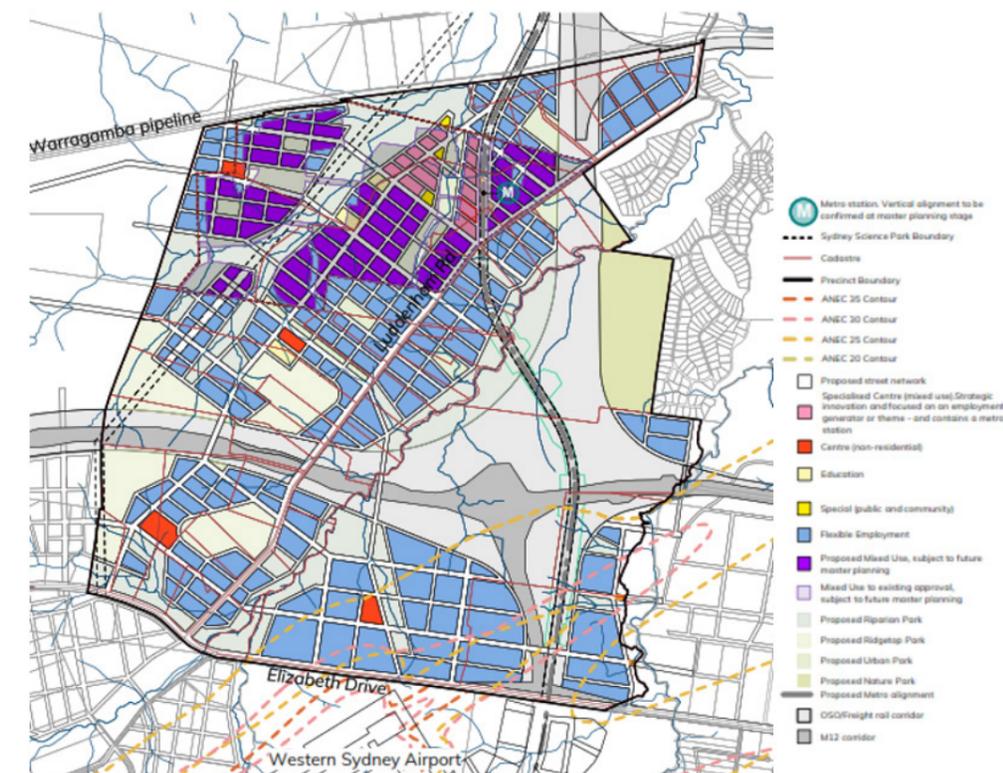
The Northern Gateway's major centre is to be focused around the future Luddenham Metro station and proposed Sydney Science Park. A smaller centre (also located within the Sydney Science Park precinct) is envisaged in the north-western corner, whilst three smaller centres are proposed in the southern area of the precinct within the Enterprise zone.

Three sub-precincts are envisaged in the Northern Gateway that align with the Mixed Use and Enterprise zonings:

- A Specialised Centre precinct with a focus on higher density employment (i.e. office typologies) and innovation uses focused around the new metro station.
- A Mixed Use precinct to the west of the metro station with a mix of shop top housing and residential flat buildings.
- A Flexible Employment precinct to the majority of the Northern Gateway precinct, accommodating a mix of large format warehousing, industrial parks and low-rise office buildings.
- Four smaller Centre precincts to play a complimentary, local-service role to the mixed-use precinct and the employment areas dispersed throughout.

Figure 3.9 illustrates the draft Precinct Plan for the Northern Gateway.

Figure 3.9: Draft Precinct Plan (Land Use), Northern Gateway



Source: Hill Thalix

A significant portion of land area in the precinct is not developable due to a variety of physical and environmental constraints. Some 57% of gross land area is identified as required for roads and public open space, with the lot developable area of the precinct approximately 705ha.

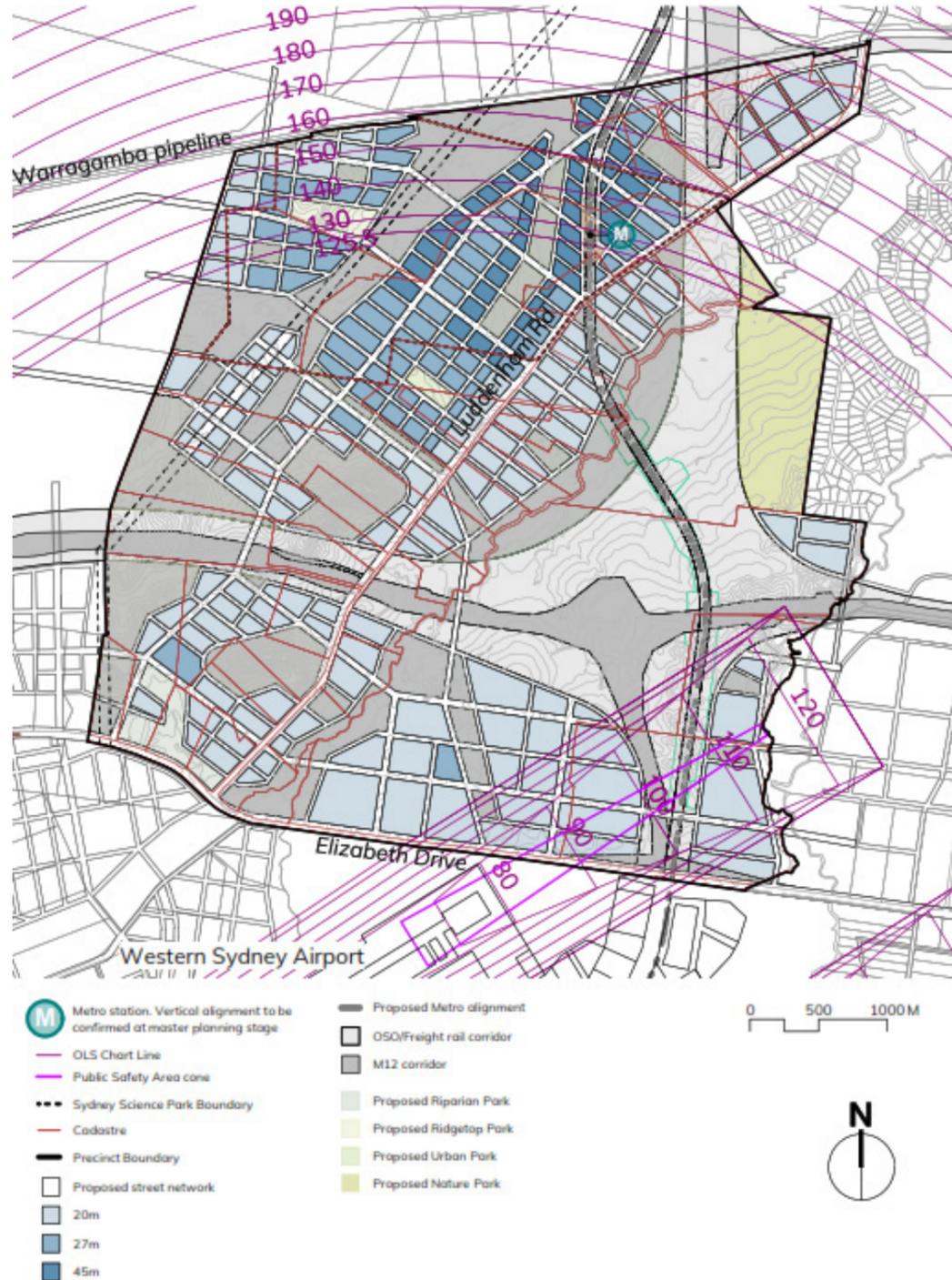
### Proposed Density Controls

Both building height and FSR controls are to guide development in the Northern Gateway. Expectedly, the greatest densities are expected in the Centre precinct and focused around the future metro station. FSR controls are only intended to apply to the Mixed Use zone with a height control the primary control in the Enterprise zone.

The Northern Gateway is heavily impacted by the Obstacle Limitation Surface (OLS) height limits associated with the neighbouring WSA. In some parts of the precinct, the OLS is lower than the proposed height control in the precinct plan.

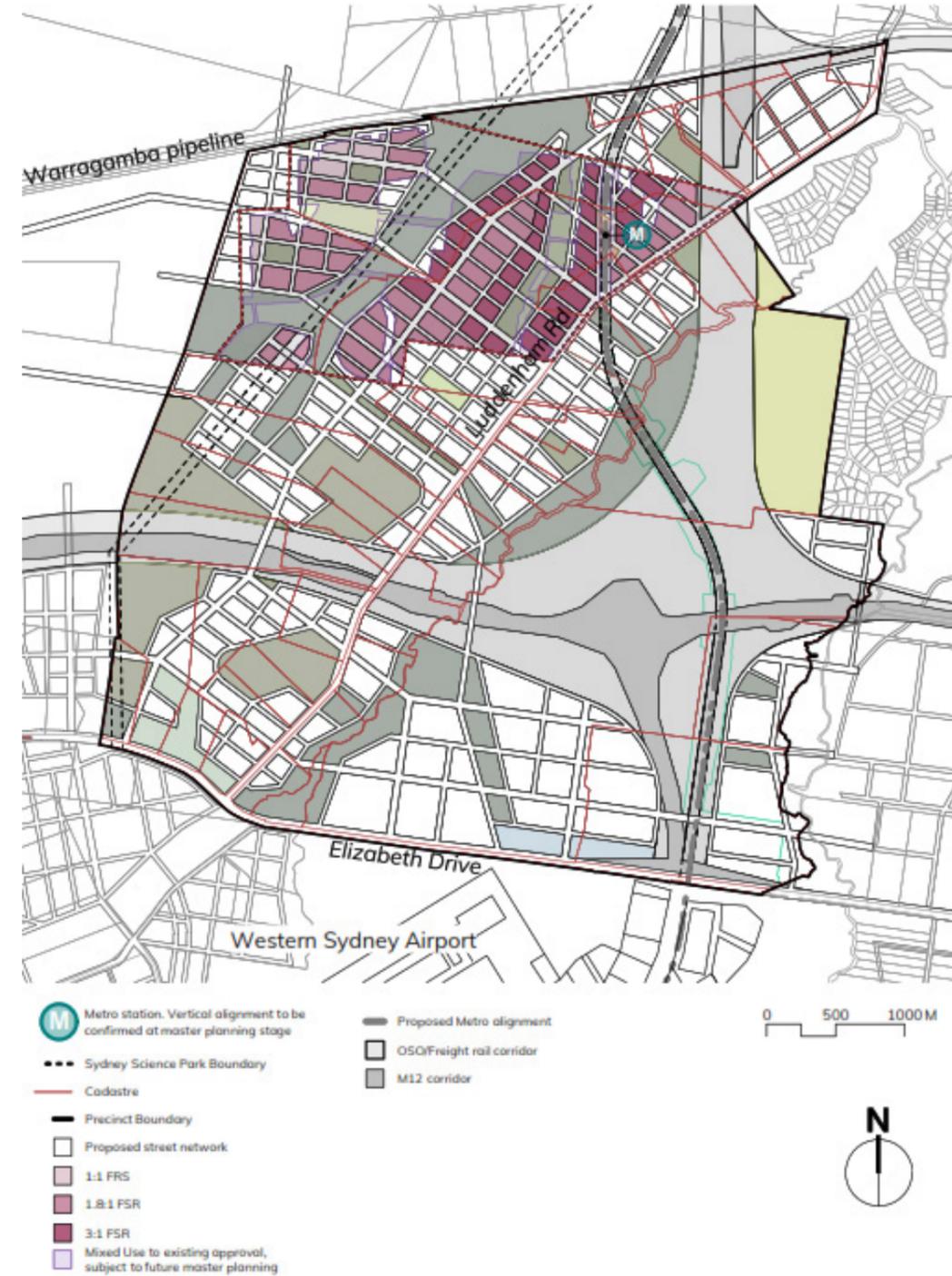
Figure 3.10 and Figure 3.11 illustrate the proposed height of building and FSR controls to apply in the Northern Gateway.

Figure 3.10: Maximum Height of Building Controls, Northern Gateway



Source: Hill Thalys (October 2020)

Figure 3.11: Floor Space Ratio Controls, Northern Gateway



Source: Hill Thalys (October 2020)

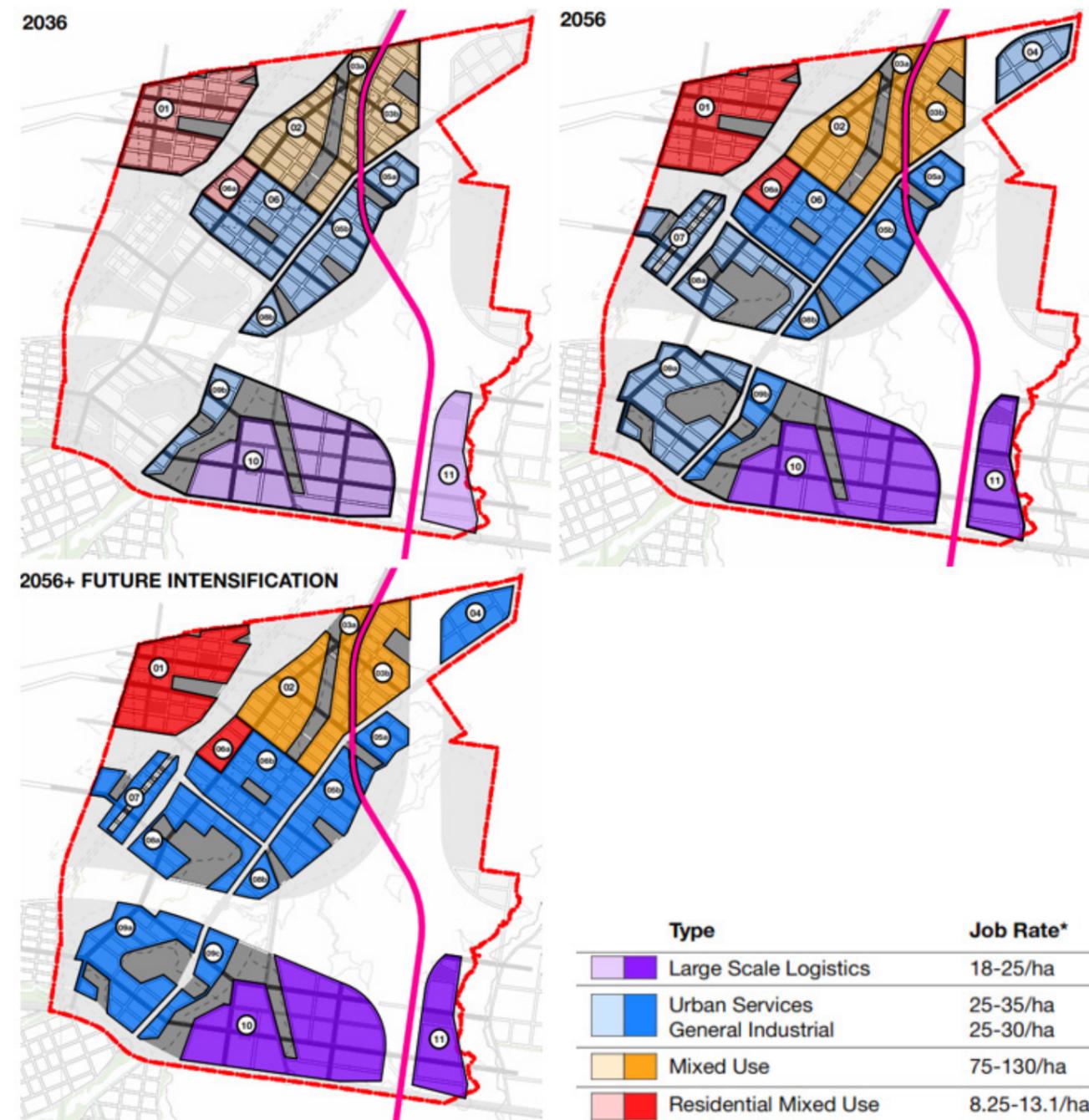
### Employment and Population Densities

Similar to the Aerotropolis Core, the draft Precinct Plan anticipates that development and land use in the Northern Gateway will intensify as the market grows and matures.

In 2036, average employment yield capacity in the Northern Gateway is anticipated to equate to around 21 jobs/ha and rise to just under 30 jobs/ha by 2056.

The envisaged employment and population densities for the Northern Gateway precinct over the 2036, 2056 and 2056+ periods are illustrated and outlined in **Figure 3.12** and **Table 3.2**.

**Figure 3.12: Land Use Mix, Density and Distribution (2036, 2056, 2056+), Northern Gateway**



Source: Hill Thalys

**Table 3.2: Employment and Population Density Capacities (2036, 2056, 2056+), Northern Gateway**

Sub-Precinct	Area (ha)*	Employment Density (Jobs/ha)			Population Density (Persons/ha)		
		2036	2056	2056+	2036	2056	2056+
1	78	8.25	8.25	13.1	75	85	85
2	46	75	100	150	150	150	150
03a	30	75	100	150	150	150	150
03b	40	75	100	150	150	150	150
4	26		30	35		-	-
05a	18	25	30	35	-	-	-
05b	45	25	30	35	-	-	-
06a	13	8.25	8.25	13.1	75	85	85
06b	60	25	30	35	-	-	-
7	26	-	30	35	-	-	-
08a	40	-	30	35	-	-	-
08b	10	25	30	35	-	-	-
09a	67	-	30	35			
09c	21	25	30	35			
10	140	18	18	25			
11	45	18	18	25			
<b>Total</b>	<b>705</b>	<b>21</b>	<b>27</b>	<b>36</b>	<b>15</b>	<b>23</b>	<b>23</b>

\*Lot developable area is the area identified capable for development excluding local roads and public open space  
Source: Hill Thalys

### Issues for Consideration

The draft Precinct Plan anticipates employment densities to increase over time as economic activity becomes more intensive. In the years to 2036, commercial development in the Specialised Centre precinct around the new metro station is expected to accommodate employment at 75 jobs/ha. This is equivalent to employment densities observed in Norwest and Bella Vista and are considered a reasonable expectation for employment growth over the coming decades.

In the Flexible Employment precincts, industrial development is expected to accommodate employment densities in the order of 25 jobs/ha – akin to other industrial precincts across Western Sydney.

At 150 jobs/ha (at build-out), the Specialised Centre precinct would resemble the employment density of Macquarie Park or the Liverpool CBD. The Flexible Employment precincts (at densities of 25-35 jobs/ha) would resemble observed densities in Rydalmere and Auburn.

Echoing earlier comments on the Aerotropolis Core, the flexibility of the Mixed Use zone and limitations on residential development will need to be carefully considered. The viability of service based centres throughout the Enterprise zone will increase over time as employment uses intensify and there are a greater number of workers within the catchment.

When uses become more intensive or buildings assume more dense formats, it will be important to ensure the road network can transition to be sufficiently fine grain and importantly, permeable. As industrial uses intensify, there will be corresponding demand for locally based services (e.g. cafés, dry cleaning, etc.) and village nodes (outside of the main centres) may emerge over time.

### 3.5 AGRIBUSINESS

The Agribusiness precinct is mostly zoned Agribusiness with a small pocket of Enterprise in the northernmost portion of the precinct. The broad range of uses sought in the Agribusiness zone is hoped to catalyse and investment in industries such as high-tech agriculture, food processing, pharmaceutical manufacturing, integrated logistics, fresh food wholesaling and retailing and research and development.

The Northern Road serves as the central spine of the Agribusiness precinct with the future Outer Sydney Orbital serving as the precincts western border. The Precinct Plan envisages three major parks (Cosgrove Creek Park, Luddenham Agri-Park and Duncan's Lake) across the precinct given existing topographical/environmental constraints and to build upon significant view corridors to the east and west.

Whilst the Agribusiness zone is expected to apply to the majority of the precinct, certain pockets are expected to accommodate smaller service-based centres. Three such centres are observed in the north (adjacent the Enterprise zoned pocket of land), in the east and the in the south.

The future vision, role and function of Luddenham Village is to be explored further during the precinct planning process. This will include detailed investigation of the potential for certain land uses that are sympathetic to the character and heritage values of the village. In the interim, the SEPP will permit development that would otherwise be prohibited in the Agribusiness to be carried out if it was permissible under the existing Penrith LEP (2015).

A significant portion of gross land area in the precinct is unable to be developed given environmental and infrastructure constraints. Some 47% of gross land area in the precinct is identified as required for public open space, parkland and roads. The lot developable area of the Agribusiness Precinct is identified as in the order of 737ha.

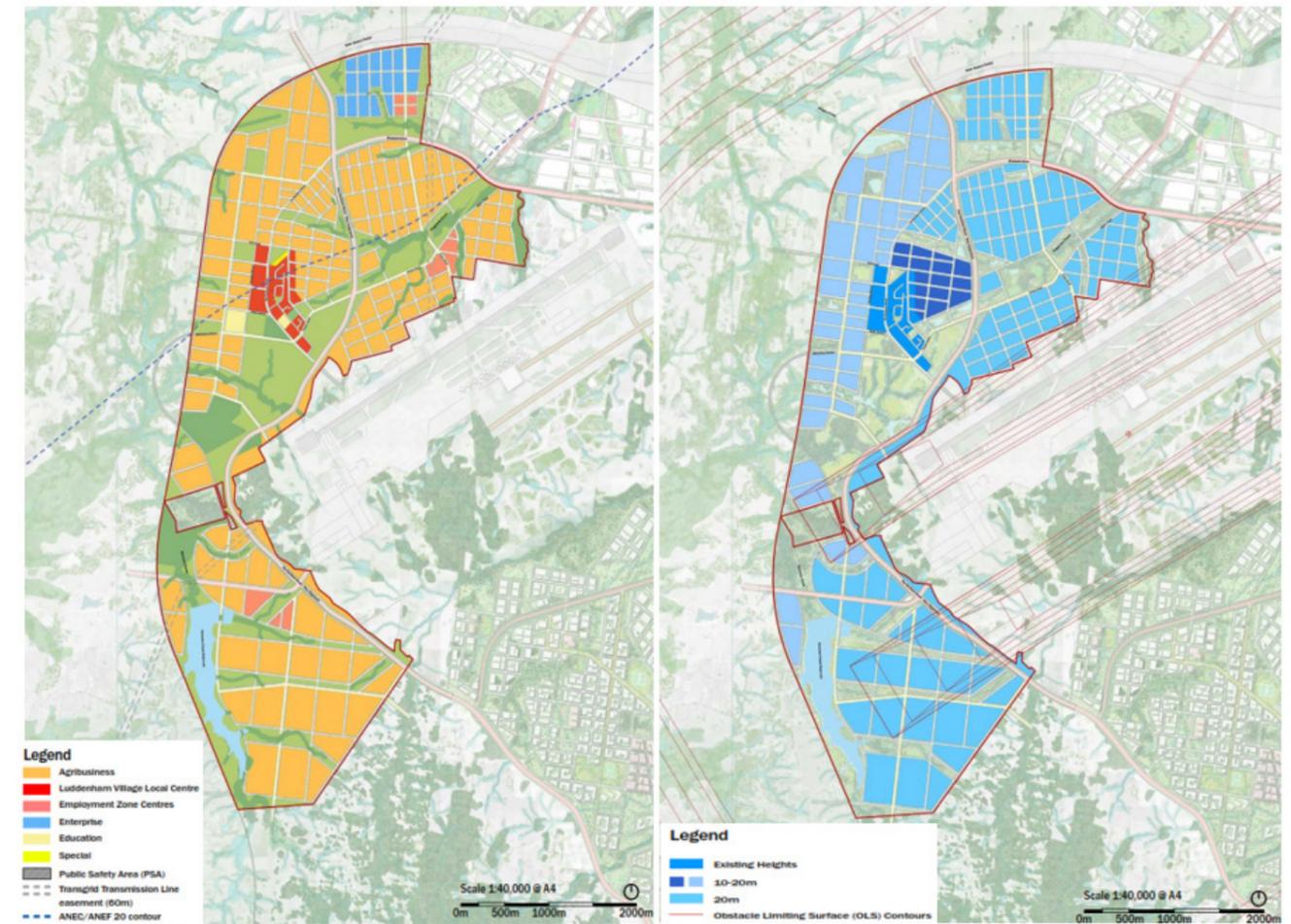
#### Proposed Density Controls

Height controls are the primary density controls in the Agribusiness precinct with no FSR controls proposed. Proposed building heights range from 10m to 24m across the majority of the precinct, equivalent to circa 3 to 6 storeys. Maximum building heights in the Luddenham Village are proposed at 10m, aligning with existing controls under the Penrith LEP (2015).

Similar to the Northern Gateway, the Agribusiness precinct is heavily impacted by the Obstacle Limitation Surface (OLS) height limits associated with the neighbouring WSA. In some parts of the precinct, the OLS is lower than the proposed height control in the draft precinct plan.

**Figure 3.13** illustrates the draft Precinct Plan and building height controls for the Agribusiness Precinct.

**Figure 3.13: Draft Precinct Plan and Height of Building Controls, Agribusiness Precinct**



Source: Studio Hollenstein

## Employment Densities

The draft Precinct Plan provides capacity for just over 3,000 jobs in the first stage of development to 2036, rising to almost 15,000 in 2056 and just over 21,000 at build out. This expected level of employment is lower than the CPA to 2036 (3,000 jobs compared to 5,400 jobs) but higher over the long-term to 2056 (15,000 jobs compared to 13,800 jobs).

The majority of employment growth in the Agribusiness Precinct is expected post-2036 as more intense forms of employment are firstly focused in the other Initial Precincts. Development momentum for more intense employment uses (post-2036) will build once prime development opportunities in the Northern Gateway, Badgerys Creek and Aerotropolis Core have been exhausted.

Owing to the variety of land uses expected in the Agribusiness precinct, a broad range of employment density are expected. These range from:

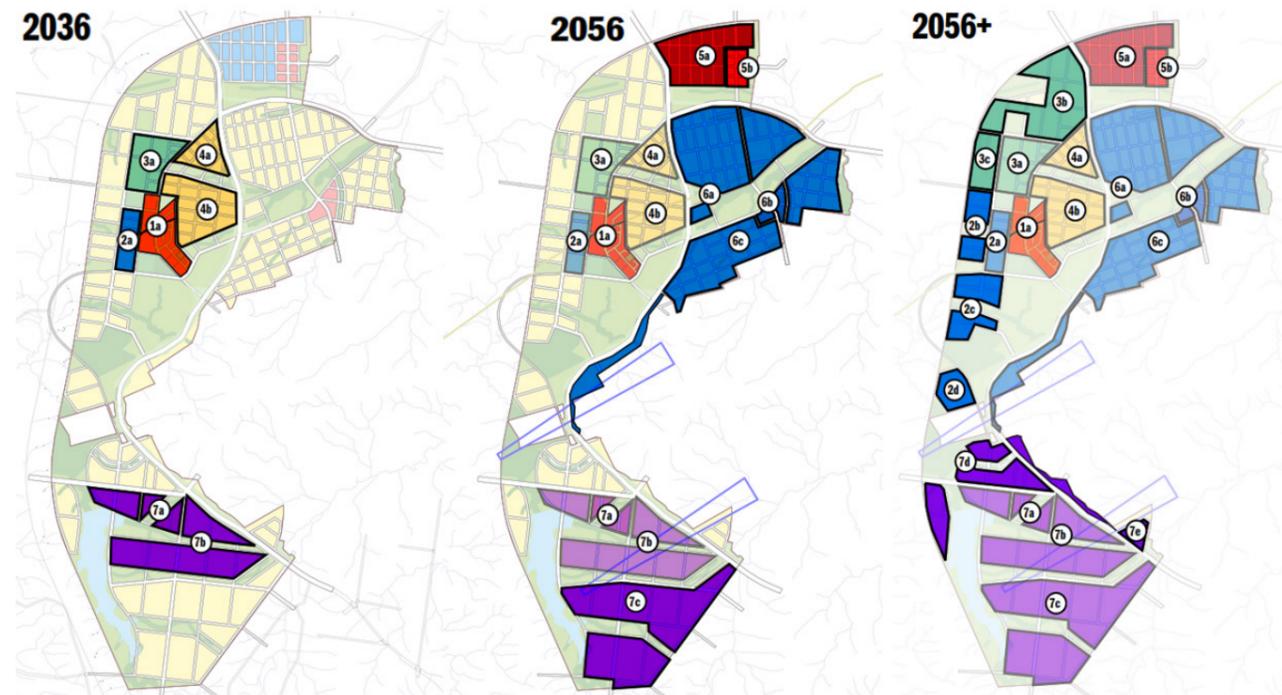
- Non-agricultural employment densities from 10 jobs/ha to 30 jobs/ha;
- Agricultural employment densities from 5 jobs/ha to 12.5 jobs/ha.

Similar to the Aerotropolis Core, Badgerys Creek and Northern Gateway precincts, employment densities for non-agricultural uses are likely to be relatively low in the early years (circa 10 jobs/ha to 20 jobs/ha) and increase over time as land opportunities are taken up and business activity intensifies. Potential development typologies to accommodate non-agricultural activity includes low-rise warehouses and industrial park buildings (1 and 2 storeys).

A fresh food market is one potential land use which would have a higher density of employment – ranging from 40 jobs/ha to 50 jobs/ha. This aligns with densities observed in Sydney and Melbourne's largest fresh food/produce markets.

**Figure 3.14** and **Table 3.3** depict the expected employment densities across the Agribusiness precinct in the years to 2056.

**Figure 3.14: Land Use Mix, Density and Distribution (2036, 2056, 2056+), Agribusiness Precinct**



Source: Studio Hollenstein

**Table 3.3: Employment and Population Density Capacities (2036, 2056, 2056+), Agribusiness**

Sub-Precinct	Area (ha)*	Employment Density (Jobs/ha)		
		2036	2056	2056+
01a	25	-	-	-
02a	14	25	27.5	30
02b	198	-	-	30
02c	36	-	-	30
02d	15	-	-	30
03a	26	5	12.5	20
03b	64	-	-	20
03c	14	-	-	20
04a	13	30	40	50
04b	37	30	40	50
05a	40	-	27.5	30
05b	7	-	30	30
06a	83	-	27.5	30
06b	8	-	30	30
06c	80	-	27.5	30
07a	8	30	30	30
07b	82	10	30	30
07c	116	-	30	30
07d	56	-	-	30
07e	5	-	-	30
<b>Total</b>	<b>737</b>	<b>4</b>	<b>20</b>	<b>29</b>

\*Lot developable area is the area identified capable for development excluding local roads and public open space  
Source: Studio Hollenstein

### Issues for Consideration

The benefits of agglomeration economies will underpin the location of industry participants who seek productivity and efficiency gains from proximity to production and logistics facilities in the precinct. That said, section 2.3.1 demonstrated the varying capacities of different agribusiness uses to pay for land in the Agribusiness precinct.

As the precinct is developed into various uses, land values will expectedly continue to rise. It will be important to secure investment for viable intensive agricultural production in the early years while land opportunities are still relatively plentiful. The establishment of intensive agricultural production that is viable will assist to 'cement' the vision for the precinct and to discourage speculative market activity.

The Agribusiness zone is designed with a degree of flexibility. Designation of intensive agricultural production uses (glasshouses) in the north western portion of the precinct where existing zonings have large minimum subdivision size controls would assist with the affordability of land cost.

Some land uses in the Agribusiness precinct could be akin to light industrial uses expected in other areas of the Aerotropolis and accordingly would have the corresponding affordability to land cost. The implementation of astute planning controls by the WSPP in the Agribusiness Development Control Plan will be needed to facilitate the desired outcomes in the precinct, refining the permissibility of land uses to reflect the precinct aspirations but yet allow commercial outcomes.



## 4. DEVELOPMENT TYPOLOGIES AND TAKE-UP

This chapter examines land use and development typologies in the Study Area, their investment pre-requisite and viability considerations. The chapter additionally estimates the likely development horizon for different typologies.

### 4.1 DRIVERS OF LAND USE AND GROWTH

The economic and market drivers that influence the future land use context in the Aerotropolis are diverse. Some uses will immediately respond to rezoning of land, other land uses have pre-requisite conditions before they can be viably delivered.

#### • Population Growth and Critical Mass

The resident population of the Western City provides the base critical mass for improving employment productivity. Local residents (not just within the Aerotropolis but in the broader region) play an important role in developing the employment potential of the Aerotropolis. Local resident populations form catchment areas that support viable retail and local services. Local residents also contribute to the labour pool from which businesses can hire and recruit.

Land uses such as retail and hospitality, local and service commercial/ industrial, require trade catchments from which they can draw custom and operate viably.

**Retail** development is largely expected to occur 'as of course' as local worker and resident catchments in the Aerotropolis establish and grow.

**Hospitality** uses such as cafés, restaurants, pubs and hotels will be driven by a diverse trade catchment, requiring different sources of clientele (workers, residents, visitors and tourists) to be viable.

**Service commercial** (e.g. tax agents and local accountants, health and wellness clinics) and service industrial (e.g. garage and home alarm supplies, smash repairers, coffee roasters) require sufficient customer mass within commuting access.

Quickly establishing a critical mass of residents in the Aerotropolis (and outside) will be crucial in providing the necessary catchment base for land uses that are 'followers', notably retail, hospitality and service commercial/ industrial. In the early years of the Aerotropolis, medium-density residential uses would be important in establishing this critical mass of residents.

#### • Accessibility to Skilled Labour Pool

The significant level of public and private investment into the Aerotropolis is a boon for its accessibility as a place to live and do business in. For knowledge workers, access to public transport is important. Research suggests the availability of train station access can form a key job consideration for skilled employees.

Being in the right location is key to business success. Businesses select locations based on accessibility by clients, workers, suppliers and to materials and transportation. Business who depend on skilled labour will expectedly select locations that enable them to recruit accordingly. Residents in the Western City are becoming more educated and affluent, forming a broad pool of workers for local businesses to recruit from. Notwithstanding the Western City's growth and residents' increasing skill levels, it is a reality that many C-suite executives reside in the more established Central and Eastern City Districts.

A holistic approach to facilitating and encouraging the formation of new communities with appropriate housing types (in the broader Western City) is important for the Aerotropolis' access to all skill levels.

#### • Amenity Expectations

Businesses typically gravitate to where there is a critical mass of occupiers. Critical mass is needed for facilities that support employee amenity to be viable, e.g. drycleaners, cafés, restaurants, gyms. Employee amenity is a critical selection factor for businesses who rely on worker talent to be viable and competitive. Working environments that offer high quality public open space, shaded public areas and a variety of community and cultural offerings are highly desirable.

It will be important for secured commercial investment to be co-located and clustered with future Metro stations to enable 'early seeding' of critical retail, hospitality and leisure facilities. This will be self-perpetuating. The location of more businesses in a precinct will enable more local retail and business services, and therefore enabling development momentum to grow. As far as possible, retail, hospitality and service commercial should cluster not only for viability but to focus amenity provision.

## 4.2 DEVELOPMENT TYPOLOGIES AND VIABILITY CONSIDERATIONS

### 4.2.1 ECONOMIC DEMAND

There are many factors that affect the feasibility of development. These vary depending on whether an area is an urban area or a greenfield area such as the Study Area.

In existing urban areas, physical form and land use patterns are established. Properties in existing urban centres derive value from their functional utility which is influenced by the level of market demand.

Land in greenfield areas may be cheaper to consolidate compared to urban areas, however market attitudes toward dense development forms of urban uses can be tepid.

#### Effective Demand

Land use markets are diverse. Market acceptance of higher density product (e.g. high density apartment living or high density office buildings) is good in inner city areas where there is a critical mass of residents/ workers and supporting retail and commercial services to underpin a lifestyle offer.

Markets for floorspace types (whether for living or for work) are competitive and influence the price households and businesses are prepared to pay for floorspace. Where there is a depth of market demand for high density floorspace, the end sale prices of the completed product justify a higher cost of construction.

Conversely in greenfield or outer city areas and in markets where existing low-density or new medium-density residential formats (houses) are comparatively affordable, there can be market resistance to, or an unwillingness to pay for higher density residential (apartments). In such markets, prices that can be achieved for residential units are limited by prices paid for detached or attached dwellings. For example, if a 3 bedroom detached dwelling is available for \$800,000, it is unlikely a 3 bedroom unit will be able to achieve the same level of pricing.

The benefits of agglomeration economies underpin the gravity of large commercial precincts and CBDs where businesses and industry participants seek to cluster in close proximity to one another and benefit from the gains in efficiency and productivity that result. In mature CBD markets like Sydney and North Sydney (and recently Parramatta), the depth of demand supports increases in rents as buildings become taller. This then offsets the increased cost associated with taller buildings (i.e. wider lift cores, more basement levels, etc.). In maturing markets like Parramatta CBD, tall buildings are becoming viable due to market willingness to pay for higher floors, views, etc.

In suburban markets that are less mature (e.g. Sydney Olympic Park, Norwest), the depth of market demand is less able to justify higher commercial rents as buildings get taller to sufficiently offset the increase in construction cost of taller buildings.

**Effective demand**, therefore, is relevant for development feasibility. The willingness of the market to pay for floorspace underpins the type and nature of development the market can respond with.

#### Construction Costs

The cost of construction increases as buildings become taller. Service requirements require a greater number of lifts so that service times are maintained. Service shafts and fire escape routes are also wider in tall buildings.

Medium density product (e.g. 2-3 storey attached dwellings) are relatively cost efficient compared to apartment buildings and are therefore a popular residential typology in markets where attitudes still favour lower density dwellings.

In deciding the amount of capital to apply to a site, that is, how intensely a site should be developed, developer capital will be applied to a point where incremental revenue is equal to incremental cost.

**Table 4.1** compares indicative cost and revenues for residential and commercial buildings in the Sydney, Parramatta and Liverpool CBDs.

The cost of construction can vary for quality but is generally consistent within metropolitan Sydney. Revenue levels however do vary considerably between locations, stemming from market attitudes towards high density development.

Table 4.1: Construction Cost and Revenue Comparison, Residential and Commercial Buildings

No. of Storeys	Residential	Indicative Revenue^			Commercial	Indicative Revenue^		
	Avg. Cost*	Sydney	Parramatta	Liverpool	Avg. Cost*	Sydney	Parramatta	Liverpool
<3 storeys	\$2,300	\$12,000	\$8,000	\$7,000	\$2,300	\$9,000	\$6,000	\$5,000
4-7 storeys	\$2,500	\$13,000	\$8,500	\$7,500	\$2,500	\$12,000	\$8,000	\$7,000
7-20 storeys	\$3,500	\$15,000	\$10,000	\$9,000	\$3,400	\$14,000	\$10,000	\$8,000
21-35 storeys	\$4,200	\$20,000	\$12,000	n/a	\$5,000	\$16,000	\$12,000	n/a
36-50 storeys	\$5,200	\$30,000	\$15,000	n/a	\$5,700	\$22,000	n/a	n/a

\*build cost per sqm of gross building area (excluding lead-in works, estate major works, uncovered areas, professional fees, statutory charges, contingencies)  
 ^sales revenue per sqm of internal area (residential) and lettable area (commercial)  
 Source: Atlas, Rawlinsons (2020)

Tall buildings will be developed in locations where developers can expect higher revenue levels to offset the increased cost of construction and risk. Expectedly, residential towers and office towers are found in the major CBDs of Sydney and Parramatta, and in recent years the Liverpool CBD.

The cost of land is more expensive in Sydney and Parramatta compared to Liverpool, a function of the higher revenue potential. Nevertheless, the comparison in Table 4.1 shows the relative difference between cost and revenue and the comparative attractiveness of developing high density in different markets.

#### Land Values and Cost of Site Consolidation

Western Sydney is a beneficiary of government investment in infrastructure and growing development interest in response to strong population growth in the region. Strategic land use and infrastructure planning by government has provided the impetus for public and private sector investment which is manifest in growing development momentum over the last decade.

Sales activity of land in the Study Area and the broader region reflects market interest in Western Sydney and the future Aerotropolis. An analysis of market activity indicates rising prices of non-urban lands in anticipation of rezoning.

**Table 4.2** summarises the analysis of prices paid for engloba land in the Study Area and surrounds in the last 24 months.

Table 4.2: Sales Analysis of Englobo Lands, Study Area and Surrounds

Suburb	Growth Area*	Precinct	Precinct Planning Status	Existing Zones (min lot size)	Range of Sizes (ha)		Range of Sale Prices (\$/ha)	
					Low	High	Low	High
Bringelly	WSA	Aerotropolis Core Dwyer Road	Rezoned Not Released	RU4 (10)	1.6	4.0	\$115,000	\$3,360,000
				R5 (2)	1.9	2.2	\$290,000	\$1,600,000
				RU4 (10)	1.2	10.1	\$590,000	\$1,650,000
Luddenham	WSA	Agribusiness Northern Gateway	Rezoned	RU1 (40)	10.1	19.0	\$48,000	\$730,000
			Rezoned	RU2 & E2 (40)	12.1	17.4	\$1,075,000	\$1,300,000
Badgerys Creek	WSA	Badgerys Creek	Rezoned	RU1 (40)	2	5.5	\$1,200,000	\$2,830,000
Kemps Creek	WSA	Kemps Creek Rossmore	Not Released	RU4 (10)	1.2	4.4	\$550,000	\$2,350,000
			Not Released	RU4 (10)	1.2	2.7	\$650,000	\$2,360,000
Rossmore	WSA	Rossmore	Not Released	RU4 (10)	1.9	2.3	\$1,400,000	\$2,930,000
Mount Vernon	WSA	Badgerys Creek	Rezoned	E4 (1) E4 & E2 (1)	1.0 1.0	60.5	\$100,000 \$2,600,000	\$3,440,000
Greendale	Outside	Not applicable	Not applicable	RU1 (40)	10.1	40.4	\$104,000	\$340,000
Mulgoa	Outside	Not applicable	Not applicable	RU5 (0.055)	1	1.2	\$1,975,000	\$2,330,000
				E4 (1)	1	1.2	\$850,000	\$1,070,000
				E2 & E3 (20, 40)	2.4	385.2	\$70,700	\$2,200,000
				RU2 (20)	1.0	92.2	\$5,000	\$825,000
Orchard Hills	GPEC	Not applicable	Not Released	RU4 (2)	2.1	1.4	\$2,500	\$1,720,000
				RU2 & E2 (40)	1.7	60.3	\$330,000	\$2,000,000

\*Western Sydney Aerotropolis (WSA), Penrith to Eastern Creek (GPEC)  
Source: RP data

Broadly, the following observations can be made from the sales analysis of non-urban land in Table 4.2.

- Small lots (1-3ha) are observed in Bringelly to range from \$1.6m to \$3.3m/ha, with greater volume of sales activity and higher sale rates observed in the portion of Bringelly north of Bringelly Road (in the Aerotropolis).
- Small flood prone lots with a minimum lot size of 40 ha in Badgerys Creek achieve a slightly lower range of \$1.2m-\$2.8m.
- As precincts are released for planning, their planning risk reduces compared to precincts that are not released. The prices paid are not significantly different though - compare prices of \$0.65m to \$2.36m/ha paid for RU4 lands in Rossmore (not released) and \$0.55m to \$2.35m/ha paid for similarly zoned RU4 lands in Kemps Creek (released).
- Lands in Greendale, Mulgoa and Orchard Hills outside of the WSA with similar rural zoning (RU2 and RU4) achieve much lower rates (circa \$100,000/ha) compared to lands in a growth area (upwards of \$1,000,000/ha).

Sale prices are generally observed to be less responsive to planning status and rezoning in precincts where there is lot and ownership fragmentation. A wide range of sale prices is observed, being a function of the following factors:

- **Land use zoning and subdivision controls** - all things being equal, rural lots with large minimum lot size controls (say 40ha) achieve lower prices than lots with lower lot size controls (say 2ha).
- **Urban potential** - lots within a growth area (e.g. Aerotropolis) generally achieve higher sale prices than lots not contemplated for future urban uses.
- **Planning status** - lots that are within precincts that have been released for precinct planning generally sell for more than lots in precincts where it is uncertain when planning will commence.
- **Ownership patterns and lot fragmentation** - despite the potential for urban development in some precincts, lot fragmentation can make them unattractive for site consolidation.

The analysis of land values in the Study Area (and surrounds) is relevant to anticipate the cost of site consolidation. The cost of site consolidation is one of the key factors that influences development viability.

Figure 4.1: Sale Prices of Englobo Sites, Aerotropolis (2016-2020)

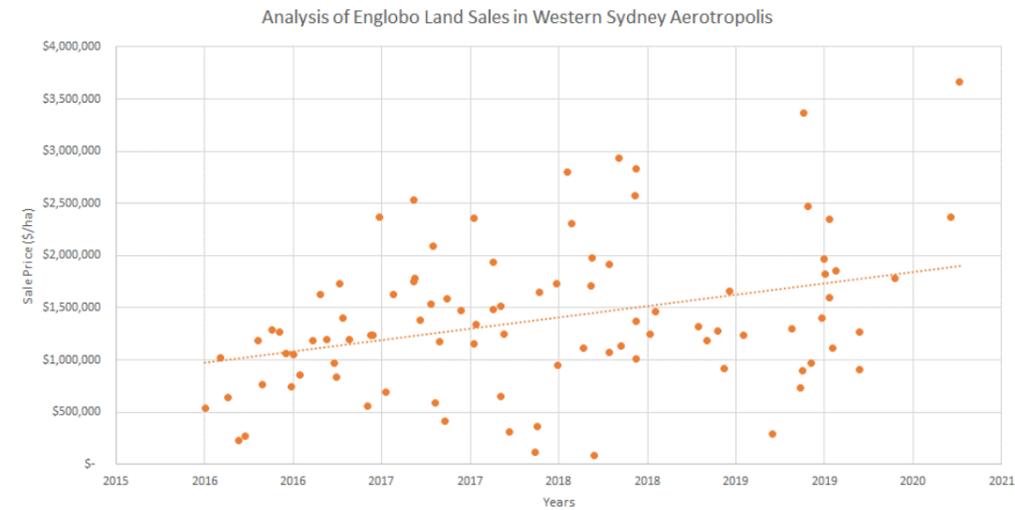


Figure 4.1 shows a clear upward trend of sale prices as planning certainty began to firm and the rezoning of the Aerotropolis was imminent.

Following the public exhibition of draft precinct plans, development control plans and contributions plans (expected in late 2020) which will detail the nature of planning permissibility and infrastructure contributions requirements, the sale prices of land are expected to adjust and respond accordingly.

## 4.2.2 DEVELOPMENT FEASIBILITY

### Market Requirements

In simple terms, a site will be feasible for development if the following pre-requisites are met:

- There is underlying market demand for the subject land use and development typology.
- There is market willingness to pay an economic price for the completed floorspace. This is effective market demand.
- The site can be economically acquired/ consolidated to enable a commercial return on investment.

Developers are customer/ market-led and will respond if there is opportunity to meet effective market demand. Even though the above pre-requisites may be present, the following factors are required to trigger when development is delivered.

- Transport infrastructure (and hard infrastructure) investment and level of accessibility available.
- Access to services and soft infrastructure.
- Sufficient depth of market demand.

The depth of market demand is the key issue for development feasibility in the Study Area. In line with observations in Chapter 2, the IAO has a critical role to play in curating market demand and attracting investment.

### Base Assumptions for Feasibility Analysis

The analysis of development feasibility makes the following presumptions:

- There will be baseline market demand resulting from the coordinated approach to investment attraction.
- Early movers will help build critical mass and help 'seed' retail and local business services.
- Coordinated investment in place-making and public realm improvements particularly in the Metro station precincts.

The analysis assumes that investment momentum will ultimately be self-perpetuating, with early movers and early government investment setting the scene for future investment.

### Feasibility and Likely Commencing Delivery Horizon

In a greenfield environment such as the Study Area, the issue of development feasibility is more a question of 'when' than 'if'. When development will be feasible and the pace of development (or take-up) will depend on the depth of market demand.

Table 4.3 suggests feasibility horizons based on the findings of generic feasibility testing of notional development typologies. Development typology assumptions and analysis of development site sales activity are detailed in Schedule 2.

**Table 4.3: Feasibility Analysis of Potential Development Typologies**

Land Use	Potential Development Typology	Notional FSR	Feasible on Opening?*	Commencing Delivery Horizon^
<b>Commercial</b>				
Low rise	Commercial/ warehouses	1.0:1 to 1.3:1	Y*	0-5 years
Low to mid rise	Commercial buildings	1.3:1 to 1.5:1	Y*	0-5 years
	Commercial buildings	2.0:1 to 2.5:1	Y*	5-10 years
Mid to high rise	Office buildings	2.5:1 to 3.5:1	N	15 years+
<b>Industrial</b>				
Transport and Logistics	High clearance warehouses and distribution centres	0.5:1 to 0.8:1	Y	0-5 years
General industrial	High clearance warehouses Manufacturing facilities	0.5:1 to 0.8:1	Y	0-5 years
Light Industrial/ Service Industrial	Freestanding workshops	0.6:1 to 0.8:1	N	5-10 years
	Strata-titled industrial suites	1.0:1	N	5-10 years
<b>Residential</b>				
Medium density	'Walk up' multi-dwellings	1.0:1 to 1.3:1	Y	0-5 years
High-density	Residential flat buildings	2.0:1 to 3.0:1	N	5-15 years
	Mixed use development	2.0:1 to 3.0:1	N	5-15 years
<b>Retail and Hospitality</b>				
Supermarket and Speciality Retail	Strip retail Shopping centres	1.0:1 1.5:1 to 2.5:1	N N	5-15 years 5-15 years
Hotels, Pubs, Serviced Apartments	Mixed use commercial buildings	2.5:1 to 3.6:1	N	5-15 years
<b>Institutional and Special Use</b>				
Education and Health Facilities	Standalone buildings	1.5:1 to 2.5:1	Y*	5-15 years
	Mixed use commercial buildings	1.5:1 to 2.5:1	Y*	5-15 years
Arts and Cultural Centres	Standalone buildings	1.5:1 to 2.5:1	Y*	5-15 years
	Mixed use commercial buildings	1.5:1 to 2.5:1	Y*	5-15 years

Y= Yes, N = No, Y\* = Yes subject to investment partner commitments. \*Opening assumed at 2026 (coinciding with opening of Western Sydney Airport)

^Commencing delivery horizon timeframes quoted from opening year 2026  
Source: Atlas

The delivery of certain land use and development typologies will be dependent on foundation/ investment partner commitments secured by the IAO. These are indicated by '\*' after "Y" in Table 4.3.

Chapter 2 indicated market expectations and requirements that influence if and when various development typologies are delivered. These market requirements are critical for the analysis as they underpin the viability of different typologies.

Table 4.4 identifies the key pre-requisites/ triggers for delivery of the potential development typologies.

**Table 4.4: Potential Development Typologies and Key Triggers for Take-up**

Land Use	Potential Development Typology	Delivery Horizon	Key Triggers for Delivery
<b>Commercial</b>			
Low rise	Commercial/ warehouses	0-5 years	Metro and transport infrastructure investment, provision of retail and urban amenity including local business services
Low to mid rise	Commercial buildings	0-5 years	
	Commercial buildings	5-10 years	
Mid to high rise	Office buildings	15 years+	Attractive value proposition against Liverpool and Parramatta (i.e. rents, urban and retail amenity and diversity of local labour pool)
<b>Industrial</b>			
Transport and Logistics	High clearance warehouses and distribution centres	0-5 years	Continued population growth in Greater Sydney
General industrial	High clearance warehouses Manufacturing facilities	0-5 years	Synergies for certain occupiers to be located proximate the WSA
Light Industrial/ Service Industrial	Freestanding workshops	5-10 years	Resident population critical mass in Aerotropolis and surrounds
	Strata-titled industrial suites	5-10 years	
<b>Residential</b>			
Medium density	'Walk up' multi-dwellings	2-3	1.0:1 to 1.3:1
High-density	Residential flat buildings	5-15	2.0:1 to 3.0:1
	Mixed use development	5-15	2.0:1 to 3.0:1
<b>Retail and Hospitality</b>			
Supermarket and Speciality Retail	Strip retail Shopping centres	5-15 years 5-15 years	Resident and worker population critical mass in Aerotropolis and surrounds
Hotels, Pubs, Serviced Apartments	Mixed use commercial buildings	5-15 years	Airport passenger throughput and visitation to the Aerotropolis
<b>Institutional and Special Use</b>			
Education and Health Facilities	Standalone buildings	5-15 years	Resident and worker population critical mass in Aerotropolis and surrounds
	Mixed use commercial buildings	5-15 years	
Arts and Cultural Centres	Standalone buildings	5-15 years	
	Mixed use commercial buildings	5-15 years	

\*Delivery horizon timeframes quoted from opening year 2026  
Source: Atlas

But for the curation and securing of investment partners, many development typologies are likely to require a longer period for delivery if a laissez faire approach were instead taken.

Absent the coordinated and targeted approach by the IAO, take-up of these development typologies is expected to occur once opportunities in Liverpool and Parramatta are exhausted.

A key factor that influences when some development typologies (i.e. hospitality, retail) are viable for delivery is the eventual operating volumes and passenger throughput when the Western Sydney Airport opens in 2026. Higher than forecast operating volumes will have positive implications for development opportunities in the Aerotropolis while lower operating volumes have adverse implications for the same.

### 4.3 BENCHMARKING OF EMPLOYMENT AND POPULATION DENSITIES

An understanding of the employment and population densities targeted in the Study Area through comparison against other centres/ precincts across Greater Sydney is an important component of the precinct planning process.

#### 4.3.1 REVIEW OF EMPLOYMENT AND POPULATION DENSITIES IN CASE STUDY CENTRES

To understand the development scale and typologies suggested, case study benchmarking of employment and population densities in centres and employment areas in Greater Sydney is undertaken.

The benchmarking analyses population and employment densities using ABS Destination Zone (DZ) geographies. While these geographies do not exactly align with boundaries of the case study areas, they are considered an appropriate proxy.

#### Select Centres

A sample of 10 centres and commercial precincts across the Western City and Central City is undertaken to understand relative employment densities. The results of this analysis are outlined in **Table 4.5**.

**Table 4.5: Employment Densities, Select Centres**

Centre	Land Use Zone	Measured DZ Area (ha)	Employment (2016)	Jobs/ha (2016)
Parramatta	B3/B4	98.84	38,144	385.9
Liverpool	B3/B4	75.91	10,233	134.8
Macquarie Park	B3/B4/B7	382.2	46,568	121.8
Bankstown	B4	71.43	8,072	113
Blacktown	B3/B4	68.65	7,470	108.8
Penrith	B3/B4	109.01	10,562	96.9
Fairfield	B3/B4	38.95	3,144	80.7
Norwest/Bella Vista	B2/B7	248.14	19,031	76.7
Campbelltown	B3/B4	120.18	6,863	57.1
Mount Druitt	B4	56.8	2,497	44

Source: ABS

A relatively broad range of employment densities (at 2016) can be observed from **Table 4.5**:

- **High:** Parramatta CBD recorded the highest employment density of the centres analysed - almost 390 jobs/ha.
- **Medium:** A much tighter range was observed in some larger strategic centres (Liverpool, Macquarie Park, Bankstown, Blacktown) - ranging from 110 jobs/ha to 135 jobs/ha.
- **Low:** smaller strategic centres in Sydney's outer west such as Campbelltown and Mount Druitt recorded lower employment densities - ranging from 40 jobs/ha to 60 jobs/ha.

#### Select Industrial/ Employment Precincts

**Table 4.6** analyses a sample of 10 industrial precincts across the Western City to understand current employment densities.

**Table 4.6: Employment Densities, Select Industrial Precincts**

Precinct	Land Use Zone	Industrial Use	Measured DZ Area (ha)	Employment (2016)	Jobs/ha (2016)
Eastern Creek	IN1	Large-scale logistics	366.7	6,776	18.5
Erskine Park	IN1		270	5,003	18.5
Greystanes	IN1/IN2		117	2,802	24
Wetherill Park	IN1/IN2/B5	General industrial	528.1	17,573	33.3
Arndell Park	IN1/IN2		135.2	4,935	36.5
Moorebank	IN1		317.3	7,925	25
Smithfield	IN1/IN2		385	11,721	30.4
North Penrith	IN1/IN2	Light industrial/ Service industrial	173.3	5,161	29.8
St Marys	IN1		230.5	5,253	22.8
Glendenning	IN1/IN2		169.9	5,105	30.1

Source: ABS/JLL

A mix of employment densities is identified in **Table 4.6**, aligning with the type of industrial activity being undertaken:

- **Large scale logistics:** precincts with large scale buildings (i.e. Eastern Creek, Erskine Creek) - 18 jobs/ha to 24 jobs/ha.
- **General industrial:** precincts characterised by general industrial occupiers - 25 jobs/ha to 35 jobs/ha.
- **Light industrial/ service industrial:** precincts occupied by light and service industrial occupiers recorded similar employment densities to those observed in the general industrial precincts - 22 jobs/ha to 32 jobs/ha.

#### Fresh Food Markets

One of the envisaged uses in the Agribusiness Precinct is a fresh food marketplace. This use could be a major employer within the precinct, providing opportunities for food and produce-based retailing and wholesaling whilst supporting other agricultural activity in the broader precinct.

To gauge the level of employment density that could occur in the Agribusiness Fresh Food hub, benchmarking of both the Sydney Markets (Flemington) and Queen Victoria Markets (Melbourne, VIC) is undertaken. This analysis indicates:

- The DZ comprising the Sydney (Flemington) Markets (71.2ha) accommodated 2,989 jobs (2016). This equates to an employment density of around 42 jobs/ha.
- The DZ comprising the Queen Victoria Markets is much smaller comparatively (12.6ha) and accommodated 1,168 jobs (2016). This analyses to an employment density of 92 jobs/ha.

This analysis shows a broad range of 42 jobs/ha to 92 jobs/ha for Sydney and Melbourne's largest fresh food/ produce markets subject to size and nature/ intensity of activity.

## Residential Areas

A sample of residential areas across the Western City and Central City is analysed to understand population densities in areas zoned for a mix of residential densities. This analysis is shown in **Table 4.7**.

**Table 4.7: Population Densities, Select Residential Areas**

Precinct	Land Use Zone	Measured SA1 Area (ha)	Population (2016)	Persons/ha (2016)
<b>Rural Residential</b>				
Picton	R2	201.54	1,496	7.4
Silverdale		390.06	2,695	9.3
<b>Low-Density Residential</b>				
Harrington Park	R2	94.95		32
Claremont Meadows		104.41		29
<b>Medium-Density Residential</b>				
The Ponds	R3	128.56	5,120	39.8
Fairfield		80.66	6,788	84.2
Castle Hill		113.13	5,476	48.4
Macarthur	R4	75.5	2,547	33.7
<b>High-Density Residential</b>				
Westmead	R4	26.65	3,842	144.2
Liverpool		101.2	14,753	145.8
Parramatta (South)		84.86	8,705	102.6

Source: ABS

The analysis undertaken in **Table 4.7** shows a relatively tight range of density bands within each of the areas selected:

- **Rural residential** areas (Picton, Silverdale) - 7 to 10 persons/ha.
- **Low-density residential** areas (Harrington Park, Claremont Meadows) - 28 to 32 persons/ha.
- **Medium-density residential** precincts (The Ponds, Fairfield, Castle Hill, Macarthur) - 35 to 85 persons/ha.
- **Higher-density residential** areas (Westmead, Liverpool and Parramatta) - 100 to 150 persons/ha.

## 4.3.2 OBSERVED DEVELOPMENT TYPOLOGIES IN CASE STUDY CENTRES

Based on benchmarking of employment and population densities in centres in section 4.3.2, the section identifies the range of development typologies and corresponding densities that accommodate workers and residents in the case study centres.

A broader range of development typologies (and densities) is observed in the commercial centres compared to the industrial and residential precincts. The following broad observations of development typologies are relevant for the Study Area:

- **Business Park** precincts such as Macquarie Park and Norwest typically accommodate a mix of 4-5 storey office buildings in addition to 2-3 storey commercial buildings with a ground floor showroom/warehousing component.
- **Suburban Centres** (i.e. Blacktown, Bankstown, Fairfield) comprise a wide variety of building typologies, ranging from large enclosed shopping centres, 4-8 storey office buildings and strip retail (single or double storey).
- **City Centres** such as Parramatta and Liverpool comprise a similar mix of uses as suburban centres though with denser forms of commercial development with office buildings of >20 storeys.
- **Industrial precincts** are often homogenous, though large-scale logistic precincts are distinct given the scale of the buildings that accommodate warehousing and distribution centres. General industrial and light/service industrial precincts commonly comprise a mix of freestanding warehouses and complexes with strata-titled industrial units.
- **Residential precincts** are diverse with built form typically reflecting the maximum density permitted under planning controls. Only medium and high density residential typologies are considered in the Aerotropolis SEPP.

**Table 4.8** contains a detailed analysis of the development typologies and densities observed in the benchmark centres.

**Table 4.8: Development Typologies and Densities for Equivalent Employment and Residential Densities**

Land Use	Potential Development Typologies	Indicative Densities		Example Locations
		FSR (Lot Size)	HOB	
<b>Commercial Uses</b>				
Business Park	4-5 storey office buildings, ground floor retail 2-3 storey commercial building with ground floor warehousing Retail showrooms	1.0 to 1-2:1	22m to 37m	Macquarie Park Norwest
Suburban Centre	4-8 storey office building, ground floor retail Enclosed shopping centres Two-storey strip retail	1.5:1 to 4:1	30m to 65m	Blacktown Bankstown Fairfield
City Centre	Office buildings (3-20 storeys and >20 storeys) Enclosed shopping centres Two-storey strip retail	>2.5:1	12m to 120m	Parramatta Liverpool
<b>Industrial Uses</b>				
Large scale logistics	High clearance warehouses and distribution centres with ancillary office component	0.5:1	-	Eastern Creek Erskine Park
General industrial	High clearance warehouses Manufacturing facilities Strata-titled industrial suites	0.5:1 to 0.6:1	9.5m to 21m	Moorebank Wetherill Park
Light Industrial/Service Industrial	Strata-titled industrial suites Freestanding workshops Small warehouses	(equivalent to 0.8:1 to 1:1)	12m	North Penrith Glendenning
<b>Residential Uses</b>				
Medium-density residential	2 storey townhouses 2-3 storey 'walk up' unit blocks	(equivalent to 0.8:1 to 1:1)	6m to 15m	The Ponds Fairfield Castle Hill Macarthur
High-density residential	3-8 storey RFBs 2-3 storey 'walk up' unit blocks 8-12 storey mixed use development	0.8:1 to 2.5:1	11m to 45m	Westmead Liverpool Parramatta

Source: Atlas

## 4.4 STAGING AND TAKE-UP

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The appropriate staging of land use and development will be important to ensure orderly release and delivery but also ensure market investment requirements with respect to different land uses are met. Chapter 2 discussed the pre-requisites for development to be viable and the key triggers required for their delivery.

The pace of development in the various precincts will be different as they are characterised by different zones and land use aspirations. The precincts are also designated with varying employment and residential densities, which consequently require different development typologies to accommodate those densities.

The review of precincts identified that densities (employment and residential) will not occur from Day 1 but over time. An increase in residential density (persons per hectare) will be accompanied by built form densification, i.e. the development of higher density formats (e.g. apartment buildings). In contrast, an increase in employment density is not always accompanied by built form densification (i.e. greater floorspace).

At this juncture it is important to discuss the concepts of intensification and densification.

### Intensification v Densification

Intensification occurs where the activity or output within a building increases but there is no densification of built form. Conversely, densification refers to a more intense use land through an increase in building floorspace. This is most commonly facilitated through an increase in building heights and/or FSR.

Intensification can occur through the use of automation, technology or knowledge. For example, the use of 'robot pickers' in large distribution centres could reduce the numbers of workers otherwise required on the site. The output per worker is however increased through the use of technology and automation.

The process of automation could reduce the direct employment density on a site (i.e. the number of workers required on-site). This is not to say the enterprise is less valuable to the economy. Productivity gains through the use of knowledge and/ or technology enable output per capita to grow.

Intensification can be observed in many industrial, enterprise and commercial zones across Sydney. Increasing occupancy cost pressures and rising competition have led to increased use of knowledge and technology that have resulted in businesses getting 'more' from their occupied space. This can be observed through falling 'work space ratios' (i.e. the floorspace occupied by a worker) and increased output ratios (i.e. turnover/ production units per occupied floorspace).

The Study considers that over time, an increase in employment densities in the Study Area will be driven by both intensification and densification.

### 4.4.1 MARKET PARTICIPANTS - ROLES AND REQUIREMENTS

It is worth considering the respective roles and requirements of various market participants in the Study Area. The Study categorises market participants into three broad categories: early movers, followers and incubators.

#### Early Movers

'Early movers' are expected to include large format industrial and lower density residential uses. A laissez faire 'zone it and they will come' approach will conceivably be sufficient for these uses to invest.

Investment by early movers will help seed investment in retail and urban amenity and contribute to emerging worker and resident populations.

Whilst early movers will play an important role in facilitating initial investment, it will be important that precinct planning allows large industrial uses to transition over time to accommodate more intensive activity and/ or densification of built form.

When uses become more intensive or buildings assume more dense formats, it will be important to ensure the road network can transition to be sufficiently fine grain and permeable. As industrial uses intensify, there will be corresponding demand for locally based services (e.g. cafés, dry cleaning, etc.) and village nodes (outside of the main centres) may emerge over time.

#### Followers

In contrast to early movers, 'followers' are those land uses that respond to population growth (residents and workers). Land uses such as retail and non-retail, service industrial and service commercial are examples of 'followers' who follow population growth. Other examples of followers are hospitality and leisure uses such as hotels and serviced apartments, pubs and taverns, gyms and recreation centres.

Hotels, serviced apartments and other short-term accommodation uses will respond to visitation to the region. Visitation to the region will be driven by passenger arrivals (domestic and international) as well as visitation to business occupiers and residents in the Aerotropolis.

Land uses who are 'followers' are important. They provide the amenity and services that make a place attractive to visit, to live and to do business in. It is an unfortunate 'catch-22' situation where their existence is mutually dependent on other uses.

Accordingly, the opportunity to 'front-load' retail and other local services should be encouraged where possible.

#### Incubators

Knowledge-based commercial and office uses generally have higher amenity expectations of retail and hospitality services. Consequently, not many businesses (unless of significant scale) are likely to want to be 'the first mover' in a commercial precinct. The Investment Attraction Office

plays a critical role in mobilising investment from these uses.

It will be important for secured commercial investment to be co-located and clustered with future Metro stations to enable 'early seeding' of critical retail, hospitality and leisure facilities. Development and take-up of land use opportunities are self-perpetuating. The location of more businesses in a precinct will enable the provision of more local retail and business services, and therefore enabling development momentum to grow.

Realising the vision of the Agribusiness precinct will in particular require a curatorial and supportive approach. Attracting key industries and occupiers will need to be led by the IAO. Precinct and master planning by WSPP and WPCA should be cognisant of the different threshold capacities various agribusiness uses to pay for land. The analysis in section 2.3.1 affirms the importance of land cost considerations for spatial and precinct planning.

#### The Role of Residential Communities

The resident population of the Western City in excess of 1 million residents provides the base critical mass for improving employment productivity. This is an important fundamental for the acceleration of employment in the Aerotropolis.

The role of local residents (not just within the Aerotropolis but in the region) to the employment function of the Aerotropolis should not be understated. Local residents form catchment areas that support viable retail and local services. Local residents also contribute to the labour pool from which businesses can hire and recruit.

Resident population catchments (inside and outside the Aerotropolis) will be essential to ensuring the viability of retail and hospitality uses in the initial years of the Aerotropolis. As the precincts develop and grow (from both a worker, resident and visitor perspective), demand for these uses will grow commensurate.

Building on the observations in Sydney Olympic Park and North Sydney (early examined in section 2.1), quickly establishing a critical mass of residents in the Aerotropolis (and outside) will be crucial in providing the necessary catchment base for land uses that are 'followers', notably retail, hospitality and service commercial/ industrial.

In the early years of the Aerotropolis, medium-density residential uses would be important in establishing this critical mass.

#### 4.4.2 DELIVERY HORIZONS

The foregoing sections identified key triggers for land use and development, the role and requirements of different market participants and the critical role the Investment Attraction Office plays.

This section summarises the potential development typologies that could be accommodated through the proposed density controls across the Study Area and when these typologies would likely begin being delivered. This assessment of delivery horizon has regard to both the findings of market and feasibility analysis and role and requirements of market participants.

**Table 4.9** summarises potential development typologies in the Initial Precincts against their likely delivery horizon.

**Table 4.9: Indicative Typologies, Aerotropolis Core and Badgerys Creek**

Sub-precinct	Zone	Potential Development Typology	Notional FSRs	Commencing Delivery Horizon*
<b>Aerotropolis Core</b>				
Centre – Metropolitan	MXU	Mid to high rise office buildings Shop-top housing Strip retail	3.0:1 to 3.5:1	15 years+ 5-15 years 5-15 years
Centre	MXU	Low to mid rise commercial buildings	2.5:1 to 3.0:1	5-10 years
Mixed Use Residential	MXU	Shop-top housing Residential flat buildings Multi-dwelling housing	1.5:1 to 2.5:1	5-15 years 5-15 years 0-5 years
Business and Enterprise	ENT	Warehousing Industrial park Business park offices	Nil	0-5 years 0-5 years 0-15 years
<b>Badgerys Creek</b>				
Enterprise & Light Industry	ENT	Warehousing Industrial park Business park offices	Nil	0-5 years 0-5 years 0-15 years
<b>Northern Gateway</b>				
Centre – Specialised	MXU	High-rise office towers Mid-rise office buildings Shop-top housing Strip retail	1.8:1 to 3:1	15 years+ 0-15 years 0-15 years 0-15 years
Mixed Use Residential	MXU	Shop top housing Residential flat buildings Multi-dwelling housing	1.0:1 to 1.8:1	5-15 years 5-15 years 0-5 years
Flexible Employment	ENT	Mid-rise office buildings Warehousing Industrial park	Nil	0-15 years 0-5 years 0-5 years
<b>Agribusiness</b>				
Agribusiness	AGR	Glasshouses Warehousing	Nil	0-15 years 0-15 years
Enterprise	ENT	Low to mid rise commercial buildings Warehousing Industrial park	Nil	0-15 years 0-15 years 0-15 years
Employment Centres	AGR	Strip retail	Nil	5-15 years

\*Commencing delivery horizon timeframes quoted from opening year 2026  
Source: Atlas/ Hill Thalís/ Studio Hollenstein

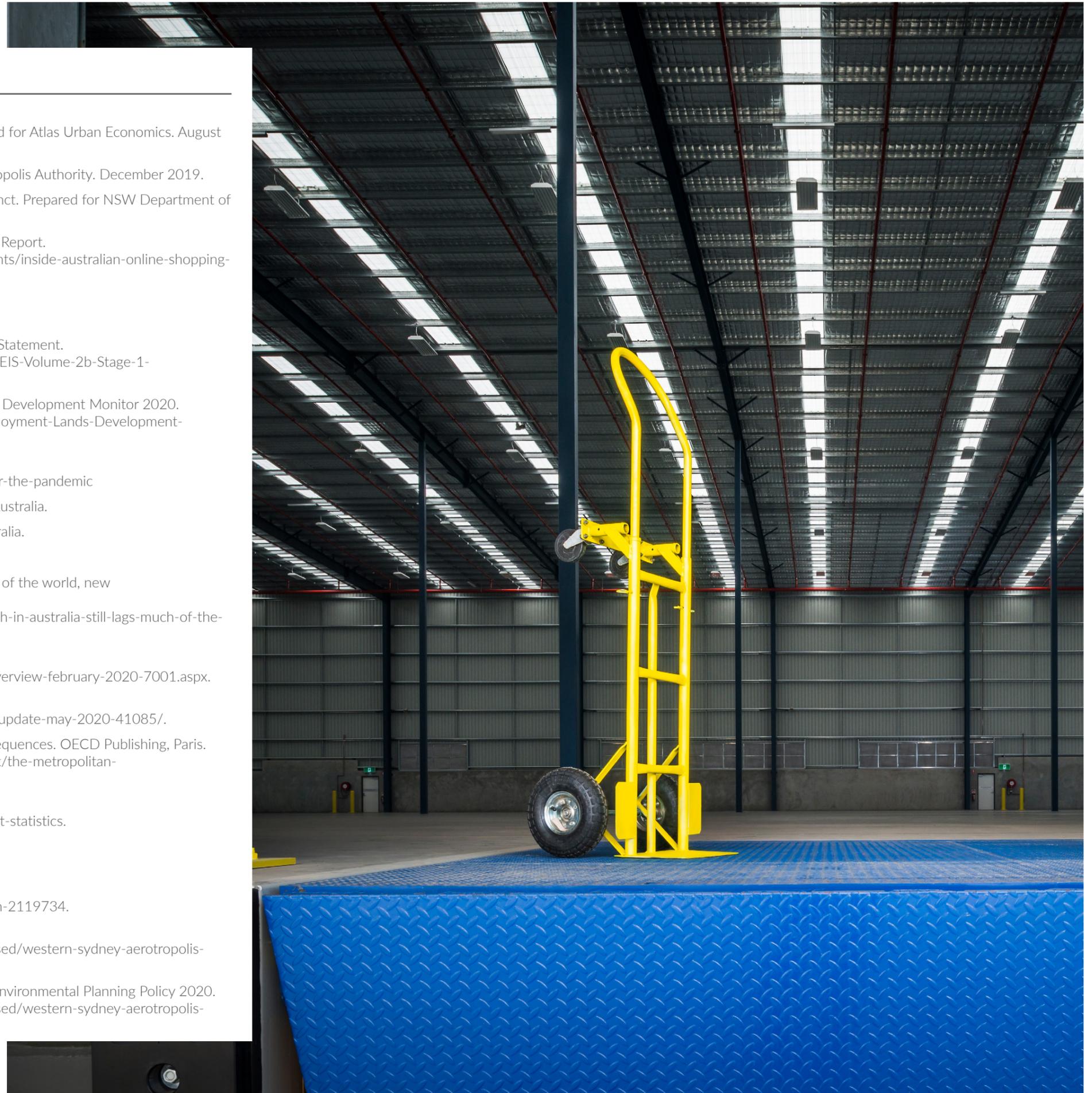
In a greenfield environment such as the Study Area, the issue of development feasibility is more a question of **'when'** than **'if'**. When development will be feasible and the pace of development (or take-up) will depend on the depth of market demand.

While the IAO will play a critical role in attracting investment and occupier interest to the Aerotropolis, the Study recognises that investment capital is mobile. Capital will gravitate to the investment that provides the most return for the assumed risk. Capital will be invested in the Study Area by having regard to investment opportunities elsewhere and their corresponding risk/ return.

Different typologies vary in feasibility thresholds and triggers. This results in varying commencement horizons for different market participants. The delivery horizons identified in Table 4.9 therefore considers the requirements of early movers, followers and incubators in approximating when development typologies may be feasible to deliver.

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# SCHEDULE 1

## SCHEDULE 1 - STATE ENVIRONMENTAL PLANNING POLICY - WESTERN SYDNEY AEROTROPOLIS

Table S1.1: Zone Objectives

Zone	Zone Objectives
<b>Mixed Use</b>	To integrate a mixture of compatible land uses in accessible locations.
	To promote business, office, retail, entertainment and tourist uses.
	To promote a high standard of public amenity and convenient urban living.
	To provide for residential and other accommodation that includes active non-residential uses at street level.
<b>Enterprise</b>	To ensure an appropriate transition from non-urban land uses and environmental conservation areas in surrounding areas to urban land uses in the zone.
	To encourage employment and businesses related to professional services, high technology, aviation, logistics, food production and processing, health, education and creative industries.
	To provide a range of employment uses (including aerospace and defence industries) that are compatible with future technology and work arrangements.
	To encourage development that promotes the efficient use of resources, through waste minimisation, recycling and re-use.
	To ensure an appropriate transition from non-urban land uses and environmental conservation areas in surrounding areas to employment uses in the zone.
<b>Agribusiness</b>	To prevent development that is not compatible with or that may detract from the future commercial uses of the land.
	To provide facilities and services to meet the needs of businesses and workers.
	To encourage diversity in agribusiness, including related supply chain industries and food production and processing that are appropriate for the area.
	To encourage sustainable and high technology agribusiness, including agricultural produce industries.
<b>Environmental and Recreation</b>	To enable sustainable agritourism.
	To encourage development that is consistent with the character of Luddenham village.
	To maintain the rural landscape character and biodiversity of the area.
	To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.
<b>Environmental and Recreation</b>	To protect the ecological, scenic and recreation values of waterways, including Wianamatta-South Creek and its tributaries.
	To provide a range of recreational settings and activities and compatible land uses.
	To protect and conserve the environment, including threatened and other species of native fauna and flora and their habitats, areas of high biodiversity significance and ecological communities.

Source: WSPP (2020b)

**Table S1.2: Prohibited Land Uses, Mixed Use Zone**

Airport Transport Facility	General Industry	Semi-detached dwelling
Airstrips	Heavy Industrial Storage Establishment	Sewage System
Boat building and repair facilities	Heavy Industry	Timber yard
Boat launching ramps	Helipads	Transport depots
Boat sheds	Highway service centres	Truck depots
Camping grounds	Intensive livestock agriculture	Turf farming
Caravan parks	Jetties	Warehouse or distribution centres
Charter and tourism boating facilities	Marinas	Waste or resource management facility
Correctional centres	Mooring pens	Water Treatment Facilities
Crematoria	Moorings	Wharf or boating facilities
Depots	Mortuaries	
Dual occupancy	Open cut mining	
Dwelling houses	Port facilities	
Exhibition homes	Rural industry	
Exhibition villages	Rural supplies	
Extractive industries	Rural workers dwelling	
Forestry	Secondary dwelling	

Source: WSPP (2020b)

**Table S1.3: Prohibited Land Uses, Enterprise Zone**

Air transport facility	Exhibition villages	Mortuaries
Airstrips	Forestry	Open cut mining
Camping grounds	Heavy Industrial Storage Establishments	Residential Accommodation
Caravan parks	Heavy Industry	Rural Industry
Crematoria	Helipads	Turf farming
Exhibition homes	Intensive livestock agriculture	

Source: WSPP (2020b)

**Table S1.4: Prohibited Land Uses, Agribusiness Zone**

Airstrips	Helipads	Residential accommodation
Amusement centres	Hotel or motel accommodation	Restricted premises
Boat building and repair facilities	Intensive livestock agriculture	Sawmill or log processing works
Caravan parks	Jetties	Serviced apartment
Centre-based Child care centres	Mooring pens	Sex services premises
Crematoria	Moorings	Specialised retail premises
Depots	Mortuaries	Stock and sale yard
Exhibition homes	Open cut mining	Storage Premises
Exhibition villages	Port facilities	Turf Farming
Extractive industries	Recreation facilities (indoor)	Vehicle sale or hire premises
Forestry	Recreation facilities (major)	Waste or resource management facilities
Heavy Industrial Storage	Recreation facilities (outdoor)	Water recreation structures
Heavy Industry	Registered clubs	Wharf or boating facilities
Exhibition homes	Rural industry	
Exhibition villages	Rural supplies	
Extractive industries	Rural workers dwelling	
Forestry	Secondary dwelling	

Source: WSPP (2020b)

**Table S1.5: Prohibited Land Uses, Environmental and Recreation**

Air Transport Facility	Hardware and building supplies	Restricted premises
Airstrips	Heavy Industrial Storage Establishment	Rural Industry
Amusement centres	Helipads	Service stations
Backpackers accommodation	Highway service centres	Sex services premises
Boat building and repair facilities	Hospital	Specialised retail (bulky goods)
Boat launching ramps	Hotel or motel accommodation	Timber yard
Boat sheds	Industrial facilities	Transport depots
Camping grounds	Industrial retail outlets	Truck depots
Caravan parks	Industry	Turf Farming
Charter and tourism boating facilities	Intensive Livestock Agriculture	Vehicle body repair workshops
Childcare centres	Jetties	Vehicle repair stations
Correctional centres	Medical Centre	Vehicle sales or hire premises
Depots	Mooring pens	Veterinary hospitals
Educational Establishment	Moorings	Warehouse or distribution centres
Electricity generating works	Mortuaries	Waste or resource management facility
Entertainment facilities	Office premises	Water Treatment Facilities
Exhibition homes	Open cut mining	Wholesale supplies
Exhibition villages	Port facilities	
Extractive Industries	Public administration buildings	
Forestry	Residential accommodation	
Freight Transport facilities	Respite day care centres	

Source: WSPP (2020b)

# SCHEDULE 2

## SCHEDULE 2 - FEASIBILITY ANALYSIS ASSUMPTIONS

### Development Typologies and Yields

Based on the proposed land uses within the Study Area, a series of development typologies are selected to approximate the built form that could eventuate in the Study Area based on the SEPP and draft precinct plans. The identification of development typologies is generic in nature and is for the purposes of testing development feasibility.

The development typologies selected are shown in Table S2.1 by land use zone.

**Table S2.1: Development Types Tested**

Development Typology	Site Area (sqm)	FSR	Gross Floor Area (sqm)
<b>Mixed Use zone</b>			
Office buildings	2,000	3.5:1	7,000
Office buildings	2,000	3.0:1	6,000
Mixed use development (with shop-top housing)	2,000	3.0:1	6,000
Business park	2,000	2.0:1	4,000
<b>Enterprise zone</b>			
Warehousing	20,000	0.7:1	14,000
Industrial park	10,000	0.9:1	9,000

Source: Atlas

We highlight that development types tested are not urban design or capacity tested. They are generic in nature and for the purposes of testing the feasibility of development types.

Parking rates from the Liverpool and Penrith development control plans are adopted for the purposes of feasibility testing. New parking controls could in the future apply, however for the purposes of testing existing ratios are applied.

**Table S2.2: Parking Requirements**

Land Use	Liverpool DCP (Aerotropolis Core)	Penrith DCP (Northern Gateway)
<b>Commercial</b>		
Business/ Office	1 per 35sqm LFA	1 per 40sqm GFA
Retail	1 per 20sqm LFA	1 per 30sqm GFA
<b>Multi-dwelling Housing</b>		
1 bedroom	1	1
2 bedroom	1.5	1.5
3 bedroom	2	2
Visitor	0.25	0.2
<b>Residential Flat Building</b>		
1 bedroom	1	1
2 bedroom	1.5	1
3 bedroom	2	2
Visitor	0.25	0.2
<b>Industrial</b>		
Warehouse/ Distribution Centre	1 per 75sqm LFA	1 per 100sqm GFA
General Industrial	1 per 75sqm LFA	1 per 75sqm GFA

LFA - lettable floor area, GFA - gross floor area  
Source: Liverpool DCP 2008, Penrith DCP 2014

### Revenue Assumptions

Efficiency ratios are used to convert GFA to net saleable area (NSA) - 85% (residential) and 90% (commercial and industrial).

Revenue assumptions for commercial and industrial floorspace are then applied to the converted saleable areas.

Residential revenue assumptions are based on a hypothetical unit and size mix as outlined in **Table S2.3**.

**Table S2.3: Shop Top Housing Average Unit Size and Mix**

Unit Type	Mix (%)	Average NSA* (sqm)
1 bedroom	25%	60
2 bedroom	70%	80
3 bedroom	5%	110

\*NSA was calculated using a hypothetical efficiency ratio of 85%  
Source: Atlas

Average revenue assumptions adopted for each development typology are based on the findings of the market appraisal undertaken in Chapter 2 and are shown in **Table S2.4**.

**Table S2.4: Average Revenue Assumptions**

Land Use	Average Revenue Rates	Average Sale Values
<b>Non-residential</b>		<b>End Sale Values (excl. GST)</b>
Commercial	\$475/sqm to \$525/sqm	\$6,000/sqm to \$7,000/sqm
Retail	\$625/sqm to \$650/sqm	\$8,000/sqm to \$9,000/sqm
Industrial	\$115/sqm to \$140/sqm	\$1,500/sqm to \$2,500/sqm
<b>Residential</b>		<b>Equivalent Rates (\$/sqm internal area)</b>
1-bedroom unit	\$450,000 to \$500,000	\$7,500/sqm to \$8,333/sqm
2-bedroom unit	\$575,000 to \$625,000	\$7,188/sqm to \$7,813/sqm
3-bedroom unit	\$700,000 to \$750,000	\$6,363/sqm to \$6,818/sqm

Source: Atlas

### Other revenue assumptions:

- 75% of apartments are pre-sold prior to construction and the balance sold on completion at a rate of 4-8 units per month.
- GST is included on the residential sales but excluded on non-residential sales.
- Marketing and legal costs are assumed at 1% and 0.5% respectively of gross sales revenue.
- Sales commission on sales included at 2.5% of gross residential sales and 1.5% of non-residential sales.

### Cost Assumptions

Cost assumptions are generic in nature and based on experience and industry cost publications.

- Legal and due diligence costs assumed at 0.5% of land cost and is assumed to be paid on exchange in Month 1.
- The site is assumed to be appropriately zoned with design and development planning occurring immediately upon settlement.

Building areas are calculated by applying a generic 110%-115% ratio to gross floor area (GFA) against which construction building costs are applied. Construction build costs assumed are shown in **Table S4.5**.

**Table S2.5: Build Cost Assumptions**

Development Typology	Build Costs (\$/sqm)*
<b>Mixed Use zone</b>	
Commercial low-rise	\$2,300 to \$2,500
Commercial mid-rise	\$2,500 to \$2,750
Commercial high-rise	\$3,250 to \$3,750
Retail	\$1,800 to \$2,000
Residential mid-rise	\$2,300 to \$2,500
Residential balconies	\$800
Parking (basement)	\$50,000 per space
<b>Enterprise zone</b>	
Warehousing	\$800/sqm to \$900/sqm
Industrial park	\$1,000/sqm to \$1,200/sqm
Parking (at-grade)	\$5,000 per space

\*applied to gross building area (110%-115% GFA)  
Source: Atlas (various)

### Other cost assumptions:

- Professional fees at 11% of construction cost expensed as follows:
  - 6.5% pre-construction (during design and DA documentation).
  - 4.5% pro-rated with construction.
- Construction contingency of 5% of construction cost.
- Site costs and lead-in services works at 1% of construction cost respectively.
- Statutory fees and charges:
  - DA, CC and long service levy at statutory rates.
  - A s7.12 Contributions Plan is currently in draft. A rate of 6.5% of the cost of development has been assumed. Any change to this adopted rate would influence development feasibility.
  - SIC rates outside Station Precincts - \$200,000/ha NDA (Enterprise) and \$500,000/ha NDA (Mixed Use);
  - Site rates inside Station Precincts:
    - \$200,000/ha NDA and 1% cost of development (Enterprise)
    - \$500,000/ha NDA and 2% cost of development (Mixed Use).
- Holding costs including land tax, Council and water rates.

### Other cost assumptions:

- Land purchase cost as equity with remaining cost debt funded with interest capitalised monthly (nominal 6% per annum)
- Finance establishment cost of 0.35% of peak debt.

### Hurdle Rates and Performance Indicators

Target hurdle rates are subject to perceived risk of a project (planning, market, financial and construction risk). The higher the project risk, the higher the hurdle rate. The following performance indicators are relied upon:

- Development Margin profit divided by total development costs (including selling costs).
- Discount rate refers to the project internal rate of return (IRR) where net present values of an investment is zero.
- Residual Land Value is arrived at by assessing the maximum land value a developer is willing to pay based on both hurdles of development margin and discount rate being met.

## ANALYSIS OF DEVELOPMENT SITE SALES

Table S2.6 summarises the analysis of development site sales that contribute to the assessment of development feasibility.

Table S2.6: Development Site Sales Activity

Address	Site Area (Potential GFA)	Sale Price (Sale Date)	Sales Analysis (\$/sqm GFA)	Comments
<b>Commercial</b>				
21B Bathurst St, Liverpool	746 (1,865)	\$2,600,000 (Jun 2020)	\$3,485 (\$1,394)	A single storey commercial building on the fringe of Liverpool CBD within the B4 zone. Sold without development consent or DA lodged.
15 Rodeo Dr, Gregory Hills	3,007 (4,302)	\$3,960,000 (Dec 2019)	\$1,317 (\$921)	A vacant site within the B5 zone sold without development consent. A DA was lodged for a 3 storey commercial building (23 business premises).
146 & 152 Macquarie St, Liverpool	1,025 (2,563)	\$11,550,000 (Aug 2019)	\$11,268 (\$4,507)	A single storey retail building occupied by Chemist Warehouse. Sold without development consent. The site falls within the B4 zone.
159 Northumberland St, Liverpool	1,140 (3,420)	\$6,300,000 (May 2018)	\$5,526 (\$1,842)	A vacant site within the B5 zone.
431 Macquarie St, Liverpool	5,500 (16,500)	\$19,000,000 (Mar 2018)	\$3,455 (\$1,852)	A prominent key site in Liverpool CBD with triple street frontage. Improvements at time of sale comprised commercial/industrial building. The site falls within B4 zone and sold without development consent. A DA has been lodged for the construction of a 26 storey commercial building with retail and community facilities.
13 Digitaria Drive, Gledswood Hills	2,952 (5,345)	\$1,623,000 (Jul 2016)	\$550 (\$304)	A vacant site within the B5 zoned sold without development consent. Subsequent approval for a 4 storey mixed use development comprising medical, business and food and drink premises over 2 levels of basement car parking.
<b>Industrial</b>				
4 Lancaster St, Ingleburn	7,538	\$4,000,000 (Jul 2020)	\$531	Un-serviced vacant industrial land within the IN1 zone. Sold with development consent for 11 industrial units. Remediation works required.
561 Great Western Highway, Werrington	8,488	\$3,825,000 (Jul 2020)	\$451	Serviced vacant industrial site with existing hardstand within the B6 zone. Subsequent DA lodged for 34 industrial units.
28 Grahams Hill Rd, Narrellan	5,573	\$4,950,000 (Nov 2019)	\$888	Serviced vacant industrial site improved with existing hardstand within the IN1 zone. No DA history subsequent to sale.
339 Wallgrove Rd, Eastern Creek	82,300	\$19,250,000 (Aug 2019)	\$234	Serviced industrial land within the Land Use 1 Open Space zone under the SEPP (Western Sydney Parkland) 2009. Existing improvements comprise of a chicken farm operation.
419 Bringelly Rd, Leppington	19,600	\$7,480,000 (May 2019)	\$382	Serviced vacant industrial land within the IN2 zone. Located within a growth precinct. No DA history.
38-45 Vallance St, St Marys	8,900	\$4,940,000 (Mar 2019)	\$556	Serviced industrial site within the IN1 zone in an established industrial location. Existing improvements comprise an industrial building with subdivision or redevelopment potential.
2 Speedwell Pl, South Windsor	1,265	\$957,000 (Nov 2018)	\$757	Serviced vacant industrial land within the IN1 zone. Established industrial area.
10 Coombes Dr, Penrith	1,673	\$1,200,000 (Oct 2018)	\$717	Vacant industrial land with hardstand within the IN1/ IN2 zone. Subsequent DA lodged for the construction of 4 light industrial units with ancillary office.

Address	Site Area (Potential GFA)	Sale Price (Sale Date)	Sales Analysis (\$/sqm GFA)	Comments
<b>Med Density Residential</b>				
119-121 Flowerdale Rd, Liverpool	1,745 (784)	\$1,925,000 (Oct 2019-Mar 2020)	\$1,103 (\$2,455)	An R3 zoned site sold with development consent for 7 townhouses.
192-196 Moore St, Liverpool	2,087 (1,478)	\$2,670,000 (Feb 2020)	\$1,279 (\$1,806)	Three adjoining residential properties zoned R4 High Density to be consolidated and redeveloped. Earlier DA (now withdrawn) for the construction of a multi-dwelling development comprising 14 townhouses.
15-17 Frangipanni Ave, Liverpool	1,681 (1,681)	\$2,400,000 (Sep 2019)	\$1,428 (\$1,428)	Two adjoining residential properties zoned R4 sold without development consent. An earlier DA for 13 townhouses has been withdrawn.
50-52 Marsh Pde, Casula	1,506 (924)	\$1,510,000 (Dec 2018)	\$1,003 (\$1,823)	Two adjoining medium density zoned residential site sold with development consent for 10 townhouses.
51 Terry Rd, Rouse Hill	36,800 (64,400)	\$22,900,000 (Jun 2018)	\$622 (\$356)	A vacant medium density zoned site in the North West Growth Area in Tallawong Station Precinct. Indicative scheme proposes 138 townhouses.
155 Cowpasture Rd, Carnes Hill	8,735 (3,319)	\$4,034,454 (Jan 2017)	\$462 (\$1,206)	A medium density zoned site sold with development consent for 26 townhouses.
<b>High Density Residential</b>				
Lots 12-13 Butu Dr, Pemulwuy	30,919 (24,900)	\$36,000,000 (Apr 2020)	\$1,164 (\$1,446)	An undulating site zoned R4 within a master planned urban renewal estate. Sold with existing DA for a staged residential 300 apartments within 7 x 3/ 4/ 5 storey residential flat buildings.
Lot 101, 35 Ingleburn Rd, Leppington	5,613 (6,682)	\$4,510,000 (Jan 2020)	\$803 (\$675)	A vacant site zoned R3 in the Leppington precinct. Subsequent deferred commencement for 82 apartments within 3 x 3/ 4 residential flat buildings.
93-143 Hoxton Park Rd, Liverpool	12,200 (12,200)	\$5,000,000 (Dec 2019)	\$410 (\$410)	Vacant surplus land with main road frontage. Elongated site zoned R4.
61 Goulburn St, Liverpool	733 (1,833)	\$2,262,500 (Dec 2019)	\$3,087 (\$1,235)	Potential mixed use development site zoned B4. Existing improvements at the time of sale comprised of an older style block of 6 units.
Lot 129 Civic Way, Rouse Hill	15,000 (36,250)	\$31,000,000 (Dec 2019)	\$2,087 (\$855)	A vacant site zoned B4 within the Rouse Hill precinct where development is subject to the Rouse Hill Master Plan. Sold with a DA under assessment for 375 apartments and 2,500sqm of commercial space within a 6 x 6-1.1 storey mixed use towers.
75-81 Schofields Rd, Rouse Hill	43,260 (93,393)	\$45,800,000 (Aug 2019)	\$1,059 (\$490)	Two vacant sites zoned R3 and B4 adjoining Tallawong Station. Sold with Concept Plan Approval for 16 mixed use building envelopes.
218 South St, Marsden Park	10,900 (4,360)	\$5,200,000 (Aug 2019)	\$477 (\$1,193)	A vacant site zoned B2 within a planned future town centre. Indicative development yield of 48 units. Approximately 20% of the site is affected by a future transport corridor.
Lots 16C-16M & Lot 15C Pelican Rd, Schofields	67,085 (129,136)	\$60,930,000 (May 2019)	\$908 (\$472)	A vacant site zoned R3 within a north-west growth area. Sold with development consents within 7 separate development approvals for the construction of 18 x 5 storey residential flat buildings comprising 1,354 home units.
226-228 Grange Av, Marsden Park	38,460 (26,600)	\$21,750,000 (Apr 2019)	\$566 (818)	A vacant site zoned R3 within close proximity to the Marsden Park town centre. DA approval was subsequently obtained for 2 superlot projects containing 108 dwellings and a 6 storey residential flat building containing 45 apartments.
49 Terry Rd, Rouse Hill	22,230 (26,545)	\$21,500,000 (Apr 2018)	\$967 (\$810)	A vacant site exchanged via option agreement in 2016 without development consent. The option was exercised and contracts exchanged in 2018 with subsequent approval being obtained for 311 apartments within 3 x 4 storey residential flat buildings.

Source: Atlas

# APPENDIX 1

## DOMESTIC ECONOMY FORECASTS (2020-2021)

Table A.1: Key Domestic Economy Forecasts (2020-2021)

	Outcomes(b)		Forecasts	
	2018/19	2019/20	2019/20	2020/21
Real gross domestic product	2	- 1/4	-2 1/2	-2 1/2
Household consumption	2	-2 1/2	-1 1/4	-1 1/4
Dwelling investment	0	-10	-16	-16
Total business investment(c)	-0.9	-6	-12 1/2	-12 1/2
<b>By industry</b>				
Mining investment	-9.4	4	9 1/2	9 1/2
Non-mining investment	1.8	-9	-19 1/2	-19 1/2
Private final demand(c)	1	-3 1/2	-4	-4
Public final demand(c)	4.4	5	4 1/2	4 1/2
Change in inventories(d)	-0.2	0	0	0
Gross national expenditure	1.6	-1 1/2	-1 3/4	-1 3/4
Exports of goods and services	4	-1 1/2	-6 1/2	-6 1/2
Imports of goods and services	0.3	-8	-6	-6
Net exports(d)	0.8	1 1/4	- 1/4	- 1/4
Nominal gross domestic product	5.3	2	-4 3/4	-4 3/4
<b>Prices and wages</b>				
Consumer price index(e)	1.6	- 1/4	1 1/4	1 1/4
Wage price index(f)	2.3	1 3/4	1 1/4	1 1/4
GDP deflator	3.3	2 1/4	-2 1/4	-2 1/4
<b>Labour market</b>				
Participation rate (per cent)(g)	66	63.4	64 3/4	64 3/4
Employment(f)(h)	2.5	-4.4	1	1
Unemployment rate (per cent)(g)	5.2	7	8 3/4	8 3/4

(a) Percentage change on preceding year unless otherwise indicated.

(b) Calculated using original data unless otherwise indicated.

(c) Excluding second hand asset sales between the public and private sector.

(d) Percentage point contribution to growth in GDP.

(e) Through the year growth rate to the June quarter.

(f) Seasonally adjusted, through the year growth rate to the June quarter.

(g) Seasonally adjusted rate for the June quarter.

(i) The forecasts are underpinned by price assumptions for key commodities: iron ore spot price assumed to decline to US\$55 per tonne free on board (FOB) by the end of the December quarter 2020; metallurgical coal spot price assumed to remain at US\$110 per tonne FOB; and thermal coal spot price assumed to remain at US\$54 per tonne FOB.

Note: The forecasts for the domestic economy are based on several technical assumptions. The exchange rate is assumed to remain around its recent average level – a trade weighted index of around 60 and a \$US exchange rate of around 69 US cents. Interest rates are assumed to move broadly in line with market expectations. World oil prices (Malaysian Tapis) are assumed to remain around US\$34 per barrel. Population growth is assumed to be 1.2% in 2019/20 and 0.6% in 2020 21. Source: ABS cat. no. 5206.0, 5302.0, 6202.0, 6345.0, 6401.0, unpublished ABS data and Treasury.



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