Wagga Wagga Airport

Master Plan 2010

REHBEIN AOS Airport Consulting

City of Wagga Wagga

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EXECUTIVE SUMMARY

BACKGROUND

Rehbein AOS Airport Consulting was commissioned by Wagga Wagga City Council (Council) to prepare an Airport Master Plan setting out the required infrastructure to support the long-term growth and development of Wagga Wagga Airport over the period to 2030 and beyond. Furthermore, the Master Plan considers the development of the area surrounding the existing civil airport and the role of the airport in the future development of the region. Council identified several specific objectives for this Airport Master Plan, including the desire to:

- Prioritise the core functions of Wagga Wagga Airport;
- Create a strategic framework to detail and facilitate future planned growth and development of the Airport whilst accounting for existing infrastructure;
- Take an integrated approach to aviation, land and commercial development, environmental management and surface transportation;
- Provide airport stakeholders a planning context for use in their own planning processes;
- Develop a strategy to enable the continued safe operation of the airport in a financially responsible and feasible manner;
- Identify commercially profitable revenue generating activities at the Airport including opportunities to develop a cluster of aviation based commercial activities; and
- Reflect the economic strengths and opportunities of Wagga Wagga relevant to industry and business.

Council's terms of reference for the study specifically mandated a constraint free approach to identifying preferred future development. Whilst, ultimately, development decisions must remain cognisant of constraints which are impractical or not cost-effective to remove, Council did not wish to have strategic thinking unnecessarily limited by perceived constraints which upon investigation may prove both possible and worthwhile to remove.

Extensive stakeholder consultation was undertaken to solicit the views, issues and concerns of Council representatives, airlines, other airport tenants and users, Defence representatives, local business and community organisations. Another key element was the conduct of a visioning workshop, at which attendees were specifically selected to represent a cross-section of Council officers, local organisations and wider industry experts intended to provoke far-sighted and imaginative exploration of the future potential of the airport as an economic generator and social asset for Wagga Wagga.

STRATEGIC VISION

This Airport Master Plan establishes the strategic vision to establish Wagga Wagga as 'a world-class aviation education and training city' and its Airport as 'A Centre of National Aviation Significance'. This strategic vision capitalises on and is driving the further development of a number of related initiatives that are likely to enhance and further define this vision in the near-term. In the medium-term, however, this strategic direction can be expected to lead to a significantly increased level of flying and other aviation training activity at Wagga Wagga airport.

EXISTING FACILITIES

RUNWAYS

Wagga Wagga Airport currently has two runways. The main runway, 05/23, is 1,768 metres long, 45 metres wide, asphalt surfaced and can handle unlimited operations up to Q400 (70-seat turboprop) or limited 78-seat E-170 jet operations. A secondary, cross runway 12/30 is 1,526 metres long and 30 metres wide and suitable for light aircraft only. Runway 12/30 is grassed and typically unavailable 20-25 days per year due to wet weather.

TAXIWAYS

Runway 05/23 is served by a parallel taxiway designated as Taxiway A. This extends from the 05 threshold to approximately 250 metres from the 23 threshold and is subject to weight and width limitations preventing use by passenger aircraft. Taxiway C provides direct access between the western GA apron, RPT apron, Taxiway A and Runway 05/23. Taxiway C is suitable for use by reference code letter C aeroplanes and is equipped with lights for use at night.

APRONS

The terminal is served by a sealed apron measuring approximately 200 metres by 100 metres. To the west of this is a general aviation apron, measuring approximately 170 metres by 85 metres. This apron accommodates all of the commercial tenants on the aerodrome, including the Regional Express maintenance facilities, AAPA hangar, Wagga Air Centre, Regional Aviation, Encore Aviation and several other smaller commercial tenants. To the south is an asphalt-surfaced apron approximately 50 metres wide and 110 metres long providing access to multi-aircraft private light aircraft hangars.

PASSENGER TERMINAL

A relatively modern brick terminal building with a footprint of approximately 1,350m^2 serves 36-seat Regional Express and 50-seat QantasLink turbo-prop aircraft conducting frequent services to

Sydney and Melbourne. The terminal has recently been expanded to accommodate future facilities for the security screening of passengers and checked baggage.

OTHER FACILITIES

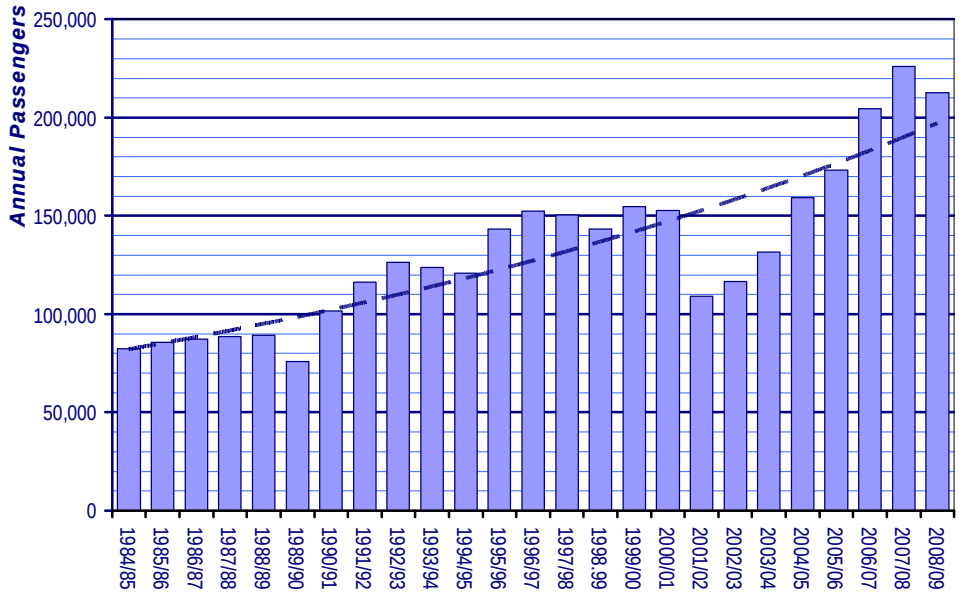
Wagga Wagga Airport is equipped with visual and radio navigational aids appropriate to its role as a significant regional airport.

HISTORICAL AVIATION ACTIVITY

PASSENGER MOVEMENTS

Annual passenger traffic from 1984/85 to 2008/09 is shown in Figure I. Over the last 25 years, passenger numbers have increased from 82,426 in 1984/85 to 226,060 in 2007/08 and have currently moderated slightly to 212,691 in 2008/09. Over the 25-year period this is equivalent compound annual growth of 4.0%.

Figure I: Historical Passenger Traffic 1985 - 2009



Source: Wagga Wagga City Council, BITRE

Between 80 and 85% of passenger traffic is between Wagga Wagga and Sydney. The proportion has remained relatively constant over the last 4 years.

There is a relatively strong cyclical component to passenger traffic at Wagga Wagga, with significantly lower traffic in December, January and February than for the rest of the year. This is indicative of the fact that the majority of the traffic is business-related and reflects the strong contribution of defence and education to the local economy.

AIRCRAFT MOVEMENTS

Aircraft movement numbers in 2008/09 are estimated to be around 27,500. Regular Public Transport (RPT) (i.e., airline) aircraft movements presently contribute around 37% of aircraft operations, with general aviation contributing almost half the total movements. Since AAPA relocated its activities to Wagga Wagga in April 2009, there is now a significant component of fixed-wing training movements at the airport. Around 6% of movements are by helicopters.

FORECAST AVIATION ACTIVITY

PASSENGER MOVEMENTS

Various forecasts were estimated to 2030 using a range of economic conditions and assumptions, supported by econometric modelling and statistical analysis. The forecasting procedure included a detailed review of several key factors to produce a set of 150 system-wide forecasts which were tested under a range of assumptions and plausible scenarios using reliable time-series data. The results of this analysis were summarised in a series of five econometric growth scenarios, each of which was assigned a probability of occurrence. By combining the probability-weighted forecast passenger numbers from each econometric growth scenario an 'expected value' forecast was also derived. From these econometric growth scenarios, three separate passenger traffic growth scenarios were selected for Master Planning purposes, representing the likely High-, Medium-, and Low-growth passenger numbers each year to 2030. Figure II summarises the annual passenger history and the growth forecasts from 2005/06 to 2029/2030 for Wagga Wagga Airport.

Projections of annual aircraft movement numbers have been developed by segmenting aviation activity into the principal component sectors, each of which has differing drivers and prospects for growth at Wagga Wagga Airport. The forecast aircraft movement growth in each segment is shown in Figure III. Consistent with Council's aspirations for Wagga Wagga to develop as an aviation training hub, fixed-wing flying training is expected to constitute the majority of aircraft movements at the airport in the future. Beyond 2014/15, it is difficult to predict how this sector may develop. Two scenarios have therefore been considered, although it should be noted that these are not mutually exclusive of each other.

Figure II: Forecast Passenger Traffic 2009/10 – 2029/30

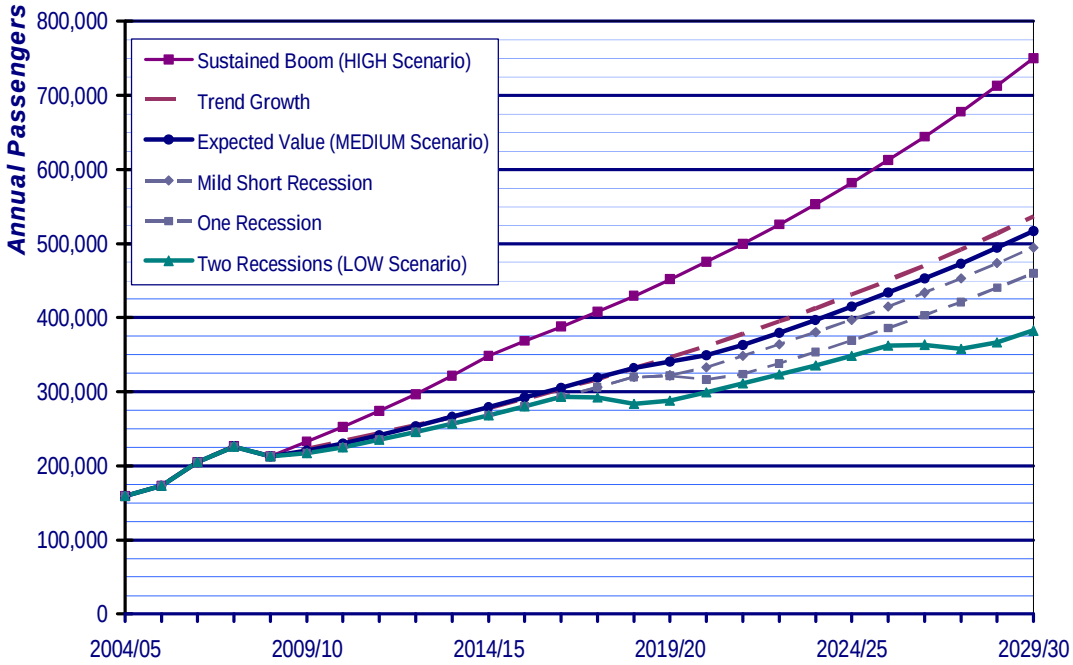
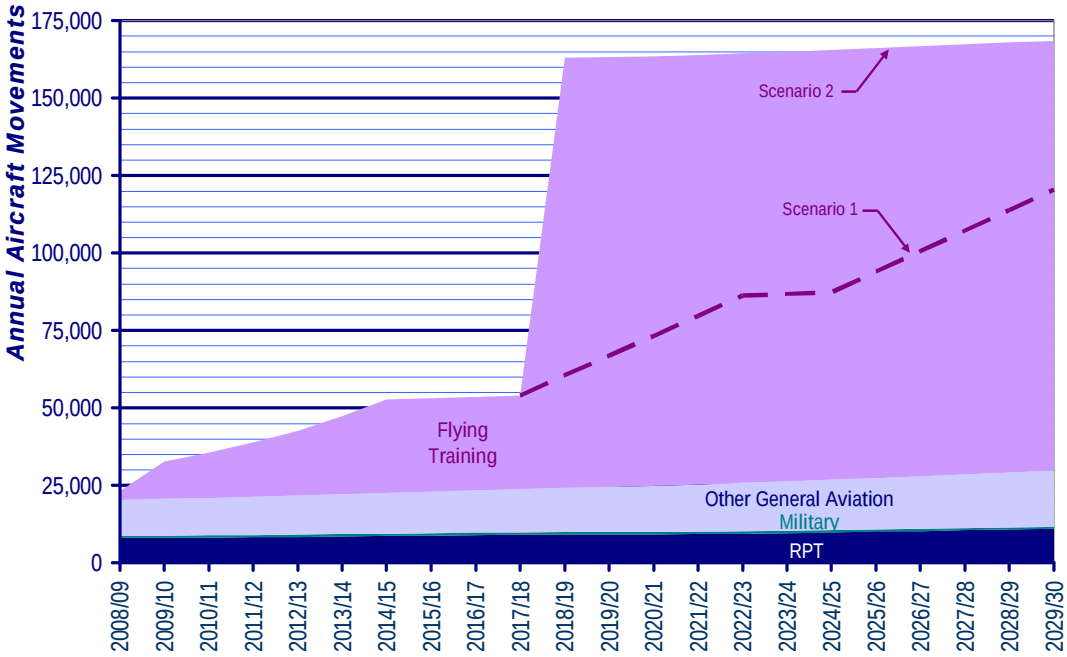


Figure III: Forecast Aircraft Movement Growth 2009/10 - 2029/30



CRITICAL PLANNING PARAMETERS

To determine the critical planning parameters for passenger terminal requirements and aircraft parking capacity on the associated apron a scenario-based approach was adopted which considered the potential impacts of varying combinations of annual passenger traffic and operating aircraft size/frequency. Statistical variability in aircraft load factor and aircraft punctuality was also taken into account to determine the planning requirements for aircraft parking and passenger processing within the terminal.

The analysis indicated that, in the worst-case scenario at 2030, a terminal building capable of accommodating approximately 1,100 passengers and 5 aircraft simultaneously might be required.

The dimensions, shape and layout of basic airport facilities such as runways, taxiways and aprons are essentially determined by the performance capability and size of the aircraft that are intended to use them. Different facilities on the airport, such as those intended for airline services and those intended solely for light GA aircraft, are normally planned for their specific critical aircraft. For the purposes of planning specific non-passenger elements of the future airfield development, the various aircraft types that might potentially use Wagga Wagga Airport were aggregated into four broad groupings, each characterised by an ICAO aerodrome reference code and Aircraft Classification Number (ACN) related to pavement strength as indicated in Table I.

Table I: Aircraft Groupings and Characteristics for Facility Planning

Description	Characteristic aerodrome reference code	Characteristic ACN
Light aircraft (Private)	1A	<5,700 kg
Light aircraft (Commercial)	2B	< 5,700kg
Turbo-prop and regional jet	3C	20
Medium-jet	4C	44
Wide-body	4E	69

AERONAUTICAL DEVELOPMENT CONCEPT

The proposed aeronautical development concept has been prepared on the basis of satisfying the critical planning parameters with the overriding objective to maximise the operational capacity of the current airport site to accommodate aircraft movements of the types appropriate to Council's intended role for Wagga Wagga Airport.

RUNWAY SYSTEM

Runway system options were considered on the basis of providing the necessary capacity to accommodate the anticipated possibilities with respect to aircraft types and operational activity. The analysis showed that additional runway capacity is likely to be required in the next 10-20 years to accommodate Wagga Wagga Airport's aspirations to develop as a hub for commercial flying training.

Various configuration options for this were assessed, as a result of which the preferred ultimate runway system at Wagga Wagga is proposed as follows:

- Existing Runway 05/23 to be retained and, as demand warrants, progressively extended and strengthened to accommodate narrow-body and possible future wide-body jet aircraft operations;
- A new runway, parallel to 05/23, to be provided, as demand warrants, providing additional capacity for light aircraft training operations. The new runway will be designated 05R/23L and the existing main runway will be re-designated 05L/23R; and
- Runway 12/30 to be retained until construction of runway 05R/23L and in the interim, partially sealed to form part of an alternative taxiway access between the existing RPT apron and Runway 05/23.

PASSENGER TERMINAL

The existing terminal facilities, including the associated apron, are adequate for current traffic and that which is likely to develop in the short-term – up to around 2020, or whenever aircraft of more than 100 seats are introduced. The previous Airport Development Strategy recommended that Council investigate the possibility of relocating the terminal precinct to an alternative location on its own property. The benefits of relocating the terminal, in the context of this Master Plan, include:

- The ability to develop a spacious, operationally efficient, high-quality statement which suitably represents Wagga Wagga and the region;
- The opportunity to properly incorporate a range of concessions within the terminal that can enhance the service to passengers whilst providing a revenue stream for Council;
- The potential to stimulate commercial development in another area of the airport, whilst making the current terminal area available for further aviation-related development at little cost;
- The ability to establish more optimal access arrangements; and
- The flexibility to safeguard surrounding land for expansion and to develop as demand dictates.

Alternative locations for the passenger terminal were considered as part of this Master Plan. The preferred location, which maximises the advantages of relocation identified above, is an area to the south of the existing Runway 23 threshold.

A decision on relocation is not required immediately. However the lead time for the wholesale relocation of the terminal is several years. To minimise unnecessary investment in the existing facility any decision to move should be taken sufficiently in advance of any further redevelopment of the current terminal being required, such that the new facility can be ready at the appropriate trigger point.

It is estimated that by 2030 a terminal footprint of between 5,000m^2 and 6,000m^2 may be required, and an associated apron for up to 5 Boeing 737-800 or similar aircraft.

AIRCRAFT PARKING AREAS

The existing western GA apron is constrained from expansion to the west in the short-term as a result of the Bureau of Meteorology. Expansion of the western GA apron will only be possible once agreement can be reached with the Bureau of Meteorology regarding an alternative location for its facility. A suitable alternative location has been proposed as part of this Master Plan.

To provide additional light aircraft parking in the short-term a new apron area to the south of the AAPA, Wagga Air Centre and Regional Aviation Services hangars is proposed. It is also proposed that this area will provide access to the relocated BP fuel facility. In the longer term, there may be a need to expand the existing southern GA apron.

In the short-term, there is potential for some apron development to the south of Runway 12/30, the extent of which is limited by the constraints imposed by the runway strip, the explosive ordnance storage facility and the NDB. In the medium-term, with the proposed re-designation of Runway 12/30 to a taxiway, apron depth can be extended to accommodate parking and circulation of aeroplanes up to reference code C. Ultimately, it is envisaged that it will be possible to provide a continuous hangar development zone extending from the proposed Private Light Aircraft Precinct to the existing Western GA Apron.

The development of Runway 05R/23L in the medium-term is likely to stimulate demand for apron frontage in the area to the south of that runway. Therefore, this Master Plan anticipates the development of further apron area and hangar development zones in this area to serve light aircraft suitable to use Runway 05R/23L.

A further aviation support apron, intended to serve freight and heavy aircraft maintenance of larger aircraft types, which might be suited operationally by proximity to the RPT apron, is proposed to the north-east of the future RPT apron and terminal location.

Private Light Aircraft Precinct

For some time there has been demand expressed by private aircraft owners interested in developing hangar space. So far, this demand has not been met because is has not proved possible for Council to identify and agree on a suitable area with Defence. It is proposed to establish an area for use by private light aeroplanes to the south of the existing NDB. This area is available immediately, and permits appropriate landside and airside access. The area can accommodate approximately 95 15-metre by 15-metre hangars. There is also the potential to develop the new aero club facilities in the same area.

TAXIWAY SYSTEM

The taxiway system is required to link the operational runways with the various aircraft parking areas on the aerodrome. It is important that as the level and criticality of aircraft circulation on the movement area increases, the taxiway system provides sufficient level of redundancy to ensure that airport operations are not paralysed if a particular taxiway link is unserviceable due to planned or unplanned outage. In order to sustain the level of runway movements anticipated in this Master Plan, it will be necessary to implement substantial extension and enhancement of the existing taxiway system at Wagga Wagga Airport. The taxiway development will be staged in conjunction with the development of the runway system and demands on the movement area.

STAGED DEVELOPMENT PLAN

The anticipated staging of the proposed aeronautical development concept is determined on the basis of the anticipated growth and development in aeronautical activities current at the time of preparation of this Master Plan. Development is anticipated in three stages: Stage 1 development is expected to occur at some point between 2010 and 2020; Stage 2 development is expected to occur at some point between 2020 and 2030; and Stage 3 developments are anticipated sometime beyond 2030. Stage 3 developments are considered to be extremely long-term and uncertain in nature but are identified in this Master Plan in order to preserve flexibility.

AIRCRAFT NOISE

The consideration of airport noise impact is an important factor in the development of individual Airport Master Plans. A thorough understanding of both existing and future noise impacts from airport operations is essential to the development of land use zone planning schemes around airports including the noise impact on adjoining land. The provision of information on projected noise impacts for Wagga Wagga Airport is intended to enable Council to make informed choices for the development and implementation of future Airport Master Plans and Local Environmental Plans to ensure that:

- Sensitive receptors are located in areas of acceptable aircraft noise; and

- The amenity of other surrounding developments is not adversely affected by aircraft noise
- Airport operations are protected long term from stakeholder conflicts due to the encroachment of inappropriate development into noise affected zones.

Aircraft noise is a complex and subjective issue. Accordingly, Council has produced a large amount of information which presents the expected impacts of aircraft noise at 2030, and at the ultimate capacity of the proposed aeronautical development concept. This ultimate capacity has been assessed as being approximately 315,000 movements. Wagga Wagga Airport is not expected to reach this ultimate capacity until many years (and quite possibly several decades) beyond 2030. The forecast level of movements in 2030 is approximately half of this ultimate capacity. In addition to Australian Noise Exposure Forecast contour maps, as defined in *Australian Standard AS 2021-2000 Acoustics – Aircraft noise intrusion – Building siting and construction*, N60 and N70 'number above' maps have been produced for both day-time and night-time movements.

COMMERCIAL & ECONOMIC DEVELOPMENT OPPORTUNITIES

THE AIRPORT CITY CONCEPT

There is now significant interest, in Australia and worldwide, in the concept of 'airport cities' for creating synergistic revenue streams to finance airport infrastructure and development. The generation of diverse, resilient, revenue sources and economic generators, strategically located within and outside the airport boundary, pays for major investments and expenditure growth. By significantly diversifying revenue growth it is simultaneously possible to attract new customers and repeat business, and contribute to the amenity of local residents who want to shop, work, visit, play or live in or near the airport because of its cosmopolitan and economic multiplier benefits. As a result, airport master planning is evolving into wider airport city revenue and expenditure system planning and is tied to land use and spatial planning over a 20 or 30 year horizon.

ECONOMIC POTENTIAL

Wagga Wagga Airport serves as a transportation, business and tourism gateway to the Riverina Region. The airport is a critical asset that helps drive community growth, vitality, enthusiasm and economic health. An airport which significantly expands high-value aviation services, skilled employment and high wage opportunities further increases the standard of living and amenity of people in the region, as well as relative economic performance and resilience to recessions. New aeronautical activities need to be developed alongside non-aeronautical services because the long-term sustainability of the whole system depends on its diversity of revenue streams and growth of diverse operations.

KEY ECONOMIC SECTORS AND ACTIVITIES

During the Master Plan process, key stakeholders identified the following economic sectors as the ones most likely to be driving the economy of Wagga Wagga in 2030:

- Sectors with a 'global' nature - education, training and development; research and development, and innovation; Defence; and culture and tourism;
- Sectors with a more regional focus - government; and healthcare.

The future contributions of these sectors were considered in the context of the key airport stakeholder groups of: airlines; other operators; passengers; meeters and greeters; tenants; employees; visitors; local businesses; and local residents. The following key activity clusters, which can be facilitated by the development of Wagga Wagga Airport, were identified:

- Training, education, innovation and research & development;
- A regional gateway showcase/presentation hub;
- Industry and commerce.

PROPOSED DEVELOPMENT PRECINCTS AND LAND-USE

Several proposed precincts and associated land-uses are identified in this Master Plan, resulting from the visioning workshop and stakeholder consultation process, together with consideration of major demand sectors and likely land availability. Demand for particular land-uses and availability of land at a cost which makes development commercially viable are the key factors which will determine the extent to which the proposed development may occur. Both of these factors are highly dynamic. Accordingly, flexibility is essential in the ongoing review of the proposed distribution of land-uses and extents of each development precinct. Not all of the land identified for potential development is necessarily required for the intent of the Master Plan to be realised.

Precinct 1: High-Value Commercial

Precinct 1 offers direct access to the Sturt Highway, and a central strategic location within the surrounding development. Development in this precinct can generate high multipliers when properly linked to defence, aerospace, transport supply, education supply, and quasi-government organisations. The highway frontage makes it possible to develop key commercial sites that gain benefit from accessibility and visibility from the highway, such as a service station, accommodation, and food and beverage.

Precinct 2: Aviation Support & Training

Flying training and other potential education and international options have sound economic potential. In addition, the synergies with AAPA and Airservices Australia provide added multiplier potential. Also the more high-value maintenance and testing, pilot training, education and research

and development linkages the more likely they have higher value-added benefits and be resilient to short economic downturns. Precinct 2 provides a suitable location for expansion of key aviation support and aviation training activities to a level of many times the existing activity.

Precinct 3: Education & Research

These synergistic activities of education, research, professional development, conventions, hospitality and sport can be co-located in and around Precinct 3, which offers synergies with the aviation support and training activities of Precinct 2. The location, juxtaposed between the developing high-tech airport and rural land offers a range of synergies with aviation training of all kinds and Wagga's more traditional agricultural skills base.

Precinct 4: Industrial Park

Precinct 4, with accessibility to the southern edge of Runway 05R/23L, clearly offers some additional potential for aviation support activity and this will be essential if the full capacity of the aerodrome is to be realised. This precinct is particularly suited to the development of a rotary wing precinct. There are, however, large areas of potential development space that would not be required for aviation support activity. Potential uses include an industrial park, potentially focussing on green, innovative and recycling technologies.

Precinct 5: Defence Activities

Precinct 5 is envisaged as being reserved for the consolidation of existing Defence activities within and around the existing airport that might be dislocated as a result of the proposals in this Master Plan.

Precinct 6: Terminal, Freight, High Service Businesses

The synergy between passenger operations, high service businesses, freight and maintenance and defence combined with future highway access has the potential to be the catalyst that propels growth to the next level. The land in proximity to the passenger terminal and potential high-value aviation freight or aircraft maintenance activity has the potential to attract and sustain high-value businesses directly supporting these activities. In the long-term highway frontage will stimulate development of a more commercial nature, whilst connectivity with Precincts 5 and 4 might result in high-value industrial development.

GROUND ACCESS CONSIDERATIONS

External road access to the terminal precinct of the Wagga Wagga airport currently occurs via Elizabeth Avenue and Don Kendell Drive. Access to Elizabeth Avenue can occur from the Sturt Highway, to the north of Don Kendell Drive, or from Inglewood Road to the south.

Given the increased traffic demand the potential development in and around the airport is likely to generate, it is suggested that the current form and nature of Elizabeth Avenue is inappropriate as the

principal access to the western half of the airport. Such access should be provided via a high standard, higher order direct road link. The existing access from the north via the Sturt Highway and Elizabeth Avenue has some significant constraints that would prevent it from ever being upgraded to a high order road.

To facilitate future development of the airport, the provision of a high standard, high-speed alternative link between the Sturt Highway and Don Kendell Drive would provide superior access to the future upgraded airport than that provided via the constrained Elizabeth Avenue link, whilst enhancing the road safety through the residential area. Upgrade of Inglewood Road should also be considered, as it is likely to be an increasingly important access route between the southern areas of Wagga Wagga and the proposed development at the airport.

These provisions will serve equally long-tem development and medium-term requirements for external access to the existing airport terminal precinct.

The area adjacent to the existing terminal is highly constrained with respect to car parking in particular. Further car parking could be accommodated in the area to the north of the Regional Express maintenance facility. Although slightly removed from the terminal, this area would be suitable for long-term parking, with the existing car park restricted to shorter stays. Relocation of the terminal to Precinct 6, however, will enable a more optimal access and car parking layout to be developed, with maximum potential for the flexibility that is required for this aspect of ground access.

AIRPORT RING-ROAD NETWORK

Should the terminal be relocated to Precinct 6, there will be a need for a road connection between Precinct 4 and Precinct 6 and then to the Sturt Highway. To maximise the development potential of Precincts 6 and 4 and to ultimately complete an orbital ring around the developing airport city, the connection should accommodate a high-speed link with limited access.

WIDER NETWORK CONNECTIVITY

To enable the scale of development around the airport ultimately envisaged by this Master Plan, it is essential that wider road network planning decisions do not undermine the potential attractiveness of the site as a key development node.

The alignment of the proposed northern bypass should be reviewed to ensure that it can maximise the traffic flow past or close to those airport developments that will derive benefit from it. It is considered fundamental to the concept of this Airport Master Plan that ‘leakage’ of traffic to any northern bypass be minimised and, if at all possible, the connection point between the bypass and the Sturt Highway should be located at the north-east apex of the airport city development.

Although a southern bypass is not currently being considered by Council, similar principles apply. The commercial and economic value of development precincts 4 and 6 especially can be enhanced by high volumes of passing traffic. This Master Plan therefore makes provision for a significant high-speed road corridor around the southern and western boundaries of the development, which should connect seamlessly with any future southern bypass at the south-west apex of the airport city development.

GLOSSARY OF TERMS AND ABBREVIATIONS

AAPA	Australian Airline Pilot Academy
ab-initio	The initial component of airline pilot flying training, traditionally commencing with a student having no prior knowledge of flying aircraft and progressing to the stage where they achieve commercial pilot status.
ACN	Aircraft Classification Number
Aerodrome	A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.
AFRU (Aerodrome Frequency Response Unit)	The AFRU is an electronic, ground based, aviation safety enhancement device, intended for use on the CTAF or MBZ frequency at non-controlled aerodromes.
AIP-DAP	Airservices Australia Aeronautical Information Publication – Departure and Approach Procedures
ANEC	Australian Noise Exposure Concept
ANEF	Australian Noise Exposure Forecast
ANEI	Australian Noise Exposure Index
ARC (Aerodrome Reference Code)	A code used to specify the standards for individual aerodrome facilities which are suitable for use by aeroplanes within a range of performances and sizes. The code is composed of two elements: the first is a number (from 1 to 4) related to the aeroplane reference field length and the second is a letter (from A to F) related to the aeroplane wingspan and outer main gear wheel span.
ATC	Air Traffic Control
BoM	Bureau of Meteorology
CASA (Civil Aviation Safety Authority)	The Australian federal government department responsible for setting and maintaining safety standards for civil aviation. CASA is responsible for the codification of international standards and recommended practices into Australian legislation and for the issue of licences for aviation personnel including pilots, amongst other responsibilities.
CASR (Civil Aviation Safety Regulation)	CASRs establish the regulatory framework (*Regulations*) within which all service providers must operate.
Council	Wagga Wagga City Council
CPL (Commercial Pilot Licence)	A licence which allows the holder to fly an aircraft for commercial activities such as charter, flying instruction, or aerial work.
CTAF	Common Traffic Advisory Frequency
DME (Distance-measuring Equipment)	Radio navigation aid providing information about the distance between an aircraft and the DME location. Often co-located with VORs.
Defence	Department of Defence

Fixed Base Operator (FBO)	A 'service centre' at an airport offering a range of services to aircraft operators and passengers, including: aircraft fuelling; aircraft parking and hangar storage; airframe and engine maintenance; avionics and instrument servicing; aircraft charter or rental; and various ground services
General Aviation (GA)	The sector of the aviation industry that does not include regular public transport (RPT) airlines and military aviation.
GNSS (Global Navigation Satellite System)	Generic term for satellite navigation systems, such as the United States' Global Positioning System, that provide autonomous geospatial (latitude, longitude and altitude) positioning with global coverage.
GPS	Global Positioning System
ICAO	International Civil Aviation Organisation
IFR/IMC (Instrument Flight Rules/ Instrument Meteorological Conditions)	Refers to rules under which flight involving navigation requiring reference to radio navigational aids or instruments is carried out. Weather conditions below a certain minima are referred to as instrument meteorological conditions (IMC). IFR flight requires pilots to be qualified in the use of instrument navigation and to use radio navigational aids provided at airports.
ILS	Instrument Landing System
LEP	Local Environmental Plan
MBZ	Mandatory Broadcast Zone
MOS	Manual of Standards
MTOW	Maximum Take-off Weight
Navaid	Commonly-used abbreviation for 'radio navigational aid'
NDB (Non Directional Beacon)	A simple and common type of radio navigational aid which allows pilots to track to or from its location.
Non-precision approach	An instrument approach and landing that uses lateral guidance but does not use vertical guidance.
OLS	Obstacle Limitation Surfaces
PAL	Pilot Activated Lighting
PAPI	Precision Approach Path Indicator
PCN	Pavement Classification Number
Precision approach	An instrument approach and landing using precision lateral and vertical guidance subject to defined meteorological minima.
RAAF	Royal Australian Air Force
RESA (Runway End Safety Area)	Area provided at the end of a runway strip, to protect the aeroplane in the event of undershooting or overrunning the runway.
RNAV/GNSS Approach	Area Navigation/Global Navigation Satellite System Approach. A form of instrument approach procedure using signals from orbiting satellites to determine an aircraft's precise position at a point in time.
RPT (Regular Public Transport)	Air services operated by airlines that are scheduled to occur on a regular basis at fixed times or frequencies and on fixed routes.

Runway usability factor	The proportion of time during which a given runway can be expected to be available for operations on the basis of the meteorological conditions and aircraft operating limits.
TORA (Take-off run available)	Defined as the length of runway available for the ground run of an aeroplane taking off. This is normally the full length of the runway.
VOR (VHF Omni-directional Range)	Radio navigational aid providing directional guidance to aircraft en-route.
VFR/VMC (Visual Flight Rules/ Visual Meteorological Conditions)	Refers to rules under which flight involving navigation solely by reference to visual cues (rather than requiring reference to radio navigational aids or instruments) is carried out. VFR flight is permissible only when meteorological conditions (cloud base and visibility) are above defined limits. Such conditions are referred to as visual meteorological conditions (VMC). VFR flight does not require pilots to be qualified in the use of instrument navigation, nor does it require expensive radio navigational aids to be provided at airports.
WWAC	Wagga Wagga Aero Club

1.0 INTRODUCTION

Rehbein AOS Airport Consulting was commissioned by Wagga Wagga City Council to prepare an Airport Master Plan for Wagga Wagga Airport. As well as setting out in detail the required infrastructure to support the growth and development of the Airport, the Master Plan considers the development of the area surrounding the existing civil airport and the role of the airport in the future development of the region.

1.1 STRATEGIC MASTER PLANNING OBJECTIVES

Airport master planning is undertaken to enable best-management practices and sound land use development in addressing diverse aviation and community interests. An Airport Master Plan is the primary strategic tool available to airport owners and operators and communicates the operator's intentions with respect to development of the airport. Its purpose is to set out a long-term framework for the development of all facilities within the airport that protects future development against the effects of current decisions.

Consistent with these strategic considerations, the *Airports Act 1996* summarizes the aims of an Airport Master Plan as follows:

- Establishing strategic direction for the efficient and economic development of the airport over the planning period;
- Providing for the development of additional uses of the airport site;
- Indicating to the public the intended uses of the airport site; and
- Reducing potential conflicts between uses of the airport site, and to ensure that uses of the airport site are compatible with the areas surrounding the airport.

Wagga Wagga City Council Objectives

Although the *Airports Act 1996* does not have statutory application to Wagga Wagga Airport, this does not reduce the relevance of these four key aims. Council has also identified several further specific objectives in commissioning this Airport Master Plan, including the desire to:

- Prioritise the core functions of the Wagga Wagga Airport;
- Create a strategic framework to detail and facilitate future planned growth and development of the Airport whilst accounting for existing infrastructure and strategic plans for future extension of services by relevant public authorities;
- Take an integrated approach to aviation, land and commercial development, environmental management and surface transportation;

- Provide airport stakeholders a planning context for use in their own planning processes;
- Develop a strategy to enable the continued safe operation of the airport in a financially responsible and feasible manner;
- Identify commercially profitable revenue generating activities at the Airport including opportunities to develop a cluster of aviation based commercial activities;
- Evaluate transportation options between the City and Airport including capacity assessments and the appropriateness of the current public road network to support future needs;
- Demonstrate compliance and consistency with Council's Local Environmental Plan (LEP) and integration with Federal or State plans to attract funding whilst ensuring environmental sustainability; and
- Reflect the economic strengths and opportunities of Wagga Wagga relevant to industry and business.

Realistically representing future facilities that will satisfy projected air traffic demand and potential economic growth opportunities, the Wagga Wagga Airport Master Plan must also ensure compatibility with the environment, local community, user needs, and regulatory obligations including aviation safety and security.

1.2 SCOPE AND TERMS OF REFERENCE

1.2.1 AREAS OF FOCUS

The scope of this Airport Master Plan is predicated on the retention and development of the existing Wagga Wagga Airport site. The option of developing a new airport site at another location has not been assessed in detail as part of this study. The advantages and disadvantages of establishing an alternative airport site have, nevertheless, been considered and in general terms the retention and development of the existing airport is considered to offer the greatest potential to bring economic benefits to Wagga Wagga at the least investment cost for Council.

The Airport Master Plan developed for the Wagga Wagga Airport represents two distinct areas of focus. These areas of focus are represented by:

- Infrastructure development strategies; and
- Airport precinct expansion opportunities.

Within the context of examining and proposing development or expansion of the Wagga Wagga Airport, parameters were established for consideration of the input received. These parameters are as follows:

- Consideration of Wagga Wagga Airport as an economic gateway to the region;
- Commercial feasibility analysis of proposal;
- Commercial sustainability analysis of proposal; and
- Integration of the Airport Master Plan with other planning initiatives.

1.2.2 TERMS OF REFERENCE

Council's terms of reference for the study specifically mandated a 'blue-sky', 'no-constraints' approach to identifying preferred future development. Whilst, ultimately, development decisions must remain cognisant of constraints which are impractical or not cost-effective to remove, Council did not wish to have strategic thinking unnecessarily limited by perceived constraints which upon investigation may prove both possible and worthwhile to remove.

Accordingly, there is no section in this report entitled 'Development Constraints' as might usually be found in a master planning study. Instead, the implications of various development decisions are discussed throughout the report. Where constraints exist, these are identified in relation to the specific developments they currently inhibit. However, whilst the proposed staging of development anticipates the relative ease and/or timing with which the constraints can be removed, it must be recognised that the overall ultimate development arrangement and hence the intermediate stages that lead to it, are predicated on progressive removal of all necessary constraints to allow the full potential of the site to be realised.

1.3 METHODOLOGY

The methodology adopted for the conduct of the Master Plan study was focussed around an integrated approach to maximising the economic benefit of the airport to the City of Wagga Wagga and surrounding region. The methodology workflow adopted is set out in Figure 1. The core activities which have served to shape the content of this Master Plan included:

- Stakeholder consultation;
- Visioning workshop;
- Forecasting and key facilities analysis; and
- Integration with other Council Master Plans.

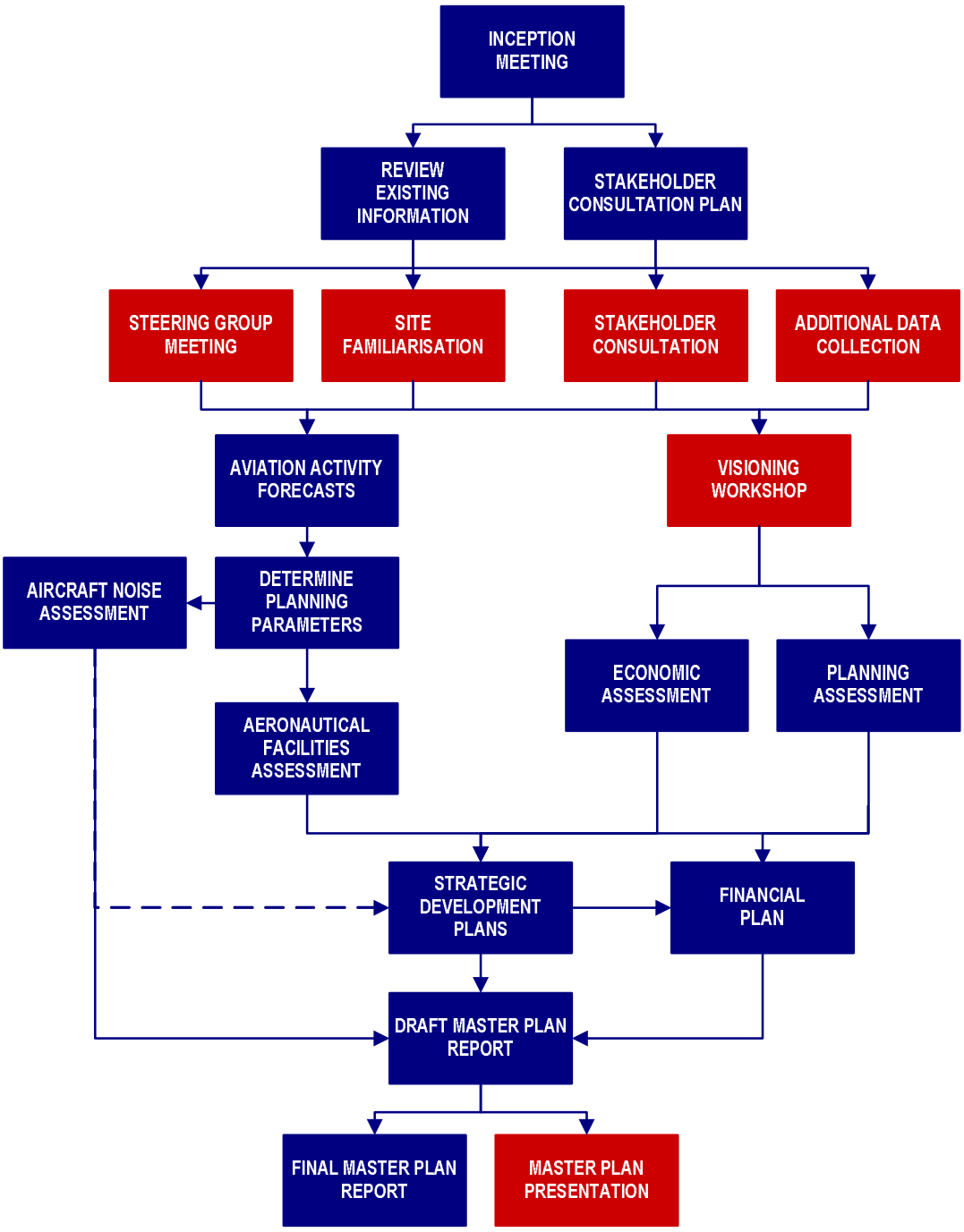
1.3.1 STAKEHOLDER CONSULTATION

Stakeholder consultation was undertaken to solicit the views, issues and concerns of Council representatives, airlines, other airport tenants and users, Defence representatives, local business and community organisations. Consultations were conducted on-site in Wagga Wagga and remotely by telephone. Discussion focused on future development potential of business and

services in relation to the airport as well as future expansion potential of Wagga Wagga Airport and issues and facility requirements specific to users. The consultations also provided an opportunity for individuals and groups to provide comment to Council on the existing service quality of the facilities at the airport.

A schedule of the stakeholders consulted is presented at Appendix A.

Figure 1: Master Plan Study Methodology Work Flow



Key Stakeholder Feedback

Feedback obtained during consultations included a wide range of concerns and issues. The key themes and issues relevant to the development of this Master Plan are summarised as follows:

- A desire to maintain adequate frequency of airline service in relation to the number of passengers;
- Concerns about overall utilisation and maintenance of current assets and the adequacy of 'gateway statement' aspects such as terminal services, amenities, car parking and hire car facilities;
- The need to ensure ground access linking Wagga Wagga Airport to the CBD, other planned development areas and local communities;
- The need to balance commercial aviation and non-aviation developments with general aviation interests;
- Concern over the ineffectiveness of previous Council development plans for the airport in ensuring strategic planning and subsequent appropriate growth and expansion of facilities;
- Anxiety over the constraints imposed by the current tenure arrangements and desire for Council to have greater control over the destiny of the airport;
- Interest in the utilisation/realisation of potential for airport to integrate cultural arts and community social benefits;
- Desire to minimise the environmental impacts associated with land use through appropriate development and associated mitigation measures;
- Retaining the qualities of a country location with inherent community/customer service priorities whilst focusing on the aspects that make an airport an economic gateway; and
- Integration with Council's other master plans and initiatives including the Bomen industrial development, Riverside precinct, Riverina Region tourism and local arts/sporting heritage.

Local governments in the Riverina Region provided input regarding the Wagga Wagga Airport and how the aerodrome impacts their respective constituencies. Responses received from these Councils were wholly positive and enthusiastic regarding development and expansion of Wagga Wagga Airport. The Councils encouraged further development and expansion of the airport, citing potential increase in opportunities for their communities and for the region as a whole.

Airport operators all expressed concerns over existing or potential development diminishing their businesses exposure to landside and access to airside facilities. Users also expressed concern over increases in fees related to air traffic control tower operations.

1.3.2 VISIONING WORKSHOP

A key element in the development of the overall master plan concept was the conduct of a visioning workshop. A 'blue-sky' visioning exercise was specifically identified by Council in the terms of reference for the Master Plan.

The visioning was undertaken in the form of a workshop in Wagga Wagga held on 26 August 2009. In contrast to the stakeholder consultations, attendees at the workshop were specifically selected to represent a cross-section of Council officers, local organisations and wider industry experts intended to provoke far-sighted and imaginative exploration of the future potential of the airport as an economic generator and social asset for Wagga Wagga. The visioning workshop included discussion around the following key topics:

- Wagga Wagga's economy in its regional context;
- Regional aviation and its potential in economic development;
- Role of airports as a hub of economic activity; and
- Role of the Wagga Wagga airport as a service and as a hub of economic activity.

Key outputs from the visioning exercise have been incorporated into Section 9.1.

1.3.3 FORECASTING AND KEY FACILITIES ANALYSIS

The development of forecasts of future aviation activity and subsequent analysis of the facilities that will be required adopted a scenario-based approach. By taking account of a wide range of possible futures, rather than a single prediction, this approach maximises the degree of flexibility offered by the development proposals included in this Master Plan. More detail on the forecasting and facilities analysis approach is provided in Section 4.2 and Section 5.0.

1.3.4 INTEGRATION WITH OTHER COUNCIL MASTER PLANS

A key feature, and essential prerequisite for a robust master plan, is an integrated approach which considers the development of Wagga Wagga airport in the context of other plans, current and proposed, for the surrounding area. In the case of Wagga Wagga, in particular, there are four planning initiatives that required consideration in completing this Master Plan:

- Bomen Business Park;
- Riverside precinct development;
- Sport and recreation precincts; and
- The possibility of city bypasses in the future.

1.4 REPORT STRUCTURE

This Master Plan is structured as follows:

- Section 2.0 provides further context for the Airport Master Plan;
- Section 3.0 describes the existing situation with respect to airport facilities and the key current operational issues;
- Section 4.0 discusses historical and future aviation activity;
- Section 5.0 summarises the key technical planning parameters assumed to develop facility requirements;
- Section 6.0 describes in detail the aeronautical development concept including a summary of anticipated development staging;
- Section 7.0 covers the issue of aircraft noise;
- Section 8.0 describes the existing and future airspace;
- Section 9.0 considers the commercial and economic development opportunities that the airport presents; and
- Section 10.0 discusses ground access considerations.

2.0 MASTER PLANNING CONTEXT

Wagga Wagga Airport is operated by Wagga Wagga City Council through a lease from the Commonwealth Department of Defence. The airport serves as a transportation, business and tourism gateway to the Riverina Region. The airport is an important asset that drives community growth, vitality, enthusiasm and economic health.

2.1 HISTORY

2.1.1 DEVELOPMENT OF WAGGA WAGGA AIRPORT

Wagga Wagga City Council acquired the airport at Forest Hill in 1992, a thirty year lease from the Department of Defence commenced on 1st July 1995. The transfer arrangements involved the upgrading of the main runway and taxiway to medium jet (specifically Fokker 28) capacity and expansion of the apron area.

Because Wagga Wagga Airport was originally developed as a RAAF base, the factors that influenced its location and development were therefore quite different to those that would have applied if it had been established as a civil airport to be managed on commercial lines. It is some distance from the City of Wagga Wagga, lacks major highway or road frontage and has a residential area, originally for RAAF personnel, established in close proximity. These factors have contributed to the limited potential for attracting commercial and/or industrial development to date.

2.1.2 PREVIOUS DEVELOPMENT PLANS

Council has produced a number of development plans in relation to the airport in the past. These include:

- *Wagga Wagga Airport Development Plan 1997*;
- *2003 Airport Development Plan* (and subsequent update in 2006); and
- *Wagga Wagga Airport GA Hangars Feasibility Study* (2008).

These development plans have been intended to identify a range of physical improvements and operational measures which should be implemented in order to ensure that the airport continues to meet the demand for aviation activity. The key feature of all of these previous plans is that they have, quite validly, recognised the significant constraints on development imposed by the present tenure arrangements. Development proposals in these plans have therefore necessarily been governed by what it has been considered possible to achieve given the limitations of the site, rather than starting from the position of what might be achieved if the site factors were more ideal.

As a result of the history and tenure of the site, past development has not always been optimal with respect to maximising the future potential of the facilities with the result that there are now several instances where previous development decisions now present obstacles to further development.

2.2 SITE FACTORS

2.2.1 AIRPORT LOCATION

The airport is located approximately 10 kilometres east of the City of Wagga Wagga and 2 kilometres south of the Sturt Highway along Elizabeth Avenue. The surrounding area is predominantly rural in character with the airport bordered by the small residential area of Forest Hill to the north and RAAF Base Wagga to the north east. Drawing B09065A001 at Appendix B is a locality plan showing the airport in relation to the City of Wagga Wagga.

2.2.2 ACCESS

Access to the airport from the centre of Wagga Wagga is via the T-intersection of Elizabeth Avenue with the Sturt Highway. A turning lane is provided for airport traffic and should suffice in the medium term. However if future residential development at Forest Hill significantly increases the volume of local traffic a roundabout or traffic signals at this intersection may then become necessary. Inglewood Road provides access for traffic from the southern residential areas around Lake Albert and other southern suburbs.

2.2.3 ZONING AND LAND USE

Council recognises that land use and development within the airport and in the surrounding areas must be controlled to ensure the safety, operational efficiency and long term expansion of the airport are not compromised.

Under the current planning controls, which are also reflected in the current draft *Wagga Wagga Local Environmental Plan (LEP) 2008* the airport area is zoned RU1 (Primary Production) except for the residential area of Forest Hill, which is principally zoned R1 (General Residential) and the nearby (undeveloped) R5 (Large Lot Residential) zone to the wast. The airport itself and adjoining RAAF Base is zoned as SP2 (Infrastructure).

The *Wagga Wagga Rural Local Environmental Plan 1991 as Amended* has a special clause relating to development in the vicinity of the airport requiring the Council when considering any development application submitted, to make an assessment of the impact of that development on the continued operation of the airport before granting consent.

The LEP has the effect of:

- Controlling the height of buildings or structures around the airport that would infringe the obstacle limitation surfaces (OLS);
- Controlling land use and the types of development around the airport to minimise bird hazards; and
- Requiring the insulation of buildings in the vicinity of the airport which may be affected by aircraft noise.

It is noted that similar provisions do not appear to have been provided in the previous *Wagga Wagga Local Environmental Plan* or current draft 2008 LEP.

2.2.4 TENURE

Council has leased the civil area of the airport from Defence for 30 years which expires on 30th June 2025. A condition of the lease guarantees up to 60 operations per year by a RAAF C130 Hercules aircraft which might otherwise be denied a pavement concession. The lease is subject to certain easements, including the protection and preservation of the existing explosives ordnance and helicopter training areas.

The lessee is required to keep the land (including the manoeuvring area) in good repair. Any new buildings erected by the lessee are deemed to become the property of the lessor at the end of the lease term. Council must seek prior approval of the lessor for the erection of any new building or improvement to the land.

The lease guarantees tenure to the Commonwealth Bureau of Meteorology on a relatively large land area whose present location creates a significant constraint on building area development in the long-term. The main Airservices Australia lease (including an office building and workshop) may also inhibit the logical long term development of the RPT terminal's public car park.

2.3 SOCIO-ECONOMIC CONTEXT

The City of Wagga Wagga is part of the Murrumbidgee region in the heartland of the New South Wales Riverina. Wagga Wagga is the administration centre for the wider region and provides a range of community services. It is located at the intersection of the Sturt and Olympic Highways on the Sydney and Melbourne trade route. Wagga Wagga lies within 5-hours drive time of two-thirds of Australia's population.

The estimated resident population in 2007 was 60,591 persons. Between 2002 and 2007 annual population growth averaged approximately 1.2% per year, 0.4% higher than the New South Wales average over the same period. Over the period to 2031, population is forecast to increase to

68,322 (0.5% per annum on average)[1]. In contrast to recent trends, population growth is projected to be below the State average.

Wagga Wagga is a key industry centre in the region, generating a gross regional product of approximately $2.6 billion, accounting for over one-third of the Murrumbidgee economic output. The key strengths of the economy are in the education, property and business services, manufacturing, and government administration and defence sectors.

2.4 STRATEGIC VISION

This Airport Master Plan establishes the strategic vision for Wagga Wagga Airport as 'A Centre of National Aviation Significance' and the strategic vision to establish Wagga Wagga as 'a world-class aviation education and training city'. This strategic vision capitalises on and is driving the further development of the following initiatives:

- The presence on the airport of the Australian Airline Pilot Academy;
- The presence at adjacent RAAF Base Wagga of the National Aerospace Training Centre of Excellence, in partnership with the TAFE NSW Riverina Institute;
- The partnership between TAFE NSW Riverina Institute and Airservices Australia, through which the Riverina Institute delivers all of Airservices' technical trades training in Wagga Wagga;
- The development of e-learning initiatives for airport and aviation-related training; and
- Consideration of the establishment of a Bachelor of Aviation Studies by Charles Sturt University.

Council is progressing a number of related initiatives that are likely to enhance and further define this strategic direction in the near-term. In the medium-term, however, this strategic direction can be expected to lead to a significantly increased level of flying and other aviation training activity at Wagga Wagga airport.

2.5 PLANNING INTEGRATION

This Airport Master Plan has been prepared with due regard for and consideration of the content of other Council planning initiatives, including in particular other development master plans, the wider Wagga Wagga road network and the draft *Wagga Wagga Local Environmental Plan 2008*.

These documents not only provided fundamental inputs to this study, but equally importantly this airport master plan feeds back into other Council planning decisions, particularly with respect to:

[1] Wagga Wagga Economic Profile, October 2008, Wagga Wagga City Council

- The potential need for re-zoning of any surrounding land in the future to permit complementary development; and
- The importance of integrating the airport into wider Wagga Wagga highway network planning decisions, to ensure that ground access appropriate to and necessary for the desired level of development is appropriately provided.

2.6 SUSTAINABLE DEVELOPMENT

Sustainability of development, from an economic, social and environmental perspective, is clearly central to the successful implementation of urban development and this principle is equally applicable to this Airport Master Plan. The developments identified within this Airport Master Plan are not inconsistent with these principles of sustainability. Subsequent planning and design of individual developments will need to ensure that these principles continue to be embraced at each stage of the process.

With respect to the particular environmental impacts of aviation, aircraft noise – which has historically been considered the most significant impact of airport development – has been considered in detail and is discussed in Section 7.0. Of the other impacts, improvements in aircraft engine technology over the last 20 years, together with effective management through usage and access agreements between airports and aircraft operators, have essentially removed local air quality as a significant impact at modern airports in the developed world.

The carbon footprint of aviation is now an issue of increasing concern to many people. The aviation industry is presently estimated to contribute approximately 3.5% of man-made climate change impacts and this is estimated to increase to around 5% by 2050[2]. Airports themselves are minor contributors to this total, as the majority of emissions result from aircraft operations in response to commercial demand. Whilst not intending to dismiss the importance of climate change impacts, airport operators, in their role as a service provider to the aviation industry and by extension the consumer, are limited in the extent to which they can address this issue. Nevertheless, Wagga Wagga City Council is committed to meeting and exceeding its requirements under applicable environmental legislation, including the *National Greenhouse and Energy Reporting Act 2007* and any subsequent emissions trading scheme, as well as to working with the aviation industry in whatever way it can to facilitate a reduction in the industry's environmental impact generally.

[2] '*Plane Simple Truth: Clearing the air on aviation's environmental impact*', Thomas, G., Norris, G., Creedy, S., Forbes Smith, C., and Pepper, R. Aerospace Technical Publications International Pty Ltd, 2008

3.0 EXISTING SITUATION

The existing airport infrastructure is shown on Drawing B09065A002 at Appendix B. The following sections provide a brief description of the main infrastructure components.

3.1 AIRFIELD FACILITIES

3.1.1 RUNWAYS

Runway 05/23

Runway 05/23 is asphalt surfaced, 1,768 metres long, 45 metres wide and has a pavement classification number (PCN) of 20/F/C/1400/T, which is suitable for a typical 50-70 seat regional jet or turboprop aircraft. A pavement concession is required for the occasional RAAF C130 operations.

The 05/23 runway strip is marked at 1,888 metres long and 150 metres wide and is suitable for non-precision instrument approach operations by aircraft up to Code 4C, subject to landing minima adjustments. The current standard for a Code 3 45 metre wide non-precision approach runway strip is 300 metres. Strip width is taken into account in determining the instrument approach landing minima, which means some improvement in poor weather runway utilisation is possible by adopting the full runway width standard. The location of Taxiway A has obviously been chosen with a full width runway strip in mind but its full implementation would require additional acquisition at the north-east boundary of the airport

Defence has previously advised that it has an ongoing requirement for the Runway 05/23 strip to be a minimum of 230 metres wide.

Runway 12/30

Runway 12/30 is 1,526 metres long and 30 metres wide. It has a grassed red clay surface which has no published strength rating. The runway strip is 1,646 metres long and 90 metres wide. Over the last ten years, a period of unprecedented drought, the runway has typically been unavailable 20-25 days per year due to wet weather.

Runway 12/30 is marked in accordance with MOS Part 139 Chapter 8 as a Code 3C non-precision instrument runway. However, Defence has previously advised that it has an ongoing requirement for Runway 12/30 strip to be a minimum of 150 metres wide.

3.1.2 TAXIWAYS

Taxiways A, B, D and E

Runway 05/23 has a parallel taxiway designated as Taxiway A. This extends from the 05 threshold to approximately 250 metres from the 23 threshold and has three link taxiways designated as

Taxiways B, D and E. Taxiway A is 10.5 metres wide and is currently subject to weight limitations. The section of taxiway A between Taxiways C and D is not available to aircraft of weight greater than 13,500 kilograms. The remaining sections of Taxiway A are restricted to aircraft of less than 5,700kg in weight.

Taxiways B and E are also 10.5 metres wide and have a weight limitation making them unavailable to aircraft with maximum all-up mass greater than 5,700 kilograms. Taxiway D is 10.5 metres wide and is not available to aircraft with maximum all-up mass greater than 13,500 kilograms.

Taxiway C

Taxiway C provides direct access between the western GA apron, RPT apron, Taxiway A and Runway 05/23. Taxiway C is 15 metres wide within a 52 metre wide strip and suitable for use by reference code letter C aeroplanes. Taxiway C is equipped with blue edge lights for use at night.

The taxiway pavement is failing as a result of overloading by aircraft traffic. Resurfacing and widening works, to 19m wide, are planned to Taxiway C by mid-2010.

Taxiways F and G

Taxiway F is an unrated grassed red clay taxiway that connects the southern GA apron with Runway 12/30. Taxiway F is 10.5 metres wide and suitable for Code B aeroplanes.

Taxiway G connects the RAAF Base with the eastern end of Taxiway A, at the intersection with Taxiway E. Taxiway G is only available for use by military aircraft.

3.1.3 APRONS

RPT Apron

The terminal is served by a sealed RPT apron measuring approximately 200 metres by 100 metres. The apron has been expanded several times in the past, at various dates, resulting in a patchwork of surface textures, ages and qualities. Pavement failures, especially in the older, south-western corner towards the Mobil fuel facility, are extensive as a result of overloading by Dash 8-300 aircraft. This area is scheduled for resurfacing during the current financial year.

The RPT apron is presently marked to accommodate up to four Saab 340 aircraft (on Bays 1-4) or one Saab 340 (on Bay 1) plus 3 Bombardier Dash 8-300 aircraft (on Bays 2-4). In addition there is one existing position for a C-130 (Bay 6) and one position for a Beech King Air (Bay 5). Concurrent with the resurfacing works, the apron will be re-marked to accommodate up to five aircraft of up to Q400 size (on Bays 1-5) in addition to the C-130 (on Bay 6).

Western GA Apron

To the west of the RPT apron is a general aviation apron, measuring approximately 170 metres by 85 metres. This apron accommodates all of the commercial tenants on the aerodrome, including

the Regional Express maintenance facilities, AAPA hangar, Wagga Air Centre, Regional Aviation, Encore Aviation and several other smaller commercial tenants. There is also one privately tenanted hangar at the western end.

There are currently no markings on this apron, which is quite congested. Resurfacing works are scheduled to this apron in the current financial year, at which point it is planned to introduce taxi guideline and parking clearance markings.

Expansion of this apron to the west is currently blocked by the line of 3 hangars at the western end.

Southern GA Apron

To the south of the RPT apron is an asphalt surfaced apron approximately 50 metres wide and 110 metres long providing access to multi-aircraft private light aircraft hangars. The apron is also provided with tie-down cables along its south-eastern edge.

3.1.4 VISUAL AND NAVIGATIONAL AIDS

Markers, markings, signals and signs

The runway strips are marked with standard white gables as are the military helicopter training lanes south of Runway 05 and west of Runway 30. Pavement markings in accordance with MOS 139 are provided on the parts of the movement area used by RPT aircraft operations. Movement area guidance signs are not provided.

There are four wind direction indicators, as indicated on Drawing B09065A002 (at Appendix B). The primary wind direction indicator and the ground signal area are located on the western side of Taxiway C, just to the south of the southern GA Apron.

Lighting

Runway 05/23 is equipped with low intensity runway edge lighting and a Precision Approach Path Indicator (PAPI). Three of the four wind direction indicators are illuminated. Each of these components of the movement area lighting system is pilot activated.

Radio Navigational Aids

The airport has the following radio navigational aids (navaids):

- Non-directional beacon (NDB),
- VHF omni-directional range (VOR), and
- Distance measuring equipment (DME) co-located with the VOR.

A satellite ground station communication facility is located immediately adjacent to and north of the control tower.

Suitably equipped IFR (instrument flight rules) aircraft may utilise the DME or Global Positioning System (GPS) arrival procedures, VOR or NDB letdown, or the runway aligned RNAV(GNSS) instrument approach procedures currently published in the Aeronautical Information Publication – Departure and Approach Procedures (AIP-DAP).

3.1.5 AIR TRAFFIC MANAGEMENT

The CASA Office of Airspace Regulation commenced a review of the Wagga Wagga airspace in April 2009. This review is complete; however Council is yet to receive the draft report from CASA.

Control Tower

The existing air traffic control tower was constructed in 1984, but ceased operations in December 1996. The Wagga Wagga control zone then reverted to a mandatory broadcast zone (MBZ) and, since November 2005, to use of a Common Traffic Advisory Frequency (CTAF-R). Growth in air traffic may justify reopening the tower in the long term however the determination to do so rests primarily with Airservices Australia. Current control tower line of sight requirements limit development on vacant land to the south of the Private GA apron.

Common Traffic Advisory Frequency

The established Common Traffic Advisory Frequency (CTAF-R) for the surrounding airspace requires all vehicles, machinery and taxiing aircraft to broadcast their intentions over 126.95 MHz whilst operating on movement areas. An additional third party air/ground communication service known as PAL AFRU or 'beep-back' offers increased safety by providing a radio test that broadcasts a recorded message response when a signal goes without receipt for five minutes.

Unicom trial

A Unicom trial was conducted by Airservices Australia between November 2007 and March 2009. The trial was operated by a private company under contract and supervision from Airservices. The operators were mainly local pilots, members of the Wagga Wagga Aero Club and a Regional Express Pilot. The trial commenced operating from the Airservices equipment building adjacent the Airport Public Car Park, and moved to the decommissioned ATC Tower after approximately 1 month. A report from Airservices Australia to CASA on the findings of the trial was drafted shortly after the trial ceased. It is understood that this report is still with CASA for review. To date Council has not been provided with the report, or any findings of the report.

3.1.6 FUELLING FACILITIES

There are two fuel installations which are separately located and owned by Air BP and Mobil. Both provide bowser fuel dispensers for Avgas and Jet-A1, and Mobil also provides tanker refuelling.

The Mobil installation is located on the south west corner of the RPT apron. Access to the depot is via the airside emergency access roadway leading from Gate 11 as well as from an access gate

located on the airport's western boundary. The BP depot is located adjacent to the Regional Express hangars.

3.1.7 OTHER FACILITIES

RAAF Explosive Ordnance Storage

An easement has been excised from the head lease for RAAF ordnance storage. The dimensions of this area have been determined taking account of the maximum quantity of explosives to be stored and the required safety distances to other facilities. Defence has indicated that the option to relocate this ordnance storage facility could be explored, subject to consideration of safety, security and access issues.

Military Helicopter Training Area

An easement has been excised for military helicopter flying training for which Defence has indicated an on-going requirement. In its present location immediately south of the runway intersection and bordering both marked runway strips this easement prevents widening of the primary runway strip to 300 metres specified for runway aligned instrument approaches.

3.2 PASSENGER TERMINAL

The terminal is a relatively modern brick building with a landscaped forecourt. The building has recently been extended to provide space to accommodate facilities in the future for the security screening of passengers and checked baggage. The total footprint is approximately 1,350m^2. The terminal provides most of the facilities commonly found at regional airports, including:

- A check-in area of approximately 160m^2 gross area, with 4 check-in desks (2 Rex and 2 QantasLink) plus airline service and administration. The check-in area provides approximately 50m^2 of queuing and circulating space for passengers;
- A large, recently extended, baggage make-up area of approximately 400m^2 to the rear of the check-in area, which also houses a small airport manager's office. The main baggage make up floor area measures approximately 18 metres by 11 metres and is large enough to accommodate simultaneous make-up of a 70-seat and 50-seat aircraft. There are 3 roller shutter doors providing access to the apron;
- A 'landside' arrival and departure lounge with a total passenger circulation and waiting area of approximately 280m^2, with seating for approximately 80 passengers. Accessed directly from this area are:
  - 5 Car rental desks (total area 20m^2) currently occupied by Avis, Budget, Hertz, Thrifty and Europcar;

- A kiosk (30m^2), serving hot and cold food and beverages, with seating for approximately 18 set out in the north-west corner of the arrivals and departures area;
- Public toilets (total 70m^2)

- A departures corridor, of approximately 40m^2, currently used to access the extended departure lounge and the apron but intended in the future to house passenger screening activities if and when these are required by the regulatory authorities. There is at present no requirement for permanent security screening facilities in the terminal;
- A departure lounge of approximately 175m^2 in area, with seating for a further 80 passengers approximately. The departure lounge is separated from the arrival and departure by a glass wall. It is noted that the way the terminal is currently arranged, if this was a secure area there would be no access from the passengers in the secure area to amenities including the public toilets and the kiosk without returning through the security screening point;
- An arrivals corridor providing access from the apron to the arrival and departure lounge (40m^2);
- An internal area of approximately 50m^2 which was previously used for the collection of baggage but is now effectively redundant; and
- An external, canopied area of approximately 140m^2, intended for passengers to await the delivery of baggage to the adjacent hardstand area.

3.3 GENERAL AVIATION FACILITIES

3.3.1 REGIONAL EXPRESS MAINTENANCE FACILITIES

Regional Express operates a significant maintenance facility located to the west of the passenger terminal and RPT apron. Regional Express also leases a second hangar located to the west of the BP fuel facility.

Wagga Wagga City Council and Regional Express have developed a significant partnership at Wagga Wagga, with the maintenance facility currently providing 120 jobs. Both parties are committed to continuing and strengthening the relationship, but the availability of space for expansion of the maintenance base is likely to be an important consideration in the airline's decision making about the level of activity it brings to Wagga Wagga. It is therefore considered essential that this Master Plan anticipates the need for Regional Express to develop further facilities in a location which is operationally convenient to its existing facilities, certainly in the medium-term and quite possibly, in the more immediate future.

3.3.2 AUSTRALIAN AIRLINE PILOT ACADEMY

The Australian Airline Pilot Academy (AAPA), a subsidiary of Regional Express, was established in November 2007 and relocated to Wagga Wagga on 7 April 2009. AAPA is a commercial flying training organisation that will initially train pilots for the Regional Express fleet. The current curriculum provides training from *ab initio* status to CPL over a 32-week full-time residential course. In the future, AAPA plans to offer training for third-parties, targeting international markets in particular. It is also intended to relocate the Regional Express Group pilot and flight attendant ground schools and engineering apprentice programme to the Wagga Wagga training centre. It is estimated that over 5 years the $35m investment will generate over 70 full-time jobs.

AAPA has taken the lease on a hangar site on the south side of the western GA apron, which was previously occupied by HeliAir until that company ceased operations. AAPA purchased the hangar structure and has made some modifications to the hangar, including the installation of a mezzanine level housing offices and classroom facilities.

AAPA currently has 10 aircraft based on airport, comprising 8 single-engine piston Piper Warrior and 2 light twin-engine piston Piper Seminole aeroplanes. It has another 10 aircraft of the same configuration due to be delivered in the second half of the 2010 financial year.

There are currently up to 80 students enrolled and AAPA is planning growth of 20% per year for the next five years to reach its planned development of 200 students per year.

AAPA is developing accommodation and training facilities for 92 students on land owned by it to the north of Don Kendell Drive. The development is due for completion in January 2010.

3.3.3 WAGGA AIR CENTRE

Wagga Air Centre operates from a purpose-built facility on the southern side of the western GA apron. It offers aircraft charter for business and leisure, private flying training and valet parking.

Wagga Air Centre currently uses Piper Chieftain and Cessna 310 aircraft to fulfil freight contracts with Toll Priority and will need to upgrade to Metro and Cessna Caravan type aircraft as this portion of their business expands.

Additionally, the centre has purchased a Robinson R44 helicopter and may provide helicopter training in the future.

3.3.4 REGIONAL AVIATION SERVICES

Regional Aviation Services is located on the southern side of the western GA apron, adjacent the AAPA hangar and provides maintenance, repairs, supply and installations of avionic equipment on single-engine aircraft and multi-engine aeroplanes and piston and turbine engine helicopters.

3.3.5 ENCORE AVIATION

Encore aviation occupies a hangar site on the western edge of the western GA apron, and provides airframe maintenance services to light aeroplanes.

3.3.6 RURAL FIRE SERVICE

The Wagga Wagga Rural Fire Service (RFS) currently has a temporary facility located to the west of the southern GA apron. The RFS has been in discussions with Council regarding the development of a permanent facility in the same location.

The RFS also has a contract, currently with Kennedy Aviation, to provide support aircraft for the RFS in the fire season. Kennedy Aviation has been in discussion with Council regarding a suitable location for a hangar approximately 30 metres wide by 25 metres deep, to house its aircraft whilst on airport. Due to the contract with RFS, there is a logical need for this facility to be located adjacent to, albeit entirely separate from, the RFS facility. This need is pertinent even in the long-term, as any future RFS contract service providers are likely to have similar requirements to the incumbent.

3.3.7 OTHER COMMERCIAL TENANTS

Three other commercial hangar sites are located around the perimeter of the western GA apron, the tenants being:

- Wagga Bike Tyres;
- Peter Middleton (L.A.M.E.);

Wagga Bike Tyres is located on the western boundary of the apron. Peter Middleton's hangar is on the northern edge, at the western end of the apron. Between them is a further, privately-owned, hangar.

3.3.8 WAGGA WAGGA AERO CLUB

The Wagga Wagga Aero Club (WWAC) building is currently located north of the terminal and car park. WWAC has been in discussion with Council regarding an alternative location on the airport.

WWAC requirements for the relocated facility as advised by members through the stakeholder consultation process are that it must have access from the landside as well as secure airside access and preferably a view of the aerodrome operational areas including the grass runway.

3.3.9 PRIVATE HANGARS

There are two multi-aircraft hangars, of seven and two bays in length respectively, located along the northern edge of the southern GA apron. The hangars are accessed by aircraft from the

southern GA apron. Vehicles access to the hangars is through Gate 13 and then via the airside emergency access road.

A single private hangar lease also exists on the western GA apron, in the north-west corner.

3.4 GROUND ACCESS

3.4.1 TERMINAL KERBSIDE

A set-down/pick-up area extends the length of the passenger terminal building. There are two lanes for through traffic and one for set-down/pick up which includes space for four waiting taxis in front of the terminal with room for an additional six taxis to wait further back down the approach road.

The section of hardstand to the west of the terminal that is not used for baggage collection is marked with two parking spaces; one for an airport shuttle bus service and one for the kiosk operator.

3.4.2 CAR PARKING

Council has recently extended the public car park to accommodate a total of 210 cars. There is also an area, accommodating approximately 25 rental cars to the west of the terminal building.

3.4.3 INTERNAL ACCESS ROADS

The principal access to the passenger terminal area is via Don Kendell Drive, a two-lane sealed road intersecting Elizabeth Avenue. Other access roads are also sealed, including the loop access past the terminal kerbside and the access roads to the rear of the hangar sites which links the Regional Express maintenance facility with Gate 13. The access roads are generally in good condition and are adequate for current traffic.

3.4.4 EXTERNAL ACCESS

Access is currently provided from the western end of Don Kendell Drive to the Sturt Highway, via Elizabeth Avenue. The Sturt Highway provides direct access to Wagga Wagga CBD. An alternative route is available to Lake Albert and the southern suburbs via Inglewood Road. Suitability of external access is discussed at Section 10.0.

3.5 OTHER FACILITIES

3.5.1 VALET CAR PARKING

There is a secure valet car parking compound to the north of the BP fuel facility, operated by Wagga Air Centre.

3.5.2 AIRSERVICES AUSTRALIA

Airservices Australia occupies a building to the north of the terminal, within the area enclosed by the loop road. There is an adjacent communications tower. It is understood that there is significant underground communications infrastructure in this area and that the engineering design for the recent adjacent car park extension had to accommodate this.

3.5.3 BUREAU OF METEOROLOGY

Meteorological Staff have had a presence at Wagga Wagga Airport since its first beginnings, with the current Bureau of Meteorology station opening in 1941. It is a condition of the head lease that Council provides a sub-lease to the Bureau of Meteorology for such land as it reasonably requires to perform its statutory obligations.

The Bureau of Meteorology facilities are located in the north-west corner of the airport, between Don Kendell Drive and Elizabeth Avenue. The current location limits the extent of development that can occur to the north and west of the western GA apron.

Some of the Bureau of Meteorology's current equipment such as radar and anemometers require certain clearances to maintain their operational capability and must be considered in any development proposal. It has not been possible to date for Council to determine from the Bureau of Meteorology the exact nature of clearances required to the current equipment array. For the purposes of this Master Plan, it has been assumed that the Bureau's lease area provides the necessary clearances to its equipment.

3.6 ENGINEERING SERVICES & INFRASTRUCTURE

3.6.1 ELECTRICITY

Electricity is supplied by Great Southern Energy. An 11 kilovolt (kV) main runs along the Sturt Highway and supplies power to a 300 kV substation next to the terminal.

Should there be a power failure or low supply voltage, a diesel generator provides standby power for the PAPI, movement area lighting and essential services in the terminal.

3.6.2 WATER

Water is supplied from the RAAF base reticulation system which is connected to the Riverina Water network. The supply main within the airport distributes water to buildings, fire hydrants and irrigation sprinklers.

3.6.3 GAS

Natural gas is supplied though a high pressure main located on the RAAF base. There is a branch line to the civil area with a regulator assembly to reduce the pressure to 35 (kPa). Gas is used for heating in the terminal and commercial hangars.

3.6.4 SEWER

Sewer reticulation extends from the terminal and commercial area to the area available for future hangar sites.

3.6.5 COMMUNICATIONS

Fibre optic telecommunications infrastructure is provided to the existing terminal building, running along Don Kendell Drive from Elizabeth Avenue.

3.7 KEY OPERATIONAL ISSUES

A number of operational matters have been identified in the course of this Master Plan study. These have either been highlighted to the consultancy team by airport management and other stakeholders, or identified by the consultants.

3.7.1 CLIMATIC CONDITIONS

The airport experiences some fog in winter (May to October which limits aircraft operations until late morning. Concern was expressed by stakeholders that the unreliability of air services in winter as a result is a deterrent to the choice of air travel for some people.

Bureau of Meteorology weather observation data for Wagga for 1995 to 2001 indicates that visibility of 800 metres or less occurs between 0600 and 1000 EST on an average of 10.5 days per year between May and October (2.9% of total days, 5.8% of May-to-October days) due to fog. Fog often forms at Wagga between 0400 and 0600 during those months and can last as long as 5 or 6 hours, although 2 to 3 hours is more usual.

An Instrument Landing System of anything less than Category III capability make little impact on availability of the airport for landings and, even if technically viable would be prohibitively expensive. No commercial airport in Australia has, so far, seen fit to install anything other than Category I equipment.

3.7.2 TAXIWAY SYSTEM

Taxiway C currently provides the only access between the western GA and RPT aprons and the sealed runway.

A bottleneck situation exists within the general aviation area fronted by the Rex aircraft maintenance hangar. The addition of the Australian Airline Pilot Academy flying training operations from the former Heli Air hangar has increased traffic in the area considerably. The configuration of hangar rows, with the northern row angled to the south and west threatens to close off the area to aircraft transit forcing a one way in/one way out situation not conducive to safe ground taxi or aircraft movement of any type.

3.7.3 WESTERN GA APRON

This apron, which accommodates the Regional Express maintenance facility and the Australian Airline Pilot Academy hangar, and currently serves all other commercial operators on the airport, is extremely congested. A line of tie-down positions is provided in the centre of the apron. However, no apron markings are provided on the apron and the *July 2008 Aerodrome Technical Inspection Report* identified the need for a review of the parking clearances to ensure aircraft can taxi safely in this area with sufficient wingtip clearances. The review, conducted by Council, has indicated that whilst aircraft can manoeuvre under tow, the removal of the central parking area is required to provide the clearances needed to operate under their own power in accordance with the *CASA Manual of Standards Part 139*.

There is also a need for increased aircraft parking areas for reference code letter A and B aircraft in the vicinity of the western GA apron. At the time of the site visit, a number of larger reference code letter B aircraft recently acquired by Regional Express were being stored on the grass tie-down area adjacent to the southern GA apron.

3.7.4 ENGINE RUN-UPS

No dedicated engine run-up bay is provided on the movement area. For the last five years it has been agreed between Regional Express (the based airline) and the airport operator that engine run-ups may be performed at the intersection of Taxiways A and B. This location has become the *de-facto* engine run-up bay as it is located at a sufficient distance from the residential properties in Forest Hill that nuisance to the residents is minimised.

Whilst this is a pragmatic solution which appears to be effective in managing the impacts of engine run-up activity on airport neighbours to an acceptable level, it is unsatisfactory in the following important respects:

- to access the run-up location, it is necessary for the Saab 340B aircraft (a reference code letter C aeroplane) to traverse a section of Taxiway A which is suitable only for reference code letter B aeroplanes and does not meet the required width of 15 metres; and
- the section of Taxiway A traversed is rated only to 5,700 kilograms. The operating empty weight of the Saab 340B aeroplane is 8,620 kilograms which exceeds the strength

limitation on the taxiway. As a result, this section of the taxiway is showing deterioration in the form of stress related cracking and some deformation.

Council has previously had designs prepared for an engine run-up facility in the area to the north-west of the intersection of Taxiways A and C, but has not proceeded with this as the current arrangements appear to be satisfactory to all stakeholders and an Airport Master Plan was considered appropriate to confirm the long-term location.

3.7.5 BAGGAGE RECLAIM

There is currently no dedicated arrivals hall. Tugs convey the bags on flat bed trolleys through a gate and into an uncovered section of the car park to the west of the terminal arrivals area. Passengers remove their own bags from the trolleys. Council has installed permanent barriers to prevent public vehicle access to this area.

Although this method of baggage delivery is not uncommon at many similar regional airports, stakeholder feedback and customer satisfaction surveys prior to the master plan process clearly indicate that it is perceived as an undesirable welcome to Wagga Wagga. In addition to the passenger discomfort in inclement weather, there are potential issues with respect to passenger safety as waiting passengers occupy the area required for manoeuvring by the baggage trolley and tug.

3.7.6 CAR PARKING

In response to increasing demand for car parking space in the vicinity of the current terminal, Council recently extended the car parking area from 106 spaces to 210 spaces. Despite this, the car park continues to regularly experience high occupancy, causing frustration among regular users.

Feedback from stakeholders suggests the cause of the high occupancy is excessive use of the public car park by car rental companies, combined with general use by airport tenants. This is supported by frustrations expressed by car rental companies about the lack of available spaces, particularly for ‘turnaround’ rentals. However, a car park of this size should be adequate for the level and type of passenger traffic operations at Wagga Wagga. As there are currently no controls on use of the car park it is difficult to prevent unintended use of this nature.

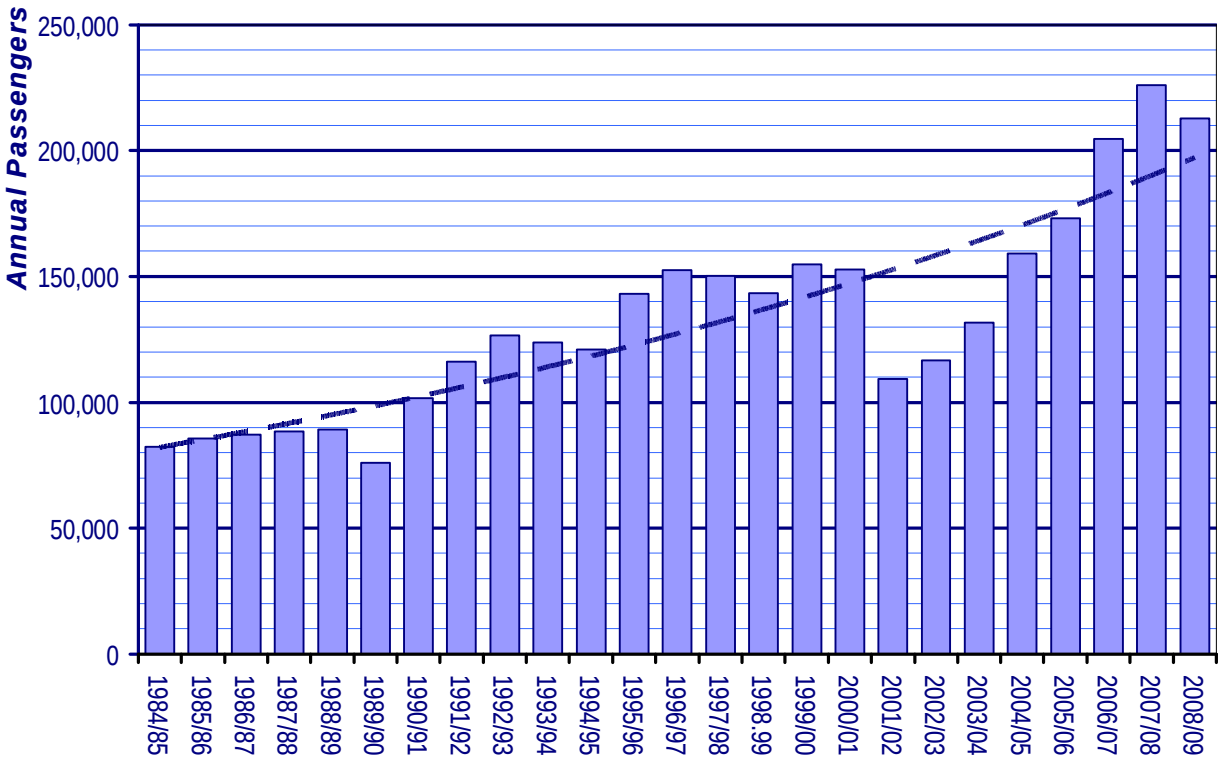
4.0 HISTORICAL & FORECAST AVIATION ACTIVITY

4.1 HISTORICAL AVIATION ACTIVITY

4.1.1 PASSENGER TRAFFIC

Annual passenger traffic from 1984/85 to 2008/09 is shown in Figure 2. Over the last 25 years, passenger numbers have increased from 82,426 in 1984/85 to 226,060 in 2007/08 and have currently moderated slightly to 212,691 in 2008/09. Over the 25-year period this is equivalent compound annual growth of 4.0%.

Figure 2: Historical Passenger Traffic 1985 - 2009



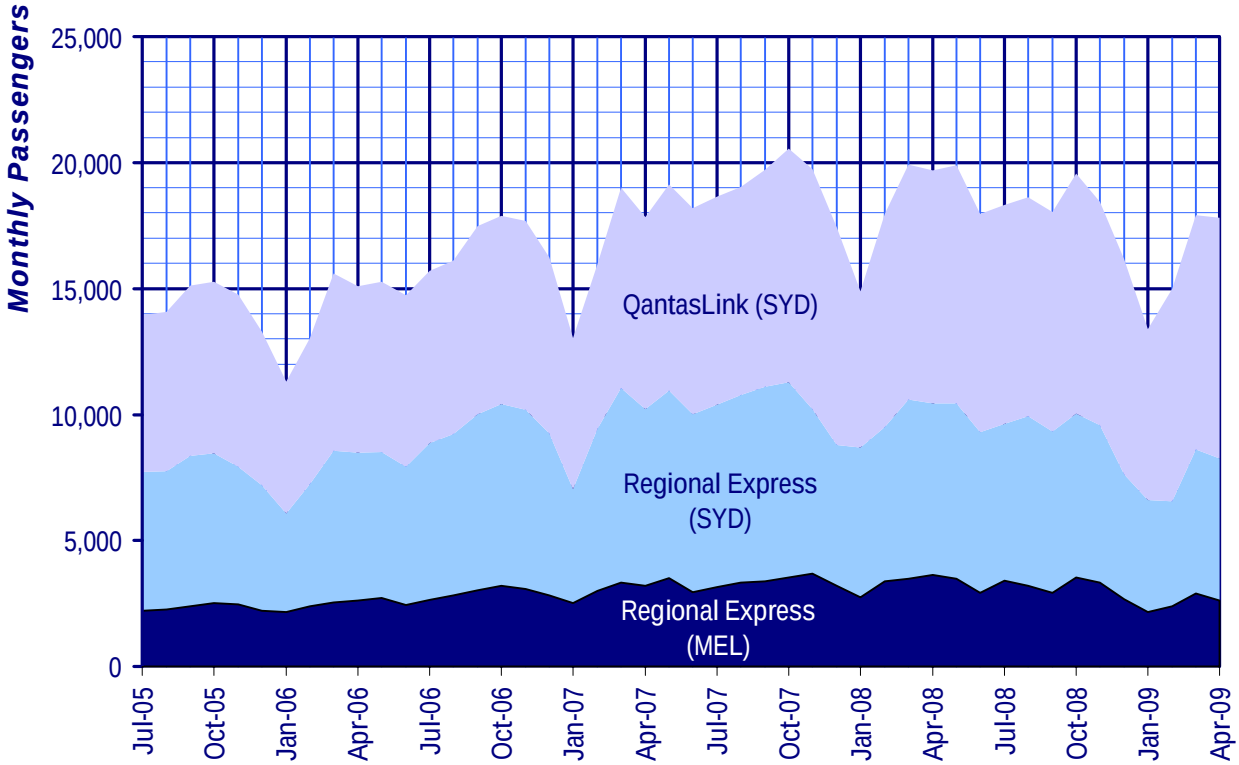
Source: Wagga Wagga City Council, BITRE

The most recent six years of passenger growth since 2001/02 have added approximately 100,000 passengers at an impressive compound annual rate of 10.0%. This can be compared to relatively modest growth in aircraft movements and population growth of 2.1 percent between the 2001 and 2006 censuses. Overall, growth in passengers over the historical long-term at Wagga Wagga has exhibited considerable resilience to shocks.

Based on available passenger traffic data for the period 1 July 2005 to 30 April 2009, between 80 and 85% of passenger traffic is on the WGA–SYD route. The proportion has remained relatively

constant over the last 4 years. Figure 3 shows monthly passenger traffic by airline and route from 1 July 2006 to 30 April 2000.

Figure 3: Monthly Passenger Traffic by Airline and Route



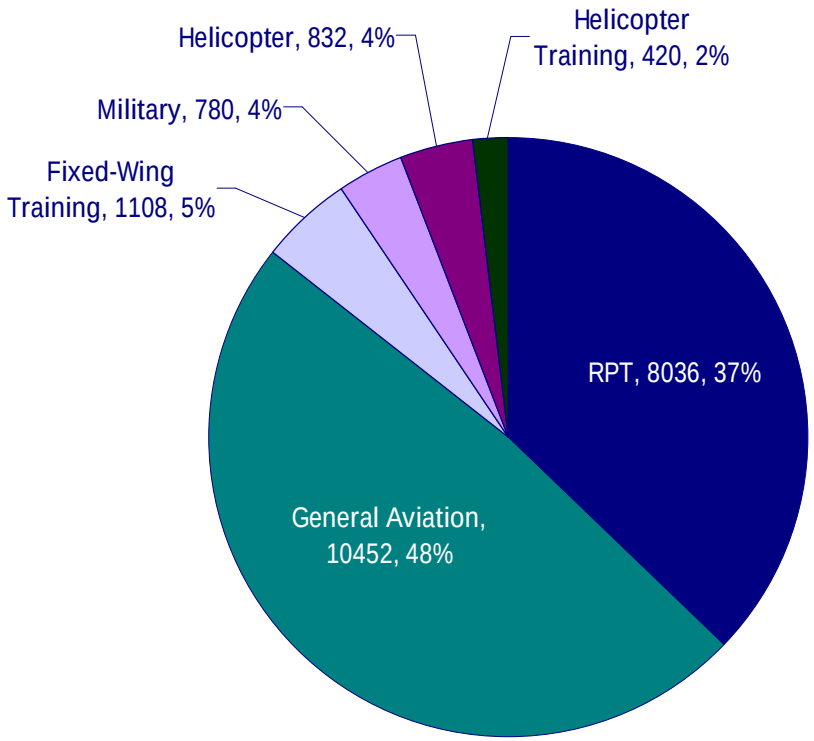
Source: Wagga Wagga City Council

Figure 3 also indicates that there is a relatively strong cyclical component to the traffic, with significantly lower traffic in December, January and February than for the rest of the year. This is indicative of the fact that the majority of the traffic is business-related, especially on the WGA-SYD route and reflects in particular the strong contribution of defence and education to the Wagga Wagga economy.

4.1.2 AIRCRAFT MOVEMENTS

Aircraft movement numbers in 2008/09 are estimated to be around 27,500. Figure 4 shows the proportion of movements by the type of activity in 2008/09.

Figure 4: 2008/09 Aircraft Movements by Activity



Source: AvData

Regular Public Transport

Regular Public Transport (RPT) (i.e. airline) aircraft movements presently contribute around 37% of aircraft operations at Wagga Wagga. Regional Express provides scheduled services to Sydney and Melbourne using Saab 340 (36-seat) aircraft and QantasLink provides scheduled services to Sydney using Bombardier Dash 8-300 (50-seat) aircraft.

General Aviation

General aviation (GA) activity involves air freight, charter, flying training, aerial tankers for fire fighting and other private operations.

Fixed-Wing Flying Training

Since AAPA relocated its activities to Wagga Wagga in April 2009, there is now a significant component of fixed-wing training movements at the airport. The 4% included in 2008/09 figures represent only a three-month period since activities. Fixed-wing training movements are expected to form a substantial proportion of movements in the future.

Military

Military fixed-wing movement account for 4% of movements. No operational squadron is based at Wagga Wagga and so military activity is limited to visiting itinerant military or VIP aircraft, and some periodic helicopter training as described below. Occasional C-130 Hercules aircraft visit the Base (under a pavement concession).

Helicopter

There are a small number of non-military helicopter movements, around 3% of total activity. Movements are mainly by Robinson R22 helicopters.

Helicopter Training

723 Squadron visits Wagga for 6 weeks twice a year to conduct training using 3 AS365 Squirrel helicopter. These movements, although concentrated in certain periods, represent around 2% of current activity.

4.2 FORECAST AVIATION ACTIVITY

4.2.1 PASSENGER TRAFFIC

Airport master planning is traditionally based, to a large extent, on long-term expectations of future passenger traffic. Passenger demand drives, to greater or lesser degree, airline decisions about aircraft size and operating schedules which in turn determine the requirements on airport operators in relation to key infrastructure components including the airfield and passenger terminal as well as contributing to landside requirements for access.

Future passenger numbers and growth rates at an airport are related to the available seat capacity, load factors, slot availability, airline route economics and traffic growth at existing and potential destinations. Clearly, they are also impacted by a range of external economic system variables that are important to understand in relation to individual airports.

For Wagga Wagga Airport various forecasts were estimated to 2030 using a range of economic conditions and assumptions, supported by econometric modelling and statistical analysis. The key drivers affecting the numbers, growth rates and aviation are:

- Economic variables such as the frequency, probability, timing and impact of economic recessions occurring, employment/unemployment rates, disposable incomes, and relative economic performance;
- Demographic relationships such as with the impact of increasing or decreasing populations, work, education and leisure, ageing and health;

- Competition from, to and at other airports in the region, airport and airline marketing, regional promotions, prevailing air fares and competition from alternative transport modes; and
- The degree of resilience to a variety of shocks to the system including, historically, fuel price spikes, pilot shortages/strikes, the collapse of Ansett, pandemic outbreaks and terrorism.

The forecasting procedure adopted for this Master Plan included a detailed review of the following factors:

- Economic conditions affecting Wagga Wagga, Australia and key trading partners;
- The current Master Plans of Sydney, Melbourne, and Canberra airports;
- Historical and forecasts data on passenger movements, aircraft movements, seat capacity, seat utilisation, and inbound/outbound travel between Wagga Wagga and Sydney, Melbourne, Canberra and Adelaide;
- Analysis of previous shocks to the system, resilience, volatility and growth turning points; and
- Other information provided by Wagga Wagga City Council.

A set of 150 system-wide forecasts were produced and tested under a range of assumptions and plausible scenarios using reliable time-series data. Data from 1984 to present was analysed and modelled using specialist econometric modelling software. For the key indicator of passenger numbers, the consistent long-term monthly series indicates that passenger growth historically has exhibited considerable resilience to shocks.

The results of this analysis are summarised in various econometric growth scenarios, of which the following were selected as sufficiently representative of the range of possible future realities:

- Sustained Boom represents continued constant growth in line with the recent strong trend until 2014/15, then moderating slightly to a compound rate of around 5.2% until 2029/30;
- Trend Growth represents constant growth to 2029/30 at a rate consistent with the historical long-term trend;
- One Recession incorporating the effect of a historically-typical economic recession occurring around 2018;
- Mild Short Recession incorporating the effect of a relatively mild and short economic recession occurring around 2019; and
- Two Recessions incorporating the effect of two historically-typical economic recessions commencing around 2017 and 2026.

Each of these five econometric growth scenarios was assigned a probability of occurrence, based on expert judgement, in order to derive the mathematical expected value. One recession before 2030 is considered the most likely event with a 30% probability assigned. A single, less severe and shorter recession is considered slightly less likely with a 25% probability weighting. Trend growth with no recession was assigned likelihood of 30%. A sustained boom scenario is considered relatively unlikely, although still quite possible, with a 10% probability assigned. Two recessions is considered the least likely scenario and was assigned a probability of 5%.

By combining the probability-weighted forecast passenger numbers from each econometric growth scenario an expected value forecast was also derived, being the scenario considered mathematically most likely to occur on the basis of the forecasting assumptions. Table 1 summarises these key econometric growth scenarios in terms of growth rate, projected 2029/30 annual passengers and probability of occurrence.

Table 1: Summary of key econometric growth scenarios

Scenario	Compound Annual Growth Rate	Projected Annual Passengers 2029/30	Probability
Sustained Boom	6.19%	750,097	0.10
Trend	4.51%	536,751	0.30
Mild, Short Recession	4.10%	494,455	0.25
One Recession	3.74%	459,839	0.30
Two Recessions	2.83%	382,558	0.05
Expected Value	4.32%	516,728	n/a(1)

Note: (1) The expected value is equal to the sum product of the annual passengers predicted under each econometric growth scenario and the assigned probability of that scenario.

From these econometric growth scenarios, three separate passenger traffic growth scenarios were selected for Master Planning purposes. The Sustained Boom econometric growth scenario, representing what is considered to be plausible but optimistic passenger growth over the Master Plan period, was selected as the High passenger growth scenario. The Expected Value econometric growth scenario, representing the most likely passenger traffic growth over the Master Plan period, was selected as the Medium passenger growth scenario. Finally the Two Recessions econometric growth scenario, representing pessimistic passenger traffic growth assumptions, was selected as the Low passenger growth scenario.

Figure 5 summarises the annual passenger history and the growth forecasts from 2005/06 to 2029/2030 for Wagga Wagga Airport. Table 2 presents projected annual passenger numbers for the selected High, Medium and Low passenger growth scenarios.

Figure 5: Forecast Passenger Traffic 2009/10 – 2029/30

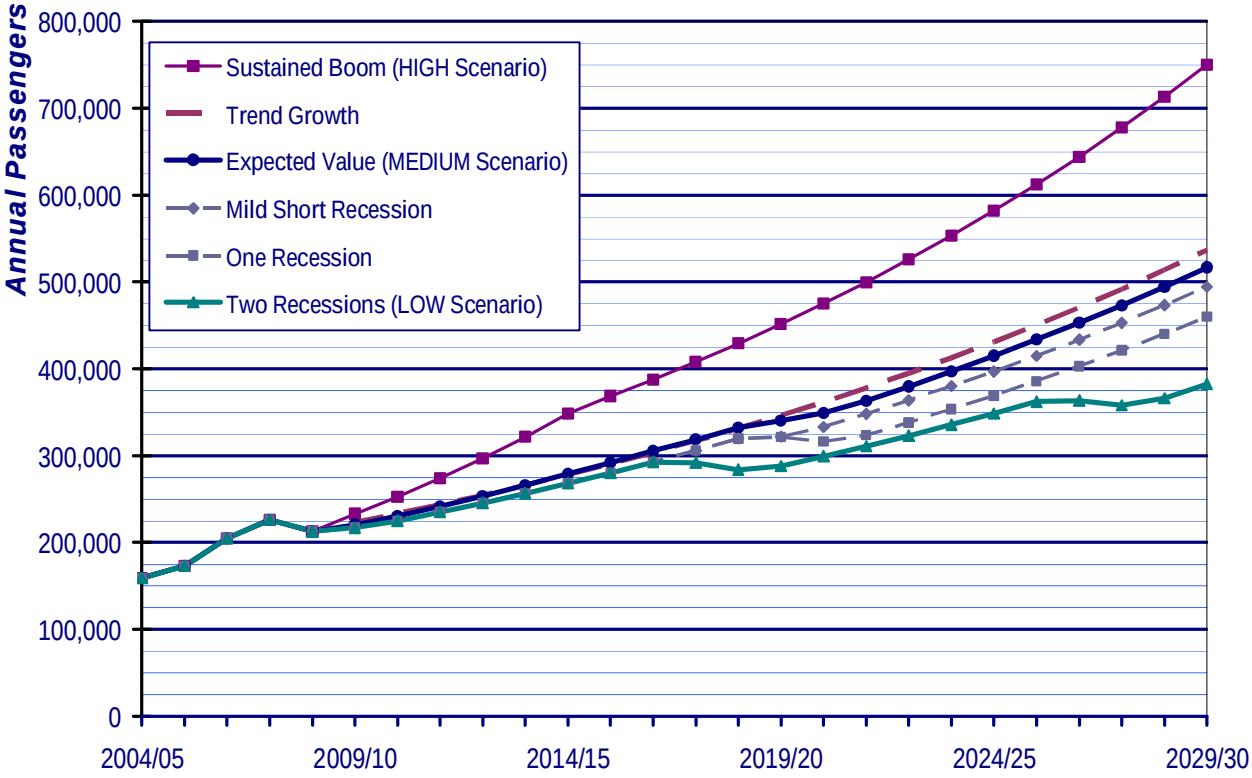


Table 2: Forecast Passenger Traffic 2009/10 - 2029/30 by Passenger Growth Scenario

Year	Low-Growth	Medium-Growth	High-Growth
2008/09	212,691	212,691	212,691
2009/10	217,102	220,528	233,103
2010/11	224,997	230,221	252,627
2011/12	235,088	241,529	273,786
2012/13	245,633	253,428	296,717
2013/14	256,650	265,949	321,569
2014/15	268,161	279,128	348,502
2015/16	280,189	292,090	368,552
2016/17	292,756	305,457	387,743
2017/18	292,053	318,746	407,932
2018/19	284,026	332,280	429,172
2019/20	288,213	340,301	451,519

Year	Low-Growth	Medium-Growth	High-Growth
2020/21	299,403	349,171	475,029
2021/22	311,027	363,023	499,763
2022/23	323,102	379,572	525,785
2023/24	335,647	396,879	553,162
2024/25	348,678	414,978	581,965
2025/26	362,215	433,906	612,267
2026/27	363,466	453,060	644,147
2027/28	357,859	472,750	677,687
2028/29	366,136	494,054	712,973
2029/30	382,558	516,728	750,097

4.2.2 AIRCRAFT MOVEMENTS

Projections of annual aircraft movement numbers have been developed by segmenting aviation activity into the principal component sectors, each of which has differing drivers and prospects for growth at Wagga Wagga Airport. These sectors are:

- Regular Public Transport (RPT);
- Military;
- General Aviation (excluding Flying Training) (i.e., business, charter and corporate aviation, aerial work, private flying, aircraft maintenance);
- Civil Flying Training; and
- Military Basic Flying Training.

The forecast aircraft movement growth in each segment is shown in Figure 6 and discussed below.

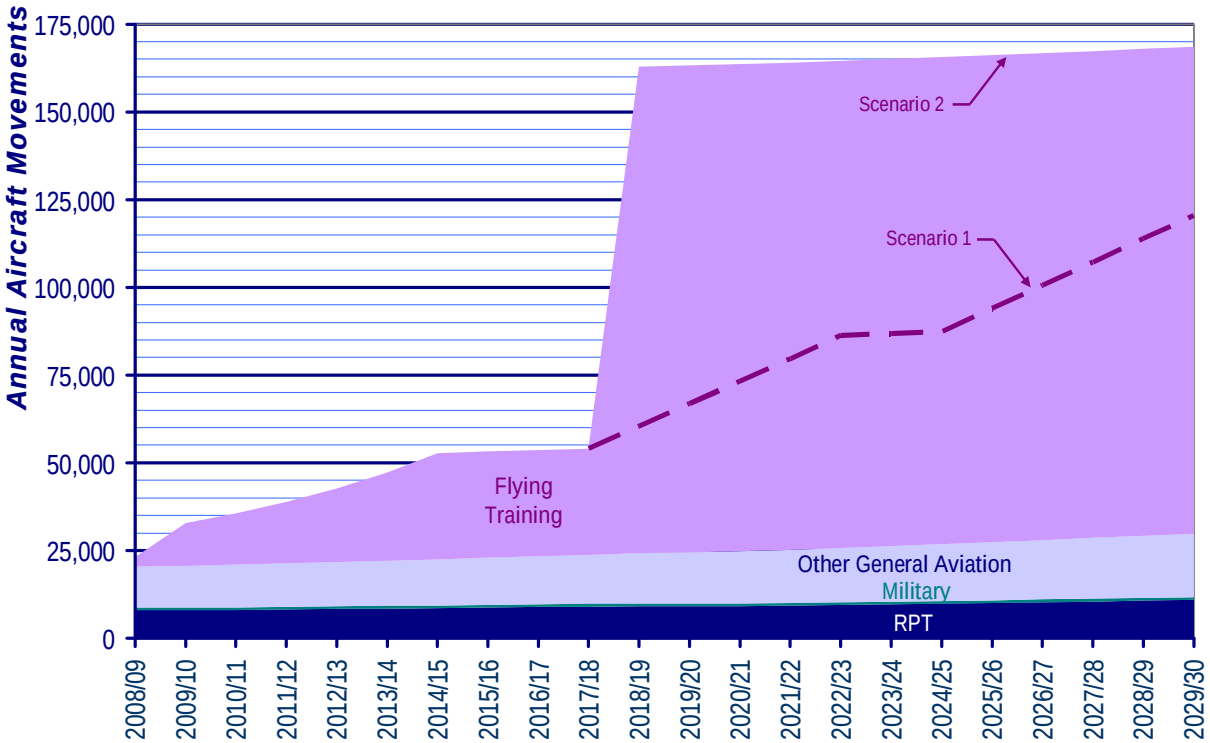
Regular Public Transport

RPT aircraft movements were estimated by reference to the forecast passenger numbers for the Medium-Growth scenario, from which an assumed flight schedule offering a medium level of service frequency appropriate to that overall level of traffic. More detail on the flight schedule scenario analysis is provided at Section 5.1.

For the expected 516,728 passengers, a requirement for approximately 10,920 annual RPT movements by 2029/30 is envisaged utilising a range of aircraft from 36-seat turboprops to 144-seat jets. This is considered to represent a reasonable estimate of likely RPT operations in

2029/30, however annual movements might possibly be as high as 19,656 if the High-Growth forecast passenger numbers were to be carried on a mix of aircraft offering what is considered to be the highest viable frequency of services. On the other hand, carriage of the 2029-30 High-Growth passenger forecast on the largest conceivable mix of operating aircraft would require around 8,424, only slightly higher than current levels of RPT aircraft operations.

Figure 6: Forecast Aircraft Movement Growth 2009/10 - 2029/30



Military

Based on Defence's stated objectives in relation to Wagga Wagga Airport, as advised during the consultation process for this Master Plan, no significant change in current levels of use by military aircraft is envisaged.

Due to the seasonal low cloud and drizzle experienced in Nowra, 723 Squadron are planning to extend the February/March/April 2010 detachment of helicopter training to 8 weeks. This will permit the inclusion of the instrument flying phase and possibly the night flying phase.

Other General Aviation

To account for likely growth in general aviation activity other than flying training, current movement levels have been assumed to grow between 2008/09 and 2029/30 at an average rate of:

- 3% per year for multi-engine aircraft; and

- 1.5% per year for single-engine aircraft.

These levels are consistent with historical trends and forecasts adopted at other Australian airports.

Fixed-Wing Flying Training

Consistent with Council's aspirations for Wagga Wagga to develop as an aviation training hub, fixed-wing flying training is expected to constitute the majority of aircraft movements at the airport in the future.

Civil flying training movements associated with AAPA and or similar flying training organisations have been estimated based on information provided by AAPA to Wagga Wagga City Council. At its initial planned level of 80 students per year in 2009/10, around 12,000 movements are anticipated. This is projected to grow at 20% per year to reach a level of activity accommodating 200 students per year by 2014/15. At this stage around 30,000 movements per year are anticipated.

Beyond 2014/15, it is difficult to predict how this sector may develop. Two scenarios have therefore been considered, although it should be noted that these are not mutually exclusive of each other. Whilst AAPA has no stated plans to develop beyond this level of activity, market forces may cause AAPA to expand its activities, or for one or more other flying training organisations to establish. To accommodate this long-term possibility, Scenario 1 assumes that two additional flying training organisations establish at Wagga Wagga by 2030 This level of growth results in around 90,000 movements per year by 2029/30, equivalent to a total of around 600 students per year.

For scenario 2, the possibility that Wagga Wagga might attract the military Basic Flying Training contract, commencing around 2018, or some other form of military flying training has been considered. An estimate of the level of aircraft movements associated with the current military Basic Flying Training syllabus and student throughput has been made, based on information provided by Wagga Wagga City Council in relation to the Interim Basic Flying Training contract currently out for tender and for which Wagga Wagga was not shortlisted. Approximately 108,000 annual movements are anticipated, and for the purposes of the forecast it is assumed they commence in the second half of 2018 under this scenario.

5.0 CRITICAL PLANNING PARAMETERS

Whilst the forecasts of overall passenger traffic and aircraft movements described in Section 4.0 are useful for gaining a general understanding of likely future activity levels, they are of limited value as inputs to the planning of individual aeronautical facilities.

To determine the critical parameters which planning for each element of infrastructure should accommodate, RPT and non-RPT activity has been considered separately.

5.1 RPT PLANNING PARAMETERS

To determine the key RPT-specific planning parameters – terminal sizing requirements and aircraft parking capacity on the associated apron – a scenario-based approach was adopted which considered the potential impacts of varying combinations of passenger traffic and operating aircraft size/frequency.

5.1.1 PLANNING SCENARIO ANALYSIS

Likely aircraft types, operating frequencies and schedules were determined through discussion with incumbent airlines, together with reference to other industry knowledge (both public and confidential), as well as through the application of a general understanding of airline operations to determine nominal future flight schedules for each scenario.

The key airline operational scenarios encapsulated in the base schedules are:

- High-Frequency operations utilising generally the smallest aircraft types appropriate to the level of traffic, to the greatest number of destinations considered viable and offering the highest frequency of service considered viable to each destination;
- Low-Frequency operations utilising generally the largest aircraft types appropriate to the level of traffic, serving only the existing destinations and offering the lowest frequency of service to those destinations; and
- Medium-Frequency operations utilising aircraft types of intermediate size to serve traffic to existing destinations and in some cases the most likely additional ones and offering a moderate service frequency to each destination.

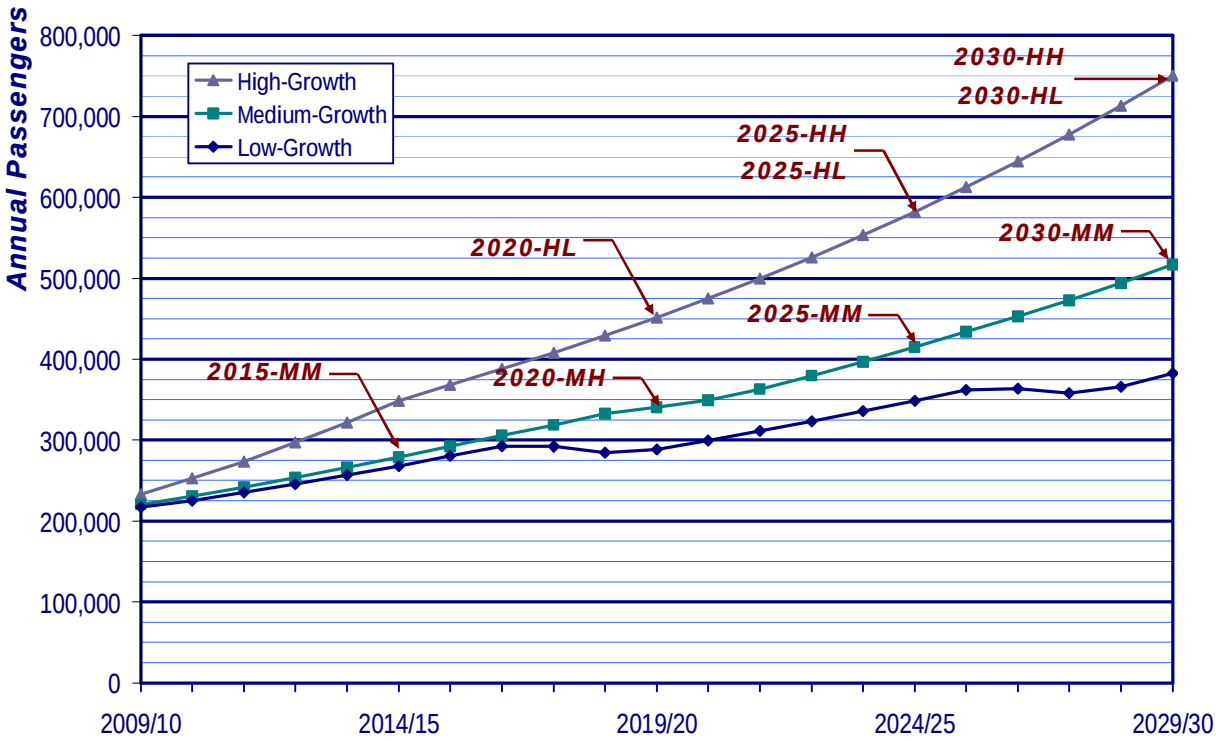
Each operational scenario can be applied to either of the three passenger growth scenarios developed in Section 4.2. This combination gives a possible nine planning scenarios at each future year. Clearly, many of these scenarios overlap, in terms of critical facility requirements, so a total of nine key planning scenarios were selected. The planning scenarios were selected with the objective of covering the worst-case situation in terms of facility requirements at 2030, together with

analysis of intermediate years to assist in the determination of likely trigger points for the implementation of new or expanded infrastructure. The scenarios selected were:

- One (1) scenario for 2015, representing medium-growth, medium frequency (2015-MM);
- Two (2) scenarios for 2020, representing the medium-growth, high frequency scenario (2020-MH) and one high-growth, low-frequency scenario (2020-HL) for this future year;
- Three (3) scenarios for 2025, representing the medium-growth, medium frequency scenario (2025-MM), the high-growth low frequency scenario (2025-HL) and the High-growth, high-frequency scenario (2025-HH) for this future year; and
- Three (3) scenarios for 2030, again representing the medium-growth, medium frequency scenario (2030-MM), the high-growth low frequency scenario (2030-HL) and the High-growth, high-frequency scenario (2030-HH) for this future year.

Taken together, these scenarios represent a range of traffic levels and related service frequencies as summarised in Figure 7.

Figure 7: Key Planning Scenarios



For each scenario, a base schedule detailing typical weekly airline operations including airline, origin/destination, scheduled arrival/departure time and operating aircraft type was developed. Traditional passenger terminal planning techniques would use these nominal schedules with

average or peak aircraft load factors and scheduled arrival/departure times to determine busy-hour passenger flow rates in the terminal and maximum concurrent aircraft parking requirements. However, variability in load factors and punctuality fundamentally affects the loading placed on terminal facilities. Accordingly, the methodology adopted therefore takes into account the statistical variability in aircraft load factor and aircraft punctuality to determine the maximum number of passengers that each area of the terminal should be designed for.

The flow of passengers through the terminal building was analysed to determine the maximum number of passengers in each separate functional area of the terminal at any given time, under each of the nine traffic scenarios. For each functional area, the 95th-percentile highest passenger loading was selected as the design passenger loading. This means that each area is sized to accommodate a number of passengers that should be exceeded on only 5% of occasions, given traffic characteristics similar to those assumed in the base schedules.

5.1.2 TERMINAL AND AIRCRAFT PARKING REQUIREMENTS

The planning scenario analysis was used to determine the maximum number of passengers in each element of the passenger terminal, based on the 5th busiest day (i.e. 95th percentile busy-day) for each planning scenario. The maximum number and mix of aircraft on the apron at any one time was also identified from the simulation output. These are the critical planning parameters for the passenger terminal, RPT apron and the components of the runway and taxiway systems used by RPT aircraft. They are summarised in Table 3.

Functional space requirements were then developed by reference to the International Air Transport Association (IATA) *Airport Development Reference Manual* (9th Edition) for a Level of Service equal to C. Level of Service C represents a good balance between passenger comfort and space efficiency and is generally adopted as the appropriate level for planning purposes, even by airports serving mainly low-cost carriers.

Retail Space

Retail space requirements were estimated through benchmarking of gross retail areas for some typical Australian and overseas airports, based on industry best practice. The benchmarking exercise suggests that even at current traffic levels, Wagga Wagga Airport could sustain a significant increase in retail offer.

Airline CIP Lounges

QantasLink has indicated a definite desire to provide a Qantas Club CIP lounge facility at WGA, in the near future, to serve the strong corporate market which is clearly QantasLink's principal target market. Size would be dependent on costs and available space, but for planning purposes a facility of approximately 75m^2 was suggested. QantasLink's indication was that in 10 years the space requirement could grow by an additional two-thirds of the initial area.

Regional Express's target markets include a mix of leisure and visiting friends and relatives (VFR) traffic with travel by small and medium businesses. The airline has advised that it currently has no strategy with respect to lounges at regional airports, despite the recent introduction of lounge facilities at Sydney, Melbourne and Adelaide airports.

Table 3: Key RPT Planning Parameters

Scenario	Terminal Design Passengers						Max Apron Parking Requirements							
	Check-in	Landside	Security	Departures	Arrivals	TOTAL	B737-800	B737-400	E190	E170	Q400	Dash 8-300	Saab 340	TOTAL
2015-MM	21	132	0	189	60	402						4		4
2020-HL	55	237	52	294	173	812	1				2			2
2020-MH	24	183	0	251	60	518					1	3		4
2025-HH	34	169	50	347	70	670					1	1	3	5
2025-HL	57	263	66	314	182	882		1	1		1			3
2025-MM	33	262	25	349	90	758				1	1	2	1	5
2030-HH	40	225	77	463	85	890					1	1	3	4
2030-HL	58	302	96	465	212	1133	1		1		1			3
2030-MM	47	309	58	440	138	991			1		1	2	1	5

5.2 DESIGN AIRCRAFT CHARACTERISTICS

5.2.1 ICAO REFERENCE CODE

The dimensions, shape and layout of basic airport facilities such as runways, taxiways and aprons are essentially determined by the performance capability and size of the aircraft that are intended to use them. The planning and design of airport facilities therefore begins by identifying the most demanding or critical aircraft that will use them.

In Australia, like most countries, this is achieved by using an ICAO reference code system. The reference code has two elements, a number and a letter, which are derived by grouping aircraft with similar performance capability and key physical dimensions. Thirteen aircraft groupings, each with a unique code number and letter combination such as 1A, 2B, 3C and 4D have been identified.

The objective is to plan individual airport facilities for the critical aircraft likely to use them. Different facilities on the airport, such as those intended for RPT services and those intended solely for light

GA aircraft, are normally planned for their specific critical aircraft. On the other hand, common use facilities such as the primary runway and taxiway system will be planned for the most demanding critical aircraft envisaged to use the airport.

5.2.2 PAVEMENT STRENGTH

The strength of airfield pavements is classified using the ICAO Aircraft Classification Number/Pavement Classification Number (ACN/PCN) system. The ACN is calculated by the aircraft manufacturer for each aircraft, based on the damaging effect of the aircraft on different types of pavement. The ACN is dependent on both the maximum weight of the aircraft and the number, type and configuration of the landing gear. The ACN also includes a component related to the tyre pressure of the main gear.

5.2.3 PRINCIPAL AIRCRAFT PARAMETERS

Table 4 summarises the principal relevant parameters that relate to aeronautical facilities for each of the key aircraft types that might conceivably to use Wagga Wagga airport in the future.

For the purposes of planning specific elements of the future airfield development, the various aircraft types have been aggregated into four broad groupings, each characterised by an ICAO aerodrome reference code and ACN as indicated in Table 5.

Table 4: Principal Design Aircraft Key Parameters

Aircraft Type	Wingspan (m)	Tail Height (m)	MTOW (kg)	ICAO Aerodrome Reference Code	ACN (1)	Typical Passenger Capacity (Pax) (2)
Piper PA-44 Seminole	11.8	2.6	1,780	1A	< 5,700 kg	N/A
Pilatus PC-9	10.2	3.3	3,200	1A	< 5,700 kg	N/A
Cessna 172	10.9	2.7	1,160	1A	< 5,700 kg	N/A
Piper PA-28-161 Warrior III	10.7	2.2	1,155	1A	< 5,700 kg	N/A
Cessna 310	11.3	3.3	2,495	1A	< 5,700 kg	N/A
Beech Super King Air 200	16.6	4.5	5,670	1B	< 5,700 kg	N/A
Bombardier Dash 8-300	27.4	7.5	18,642	2C	13	50
Saab 340B	21.4	7.0	12.371	3C	6.5	36
Embraer E-170	26.0	9.7	37,200	3C	19	78
Bombardier Q400	28.4	8.3	29,257	3D(3)	19	72
Embraer E-190	28.7	10.5	46,990	4C	28	104
Boeing B737-700	35.8	12.6	60.330	4C	36	144
Boeing B737-800	35.8	12.6	70,535	4C	44	180

Aircraft Type	Wingspan (m)	Tail Height (m)	MTOW (kg)	ICAO Aerodrome Reference Code	ACN (1)	Typical Passenger Capacity (Pax) (2)
Boeing B767-300	47.6	15.9	172,365	4D	65	N/A
Hercules C-130J	40.4	11.7	76,000	4D	33	N/A
Airbus A330-300	60.3	17.2	230.000	4E	69	N/A

Notes:

(1) For flexible pavement on a Low (category C) subgrade with characteristic CBR 6%

(2) Based on typical configurations currently adopted by the carrier considered most likely to operate the aircraft

(3) Technically a 3D aeroplane on account of its outer main gear wheel span of 9.2 metres, which is slightly greater than the threshold of 9 metres, this aircraft has been operating satisfactorily on facilities designed for reference code letter C aeroplanes since its introduction to the Australian fleet. It is understood that it is CASA's intention to accept Q400 operations as code 3C, provided that the wheel clearances in relation to taxiway width are achieved.

Source: CASA, Aircraft manufacturers

Table 5: Aircraft Groupings and Characteristics for Facility Planning

Description	Characteristic aerodrome reference code	Characteristic ACN
Light aircraft (Private)	1A	<5,700 kg
Light aircraft (Commercial)	2B	< 5,700kg
Turbo-prop and regional jet	3C	20
Medium-jet	4C	44
Wide-body	4E	69

5.3 AIRCRAFT MOVEMENTS

For the purposes of assessing the annual runway capacity, the number of movements of each type during daylight hours only is critical as most of the training movements will need to occur during the day. The estimated number of each type of movement from each source is summarised in Table 6.

Table 6: Breakdown of Forecast 2029/30 Fixed-Wing Aircraft Movements

Source	Total Movements			Daylight Hours Movements (1)		
	Arrivals	Departures	Circuits	Arrivals	Departures	Circuits
RPT	5,460	5,460	0	4,680	4,680	0
Military	390	390	0	390	390	0
Flying Training(2)	47,207	47,207	44,324	33,882	33,882	38,974
Other GA	8,220	8,220	1,644	7,563	7,563	1,513
Sub-total	61,277	61,277	45,968	46,455	46,455	40,487
TOTAL			168,522			133,397
Notes:	(1) Based on assumed average 12 daylight hours per day approx 0630 – 1830 hrs (2) Based on likely composition of Scenario 2 flying training operations at 2030					

6.0 AERONAUTICAL DEVELOPMENT CONCEPT

The proposed aeronautical development concept, covering airfield and terminal infrastructure requirements and development staging, has been prepared on the basis of satisfying the critical planning parameters described in Section 5.0. The overriding objective of the aeronautical development concept is to maximise the operational capacity of the current airport site to accommodate aircraft movements of the types appropriate to Council's intended role for Wagga Wagga Airport. The proposals and ultimate development concept for the runways, taxiways, passenger terminal facilities and aircraft parking areas are described in the following sections.

6.1 RUNWAY SYSTEM

Wagga Wagga Airport runway system options were considered on the basis of providing the necessary capacity to accommodate the anticipated possibilities with respect to aircraft types and operational activity.

The capacity of a runway is dependent on the mix of aircraft types and the proportions of each type of movements (departure, arrival, touch and go) that are executed on the runway. To calculate the capacity of the existing Runway 05/23, actual movement data from 1 April 2008 to 30 April 2009 was analysed to determine the current aircraft mix at Wagga Wagga Airport. Additional movements were then added to this data, based on Table 6 at Section 5.3 to account for:

- Estimated future RPT movements; and
- Estimated movements associated with fixed wing flying training operations.

For the purposes of the analysis, only movements in daylight hours were considered, assuming an average of 12 hours of daylight per day. The total number of daylight-hours movements required to accommodate the above activities is estimated as around 135,000. The corresponding daylight-hours maximum theoretical capacity of the existing runway is estimated, based on this assumed mix of aircraft types, to be around 150,000 movements per year. In reality, it has been shown that the maximum sustainable practical capacity of a runway is typically around 10% lower than the theoretical capacity, which would be approximately equivalent to the forecast number of movements.

Although the current capacity of the existing runway layout is theoretically sufficient to handle the anticipated level of movements until around 2030, due to the high number of training circuit movements, issues in relation to airspace congestion and associated safety risks are likely to arise well before the movement capacity of the runway is reached. Furthermore, analysis at an annual level does not take account of congestion during busier periods of the day, or for the fact that during winter the available daylight hours are reduced. Therefore, it is quite possible that additional

runway capacity will be required in the next 10-20 years to accommodate Wagga Wagga Airport's aspirations to develop as a hub for commercial flying training.

The most effective way to provide additional runway capacity is to provide a parallel runway system. Various configuration options for this were considered, including the paving and extension of Runway 12/30 to accommodate RPT operations and the provision of parallel runways in the 12/30 direction in conjunction with the existing runway. With the exception of the preferred option described below, all are unsatisfactory with respect to likely cost, operational efficiency and the effective use of the available space.

As a result of the assessment completed as part of this Master Plan study, the preferred ultimate runway system at Wagga Wagga is proposed as follows:

- Existing Runway 05/23 to be retained and, as demand warrants, progressively extended and strengthened to accommodate narrow-body and wide-body jet aircraft operations;
- A new runway, parallel to 05/23, to be provided, as demand warrants, to provide additional capacity for light aircraft training operations. The new runway will be designated 05R/23L and the existing main runway will be re-designated 05L/23R; and
- Runway 12/30 to be retained until construction of runway 05R/23L and, in the interim, partially sealed to form part of an alternative taxiway access between the existing RPT apron and Runway 05/23.

The new runway could be dedicated primarily to training aircraft essentially segregating flying training from other aircraft operations conducted on Runway 05/23. Although Runway 05/23 and the parallel runway would not operate entirely independently of each other, the separation restrictions placed on aircraft when both runways are being used would be relatively minor. A parallel runway used predominantly for circuit movements with a limitation of 6 aircraft in the circuit at any one time and used by light piston single and twin engine aircraft could have a theoretical annual capacity of approximately 210,000 movements.

The capacity of the parallel runway system, if operated in this manner would be less than the combined maximum capacities estimated for each runway, to account for the need for aircraft to cross runway 05/23 to access the parallel runway. Estimated theoretical capacity of runway 05/23 if used for arrivals and departures only would be approximately 131,000 daylight-hour movements per year. Reducing this by 20% to allow for runway crossings and combining with the parallel runway capacity for circuit operations gives an estimated total theoretical capacity for the dual-runway configuration as approximately 315,000 daylight-hours movements per year. This would equate to around 350,000 total annual movements assuming a typical daylight hours/non-daylight hours split of approximately 90%/10%.

The Master Plan provisions made in relation to each runway are described in detail in the following sections.

6.1.1 RUNWAY 05L/23R

It is expected that the existing Runway 05/23 will need to cater for operations by Code 4C aircraft such as Embraer E-190, Boeing 737-700 and Boeing 737-800 aircraft within the short- to medium-term. The current runway length is sufficient to accommodate these aircraft types under certain operating conditions. However, an extension of approximately 600 metres to around 2,368m will allow essentially unrestricted operations by all of these aircraft types, certainly on any likely regular domestic routes such as Sydney, Melbourne, Brisbane or Adelaide.

Extension to the south-west is the preferred option as the extent of earthworks required to achieve a compliant vertical runway profile is significantly less than would be the case for an extension to the north-east. Provision has therefore been made in this Master Plan for extension to south-west of 600 metres, together with allowance for a 90m x 90m Runway End Safety Area (RESA) to meet MOS 139 requirements. The extension would also trigger a requirement to provide a RESA at the opposite end of the runway.

In the longer term, use by wide-body aircraft such as Boeing 767 and Airbus A330 aircraft would necessitate widening and strengthening of the runway in addition to further extension. Continued extension to the south would necessitate the diversion of Elizabeth Avenue. This is not precluded, but the extent of diversion to accommodate a 600 metre extension would be significant. To the north-east, however, a further 600 metres extension is possible without physical infringement of the Sturt Highway, although the topography and allowable runway gradients might necessitate some engineering works between the RESA and the highway. It is understood that issues relating to the crossing of the ARTC land to the north of the existing airport boundary can be resolved. However, it is recognised that extension to the full extent would require the resolution of a number of other issues regarding the proximity of the runway threshold to the Sturt Highway, notably potential distraction of both drivers and pilots.

From the perspective of the overall airport site and envisaged development, extension to the north-east is considered likely to be marginally preferable to further extension to the south-west. It should however be emphasised that this extension is not anticipated as a short- or medium-term requirement. It would only be required to accommodate wide-body aircraft. Even in the long-term, it is presently highly speculative that an economic case warranting the substantial works required to allow operations by wide-body aircraft at Wagga Wagga would develop. Nevertheless, this Master Plan makes provision for the possibility that land to the north-east of the existing Runway 23 threshold might one-day be valuable for an extension of the runway.

6.1.2 RUNWAY 05R/23L

The parallel runway is required to serve daytime training movements by light aircraft, so a Code 2B non-instrument runway is all that is required. Insufficient separation is available to provide fully independent approaches. However, it is possible to achieve a separation of 210 metres, which would allow simultaneous daytime visual operations on both runways under air traffic control guidance. Whilst likely to be required to serve daytime demand only, provision of a full 80 metre strip to allow night-time operations in the future should be protected.

Whilst current CASA standards do not require a RESA for Code 2 non-instrument runways, the primary purpose of this runway is for pilot training. It is therefore proposed to provide a 60m x 46m RESA at each end of the runway for additional safety.

Two options existing for the location of Runway 05R/23L. The first (Option A) is to locate the runway within the existing airport boundary. This would allow a runway length (TORA) of 1,065m to be achieved. However, to accommodate this option, the existing VOR would need to be relocated. The second option (Option B) is to provide a 1,200m TORA whilst maintaining the associated obstacle limitation surfaces clear of the existing VOR location. Option B would require acquisition of land to the south of the existing airport boundary. However, when considered against the cost of relocating the VOR this may be the more attractive option. Otherwise the cost difference between the two options is relatively small and proportionate to the additional length provided by Option B.

6.1.3 RUNWAY 12/30

The types of light GA aircraft that are currently capable of using Runway 12/30 are typically the least crosswind tolerant. To determine the feasibility of closing Runway 12/30, a wind analysis was conducted to estimate the usability of runways oriented in the 05/23 direction by light GA aircraft. The analysis used the 3-hourly wind speed and direction data recorded by the Bureau of Meteorology station at Wagga Wagga Airport between May 1 1966 to April 30 2006. Because the majority of aircraft operations usually occur during the day the analysis has been conducted in two parts, the first solely during daylight hours (considered as 0600 – 1800 hrs for the purposes of this analysis) and the second for a full 24 hour period.

Table 7 presents the estimated usability of Runway 05/23 for a range of allowable crosswind tolerances. Table 8 presents typical allowable crosswind components for the most common light GA aircraft types anticipated at Wagga Wagga.

Table 7: Runway 05/23 Estimated Usability Factors

Period	Maximum Allowable Crosswind Component				
	10 knots	13 knots	15 knots	17 knots	20 knots
0600-1800 ('Day')	90.6%	96.4%	98.2%	99.2%	99.8%
0000 – 2400	93.0%	97.4%	98.7%	99.5%	99.9%

Table 8: Typical Aircraft Maximum Crosswind Components

Aircraft	Maximum Demonstrated Crosswind Component
Cessna 172	15 knots
Piper PA-28-161 Warrior III	17 knots
Piper PA-44 Seminole	17 knots

On the basis of Tables 7 and 8 the penalty to light aircraft as a result of decommissioning Runway 12/30 appears low, especially to those aircraft which are anticipated to form the majority of movements by commercial flying training operators. This analysis is substantiated by comments from AAPA that, although it uses Runway 12/30 on occasion, this is more for convenience than any real safety need. AAPA advised that it would not adversely affect it operations should Runway 12/30 be unavailable.

It is noted that the 2003 Development Plan investigated a proposal to relocate Runway 12/30 to the south of its existing location and reduce its length to 1,199 metres. The 2003 Plan investigated relocation of the secondary grass runway to the south west to open up 20 hectares of land for development. The proposal was ultimately rejected by defence. This proposal has been reviewed in this Master Plan and is no longer considered a preferable option.

In the short term, it is proposed to retain Runway 12/30 for use by light aircraft in conditions when high crosswind components would make use of Runway 05/23 unsafe or otherwise undesirable. Furthermore, to provide part of a new taxiway route between the RPT apron and Taxiway A and an eventual link to Runway 05R/23L, it is proposed to seal the central 23 metre width over a length of approximately 1,070 metres commencing at the 12 threshold. In the short- to medium-term this will serve to increase the availability of Runway 12/30 as it will no longer be rendered unserviceable following wet weather.

6.2 PASSENGER TERMINAL FACILITIES

6.2.1 LOCATION

The 2006 Development Strategy recommended that Council investigate the possibility of relocating the terminal precinct to an alternative location on its own property, noting that the present leasing arrangements may influence the level of resources Council is prepared to commit to airport development particularly during the last years of the lease term.

The benefits of relocating the terminal, in the context of this Master Plan, include:

- The ability to develop a spacious, operationally efficient, high-quality statement which suitably represents Wagga Wagga and the region;

- The opportunity to properly incorporate a range of concessions within the terminal that can enhance the service to passengers whilst providing a revenue stream for Council;
- The potential to stimulate commercial development in another area of the airport, whilst making the current terminal area available for further aviation-related development at little cost;
- The ability to establish more optimal access arrangements; and
- The flexibility to safeguard surrounding land for expansion and to develop as demand dictates.

The major disadvantages, of course, relate to the cost involved which will be significant. Depending on the alternative site that might be adopted, other issues with respect to accessibility and operational considerations may need to be considered.

Alternative locations for the passenger terminal were considered as part of this Master Plan. The preferred location, which maximises the advantages of relocation identified above, is an area to the south of the existing Runway 23 threshold.

A decision on relocation is not required immediately. The existing facilities are adequate for current traffic and that which is likely to develop in the short-term (see Section 6.2.2 below). However, Council must recognise that the lead time for the wholesale relocation of the terminal is several years. To minimise unnecessary investment in the existing facility any decision to move should be taken sufficiently in advance of any further redevelopment of the current terminal being required, such that the new facility can be ready at the appropriate trigger point. A firm decision one-way or the other is therefore recommended as soon as possible.

6.2.2 CAPACITY OF EXISTING FACILITIES

The largest constraint in the existing facility is the configuration of the current check-in area is the number of check-in desks and baggage access to the make-up area. There are currently only four check-in desks and there is little opportunity for additional desks to be installed readily. Whilst new technologies such as kiosk, online and mobile check in are rapidly reducing the infrastructure requirements for check-in at larger airports, it is likely that regional airports such as Wagga Wagga will operate on the current semi-automated basis for several more years.

The introduction of a new carrier such as Virgin Blue operating regional jets could well require expansion of the check-in area to allow for additional desks, whilst the introduction of larger aircraft such as might be operated by other carriers such as Tiger or Jetstar would require substantial expansion of this area. A smaller regional carrier could probably be accommodated within the existing infrastructure by converting one of the desks adjacent to the departures corridor to a check-in desk. The existing baggage make up area is adequate for two simultaneous flights, but a third flight would probably require an expansion of the area. The introduction of jet services would

attract a requirement for checked bag screening, the equipment for which would need to be accommodated also.

The existing 'landside' lounge can accommodate current traffic and forecasted traffic in the short-term, although opportunities to expand the retail offer are limited. There is currently no security required at Wagga Wagga airport or a need for security in the short-term provided the airport does not attract jet passenger traffic and legislation is changed. The recent expansion of the terminal has made provision for the introduction of a passenger screening point at the entrance to the expanded departures area.

The existing departure lounge is sufficient to accommodate current traffic and forecasted traffic in the short term. The current departure lounge can accommodate two typical 50-seat aircraft loads but can become congested when carriers have high load factors.

On the basis of the scenario planning, the existing terminal might potentially be adequate until as late as 2025 in the most favourable combination of low traffic growth and continued high-frequency services. However, the best estimate is that the existing terminal is likely to be able to accommodate potential demand up to around 2020, or whenever aircraft of 100-seats or larger are introduced.

6.2.3 FUTURE TERMINAL REQUIREMENTS

The terminal space requirements for 2030 were estimated by application of the design parameters established from the planning scenario analysis and summarised in Table 3 at Section 5.1.2. The space requirements are summarised in Table 9.

Table 9: Estimated Future Terminal Spatial Requirements

Element	Functional Space	Retail Space	Total
Check-in	600 m^2	-	600 m^2
Baggage Make-up	600 m^2	-	600 m^2
Landside Concourse	650 m^2	500 m^2	1,150 m^2
Security	150 m^2	-	150 m^2
Departure Lounge	800 m^2	300 m^2	1,100 m^2
Airline CIP Lounge	250 m^2	-	250 m^2
Baggage Break-down	500 m^2		500 m^2
Arrivals	950 m^2	250 m^2	1,200 m^2
TOTAL ESTIMATED FOOTPRINT			5,550 m^2

The methodology adopted to determine the space requirements in Table 9 leads to a conservative estimate of overall terminal footprint, which it is considered reasonable to plan and safeguard for but which may, ultimately, not all be required. Between 5,000 – 6,000 m^2 of terminal footprint is

anticipated as the ultimate terminal development requirement at Wagga Wagga and would be sufficient to handle the highest traffic growth forecast with the most demanding combination of aircraft sizes and frequencies to at least 2030.

6.3 AIRCRAFT PARKING AREAS

6.3.1 EXISTING RPT APRON

The existing RPT apron probably has sufficient capacity to accommodate the likely number and type of aircraft expected up to 2020. Beyond that the apron is likely to require expansion at some point between 2020 and 2030, depending on passenger traffic growth and the actual mix of aircraft types and schedules adopted by the airlines.

In light of the discussion regarding the preferred location of the terminal in the long-term at Section 6.2.1 and similar observations regarding the capacity of the existing terminal facilities, this Master Plan anticipates the possible relocation of the terminal and RPT apron to a new terminal precinct south of the existing Runway 23 threshold at some point between 2020 and 2030.

Once RPT operations are relocated, the existing RPT apron would be available for use by other aviation related businesses – in particular anyone occupying the vacated terminal building, which would be ideally suited for use by a fixed base operator serving the business, corporate and charter segments.

6.3.2 PROPOSED RPT APRON

The planning scenario analysis indicates that in the 2025-2030 period with the highest traffic growth envisaged, the maximum number of aircraft parking positions required for RPT aircraft is likely to be five (in the high-frequency scenarios) and the maximum aircraft size is likely to be a Boeing 737-800 or similar. To maximise flexibility, therefore, the new RPT apron is planned to accommodate a maximum of 5 Boeing 737-800 aircraft simultaneously.

6.3.3 WESTERN GA APRON

The existing western GA apron is constrained from expansion to the west in the short-term as a result of the Bureau of Meteorology. Any modest expansion that could be achieved would also require the relocation of the existing hangars at the western end of the apron, which would need to be accommodated elsewhere. It is therefore expected that expansion of the western GA apron will not occur unless and until agreement can be reached with the Bureau of Meteorology regarding an alternative location for its facility.

In order to provide the required clearances for aeroplanes manoeuvring on the western GA apron, removal of the existing centre parking and tie-down area is required. Aircraft parking will still be possible adjacent to the hangar line. To compensate for the loss of aircraft parking areas on this

apron, it is proposed to develop additional apron space for light aircraft to the south of the existing AAPA, Regional Aviation Services and Wagga Air Centre facilities (see Section 6.3.5).

6.3.4 SOUTHERN GA APRON

There may be a need to expand the southern GA apron to accommodate the parking of light aircraft to serve operators establishing in, or in the vicinity of, the existing passenger terminal, to supplement the available parking of the existing RPT apron.

6.3.5 SOUTH-WEST GA APRON

To provide additional light aircraft parking in the short-term, to accommodate aircraft displaced from the existing centre parking in the western GA apron and new aircraft operated by AAPA, a new apron area to the south of AAPA is proposed. The apron will link proposed Taxiways H and J and provide parking for approximately 15 reference code letter A and B aeroplanes. It is also proposed that this area will provide access to the relocated BP fuel facility (see Section 6.5.1).

6.3.6 PRIVATE LIGHT AIRCRAFT PRECINCT

For some time there has been demand expressed by private aircraft owners interested in developing hangar space. So far, this demand has gone un-met because is has not proved possible for Council to identify and agree on a suitable area with Defence.

It is proposed to establish an area for use by private light aeroplanes to the south of the NDB. This area is available immediately, and permits appropriate landside and airside access. The area can accommodate approximately 95 15-metre by 15-metre hangars in contiguous structures either side of Code B taxilanes, without infringing the 150-metre diameter protection zone for the NDB. There is also the potential to develop the new aero club facilities in the same area.

In the short-term, this area will be somewhat isolated from the principal activity areas on the aerodrome, including the fuel facilities. However, in the long-term it will be more centrally located, in particular being more convenient for access to Runway 05R/23L.

The staged development will mean that in the earlier stages of development, the area will provide large quantities of tie-down parking with landside access, for the parking of itinerant aircraft. This would make it ideal for hosting fly-ins and similar events with large numbers of visiting aircraft. In the longer term, once fully developed with hangars, there will still be modest tie-down areas in this precinct, but large numbers of itinerant aircraft may necessitate the use of additional parking, either in the expanded southern GA apron or on the grassed area to the south of it, although these locations would not offer the same ease of access to and from the landside.

6.3.7 NEW GA APRON DEVELOPMENT SOUTH OF RWY 12/30

In the short-term, there is potential for some apron development to the south of Runway 12/30, provided that the requirement by Defence to maintain a 150 metre wide strip can be removed. The extent of short-term development is limited by the constraints imposed by Runway 12/30, the Explosive Ordnance Storage facility and the NDB. It is nevertheless possible to provide an apron wide enough to accommodate parking and circulation of reference code letter B aircraft in the short-term in the areas to the north and south-west of the Explosive Ordnance Storage magazine.

In the medium-term, with the proposed re-designation of Runway 12/30 to a taxiway, apron depth can be extended away from the building line to accommodate parking and circulation of reference code letter C aeroplanes.

6.3.8 NEW GA APRON DEVELOPMENT SOUTH OF RWY 05R/23L

The development of Runway 05R/23L in the medium-term is likely to stimulate demand for apron frontage in the area to the south of that runway. Therefore, this Master Plan anticipates the development of further apron area and hangar development zones in this area to serve light aircraft suitable to use Runway 05R/23L.

6.3.9 FREIGHT/MAINTENANCE APRON

A further aviation support apron, intended to serve freight and heavy aircraft maintenance of larger aircraft types, which might be suited operationally by proximity to the RPT apron, is proposed to the north-east of the future RPT apron and terminal location. This apron would be capable of serving larger wide-body aircraft that might possibly be attracted to Wagga Wagga for freight or aviation support purposes.

It is anticipated that modest provision for up to two reference code letter E aircraft will be sufficient. The apron can be sized accordingly without significant impact on the natural watercourse in this area. However, if Runway 05L/23R is ultimately extended to the north-east, there is the possibility of expanding this apron in the same direction should more significant demand than anticipated occur.

6.4 TAXIWAY SYSTEM

The taxiway system is required to link the operational runways with the various aircraft parking areas on the aerodrome. An effective taxiway network is critical to maximising the operational capacity of the airfield. However, the capacity of taxiway systems is difficult to define precisely in the same way as it is for runways. Instead, it is necessary to rely on experience, drawn from the operation of other airports, as to what constitutes an effective taxiway network.

In general terms, a well-designed taxiway network is rarely a limiting factor on airport operational capacity in the same way as the runway system or available aircraft parking space can be. However, it is important that as the level and criticality of aircraft circulation on the movement area increases, the taxiway system provides sufficient level of redundancy to ensure that airport operations are not paralysed if a particular taxiway link is unserviceable due to planned or unplanned outage.

In order to sustain the level of runway movements anticipated in this Master Plan, it will be necessary to implement substantial extension and enhancement of the existing taxiway system at Wagga Wagga Airport. The taxiway development will of course be staged in conjunction with the development of the runway system and demands on the movement area.

6.4.1 EXISTING TAXIWAYS

Taxiway A

As total aircraft movement numbers on Runway 05/23 increase, it will be increasingly necessary for RPT aircraft to occupy the runway for the shortest time possible, in order to impose the least delay on other aircraft operations. To this end, upgrade of the current parallel taxiway (Taxiway A, together with B and D) to accommodate Code C aircraft will be required.

As Runway 05L/23R is extended to the south-west, Taxiway A will also need to be extended to connect to the new 05L threshold.

Taxiways B and E

An extension of Taxiway B, from the existing intersection with Taxiway A to the proposed Taxiway K which will serve the private light aircraft precinct and apron development at the southern end of Precinct 2. This taxiway section will need to be capable of serving reference code letter B aircraft in the short-term and reference code letter C aircraft in the long-term.

The existing sections of Taxiways B and E, connecting Taxiway A with Runway 05/23, will need to be upgraded to reference code letter C status in conjunction with the corresponding upgrade of Taxiway A.

Taxiway C

Taxiway C is adequate for current and planned aircraft operations, with the exception of its pavement strength increase to a PCN of 20 through reconstruction and resurfacing this financial year.

In the future, as the western GA apron gets extended, it is proposed that Taxiway C will continue with clearances suitable for reference code letter C aircraft to connect to the future Taxiway K at the location of the existing Runway 12 threshold.

Taxiway F

It is proposed to retain this taxiway in the short term as a link between the Southern GA Apron and Runway 12/30. In the longer term, as expansion of the southern GA apron occurs, it is proposed that Taxiway F will eventually be upgraded to a Code B sealed taxiway.

6.4.2 ADDITIONAL TAXIWAYS

Several additional taxiway links have been identified as being required at varying stages of the proposed Master Plan development. Each of the major proposed taxiway segments are described below. Note that the taxiway letter designations have been assigned purely for the purposes of reference in this Master Plan and that ultimate taxiway designation across the aerodrome should take into account the recommended practices of ICAO and CASA.

Taxiway H

In the short-term, current activity levels on the RPT, western and southern GA Aprons means that an alternative means of access to Runway 05/23 is increasingly essential. The current arrangement potentially compromises all airport users if Taxiway C is unavailable for any reason. Therefore, an additional taxiway link is proposed from the south-west corner of the RPT apron to Runway 12/30. In conjunction with the sealing of Runway 12/30 between the 12 threshold and the proposed alignment of Runway 05R/23L, this will complete an alternative taxi path for reference code letter C aeroplanes connecting the RPT apron and Regional Express maintenance facilities with Taxiway A and Runway 05/23.

Taxiway J

In the short-term, there is a need for an additional taxiway between the western GA apron and Runway 12/30 to serve AAPA's reference code A aircraft. Initially the taxiway will be of natural surface and will need to incorporate a controlled crossing of the landside access road to maintain access to the existing businesses located to the east.

In the medium-term, for greater flexibility, it is proposed that the taxiway will be sealed to provide all-weather accessibility and widened to accommodate reference code letter B aircraft

Taxiways K & M

Upon de-commissioning of Runway 12/30 it is proposed that the sealed section see Section 6.1.3 be re-marked and designated as a taxiway suitable for reference code letter C aeroplanes connecting the existing Runway 12/30 threshold with the proposed Taxiway P.

Taxiway L

Taxiway L is proposed to connect the private light aircraft precinct with Runway 12/30/Taxiway K in the short-term. This taxiway will serve as an alternative to Taxiway A for light aircraft circulating between the parking areas and the fuel facilities in the vicinity of the existing terminal. The eastern

section of Taxiway L, between Runway 12/30/Taxiway K and Taxiway C will also enhance the accessibility of the proposed Code C engine run-up facility when constructed in its ultimate location adjacent the intersection of taxiways C and L.

Taxiway L will need to be capable of serving aircraft of up to reference code C.

Taxiway N

Taxiway N is proposed as a full-length parallel taxiway serving the proposed parallel runway, 05R/23L, suitable for aeroplanes up to reference code letter B in size.

Taxiway P

Taxiway P is proposed as a full-length parallel taxiway serving the proposed parallel runway, 05R/23L, to be developed to serve aviation-related development to the south of Runway 05R/23L. Taxiway P will need to be suitable for aeroplanes up to reference code letter B in size.

Taxiways Q, R, S and T

These four taxiways, to the south of Runway 05L/23R opposite existing Taxiways B, C and D and the proposed extension of Taxiway A to the extended 05L threshold, will provide access to Runway 05R/23L from the development to the north of Runway 05L/23R.

If Option A for Runway 05R/23L is implemented, Taxiway Q will be omitted. Similarly, if Option B is chosen, it is likely that Taxiway T would be omitted. Each crossing of Runway 05L/23R by aircraft will reduce its capacity slightly. Therefore, the maximum number of taxiway crossings is desirable to allow simultaneous crossing thus minimising the reduction in capacity.

Taxiways Q, R, S and T will need to be suitable for use by aeroplanes up to reference code letter B in size.

Taxiway V

This taxiway will link the proposed new RPT apron to Runway 05L/23R opposite Taxiway A, primarily to serve aircraft taxying between the 05L threshold and the RPT apron or possible future freight/maintenance apron adjacent.

Within the 20-year timeframe considered in detail in this Master Plan, it is expected that this taxiway will need to serve only reference code C aircraft up to Boeing 737-800 size. However it is possible that in the longer-term, beyond 2030, it may need to serve larger reference code letter D or E aircraft conducting freight or maintenance operations if Wagga Wagga is successful in attracting these types of activity to the airport.

Taxiway W

To maximise the runway capacity and available length of Runway 05L/23R, Taxiway W is proposed to link the proposed RPT apron and possible future freight/maintenance aprons with the 23R threshold avoiding the need for RPT aircraft to backtrack along the runway.

For the same reasons, if Runway 05L/23R were to be extended to the north-west, Taxiway V would extend to the 23R threshold to serve aircraft up to reference code C in size. It is not envisaged that it would be necessary for this taxiway to serve larger aircraft as operations by larger aircraft are expected to be sufficiently infrequent that impacts on runway capacity as a result of backtracking are likely to be negligible. Provision of a runway turning node suitable for reference code letter D and E aircraft would be sufficient to accommodate the envisaged scale of any wide-body aircraft operations.

6.5 OTHER AIRFIELD FACILITIES

6.5.1 FUEL FACILITIES

This Master Plan does not envisage a requirement to relocate the existing Mobil fuel facility. Proposed developments in the area, in the long-term, may ultimately facilitate expansion of this facility although no specific provision for expansion has been made.

Relocation of the BP fuel facility would be advantageous, from the point of view of facilitating expansion of the adjacent Regional Express maintenance facilities. It is understood, from the consultation process, that BP is amenable to relocation in the immediate future.

A potential site, located to the south of the proposed south-west GA apron adjacent proposed Taxiway H. This location is central and especially convenient for users on the southern and western GA aprons.

6.5.2 RURAL FIRE SERVICE FACILITY

This Master Plan identifies the preferred location for the development of a facility for the Rural Fire Service, to the east of proposed Taxiway J. in the short-term this location can be accessed via the existing landside road. In the longer-term, direct landside access will not be possible as the western GA apron expands. However public access is not considered essential to this facility. The identified site is sufficiently large to accommodate both the proposed RFS facility and a possible adjacent 30 metre x 25 metre hangar for RFS contractor's aircraft.

6.5.3 MILITARY HELICOPTER TRAINING AREA

The military helicopter training area would need to be relocated in order to allow the development of Runway 05R/23L. Shifting this area slightly south and east of its existing area can be achieved

without disturbing the existing infrastructure for the adjacent small arms training range or the existing airfield perimeter road.

6.6 STAGED DEVELOPMENT PLAN

The anticipated staging of the proposed aeronautical development concept described in the preceding sections is summarised below. Development staging is subject to a range of external factors including the removal of existing constraints and the acquisition of any additional land required, as well as demand. The timing and location of developments as set out below will need to be subject to periodic review and adjustment as a result of all of these factors. The Master Plan, whilst setting out the optimum long-term land-use arrangement for the airport site, incorporates flexibility to adjust the location and timing of particular developments as necessary to suit specific constraints.

6.6.1 STAGE 1 – SHORT-TERM DEVELOPMENT

The key components of the aeronautical development concept proposed during Stage 1 are summarised in Table 10 below. Expected trigger points for implementation of each component are also indicated. On the basis of the anticipated growth and development in aeronautical activities current at the time of preparation of this Master Plan, Stage 1 development is expected to occur at some point between 2010 and 2020. Actual development timeframes will depend on a number of factors including the preparation of detailed business cases for each element.

Table 10: Proposed Stage 1 Development

Proposed Development	Anticipated Trigger
Provide a Code A/B taxiway from western edge of existing GA Apron to Runway 12/30 to accommodate AAPA operations. (1)	Immediate
Develop South-West GA Apron to accommodate aircraft parking for the AAPA, Wagga Air Centre and regional Aviation Services	Immediate
Provide a Code C taxiway between the existing RPT Apron and Runway 12/30 (Taxiway H)	c. 40,000 annual movements
Seal approximately 1,070 metres of 12/30 from the 12 threshold for use as both an all-weather Code 2B non-instrument runway and an alternative taxiway by Code C aircraft between the RPT apron and Taxiway A	c. 40,000 annual movements
Upgrade Taxiway A to accommodate Code C turboprop and regional jet aircraft up to Q400 and E-170 size	c. 50,000 annual movements
Develop a precinct for private light aircraft to the south of the existing NDB site. Stage 1 of the development to accommodate up to 32 No hangars with landside road access to each hangar (2)	Immediate
Development of new apron areas and hangar development zones between Runway 12/30 and 05/23 (3)	On Demand

6.6.2 STAGE 2 – MEDIUM-TERM DEVELOPMENT

The key components of the aeronautical development concept proposed during Stage 2 are summarised in Table 11 below. Expected trigger points for implementation of each component are also indicated. On the basis of the anticipated growth and development in aeronautical activities current at the time of preparation of this Master Plan, Stage 2 development is expected to occur at some point between 2020 and 2030. Actual development timeframes will depend on a number of factors including the preparation of detailed business cases for each element.

Table 11: Proposed Stage 2 Development

Proposed Development	Anticipated Trigger
Upgrade of existing Taxiway A to Boeing 737-800 standard and lighting for use at night (1)	Boeing 737 operations
Extension of existing Runway 05/23 600m to south-west, including associated extension of Taxiway A to the new 05 threshold (2)	Extended Boeing 737-800 operations
Development of new RPT apron and Taxiways V and W connecting to existing Runway 05/23	2020 or 100-seat aircraft
Development of new passenger terminal (area 5,000 m^2), access roads and car parking	2020 or 100-seat aircraft
Develop a new parallel Code 2B non-instrument Runway 05R/23L for training operations (Option A) (3) associated Taxiways N, P, Q, R, S and T(4)	c. 100,000 annual movements
Develop a new parallel Code 2B non-instrument Runway 05R/23L for training operations (Option B) and associated Taxiways N, P, Q, R and T(4)	c. 100,000 annual movements
Expansion of the precinct for private light aircraft to accommodate up to a further 59 hangars with landside road access to each hangar	On demand
Extension of the western GA Apron to the west and connecting with the Stage 1 development to the south of Runway 12/30 (5)	On demand
Expansion and extension of apron development south of existing Runway 12/30 (5)	On demand
Extension of Taxiway L between K and C and provision of engine run-up bay for Code C turboprop aircraft (6)	Re-development of existing run-up location
Extension of southern GA Apron for Code B light aircraft	On demand
Develop light aircraft parking areas to south of Runway 05L/23R, including rotary wing precinct (7)	Military flying training contract or second Civil FTO

6.6.3 STAGE 3 – LONG-TERM (ULTIMATE) DEVELOPMENT

Stage 3 considers any development that is not anticipated to occur before 2030, but for which it is nevertheless considered prudent to account for in this Master Plan. These Stage 3 developments fall into two categories:

- Developments that are likely to occur naturally as a result of development proposed in the short- and medium-term; and
- Developments that may occur if circumstances and opportunities present themselves, but for which there is currently no evidence of demand. These developments are considered to be extremely long-term and uncertain in nature but are identified in this Master Plan in order to preserve flexibility should the situation change.

The key components of the aeronautical development concept proposed during Stage 3 are summarised in Table 12 below. Possible trigger points for implementation of each component are also indicated.

Table 12: Proposed Stage 3 Development

Proposed Development	Anticipated Trigger
Develop freight/heavy maintenance apron to accommodate any potential activity in these sectors, particularly by jet aircraft	Subject to demand
Possible extension of existing Runway 05R/23L by 600m to north-east, including associated extension of Taxiway W to the new 23 threshold	Wide-body aircraft demand
Possible upgrade of Taxiways A, E and V to Code E standard	Wide-body aircraft demand
Possible future extension of freight/heavy maintenance apron to north-east (maximum development)	Subject to demand

7.0 AIRCRAFT NOISE

The consideration of airport noise impact is an important factor in the development of individual Airport Master Plans. An understanding of the noise impact on land adjoining the airport provides valuable information to local government authorities for development planning of adjacent land uses. A thorough understanding of both existing and future noise impacts from airport operations is essential to the development of land use zone planning schemes around airports. It is also important for the general public to be able to understand possible future noise impacts in a wider sense, to assist individuals in making their own assessment of their acceptability.

The provision, in this section of the master plan, of information on projected noise impacts for Wagga Wagga Airport, is intended, firstly, to enable Council to make informed choices for the development and implementation of future Airport Master Plans and Local Environmental Plans to ensure that:

- Sensitive receptors are located in areas of acceptable aircraft noise; and
- The amenity of other surrounding developments is not adversely affected by aircraft noise
- Airport operations are protected long term from stakeholder conflicts due to the encroachment of inappropriate development into noise affected zones.

However, additional information over and above that required by the statutory planning framework has also been provided, to assist non-experts including the general public in gaining a better understanding of future aircraft noise in relation to Wagga Wagga Airport.

7.1 AIRCRAFT NOISE MEASUREMENT

Aircraft noise pollution is a significant unwanted by-product of aviation activities at many airports. Many of the noise descriptors that have traditionally been used to convey aircraft noise impacts are based on complex non-linear metrics that are not easy for the non-expert to understand. It is important that an aircraft noise descriptor is selected so that it matches the needs of the issue being examined. In the past this match has not been achieved effectively and this has contributed significantly to the expert and non-expert failing to reach a common understanding about aircraft noise exposure patterns around airports.

Usually the overall sound level is described in decibels (dB) and measured using a sound level meter equipped with an ‘A-weighting’ filter which approximates the frequency response of the typical human ear. Different sources having the same dB(A) level generally sound about equally loud. The decibel scale is non-linear: a change of 1 dB(A) or 2 dB(A) in the level of a sound is difficult for most people to detect, whilst a 3 dB(A) to 5 dB(A) change corresponds to a small but

noticeable change in loudness and a 10 dB(A) change corresponds to an approximate doubling or halving in loudness.

Some sound levels typically associated with some common activities are shown in Table 13.

Table 13: Typical Noise Levels

Activity	Typical Noise Level dB(A)
Quiet Room	30
Rainfall	50
Conversation at 2m	60
Washing Machine	65 – 70
Inside Car, Windows Closed, 50km/h	68 – 73
Main Road	70
Vacuum Cleaner	85 – 90
Very Loud Rock Music	120

Although the noise levels shown in Table 13 do not specifically relate to noise caused by aircraft, they remain a good benchmark for an individual to compare with when interpreting the noise information in the following sections. One of the characteristics of noise is that, unless two noise sources are of approximately the same intensity (within a few dB(A) of each other) the intensity of the combined noise sources is effectively the same as the loudest source only. For that reason, it would be difficult to distinguish the noise of a main road or washing machine, for example, above that of a vacuum cleaner.

7.1.1 THE ANEF SYSTEM

The principal means of assessment of potential aircraft noise exposure at a given site in Australia is based on the Australian Noise Exposure forecast (ANEF) system. The ANEF system was developed in the early 1980s based on a social survey of the reaction of people around several Australian airports to noise from aircraft. The ANEF combines the effects of the intensity, duration and number of noise events as well as incorporating a penalty for events at night which is illustrated by contours.

The ANEF is intended to be used to guide the long-term decisions of land-use planners about types of compatible development in areas that may be subject to significant levels of aircraft noise in the future. Additionally, the ANEF system is the basis of *Australian Standard AS 2021-2000 Acoustics – Aircraft noise intrusion – Building siting and construction* (AS2021-2000) which provides guidance on the protection of new buildings against aircraft noise intrusion and on the acoustical adequacy of existing buildings in areas near aerodromes.

Although the ANEF system is considered suitable for land-use planning purposes it is not without its limitations. The ANEF system is a ‘one size fits all’ approach to land use planning. The ANEF

criteria for acceptable land use are the same whether the land is in the vicinity of a major international airport or a small regional aerodrome without jet aircraft. The system does not take into consideration local conditions, for example an airport on a Greenfield site is treated the same as one which has already been developed.

Additionally, the ANEF is a complex metric which combines the effects of loudness, duration and frequency of noise events to develop a measure of the cumulative noise dose and does not illustrate the noise from a specific noise event which is what the non-expert can readily relate to.

7.1.2 OTHER AIRCRAFT NOISE METRICS

The Australian Government has published several documents aimed to improve 'aircraft noise disclosure' and avoid 'surprise noise' which is usually associated with people believing that they have either been given misleading information or have had important information withheld from them. These documents include:

- *Discussion Paper - Expanding Ways to Describe and Assess Aircraft Noise*;
- *Discussion Paper - Going Beyond Noise Contours, Local Approaches to Land Use Planning around Smaller Australian Airports; and*
- *Guidance Material for Selecting and Providing Aircraft Noise Information*.

The latter document recommends airports such as Wagga Wagga Airport also utilise additional noise metrics such as 'Number Above' contours which illustrate the average number of events per day louder than a certain sound level. In response, Wagga Wagga Airport has produced 'Number Above' contours in order to assist the community and airport stakeholders better understand the impact of aircraft noise. This additional noise modelling is described further in Section 7.4.

7.2 NOISE MODELLING SOFTWARE

7.2.1 INTEGRATED NOISE MODEL

The noise contours for Wagga Wagga Airport were prepared using the Integrated Noise Model (INM) version 7.0. The INM software has been developed and progressively refined by the United States Federal Aviation Administration to enable the estimation of noise impacts around airports resulting from aircraft operations.

The INM calculates noise impacts by applying standard or user defined aircraft flight profiles, performance data and noise curves to the specific runway configuration and flight tracks. Under the Australian Noise Exposure Forecast system, the time of day at which operations take place is also factored into the noise computation. This allows for varying sensitivity in people's reaction to noise.

In interpreting the output of the model it should be noted that:

- Aircraft movements are allocated as a day or night operation, defined as being the hours between 7.00 am to 7.00 pm and 7.00 pm to 7.00 am respectively;
- The number of approach and departure operations modelled relate directly to the actual number of approach and departure movements; and
- The INM requires touch and go (TGO) training to be modelled as a circuit - the initial take-off coupled with the final landing - in conjunction with a number of TGO operations (i.e., each INM circuit or TGO corresponds to two aircraft movements).

The model has been constructed to produce the Australian Noise Exposure Forecast (ANEF) metric defined in AS2021-2000.

The Wagga Wagga Airport ANEF contours developed as part of this Master Plan have been submitted for endorsement by Airservices Australia in the manner of endorsement approved by the Minister for Infrastructure, Transport, Regional Development and Local Government on 2 May 2008.

7.2.2 TNIP

The Transparent Noise Information Package (TNIP) has been produced by the Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) to enable aircraft noise disclosure information to be rapidly produced for individual airports. The software takes data outputs from INM (discussed in Section 7.2.1) or data from the Noise and Flight Path Monitoring Systems (NFPMS) such as those found at Sydney Airport to produce a range of flight path and aircraft movement based noise descriptors or to produce and manipulate conventional noise contours. The 'Number Above' noise contours are produced using TNIP.

7.2.3 GROUND-BASED NOISE

INM only considers noise from aircraft taking off, landing and in flight. Ground-based noise, such as that from taxying aircraft or engine run-ups or that from ground vehicles or equipment is not included in the model, and therefore cannot be represented in the ANEF or other outputs derived from the INM model such as N60/N70 contours. Individual developments which have the potential to generate significant ground-based noise, such as engine run-up facilities or the development of a new RPT terminal and apron, should incorporate further, more detailed, studies to provide an assessment of the noise impacts of these proposals. Airport operational matters influencing noise from ground-based sources should be managed in consultation with local residents through a community consultation strategy.

7.3 ANEF METRICS FOR WAGGA WAGGA

7.3.1 AUSTRALIAN NOISE EXPOSURE INDEX

The ANEI is a contour map that is based on historical aircraft movement data for the last 12 months. The ANEI shows the average daily aircraft noise exposure around the airport over the year and, as it is based on actual movements, is useful to highlight any growth or decline in future aircraft noise levels illustrated through an ANEF.

The 2008/09 ANEI for Wagga Wagga Airport was based on actual aircraft movements for the period 1 April 2008 to 30 March 2009 and is shown in drawing B09065A301 included at Appendix B.

The 2008/09 ANEI contour map shows the 15, 20, 25, and 30 ANEI contours. The large majority of the 25 ANEI contour is contained within the airport boundary and only exceeds the boundary to the north-east over land currently zoned large lot residential. The 20 ANEI contour exceeds the airport boundary off the ends of Runway 05/23 extending just over Elizabeth Ave to the south-west and the Sturt highway to the north-east.

The Wagga Wagga Airport ANEI contours developed as part of this Master Plan have been submitted for endorsement by Airservices Australia.

7.3.2 AUSTRALIAN NOISE EXPOSURE CONCEPT

An Australia Noise Exposure Concept (ANEC) has been prepared based on the forecasted number of movements for the year 2029/30. The ANEC is a noise contour map which is produced during consideration of options for airport development.

The model assumed the closure of the existing Runway 12/30 and the development of a new runway (Runway 05R/23L) parallel to the existing Runway 05/23. For the purposes of developing the noise contours, both location options for Runway 05R/23L (see Section 6.1.2) were incorporated by assuming a single runway extending the full length covered by both options. Similarly, the study assumes Runway 05L/23R will, ultimately, be extended as shown in Drawing B09065A013 at Appendix B. This runway layout represents a worst-case scenario.

The 2029/30 ANEC is shown on Drawing B09065A302 at Appendix B.

7.3.3 AUSTRALIAN NOISE EXPOSURE FORECAST

The ANEF is a contour map based on forecast aircraft movements and is the only contour map under the ANEF system which is intended to have status in land-use planning decisions.

The ANEF for Wagga Wagga Airport is based on the same assumptions as the ANEC but with the number of movements increased to reflect the ultimate capacity forecast. The use of an ultimate

capacity approach is justified on the basis that the ANEF is intended to protect the public from unacceptable impacts of aircraft noise in the long-term and is therefore very much a worst-case assessment.

The maximum number of aircraft movements that could be accommodated on the proposed ultimate development runway system has been included in the ANEF. This ultimate capacity has been assessed as being approximately 315,000 movements. It can be clearly seen from Section 4.2.2 that activity at Wagga Wagga Airport is not expected to reach this ultimate capacity until many years (and quite possibly several decades) beyond 2030. The forecast level of movements in 2030 and modelled in the development of the ANEC is a little over half of this ultimate capacity, even in the worst case scenario in terms of fixed-wing flying training activity.

The ANEF for Wagga Wagga Airport is shown in drawing B09065A303 included at Appendix B.

The 2029/30 ANEF shows the 15, 20, 25, 30 and 35 ANEF contours. In terms of the ANEF contours that are significant under AS2021:2000:

- the 35 ANEF contour is contained within the airport boundary needed to accommodate the extent of the assumed runway layout;
- The 30 ANEF contour only exceeds the assumed airport boundary to the north-east and south-west, extending slightly over the Sturt highway and Elizabeth Avenue respectively;
- The 25 ANEF contour is mostly contained within the proposed adjacent development precincts, except at the ends of the runways to the south-west and north-east where it extends over portions of presently uninhabited land; and
- The 20 ANEF contour encompasses part of the RAAF Base and the existing residential area to the east.

7.3.4 COMPARISON OF CONTOURS

2008/09 ANEI vs 2029/30 ANEC

As expected there is an increase between the 2008/09 ANEI contours and the 2029/30 ANEC contours due to the higher forecasted level of traffic in 2029/30 and changes to the runway layout and flight paths.

The shape of the more significant 30 and 35 contours on both the 2008/09 ANEI and 2029/30 ANEC contour maps are similar and centred around the existing Runway 05/23. The development of the parallel Runway 05R/23L has widened the contours more to the south over land which is predominantly open pasture. The 20 and 25 ANEC contours extend farther out from the runway ends than those of ANEI.

2029/30 ANEC vs Ultimate Capacity ANEF

The size and shape of both the ultimate capacity ANEF contours and the 2029/30 ANEC contours are similar with only a small increase from the ANEC to the ANEF contours. This is due to the relative increase in forecasted traffic between the two scenarios being limited to light aircraft conducting training which have correspondingly less noise impact under the ANEF metric than larger commercial aircraft.

7.4 N60 AND N70 CONTOURS

The ANEF system is generally recognised as being the most technically complete description of aircraft noise in use in the Australian context and the ANEF is the only metric recognised under AS2021:2000. However, it is also widely recognised that the ANEF system is not easily translated into the important factors which affect how individuals react to aircraft noise: the number of overflights and the loudness of individual events. This is due to the way the ANEF combines the effects of loudness, duration and frequency of noise events to develop a measure of the cumulative noise dose. The Australian Government recognises this and has been encouraging airports to include other information about noise in their Master Plans.

Use of 'Number Above' contours has therefore gained popularity recently to complement the ANEF system. Number above, or 'N', contours illustrate the average number of events per day louder than a certain sound level. In the case of the N60, this level is 60 dB(A). The single event level of 60 dB(A) is specified in Australian Standard AS2021:2000 as the indoor design sound level for normal domestic areas in dwellings and 70 dB(A) is the noise level at which conversation is disturbed within a house with the windows open.

Contours such as the N60s and N70s assist the community to better understand the impacts of aircraft noise by giving individuals the ability to interpret aircraft noise based on actual counts of aircraft with a noise profile greater than a certain level over a range of flight paths. The provision of 'Number Above' contours has been recently recommended by Department of Infrastructure, Transport, Regional Development and Local Government (previously the Department of Transport and Regional Services) in a discussion paper entitled *Guidance Material for Selecting and Providing Aircraft Noise Information*.

In response to these recommendations N60 and N70 maps for Wagga Wagga Airport based on the year ultimate capacity forecasted level of traffic have been produced and are shown in drawing B09065A304 and B09065A305 respectively.

As the maps show, the area outside of the airport boundary including Forest Hill is expected to experience between 20 and 50 events of 60 dB(A) or greater and less than 10 events of 70 dB(A) or greater on the average day. This corresponds to approximately 2-3 events over 60 dB(A) and less than 1 event over 70 dB(A) each hour of a typical 16-hour operating day. For comparison

however, as Table 13 shows, a number of other typical daily activities are likely to exceed these noise levels several times per day. In particular the several hundred trucks and other vehicles travelling on the Sturt Highway on a daily basis are also capable of producing noise in excess of 70 dB(A) which would affect residents whose property is adjacent to the road.

Furthermore, as the tolerance for unwanted noise at night is lower than during the day an N60 map based on day movements (07:00 to 19:00) and an N70 map based on night movements (19:00 to 07:00) 2029/30 have also been produced for the year 2029/30 and are shown in drawing B09065A306 and B09065A307 respectively.

The maps highlight that all of the events over 60 dB(A) and 70 dB(A) outside the airport boundary in the area of Forest Hill are during daylight hours. The small number of events over 70 dB(A) that are forecasted to occur during night hours are mostly contained to the airport boundary and only exceed the boundary to the south-west and north-east directly off the runway ends. It be should be noted however that although 'night' for aircraft noise modelling purposes is defined as the time between 19:00 and 07:00, the vast majority of night-time flying operations would usually be conducted outside of the most sensitive hours between 22:00 and 06:00.

8.0 AIRSPACE

8.1 SURROUNDING TERRAIN

The airport elevation is approximately 220 metres (724 feet). The site is relatively flat, falling slightly to the north towards the Sturt Highway and with higher ground to the east, south and west.

In the south-east quadrant a ridge runs north-south some 2 kilometres from the end of the runways infringes the existing inner horizontal obstacle limitation surface (see Section 8.2). The ridgeline is delineated with a number of hazard beacons (obstacle lights). This ridge continues to the south and west in a crescent formation, rising in elevation with distance from the airport. Mount Coreinbob (463 metres) and Mount Flakney (535 metres) are significant features but are located some 15 kilometres from the airport.

There are a number of towers to the north and east of the airport, the most significant being at Wheel of Fortune (607 metres) located north-east of the airport, again at a distance of about 15 kilometres.

8.2 OBSTACLE LIMITATION SURFACES

Obstacles on or in the vicinity of an airport – whether natural features or man-made structures – may prevent its optimal utilisation by aircraft through:

- Reducing the runway distances available for take-off or landing;
- Reducing the authorised take-off and landing weights for some aircraft;
- Restricting certain types of aircraft; and/or
- Limiting the range of weather conditions in which aircraft can operate.

The shape and dimensions of the Obstacle Limitation Surfaces (OLS) for an airport are determined on a case by case basis, depending on runway aerodrome reference code number and the type of instrument approaches intended.

Any natural feature or structure which exceeds the vertical limits of the established OLS is defined as an obstacle and needs to be assessed by CASA to determine its operational impact. No structure located on airport should be allowed to exceed the vertical limits of the OLS unless required to do so to serve its operational purpose.

8.2.1 EXISTING OLS

Runway 05/23 is a Code 3 non-precision instrument runway of 45 metres width within a 150 metre wide runway strip. Runway 12/30 is a Code 3 non-instrument runway of 30 metres width within a 90 metre runway strip. Obstacle limitation surfaces protect take-off and landing and visual circling for both runways. The existing OLS applicable to current operations at Wagga Wagga Airport is shown in Drawing B09065A030 at Appendix B.

The inner horizontal surface is penetrated by a ridge to the south-east some 2 kilometres from the end of the runways.

8.2.2 FUTURE OLS

With respect to the future OLS, provision is made for extension of runway 05L/23R to a total length of 2,968 metres, construction of a new parallel runway 05R/23L and decommissioning of runway 12/30.

For the purposes of developing the noise contours, both location options for Runway 05R/23L (see Section 6.1.2) were incorporated by assuming a single runway extending the full length covered by both options. Conical and outer horizontal surfaces are included to protect future precision instrument approach operations to runway 05L/23R.

Wagga Wagga and Tarcutta 1:100,000 topographical charts indicate that the Runway 05L/23R Code 3/4 future precision approach and take-off surfaces are clear of obstacles to 15,000 metres in both directions. The outer horizontal surface is penetrated by terrain at 437 metres and 460 metres at two places just northwest of Mt Flakney, and again by terrain at Yalgo Hill (377 metres and 380 metres) 13 kilometres to the northeast of the airport. These penetrations are not likely to unduly affect operations by B737 or B767/A330.

8.3 INSTRUMENT PROCEDURES

8.3.1 EXISTING PROCEDURES

Current published instrument approach procedures for Wagga Wagga include sectorised DME or GPS Arrival procedures to circling minima, and NDB, VOR and RNAV (GNSS) non-precision instrument approach procedures. Sector A DME Arrival minima for Category A, B and C aircraft are 1,960 feet/ 2.4 kilometres visibility on tracks of 001 degrees magnetic clockwise to 180 degrees magnetic. Sector B DME Arrival minima for Categories A, B and C aircraft are 2,060 feet / 2.4 kilometres on tracks of 181 degrees magnetic clockwise to 000 degrees magnetic.

The NDB-A or VOR-A procedure provides an approach to circling minima of 1,600 feet / 2.4 kilometres visibility for Category A and B aircraft; 1,700 feet / 4.0 kilometres visibility for Category C aircraft; and 2,010 feet / 5.0 kilometres visibility for Category D aircraft. VOR approach procedures

for Runways 05 and 23 are runway approaches which provide straight-in landing minima of 1,370 feet / 3.7 kilometres and 1,480 feet / 4.4 kilometres respectively.

RNAV (GNSS) approach procedures for Runways 05 and 23 provide straight-in landing minima of 1,290 feet / 3.2 kilometres visibility and 1,480 ft / 4.4 kilometres visibility respectively.

Existing instrument approaches are adequate for transient weather conditions such as the passage of frontal weather where ceiling and visibility are reduced for relatively short periods. The operational benefit of the existing approaches is limited where reduced ceiling and visibility conditions persist for longer periods, such as during fog in the winter months.

8.3.2 FUTURE PROCEDURES

No future instrument approach procedures are envisaged to Runway 05R/23L, which is intended for daytime non-instrument use.

Non-precision approach procedures based on required navigation performance (RNP) typically provide approach and landing minima of the order of 300 feet and 1.50 kilometres visibility and do not require precision approach Category I lighting or high intensity runway lighting. Lower approach minima may be feasible if the aeroplane navigation system and flight crew meet more stringent performance requirements. The existing runway 05/23 approach surface inner edge width of 150 metres would be sufficient for future GNSS RNAV non-precision approaches by aircraft up to and including Code 3 to minimum descent altitudes of the order of 300 feet.

Category I ILS / GLS operations are likely to provide approach minima in the order of 250 feet / 800 metres visibility for runway 05 / 23. These operations would require an approach surface inner edge width of 300 metres. However, facilities required to fully support these operations include Category I high intensity approach lighting and high intensity runway edge, threshold and end lighting. When forward visibility is significantly reduced such as in fog, the runway may not be visible at the decision height. However the approach lighting is often visible at the decision height, enabling the pilot to continue the approach and land. If high intensity approach lighting is not available, required Category I approach visibility increases to 1.5 kilometres. If high intensity runway edge lighting is not available, required Category I approach visibility increases to 1.2 kilometres. These penalties can significantly erode the operational benefits of Category I precision approach procedures.

8.4 AIR TRAFFIC MANAGEMENT

CASA now examines each site on its merits by conducting a risk assessment and cost benefit analysis to determine whether ATS is necessary. However, the criteria proposed in the draft CASR Part 71 and in draft MOS part 71 for the provision of Air Traffic Services remain useful as guidelines although the proposals were set aside during the formation of the CASA Office of Airspace Regulation.

Draft MOS Part 71 proposed an assessment of the need for provision of a Certified Air/Ground Radio Service (CA/GRS) where the total annual IFR movements at an aerodrome exceed 7,500, or where the total annual movements exceed 40,000. Current airline movement levels exceed 8,000 and therefore exceed the threshold proposed in MOS Part 71 for provision of a CA/GRS.

The threshold proposed in the draft MOS Part 71 for assessment of the need for an aerodrome control service was 60,000 movements of which at least 15% are IFR or 100,000 annual movements otherwise. It is possible that the former threshold will be reached at Wagga Wagga around 2015 and the latter is certainly forecast to occur within the planning period.

Forecast movements indicate that an assessment of the need for provision of an aerodrome control service will be needed during the planning period because annual movements are forecast to exceed 100,000 and the traffic mix will include airline passenger carrying operations and basic flying training.

In view of recent CASA directions in relation to GAAP aerodromes, a risk assessment of operations at Wagga Wagga Airport is likely to result in a determination that a Class D Control Zone is required. This is because of the risk to passenger carrying public transport operations caused by a significant proportion of movements by basic training aeroplanes flown by inexperienced pilots. Mitigation measures would include separation of IFR public transport aircraft from other IFR flights and the provision of at least a directed traffic information service to IFR aircraft about VFR flights.

9.0 COMMERCIAL & ECONOMIC DEVELOPMENT OPPORTUNITIES

9.1 THE AIRPORT CITY CONCEPT

There is significant Australian and international interest in the concept of 'airport cities' for creating diverse synergistic revenue streams which grow at various speeds to finance airport infrastructure and development. The generation of diverse, resilient, revenue streams and economic generators, that are strategically located both within and outside the airport boundary, pays for major investments and expenditure growth.

No longer is it a single aeronautically-driven revenue stream which supports this business system. It is necessary to think more clearly about airports and thus airport cities in terms of diverse synergistic revenue streams rather than just in terms of the revenue and benefits that can be derived from the provision of air services and aviation support activities. Revenue from ground access, offices, hotels, conferences, retail, education, residences, carbon credits, emissions trading, electricity, water, and even toll roads can help make aeronautical charges a much smaller component in this business system. Besides that, aeronautical revenue has a relatively low economic multiplier value.

By significantly diversifying revenue growth it is simultaneously possible to attract new customers and repeat business, and contribute to the amenity of local residents who want to shop, work, visit, play or live in or near the airport because of its cosmopolitan and economic multiplier benefits.

As a result, airport master planning is evolving into wider airport city revenue and expenditure system planning and is tied to land use and spatial planning over a 20 or 30 year horizon. Provision for future revenue growth through effective land-use allocation can help minimise risks and maximise the reward to a diverse range of stakeholders.

9.2 ECONOMIC POTENTIAL

Wagga Wagga airport serves as a transportation, business and tourism gateway to the Riverina Region. The airport is a critical asset that helps drive community growth, vitality, enthusiasm and economic health. In some ways the airport is similar to the Bomen Business Park, where a diverse range of people and businesses generate economic activity and contribute to relative economic performance via both direct and indirect flow on benefits. In other ways it is strategically different because of the mix of direct activities, key differences in production-induced impacts associated with the use of materials or services purchased from other businesses, and with consumption-induced impacts associated with the employment of people and the chain of expenditure of diverse incomes.

The airport can be expected to have activities and benefits associated with: airline operations; airport operations, safety and security; aircraft sales and maintenance; fuel sales; flying training and other aerial work; ground transport including taxis and car rentals; retail; tourism; accommodation; meetings and conferences; aerospace and defence. The airport is also a place where business visitors, students, tourists, defence personnel and relatives can be expected to transit and dwell, as well as an advanced technology employment hub in its own right. An advanced technology or high-tech airport will have some high income patrons, skilled employees and employers which pay above-average wages and benefits.

Wagga Wagga airport is actually a provider of services used by a range of businesses and travellers. Like a business park, it is actually the activities of the businesses and tenants that create value by providing products and services to a wide variety of consumers. These business activities are the key drivers of the economic impacts associated with the airport and its surrounding activities. The airport is thus essentially associated with the flow-on impacts generated by airport-related users. Most of these flow-on impacts arise through the payments made for aeronautical services and the rentals associated with the property leases. In revenue terms the property services are often several times more important than the aeronautical services. Thus the more useful land to rent out, more high paying employers, more passengers, more facilities, locally produced advanced or high-tech, and higher sales turnover generated, the greater the economic impact.

Property services can be divided into two main categories. There are those that are related to the air transport industry generally and have to be located on or adjacent to an airport such as in the maintenance or repair of aircraft, high-tech/high value spares, hangars, related facilities, safety and refuelling services. These are often high value businesses because of the nature of the products and services provided and the skills and technologies that are employed and thus can have the highest multiplier values unless the value is imported from outside the region.

The other group of tenants is mixed and includes a number of businesses that can have much less association to the operations of the airport such as a variety of retail operations, food and beverage providers, manufacturing, convention centres, consultants, child-care and road transport. So while some of the activities are not integral to the airport system, a significant majority of the overall impacts can be expected from activities that are directly linked to the existence of the airport.

Airport operations are part of the flow-on impacts that accrue to other property services. Some of the largest impacts can thus occur in some sectors that service households and arise from the consumption-induced impacts including ownership of dwellings, wholesale trade, retail trade, accommodation, cafes, roads, utility and communication systems. Others accrue to industries that supply materials and services such as other property services, parking, aircraft repair and maintenance, legal, accounting, consulting, insurance, banking, storage and services to transport. Air ticket sales do not have such a high value to regional communities because often a significant

portion of that revenue is external or exported. Fortunately the airlines also employ local people and the wages paid to those employees are spent on acquiring household goods and services. Furthermore, airports also invest relatively large amounts to meet new requirements, maintain their infrastructure and expand capacity. These investments often comprise both local construction and equipment.

Spare capacity, smart growth and multi-modal access permit an airport to operate as a multi-use facility, with the capacity to handle training, charter, freight, agricultural, defence, corporate and emergency services traffic as well as passenger services. During the recent period of record high jet fuel prices, one of the few sectors apparently unaffected by this recent price shock was commercial pilot training. So an airport which significantly expands high-value aviation services, skilled employment and high wage opportunities further increases the standard of living and amenity of people in the region, as well as relative economic performance and resilience to recessions. Clearly then, new aeronautical activities need to be developed alongside non-aeronautical services because the long-term sustainability of the whole system and its resilience to shocks to the system depends on its diversity of revenue streams and growth of diverse operations.

9.3 KEY ECONOMIC SECTORS AND ACTIVITIES

At the visioning workshop (refer Section 1.3.2), key stakeholders identified the following economic sectors as the ones most likely to be driving the economy of Wagga Wagga in 2030:

- Sectors with a 'global' nature:
  - education, training and development;
  - research and development, and innovation;
  - Defence; and
  - Culture and tourism;
- Sectors with a more regional focus:
  - government; and
  - healthcare.

At the visioning workshop the future contributions of these sectors were considered in the context of the key airport stakeholder groups of: airlines; other operators; passengers; meeters and greeters; tenants; employees; visitors; local businesses; and local residents.

A mutual mind-map was developed identifying and linking the possible economic development opportunities (refer Appendix C). These opportunities were then examined and the following three key activity clusters, which can be facilitated by the development of the airport, were identified:

- Training, education, innovation and research & development;
- A regional gateway showcase/presentation hub;
- Industry and commerce.

9.4 PROPOSED DEVELOPMENT PRECINCTS & LAND-USE

A series of 6 potential development precincts has been identified within the existing airport land and immediate surrounds. The precincts and proposed land-uses within each are indicated on Drawing B09065A010 at Appendix B and described below.

The proposed precincts and land-uses are those that have been identified during the preparation of this Master Plan, through the visioning workshop and stakeholder consultation process, considering both the major demand sectors and likely land availability. Demand for particular land-uses and the availability of land at a cost which makes development commercially viable are the key factors which will determine the extent to which the proposed development may occur. Both of these factors are highly dynamic. Accordingly, flexibility is essential in reviewing the proposed distribution of land-uses and extents of each development precinct accordingly. Not all of the land identified for potential development is necessarily required for the intent of the Master Plan to be realised.

It should be noted that all proposed land uses are subject to the necessary agreement and/or approval from relevant landowners and rezoning in accordance with applicable statutory procedures.

It should be noted that the potential for further growth and development beyond the areas described here is acknowledged and to be expected in the period beyond 2030. Nevertheless, it is necessary to identify a boundary to what can reasonably be considered part of the Airport Master Plan. Most notably, the areas to the south and east of O'Hehirs Road and Brunskill Road are likely to be attractive for development as a result of the proposals included in this Master Plan.

9.4.1 PRECINCT 1: HIGH-VALUE COMMERCIAL

Precinct 1 offers direct access to the Sturt Highway, and a central strategic location within the surrounding development which makes it ideally suited to generate high multipliers benefits.

Development in this precinct can generate high multipliers when properly linked to defence, aerospace, transport supply, education supply, emergency, quasi-government organisations, and consulting. The highway frontage makes it possible to develop key commercial sites that gain benefit from accessibility and visibility from the highway, such as a service station, accommodation, and food and beverage.

The site is also strategically located for significant defence collaboration/investment, whether in relation to a potential expansion of RAAF Base Wagga Wagga or as a site for the co-location of high-value Defence suppliers. This synergy would critically generate additional high multiplier benefits, especially since additional defence land for expansion is available in Precinct 5.

There is also the potential for centralised regional emergency response services to be located at Wagga Wagga airport. Doctors, medical operations, fire and rescue services, including flying doctor and helicopter rescue, all have high multiplier benefits, and can co-locate near Wagga's important defence medical facilities. The highway, airport and rail corridor may offer some additional advantages in this respect.

Prime commercial development covering commercial and business uses is therefore desirable in this area. Accessibility to the airfield is not considered critical in this precinct, however airfield access is not precluded.

Precinct 1 incorporates a number of existing residences on Smith Street and adjoining the Sturt Highway. These residences are identified with hatching on Drawing B09065A010 at Appendix B. It is recognised that juxtaposition of these with the adjacent commercial development will need to be considered carefully in the detailed planning of this precinct. It is also possible that, should aviation activity at Wagga Wagga Airport develop as envisaged in this Master Plan, residential land-use in this particular location could experience reduced amenity as a result of aircraft noise impacts in the long-term, beyond 2030. Focussed consideration of possible strategies to deal with these issues in the long term may be required. Council intends to consult thoroughly with all stakeholders before establishing any particular way forward on this potential issue.

9.4.2 PRECINCT 2: AVIATION SUPPORT & TRAINING

Precinct 2A

Precinct 2A covers the primary existing airport development plus the area between Runway 05/23 and Runway 12/30. Proximity to the runway system and the established infrastructure in this area mean that it is ideally suited primarily to continued aviation support activity.

Flying training and other potential education and international options have sound economic potential. In addition, the synergies with AAPA and Airservices Australia provide added multiplier potential. Many of these options have a medium set of multipliers plus strong resilience depending on the number of employees, salaries, and revenues generated. Also the more high-value maintenance and testing, pilot training, education and research and development linkages the more likely they have higher value-added benefits and be resilient to short economic downturns.

In the context of Wagga Wagga as a centre of aviation significance with an aviation training focus, there is also the potential for synergy with the educational, research and professional development activities that could develop in Precinct 3.

To give an idea of the extent of aviation support development that is possible in Precinct 2A, expansion of the current Regional Express maintenance facilities to between 2 and 3 times their current size and apron frontage would be possible if the full extension of the western GA apron to the current Bureau of Meteorology site were to be undertaken. As this is the logical location for any future Regional Express expansion, this are should be reserved specifically for that use as far as possible.

Similarly, the area currently occupied by Wagga Air Centre and Regional Aviation could, if and when vacated by these businesses for alternative sites able to offer continued public access, facilitate the development of a further AAPA facility of similar size to the existing. Again, this area (once available) should be reserved for future AAPA use as far as possible and until such time as circumstances confirm it is no longer appropriate.

Such preferred uses have been indicated on Drawings B09065A015 and B09065A016 at Appendix B.

Between the existing Runway 12/30 and 05/23 strips, development in Stage 1 of hangar sites equivalent to around 9 facilities such as those currently occupied by Encore Aviation and Wagga Bike Tyres on the western GA apron would be possible. In Stage 2, another 14 or so similar sites, or the equivalent of 3 to 4 of Regional Express's current maintenance facilities, could be achieved. Following closure of Runway 12/30, these could be accessed by Code C aircraft making the development of paint shops and maintenance workshops for aircraft up to B737 size possible. The closure of Runway 12/30 would also facilitate further development to the north-west of the Runway 12 threshold, of a scale equivalent to around twice the current Regional Express facilities.

Precinct 2B

Precinct 2B is located adjacent to a residential area. Business uses that connect with the aviation support and training focus on Precinct 2A or the adjacent RAAF Base which do not need direct airfield access would be ideally located here.

9.4.3 PRECINCT 3: EDUCATION & RESEARCH

These synergistic activities of education, research, professional development, conventions, hospitality and sport can be co-located in and around Precinct 3. With adequate sound proofing and planning for future noise and visual disturbances, this complex can host regional and national conferences, teach Australian and international students who want to study close to the capital cities of Melbourne, Sydney and Canberra for weekend and vacation trips, and help support the local hospitality and travel industry. The location, juxtaposed between the developing high-tech airport and rural land offers a range of synergies with aviation training of all kinds and Wagga's more traditional agricultural skills base.

Tertiary institutions which pay professors, lecturers, and staff well generally have high multipliers and produce diverse community benefits. One such agricultural college in central USA became a large university and major farmland owner because graduates were reportedly able to bequeath their farms and reap additional tax or scholarship benefits for descendants. Despite its remote location this institution - convention - sporting complex hosted international students and professors from around the world, providing skilled labour, additional teaching, conference and college sporting benefits for decades to come. It would appear that Wagga has all the right elements needed to make this synergy of education – conventions – sports work well based on this experience.

9.4.4 PRECINCT 4: INDUSTRIAL PARK

Precinct 4, with accessibility to the southern edge of Runway 05R/23L, clearly offers some additional potential for aviation support activity and this will be essential if the full capacity of the aerodrome is to be realised. Whilst close enough to Precinct 3 to be used for additional aviation training purposes, its separation may nevertheless mean that these types of activities add less value here. The exception is the development of a dedicated rotary-wing precinct, with proximity to the helicopter training area providing an advantage.

There are, however, large areas of potential development space that would not be required for aviation support activity. Potential uses of the adjacent land include:

- An industrial park, potentially focussing on green, innovative and recycling initiatives: The proximity to wind generating regions, agricultural areas, the Murrumbidgee and irrigation districts provides exciting connectivity for the development of renewable energy sources, soil and water conservation technologies, salinity programs, and carbon capture and emissions technologies. If careful consideration is taken in relation to co-location to an airport and educational precinct these back pocket industries could succeed and be able to market themselves nationally using Wagga as their home. The other advantage of these activities is that they help maintain the diversity of employment.

- Alternatively, the land in Precinct 4 can be set aside for later development when other precincts are full or used to attract a major “jobs-box” company looking for significant land adjacent to an airport. However this normally requires the land to be provided at a significant discount to market value and with on-going tax concessions so that the “jobs-box” company can be persuaded to set up shop in Wagga regardless of the total cost to tax-payers.

- As a location for Defence-related industry that might derive synergies from the adjacent Defence activities in Precinct 5.

Development of a residential air park or residential hangars within an aviation-related industrial park is a popular concept at regional aerodromes. However, a residential development of this nature at Wagga Wagga airport is not compatible with the high levels of flying training activity that would be associated with the large scale flying training operations anticipated by this Airport Master Plan. Additionally, the majority of successful air park communities are situated on property exclusively designed for homeownership adjacent to an airport. It is considered that other aerodromes such as those at nearby Temora and Tumut would be better suited to the development of a residential airpark as they are in a rural location in an attractive part of the region yet close to the amenities of Wagga Wagga and Canberra.

9.4.5 PRECINCT 5: DEFENCE ACTIVITIES

Precinct 5 is envisaged as being reserved for the consolidation of existing Defence activities within and around the existing airport that might be dislocated as a result of the proposals in this Master Plan. These activities include small arms training and associated explosive ordnance storage. The large tract of land allows isolation of these activities from the surrounding development.

9.4.6 PRECINCT 6: TERMINAL, FREIGHT, HIGH SERVICE BUSINESSES

The synergy between passenger operations, high service businesses, freight and maintenance and defence combined with future highway access has the potential be the catalyst that propels growth to the next level. While one of these elements alone may not be able to justify a quantum expansion, the synergy between all future revenue streams and stakeholders change the equation.

The land in proximity to the passenger terminal and potential high-value aviation freight or aircraft maintenance activity has the potential to attract and sustain high-value businesses directly supporting these activities. The highway frontage will stimulate development of a more commercial nature, whilst connectivity with Precinct 5 and 4 might result in high-value industrial development.

9.5 ECONOMIC ASSESSMENT

Development of the nature described in Section 9.4 will clearly attract costs as well as benefits. The scale of the potential development means that a full, detailed, cost-benefit analysis of each development precinct and the myriad options within is not feasible within the scope of this Master Plan. Detailed cost estimates even for basic subdivision development will depend on the development pathway that Council chooses as well as the specific concepts for the internal layout of each area, itself dependent on the precise mix of activities to be accommodated.

Nevertheless, a qualitative assessment of the costs and benefits of each precinct has been undertaken, to support the development pathway adopted in this Master Plan and to assist Council in its preliminary decision-making with respect to implementation. This assessment is presented in Table 14.

Development precincts with the lowest development costs, highest multipliers and most immediate demand represent the most logical areas to develop first. It makes sense to develop precincts with higher development costs offering lower benefits later. It should be emphasised that as the potential multiplier benefits and, to a lesser extent, yield are dependent on the mix of activities that actually takes places, the assessment is predicated on the activities described in Section 9.4 and column 2 of Table 14.

Table 14: Assessment of Development Precincts

Precinct	Core activities	Potential Demand	Competition	Land Development Costs	Potential Yield/Multipliers
1	Prime Commercial Food/beverage Accommodation Defence supply chain Quasi-govt orgs Small business	High (Short-term)	Low (but area limited)	Low	High
2A	Aviation support Aviation-related education & training	High (Short-term)	Moderate (May require some incentives in lease costs and fees)	Low	Moderate
2B	Defence or aviation training related businesses	Moderate (Short-term)	Moderate	Low	Moderate
3	Education & training Conventions Accommodation Hospitality Sport	Moderate (Medium-term)	Moderate (Mainly from larger cities or special locations)	Moderate	High
4	Aviation support Industrial park Sustainable technologies	Low (Long-term)	Moderate	High	Moderate
5	Department of Defence activities	Not considered			
6	Passenger terminal Freight/logistics	Moderate (Medium-term)	Moderate	High	High

9.6 DEVELOPMENT STAGING

The optimum staging of the non-aeronautical development is closely linked to the proposed aeronautical development concept staging plan described in Section 6.6.

9.6.1 STAGE 1 – SHORT TERM DEVELOPMENT

The Stage 1 aeronautical development concept has the potential to stimulate non-aeronautical development particularly in relation to:

- Educational facilities in support of aviation training development;
- Limited retail facilities serving the increasing number of airport tenants, users and visitors.

Non-aeronautical development in Stage 1 is therefore logically concentrated around Precincts 2 and 3. There is also some potential for the commencement of components of development in Precinct 1 which are not contingent on the aeronautical development but which can capitalise on the available highway access to serve some of Wagga Wagga's immediate needs.

9.6.2 STAGE 2 – MEDIUM-TERM DEVELOPMENT

It is anticipated that the aeronautical development undertaken in Stage 2 will stimulate non-aeronautical development within Precinct 6 and Precinct 4.

Development within Precinct 6 will be driven by the relocation of the passenger terminal to this area. Initially, the provision of access from the Sturt Highway to the terminal will also feed commercial development in this area. Similarly, the development of aviation-support business alongside Runway 05L/23R will require access and infrastructure that will equally be able to feed development to the south of this spine.

As development in both precincts progresses southwards and eastwards respectively, the development of a road connection between them becomes both more logical and increasingly necessary if the circuitous alternative route between the two development precincts is not to stifle development.

9.6.3 STAGE 3 – LONG-TERM (ULTIMATE) DEVELOPMENT

It is anticipate that Stage 3 non-aeronautical developments will continue from Stage 2, stimulated by increasing levels of aeronautical and commercial activity. Some new aeronautical activities such as freight and maintenance, should they occur, will necessarily serve to influence the logical allocation of land-uses for non-aeronautical purposes. In particular, freight and heavy maintenance activity would increase demand for logistics-focussed businesses in Precinct 6 adjacent to the aviation support zone.

10.0 GROUND ACCESS CONSIDERATIONS

10.1 ASSESSMENT OF EXISTING ACCESS ROADS

External road access to the terminal precinct of the Wagga Wagga airport currently occurs via Elizabeth Avenue and Don Kendell Drive. Access to Elizabeth Avenue can occur from the Sturt Highway, approximately 1.4 kilometres to the north of Don Kendell Drive, or from Inglewood Road around 700 metres to the south.

10.1.1 DON KENDELL DRIVE

Done Kendell Drive provides the sole access to the Wagga Wagga airport terminal precinct and is a two-way two-lane road with a current pavement width of approximately 10 metres. Don Kendell Drive provides a high standard direct access to the terminal precinct and car parking areas within the existing airport.

Traffic survey data obtained from Council surveys undertaken in March 2009 indicate that Don Kendell Drive currently carries, on average, over 1,300 vehicles per day.

Don Kendell Drive currently intersects with Elizabeth Avenue at an unsignalised T-intersection that currently does not include any turn-lane treatments. The sight distance at this intersection currently satisfies the existing industry standard requirements.

10.1.2 ELIZABETH AVENUE

Elizabeth Avenue is a two-way two-lane road that provides a direct link from the Sturt Highway in the north and Inglewood Road in the south to the sole airport terminal precinct access at Don Kendell Drive. Elizabeth Avenue also provides access to a relatively significant residential catchment within Forrest Hill.

North of Don Kendell Drive, Elizabeth Avenue has a pavement width of approximately 10 metres and south of Don Kendell Drive the width is approximately 6.5 metres. The road reserve width of Elizabeth Avenue appears to be greater than 30 metres between the Sturt Highway and Sackville Street to the north of the airport access.

While Elizabeth Avenue appears to be a higher order road it is noted that there are currently a large number of residential properties with direct frontage access to Elizabeth Avenue north of the airport access. The presence of these direct residential accesses limits the potential for any upgrade of Elizabeth Avenue in this area to a direct, high speed / higher order connection to the airport precinct. Traffic survey data obtained from surveys undertaken in March 2009 indicate that Elizabeth Avenue, north of the airport access currently carries, on average around 2,800 vehicles per day.

Elizabeth Avenue currently intersects with the Sturt Highway at an unsignalised t-intersection that incorporates a fully chanelised right-turn treatment. The intersection is complicated by an unsignalised fourth approach to the intersection directly opposite to Elizabeth Avenue and a service road intersection on Elizabeth Avenue within metres of the intersection with the Sturt Highway. These complicating factors have the potential to cause serious safety issues at the intersection. However, this intersection is currently at the highest standard that can be achieved without a roundabout or signalised intersection.

To the south of the airport access Elizabeth Avenue intersects with Inglewood Road at an unsignalised T-intersection that currently does not include any turn treatments. The sight distance at this intersection currently satisfies the existing industry standard requirements.

10.2 FUTURE TRAFFIC DEMAND

At the present time it is estimated that there are between 200 – 250 employees working on the existing airport site. On the basis of the proposed Master Plan this number is expected to at least double by 2030 due to the development of vacant land in Precinct 2A.

Added to this, the passenger traffic is forecast to increase to between 1.8 and 3.5 times the existing levels. These increases in staff and passengers will result in a significant increase in vehicular traffic accessing the airport. On the basis of existing traffic volumes on Don Kendell Drive the increase in passenger and staff numbers could increase traffic accessing the airport to well over 3,000 vehicles per day.

In addition to the development of the existing airport site, this Master Plan envisages development of a significant adjacent area. Of the proposed development precincts indicated on Drawing B09065A010 at Appendix B, Precincts 2b, 3 and 4 would derive most or all of their ground access needs from Elizabeth Avenue. The total area to be developed is approximately 2-3 times that of the existing development at the airport.

10.3 FUTURE ACCESS ARRANGEMENTS

10.3.1 ACCESS TO STURT HIGHWAY

Given the increased traffic demand the potential development in and around the airport is likely to generate, it is suggested that the current form and nature of Elizabeth Avenue is inappropriate as the principal access to the western half of the airport. Such access should be provided via a high standard, higher order direct road link. The existing access from the north via the Sturt Highway and Elizabeth Avenue has some significant constraints that would prevent it from ever being upgraded to a high order road. These constraints include:

- The existing direct frontage residential accesses that are provided north of the airport access;

- The significant volume of residential traffic that utilises Elizabeth Avenue to access the Forest Hill catchment; and
- The existing form of the Elizabeth Avenue / Sturt Highway intersection, including the unsealed fourth approach at the adjacent service road intersection would create significant obstacles to upgrading this intersection to provide addition through carrying or right turning capacity.

To facilitate future development of the airport, the provision of a high standard, high-speed alternative link between the Sturt Highway and Don Kendell Drive would provide superior access to the future upgraded airport than that provided via the constrained Elizabeth Avenue link, whilst enhancing the road safety through the residential area. A possible alignment for such a link is indicated on Drawing B09065A020 at Appendix B.

The connection to the Sturt Highway would need to be designed to accommodate future growth in the airport precinct as well as on the Sturt Highway. It is likely in the long term that this connection would need to be in the form of a high standard roundabout or signal controlled intersection. It is understood from the RTA that it will not permit any additional access points to the Sturt Highway and that, as a result, the existing Elizabeth Avenue intersection would be closed it the alternative link was constructed. To avoid a circuitous journey for residents and to keep the residential and airport traffic as separate as possible, it is suggested that Elizabeth Avenue be connected to the alternative link close to the new intersection if not at the intersection itself. It may be then be appropriate to close Elizabeth Avenue to the north of Don Kendell Drive to completely separate airport traffic and residential traffic on Elizabeth Avenue accessing the Forest Hill catchment.

The construction of this alternative link would result in a new four way intersection with Elizabeth Avenue and Don Kendell Drive. This new four way intersection would need to be constructed as a roundabout or signalised as unsignalised four way intersections create potential road safety hazards. A new four way intersection at this location could provide a high standard 'entry statement' for the upgraded airport precinct.

10.3.2 INGLEWOOD ROAD

Upgrade of Inglewood Road should be considered, as it is likely to be an increasingly important access route between the southern areas of Wagga Wagga and the proposed development at the airport.

10.3.3 TERMINAL ACCESS AND CAR PARKING

The provisions described in Section 10.3.1 and Section 10.3.2 will serve equally long-tem development and medium-term requirements for external access to the existing airport terminal precinct.

The area adjacent to the existing terminal is highly constrained with respect to car parking in particular. Benchmarking against similar regional airports suggests that a total of up to 300 car spaces serving the terminal including up to 80 for rental cars could be appropriate, even at current traffic levels. Further car parking could be accommodated in the area to the north of the Regional Express maintenance facility. Although slightly removed from the terminal, this area would be suitable for long-term parking, with the existing car park restricted to shorter stays.

With respect to car parking in the future, it is extremely difficult to predict the number of spaces that might be required. Demand for spaces will be related to the passenger throughput of the terminal, but also dependent on the level of any fees for car parking. The introduction of paid car parking, common at capital city airports for many years, has until recently been resisted at regional airports. Nevertheless, commercial realities now make it imperative for regional airports to diversify their revenue streams in order to operate with minimal burden on rate payers. This has led to increasing pressure to introduce a form of paid parking to act as both a demand regulator and a source of valuable revenue. Current trends at other regional airports suggest that paid parking will be a reality at Wagga Wagga by 2030 and realistically much sooner.

In the highest growth scenario an approximate four-fold increase in passenger traffic is forecast. Assuming factors such as modal split, passengers per vehicle and length of stay remain similar to today, this would lead to around 800 public parking spaces plus rental car bays being required by 2030. Parking charges are likely to reduce this demand by limiting use of the car park. Further study is essential to determine the optimum number of spaces based on a particular paid parking offer. However, for the purposes of this master plan a reduction of 25 – 40% is assumed to be reasonable. Allowance for around 600 spaces in total has therefore been made, which would be sufficient to cover the medium-growth scenario requirements without the demand-moderator of parking fees. It is essential to undertake further study through passenger surveys and economic analysis to determine likely car parking requirements more thoroughly prior to implementation of a paid parking arrangement. It is also essential to maintain sufficient flexibility in the master plan with respect to the provision of more or less car parking as dictated by demand. Parking, as the second most important revenue stream for regional airports after aeronautical charges, should not be constrained because of inappropriate planning decisions.

A typical split of car parking for a total provision of 600 spaces with Wagga handling 50-100 seat aircraft might be: around 150 rental car spaces (located closest to the terminal); approximately 100 short-term (i.e. less than 2 hours) parking spaces (located close to the terminal but beyond the rental car area); and the remainder as long-term spaces (longer than 2 hours). Again, flexibility in planning is the key and the exact splits will need to be determined through further study. However, typically rental car and short-term parking areas might be physically combined to maximise flexibility in the respective allocation of spaces. Additional parking for any adjacent businesses should be provided separately to that for the travelling public.

Relocation of the terminal to Precinct 6, however, will enable a more optimal access and car parking layout to be developed, with maximum potential for the flexibility that is required for this aspect of ground access. In the first instance, access to the new terminal location can be provided via a simple link from the Sturt Highway via O'Hehirs Road. In the longer-term though, to maximise development potential of Precinct 6 and the whole airport site, a higher standard of access and network connectivity will be required.

10.3.4 AIRPORT RING-ROAD NETWORK

Elizabeth Avenue

On the basis of the increased traffic volumes on Elizabeth Avenue south of Don Kendell Drive it is considered that the cross section of Elizabeth Avenue would need to be widened from the existing 6.5m to accommodate the additional traffic volumes. The existing road is likely to prove suitable for access to development in Precinct 4.

Proposed Southern Ring Road

Should the terminal be relocated to Precinct 6, there will be a need for a road connection between Precinct 4 and Precinct 6 and then to the Sturt Highway. To maximise the development potential of Precincts 6 and 4 and to ultimately complete the orbital ring around the developing airport city, the connection should accommodate a high-speed link with limited access.

10.3.5 WIDER NETWORK CONNECTIVITY

To enable the scale of development around the airport ultimately envisaged by this Master Plan, it is essential that wider road network planning decisions do not undermine the potential attractiveness of the site as a key development node. There are two considerations in particular:

- The proposed northern bypass of Wagga Wagga; and
- A possible southern bypass.

Northern Bypass

The alignment of the proposed northern bypass should be reviewed to ensure that it can maximise the traffic flow past or close to those airport developments that will derive benefit from it. In particular, the prime commercial space in Precinct 1 has this status because of the high traffic flows on the Sturt Highway. The connection point of any bypass clearly had the potential to maximise or considerably reduce such flows. It is considered fundamental to the concept of this Airport Master Plan that 'leakage' of traffic to any northern bypass be minimised and, if at all possible, the connection point between the bypass and the Sturt Highway should be located at the north-east apex of the airport city development.

Southern Bypass

Although a southern bypass is not currently being considered by Council, similar principles apply. The commercial and economic value of development precincts 4 and 6 especially can be enhanced by high volumes of passing traffic.

This Master Plan therefore makes provision for a significant high-speed road corridor around the southern and western boundaries of the development, which should connect seamlessly with any future southern bypass at the south-west apex of the airport city development.

APPENDIX A

STAKEHOLDER CONSULTATION SCHEDULE

Organisation	Name	Title	Date	Location
Wagga Wagga City Council	Grant Johnson	Manager Council Businesses	29 June – 1 July 2009	Wagga Wagga
	Stephen Prowse	Manager Airport & Property Management	29 June – 1 July 2009	Wagga Wagga
	Lyn Russell	General Manager	29 June – 1 July 2009	Wagga Wagga
	Lindsay Tanner	Acting Director – Infrastructure Services	29 June – 1 July 2009	Wagga Wagga
	Andrew Crakanthorp	Director – Corporate Services	29 June – 1 July 2009	Wagga Wagga
	Janice Summerhayes	Director – Environmental & Community Services	29 June – 1 July 2009	Wagga Wagga
	Fiona Wilson	Director – Commercial & Economic Development	29 June – 1 July 2009	Wagga Wagga
	Bob Karaszkewych	Director – Planning	29 June – 1 July 2009	Wagga Wagga
	Ian Grant	Manager – Strategic Planning	29 June – 1 July 2009	Wagga Wagga
	David Christiansen	Senior Project Management Coordinator	29 June – 1 July 2009	Wagga Wagga
	James Davis	Manager – Economic Development	29 June – 1 July 2009	Wagga Wagga
	Cr Kerry Pascoe	Mayor	30 June 2009	Wagga Wagga
	Cr Donna Argus	Councillor	30 June 2009	Wagga Wagga
	Cr Yvonne Braid	Councillor	30 June 2009	Wagga Wagga
	Cr Alan Brown	Councillor	30 June 2009	Wagga Wagga
	Cr Wayne Geale	Councillor	30 June 2009	Wagga Wagga
	Cr Ray Goodlass	Councillor	30 June 2009	Wagga Wagga
	Cr Garry Hiscock	Councillor	30 June 2009	Wagga Wagga

Organisation	Name	Title	Date	Location
	Cr Rod Kendall	Councillor	30 June 2009	Wagga Wagga
	Cr Clint Uden	Councillor	30 June 2009	Wagga Wagga
	Cr Lindsay Vidler	Councillor	30 June 2009	Wagga Wagga
	Cr Kevin Wales	Councillor	30 June 2009	Wagga Wagga
Regional Express Airlines	Dale Wallace	Maintenance	2 July 2009	Wagga Wagga
	Warrick Lodge	General Manager – Network		
	Kaylene Price	Airport Manager		
	Paul Hull	Ramp Supervisor		
Australian Airline Pilot Academy	Leon Burger	AAPA General Manager	29 June 2009	Sydney
	Ian Cruickshank	Chief Pilot		Wagga Wagga
QantasLink	Gordon McKirdy	Head of Customer Service	16 July 2009	Sydney
	Elsa Delassio			Brisbane
	Des Croft	Manager Pricing & Scheduling		
	David Tregea	Manager Customer Service		
	Andrew Rattle	Manager Business Development NSW/VIC/TAS		Sydney
	Chris Humphries	Performance Engineer and Technical Publications Officer		
Gundagai Shire Council	Len Tozer	Mayor	23 July 2009	Remote
	Graeme Tickner	General Manager		
Tumut Shire Council	Trina Thomson	Mayor	23 July 2009	Remote
	Bob Stewart	General Manager		
Tumbarumba Shire Council	George Martin	Mayor	13 August 2009	Remote
	Brian Pearson	General Manager		

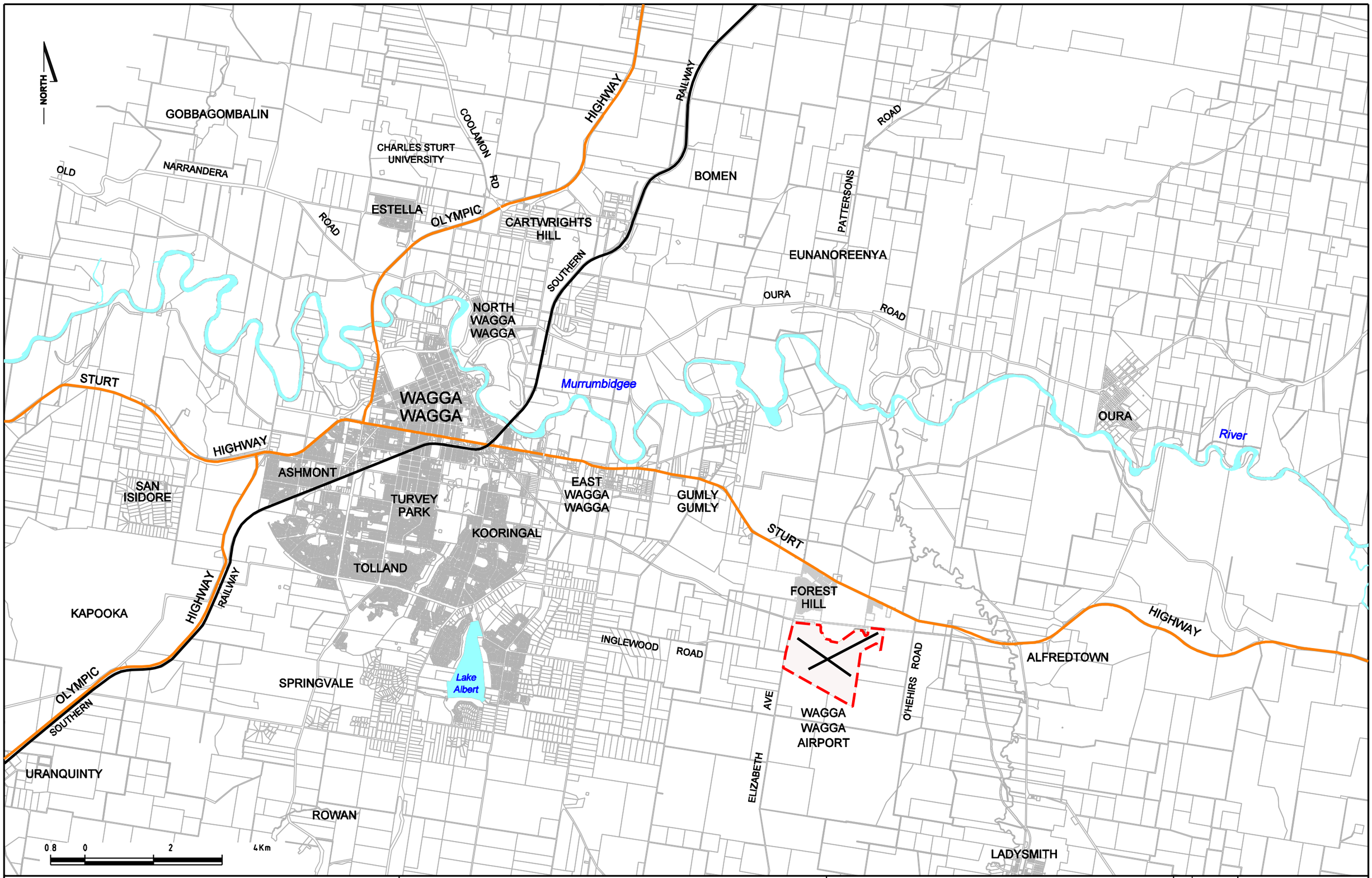
Organisation	Name	Title	Date	Location
Greater Hume Shire Council	Denise Osborne	Mayor	23 July 2009	Remote
	Steven Pinnuck	General Manager		
Lockhart Shire Council	Peter Yates	Mayor	22 July 2009	Remote
	Chris Gallagher	General Manager		
Narrandera Shire Council	Graham Eipper	Mayor	22 July 2009	Remote
	Mark Amirtharajah	General Manager		
Coolamon Shire Council	Robert Menzies	Mayor	22 July 2009	Remote
	Terrey Kiss	General Manager		
Junee Shire Council	Lola Cummins	Mayor	22 July 2009	Remote
	John Whitfield	General Manager, Acting		
Royal Australian Air Force (RAAF)	WGCDR John Herlihy	Commanding Officer Combat Support	1 July 2009	Wagga Wagga
Department of Defence	Judith Bedford	AD Master Planning	30 June 2009	Wagga Wagga
	Milton Mann	Regional Property Services Officer	1 July 2009	Wagga Wagga
Department of Defence (cont.)	Helen Brindley	Senior Environment Manager	1 July 2009	Wagga Wagga
Wagga Air Centre	Chris Cabot	Managing Director/Chief Pilot	1 July 2009	Wagga Wagga
Regional Aviation Services	Alex Von Mengersen	Business Manager	1 July 2009	Wagga Wagga
	Laurence Hart	Director		
Rural Fire Service	Joe Knox	Manager Fire and Emergency	1 July 2009	Wagga Wagga
Royal Flying Doctor Service	Enquiries	Dubbo Base	17 August 2009	Remote
Air Ambulance	Enquiries	State Headquarters	17 August 2009	Remote
Air BP	Pat Mezzatesta	Operations Manager Vic/Tas/Sth.NSW	2 July 2009	Wagga Wagga
Mobil	Ian Woods	Regional Manager	24 August 2009	Remote
Private Leaseholders	John Smith - Orange Grove	GA Hangars / Mobil Manager	1 July 2009	Wagga Wagga

Organisation	Name	Title	Date	Location
	Craig Bromley & Colin Taylor	GA Hangars		
	Tony Middleton	Commercial Hangars		
	Peter Middleton	Commercial Hangars		
Wagga Bike Tyres	Fred Burke	Proprietor	1 July 2009	Wagga Wagga
Encore Aviation	Mark Wallace	Proprietor	1 July 2009	Wagga Wagga
Wagga City Aero Club	Gerard Gaskin	Secretary	1 July 2009	Wagga Wagga
Terminal kiosk operator (Mick's Bakehouse)	Michael Di Salvatore	Proprietor	26 June 2009	Remote
Avis	Phil Wallace	Manager	30 June 2009	Wagga Wagga
Hertz	John Diessel	Office Manager	30 June 2009	Wagga Wagga
Thrifty	Nicole Skerry	Office Manager	30 June 2009	Wagga Wagga
Europcar	John Morris	Group Development Manager	30 June 2009	Wagga Wagga
Country Car Hire	Marilyn J Smith	Manager	30 June 2009	Wagga Wagga
Bureau of Meteorology	Jeff Nichols	Acting Station Manager	30 June 2009	Wagga Wagga
	Rod Harrison	Regional Observations Manager	29 July 2009	Remote
Tourism NSW	Lyndel Gray	Executive Director / General Manager	3 August 2009	Remote
GA Hangar Interested Parties	Paul Samuelson		30 June 2009	Wagga Wagga
	Geoff Kidd		29 June 2009	Wagga Wagga
	Bradley Smith		30 June 2009	
	Frank Lovell		29 June 2009	
	Dennis Tolberg		30 June 2009	
Business Advisory Committee	Mr Peter Adams		16 July 2009	Wagga Wagga
	Mr Andrew Bell			

Organisation	Name	Title	Date	Location
	Mr Bob Connelly			
	Mr Geoff Crouch			
	Mr Colin Duff			
	Col Graeme Finney			
	Ms Jessica Grant			
	Mr Peter Hurst			
	Mr Paul Hutchinson			
	Ms Robyn McPherson			
	Mr Michael Morris			
	Ms Naomi Stuart			
	Ms Jill Toohey			
	Ms Janett Tucjer			

APPENDIX B

DRAWINGS



Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
LOCATION PLAN

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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B	22.01.10
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File Ref: B09065

RAAF

BASE

ARTC CORRIDOR

STURT HIGHWAY

NORTH

AIRPORT ENTRANCE

AAPA

BOM SITE

REFER INSET

GATE 11

TERMINAL

RPT APRON

TWY G

TWY E

GATE 9

AVENUE

ELIZABETH

ROAD

INGLEWOOD ROAD

O'HEHIRS ROAD

RUNWAY 12/30

TWY F

TWY C

CONTROL TOWER (DISUSED)

TWY A

TWY D

1768 X 45m (150m STRIP)

IWI

PAPI

GATE 6

NDB

RAAF EXPLOSIVE ORDNANCE STORAGE AREA

TWY A

RUNWAY 05/23

ARP

DME

VOR

TWY B

1526 X 30m (90m STRIP)

HELICOPTER TRAINING AREA

GATE 1

EXPLOSIVE ORDNANCE DEMOLITION AREA

GATE 8

SMALL ARMS RANGE AND TRAINING AREAS

LEGEND

DEFENCE LAND

WWCC LEASE

WWCC LAND

100 0 250 500m

INSET

Scale 1:5,000

AERO CLUB

AIRSERVICES AUSTRALIA

BP FUEL DEPOT

GATE 3

RAAF BASE

CAR PARK

GATE 1

P.MIDDLETON (L.A.M.E.)

PRIVATE HANGAR

REX

REX

GATE 12

TERMINAL

ENCORE AVIATION

WESTERN GA APRON

GATE 2

WAGGA BIKE TYRES

AAPA

GATE 13

RPT APRON

MOBIL FUEL DEPOT

TO GATE 11

WAGGA AIR CENTRE

TWY C

WWCC LEASE BDY.

REGIONAL AVIATION SERVICES

SOUTHERN GA APRON

PRIVATE MULTI-AIRCRAFT HANGARS

Project: WAGGA WAGGA AIRPORT MASTER PLAN 2009 - 2030

Client: WAGGA WAGGA CITY COUNCIL

Title: EXISTING AIRPORT LAYOUT

REHBEIN AOS Airport Consulting
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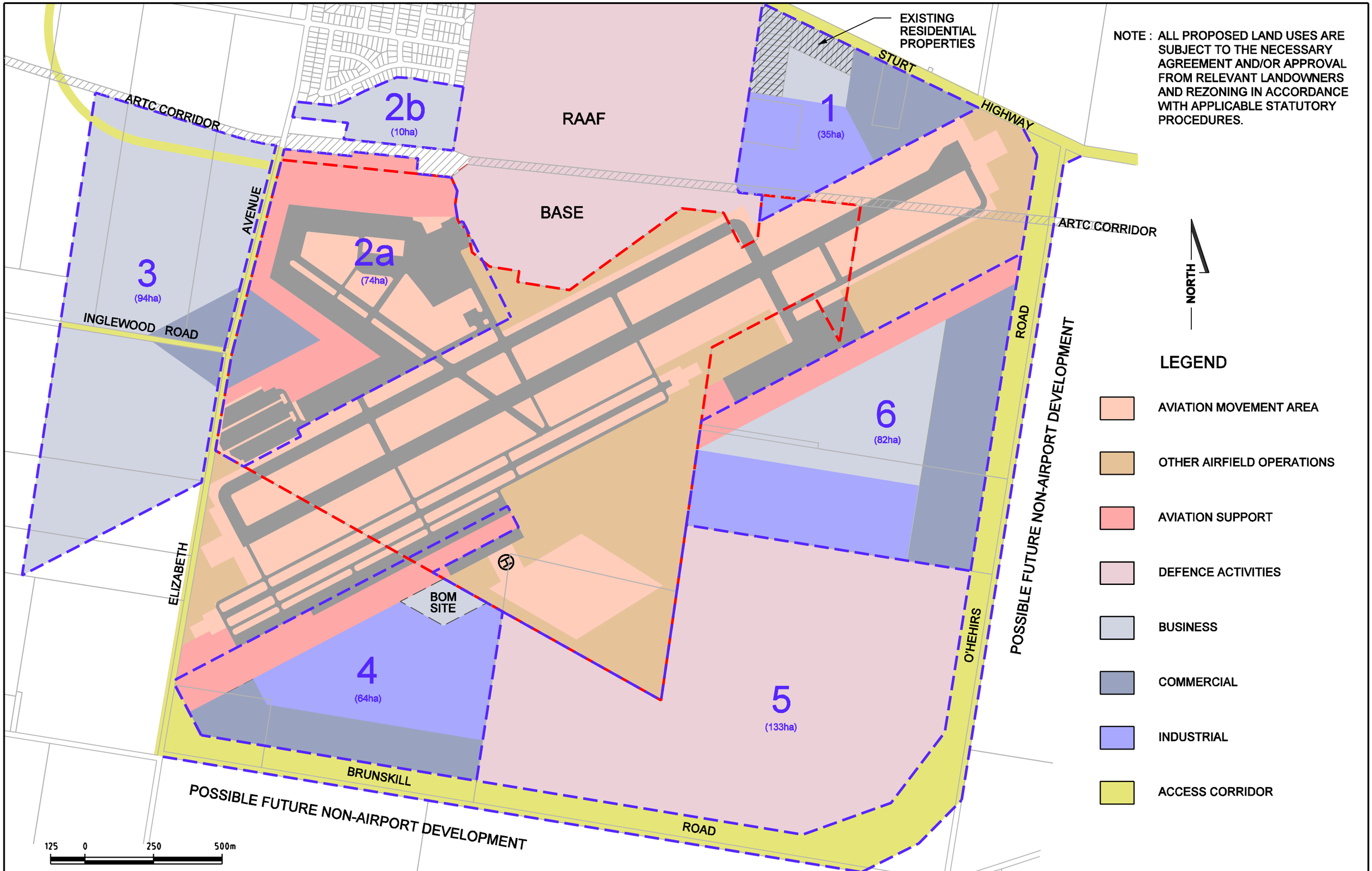

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
PROPOSED DEVELOPMENT PRECINCTS AND LAND USE PLAN

REHBEIN AOS Airport Consulting
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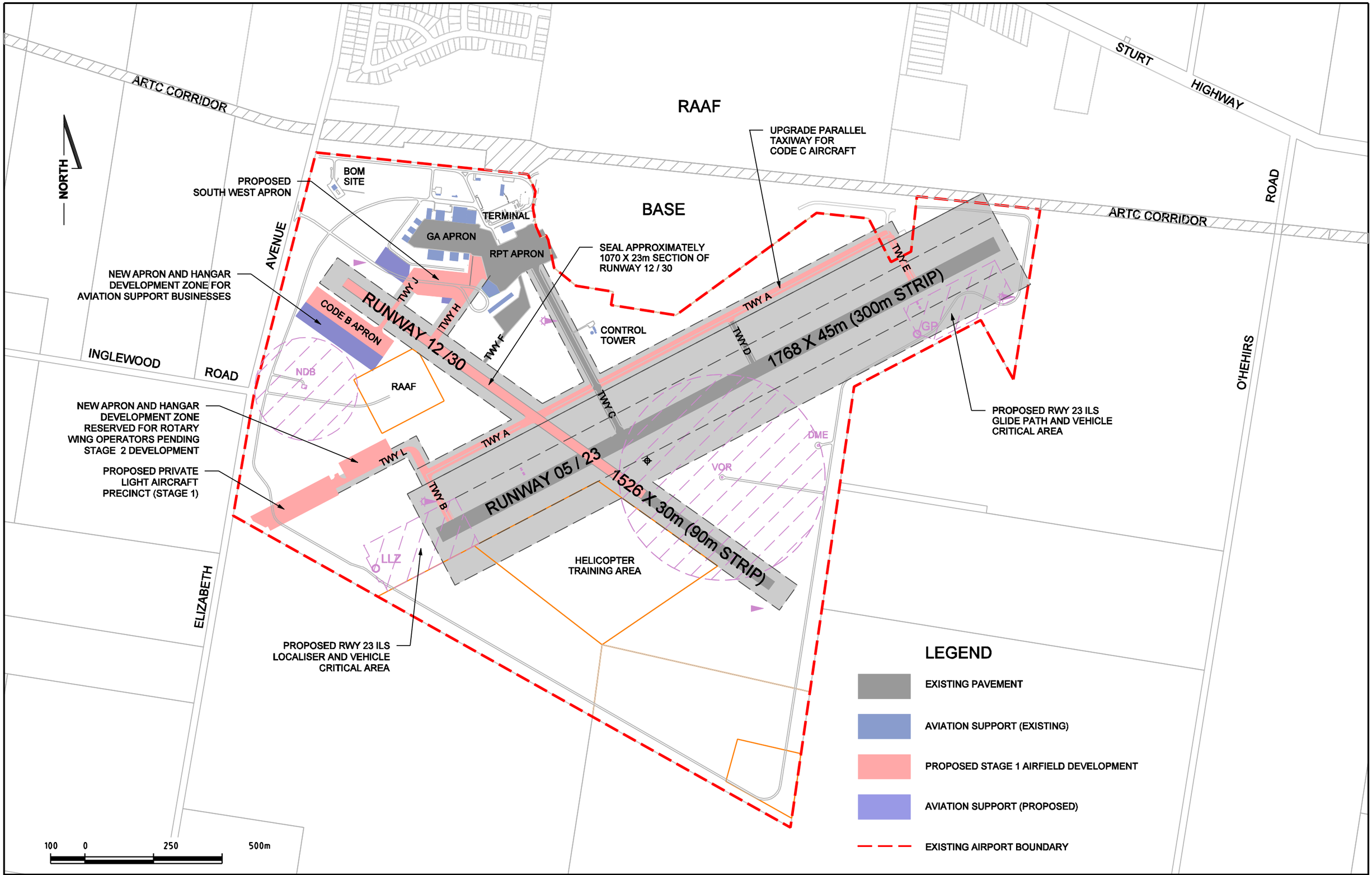


Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

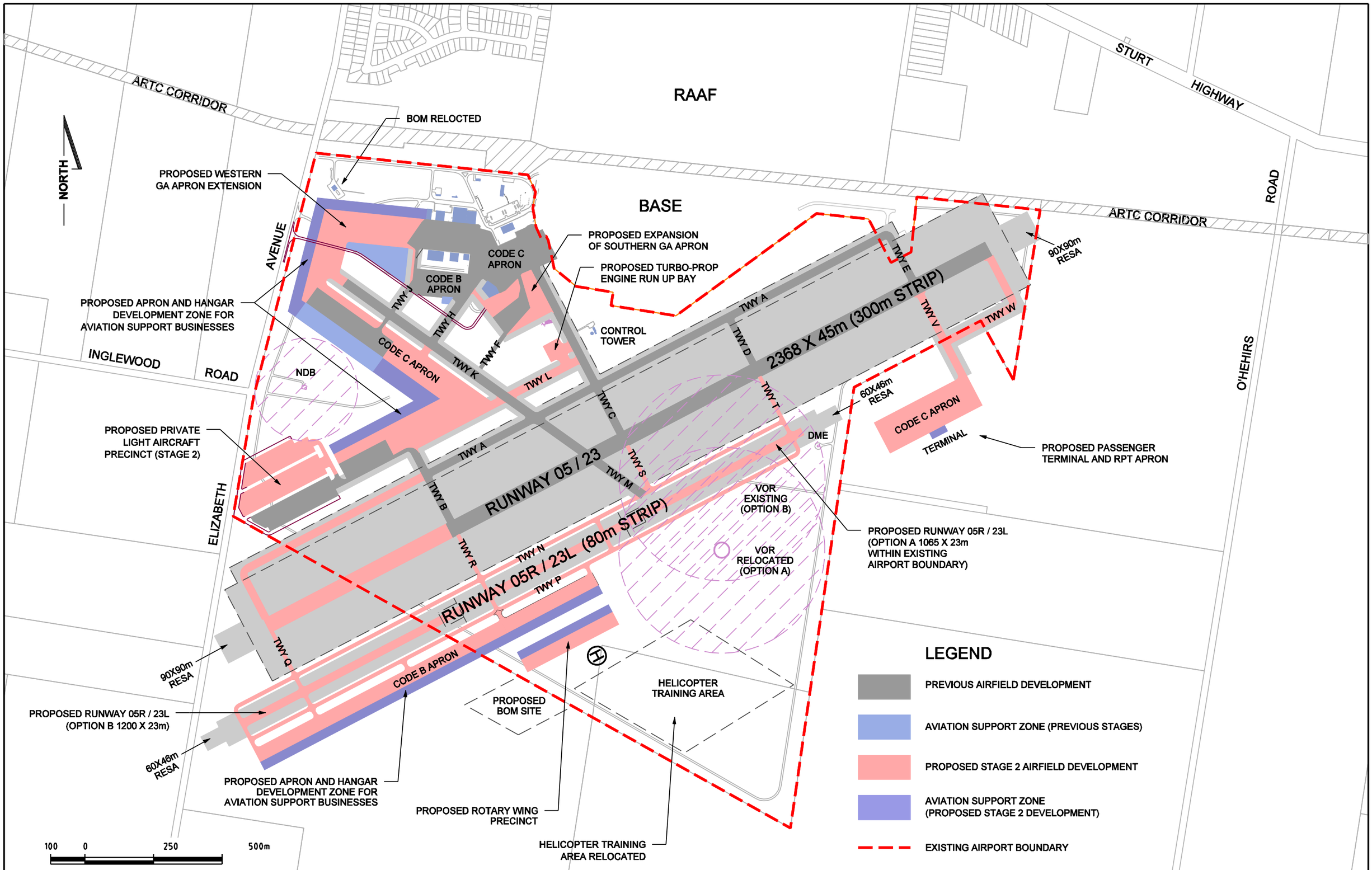
Title:
PROPOSED AIRFIELD DEVELOPMENT
STAGE 1 (2010 - 2020)

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
FORTITUDE VALLEY QLD 4006
A.C.N. 126 939 768
TELEPHONE (07) 3250 9000
FACSIMILE (07) 3250 9001
EMAIL mail@lar.net.au

Drawn: CMF | Checked: BJH | Approved: BJH

Rev.	Date
B	22.01.10
A	29.10.09

Drawing No: B09065A011
Scale: 1:10,000
File Ref: B09065
Sheet Size: A3



Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
PROPOSED AIRFIELD DEVELOPMENT
STAGE 2 (2020 - 2030)

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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EMAIL mail@lar.net.au

Drawn: CMF | Checked: BJH | Approved: BJH

Rev.	Date
B	22.01.10
A	29.10.09

Drawing No:
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Scale: 1:10,000 | A3 Sheet Size

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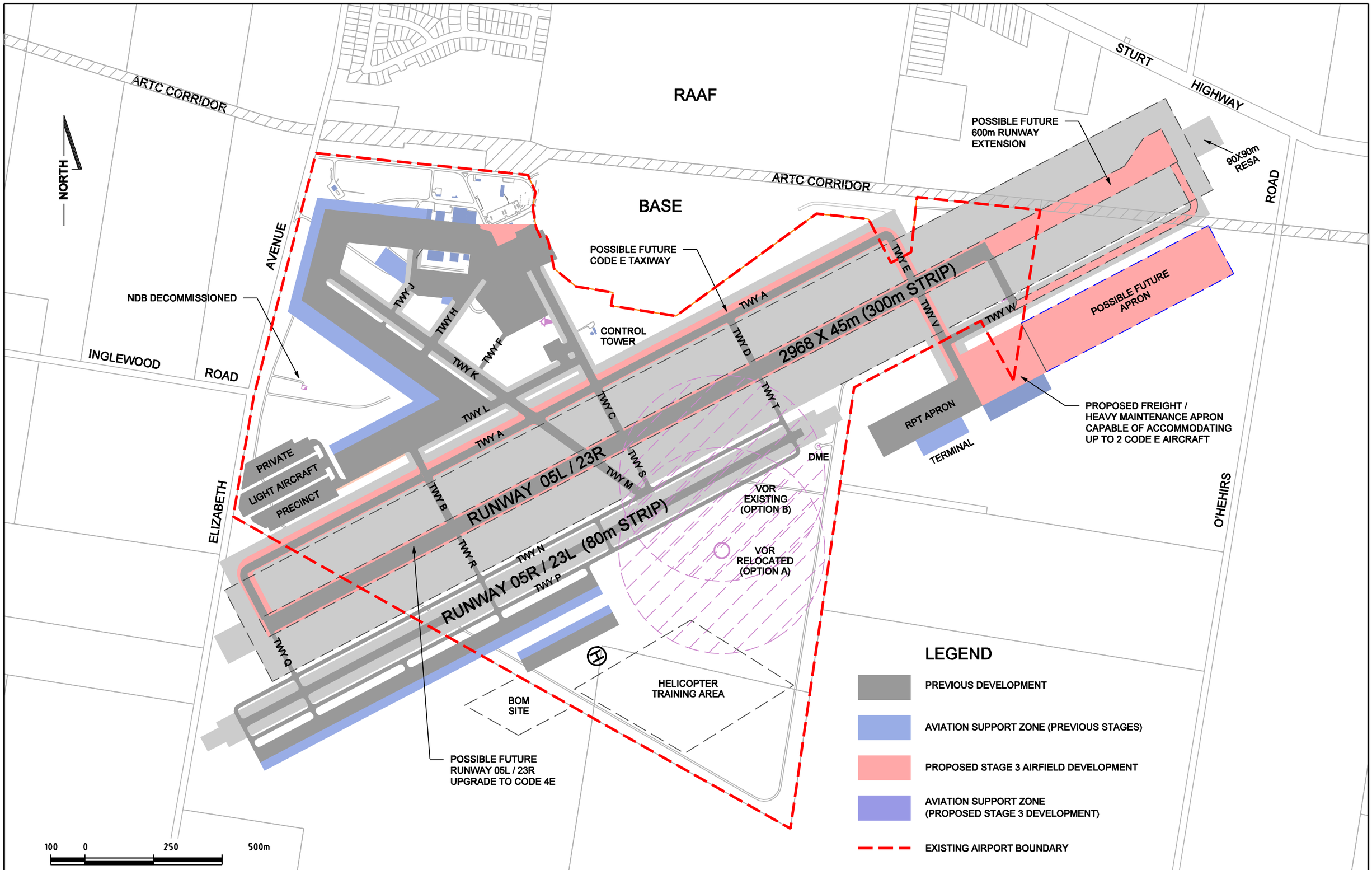

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
PROPOSED AIRFIELD DEVELOPMENT
STAGE 3 (ULTIMATE)

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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Drawn: CMF | Checked: BJH | Approved: BJH

Rev.	Date
B	22.01.10
A	29.10.09

Drawing No: B09065A013
Scale: 1:10,000
File Ref: B09065
Sheet Size: A3

RPT APRON

B737-800
E190

B737-800
E190

DH3
Q400
E170
SF340

DH3
Q400
E170
SF340

B737-800
E190

B737-800
E190

NORTH

FREIGHT / MAINTENANCE

APRON

APRON ROAD

APRON ROAD

DEPARTURES

FUTURE
TERMINAL
EXPANSION
ZONE

BAGGAGE
MAKE UP

AIRLINE
LOUNGE

SECURITY

RETAIL

RETAIL

CHECK-IN

CONCOURSE

BAGGAGE
BREAKDOWN

ARRIVALS

RETAIL

RETAIL

RETAIL

TERMINAL

FUTURE
TERMINAL
EXPANSION
ZONE

FREIGHT / MAINTENANCE

FACILITIES

SET

DOWN

PICK

UP

SHORT TERM CAR PARK

RENTAL
(150 SPACES

PARKING
APPROX.)

SHORT
(150 SPACES

TERM
APPROX.)

FUTURE

CAR PARK

EXPANSION

ZONE

FUTURE

CAR PARK

EXPANSION

ZONE

COMMERCIAL

(AVIATION SUPPORT)

DEVELOPMENT

ZONE

TO O'HEHIRS ROAD
AND STURT HIGHWAY

LONG TERM CAR PARK

LONG
(300 SPACES

TERM
APPROX.)

COMMERCIAL

(BUSINESS)

DEVELOPMENT

ZONE

TO COMMERCIAL (BUSINESS)
DEVELOPMENT

12.5 0 25 50m

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
PASSENGER TERMINAL AREA CONCEPT
STAGE 2 PROPOSED LOCATION

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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Drawn: CMF | Checked: BJH | Approved: BJH

Rev. A | Date 22.01.10

Drawing No: B09065A014

Scale: 1:1,250 | A3 Sheet Size

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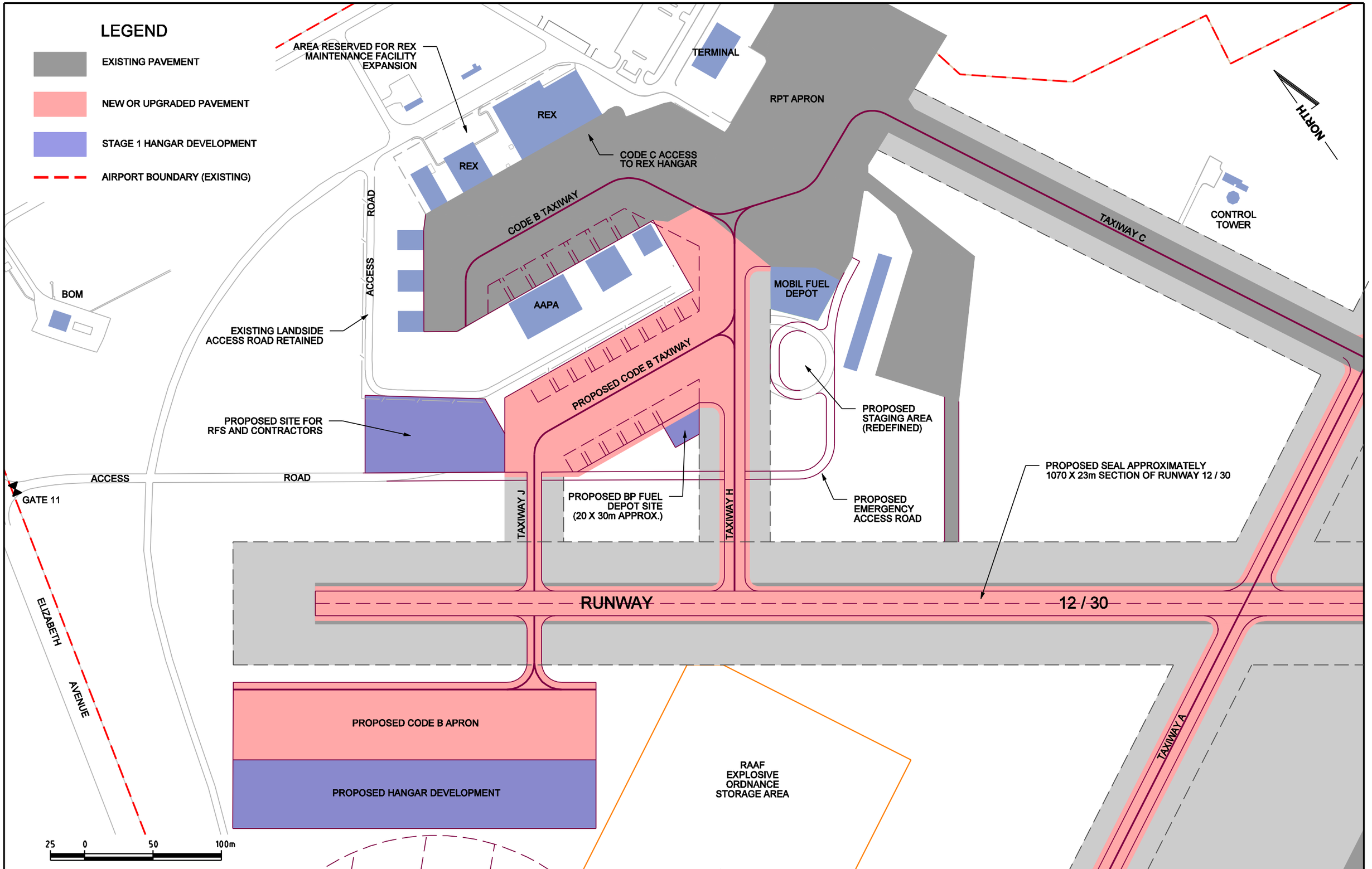

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
PRECINCT 2A - STAGE 1 DEVELOPMENT

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
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FACSIMILE (07) 3250 9001
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Drawn: CMF | Checked: BJH | Approved: BJH

Rev.	Date
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B	22.01.10
A	29.10.09

Drawing No: B09065A015
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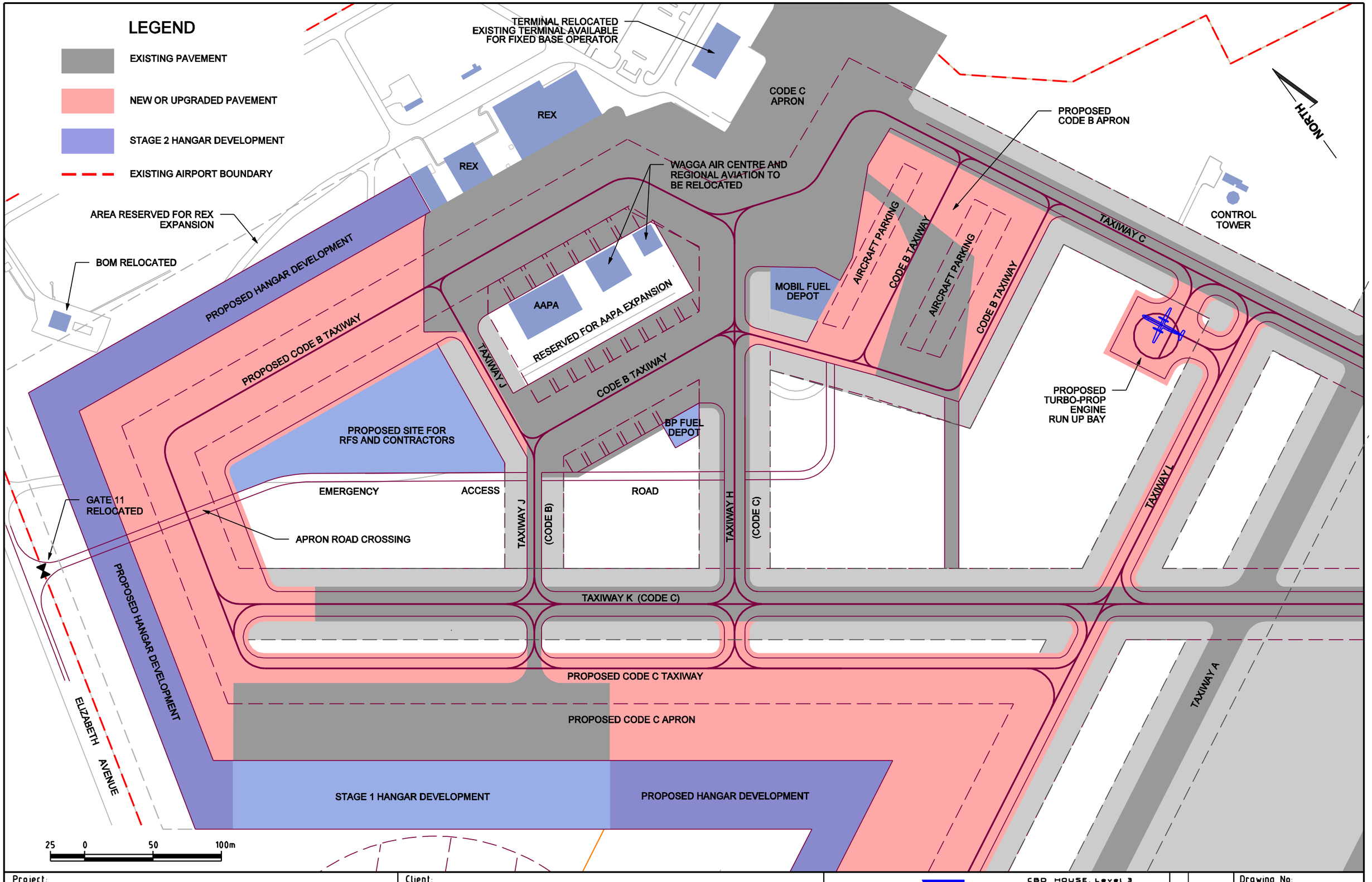

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
PRECINCT 2A - STAGE 2 DEVELOPMENT

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
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Drawn: CMF | Checked: BJH | Approved: BJH

Rev	Date
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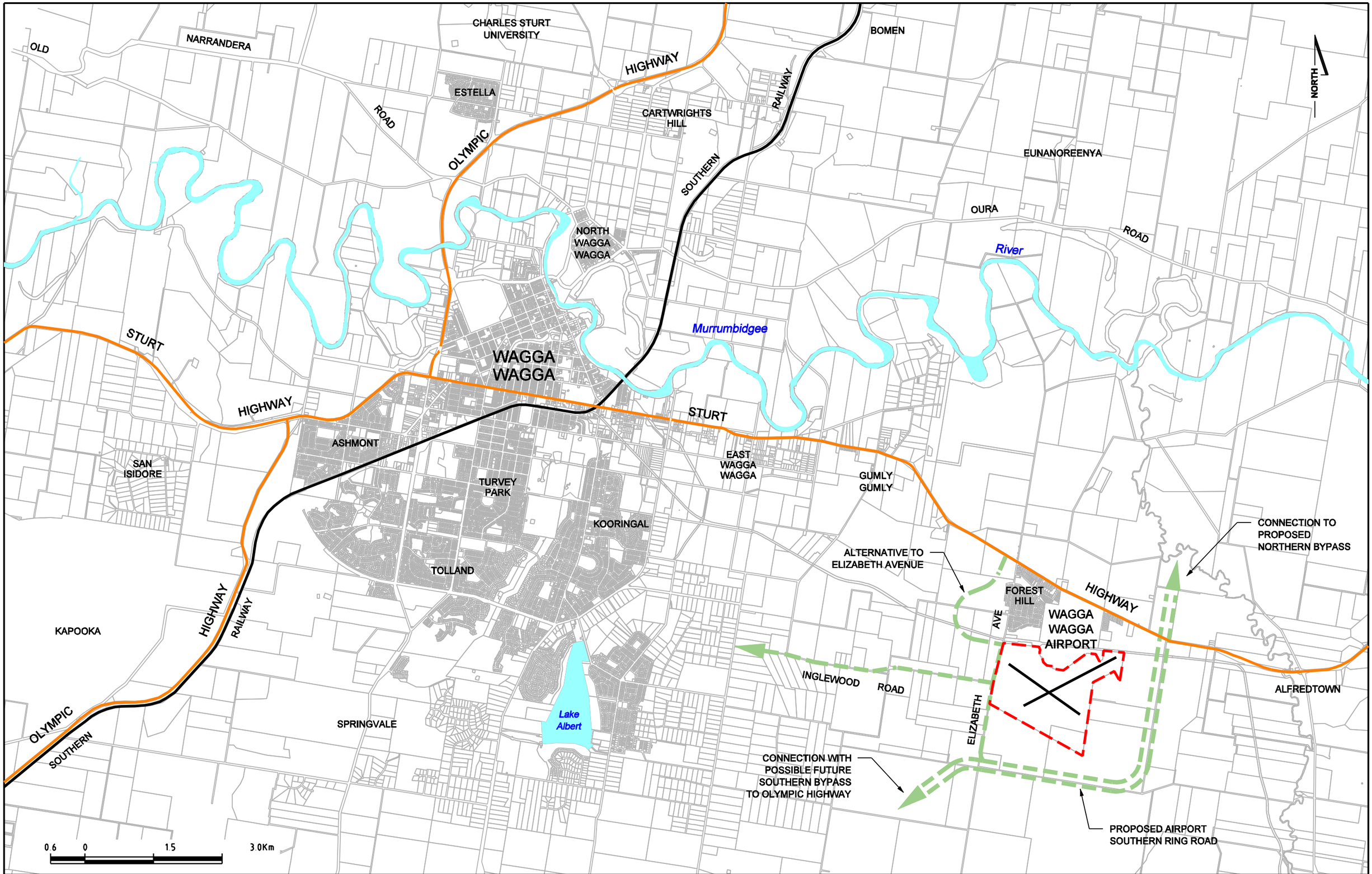
A	29.10.09

Drawing No: B09065A016
Scale: 1:2,500
File Ref: B09065
Sheet Size: A3



Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
EXTERNAL ROAD ACCESS

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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EMAIL mail@lar.net.au

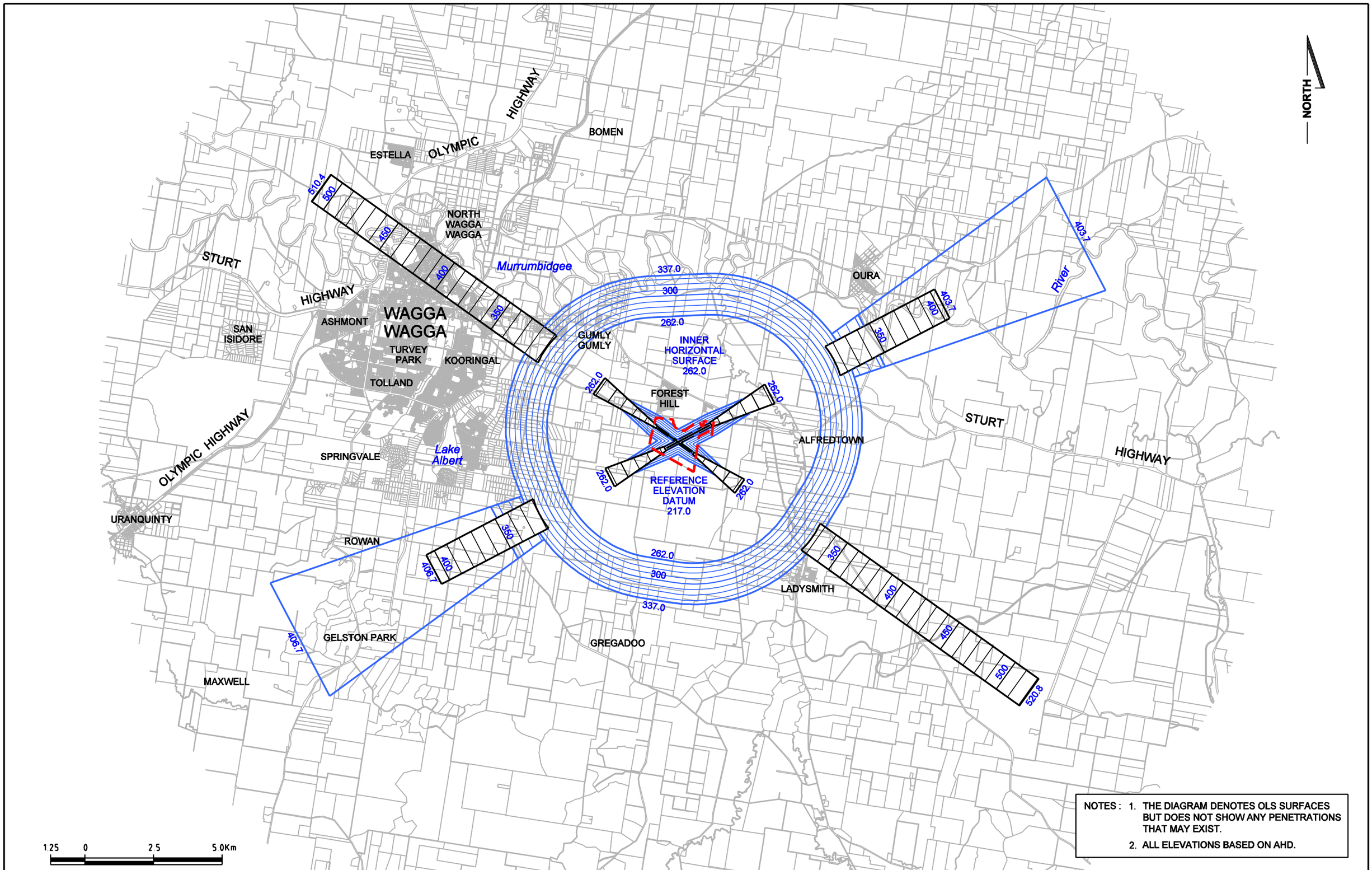
Rev.	Date
B	22.01.10
A	29.10.09

Drawn: CMF | Checked: BJH | Approved: BJH

Drawing No:
B09065A020

Scale: 1:60,000 | A3 Sheet Size

File Ref: B09065



NOTES :
1. THE DIAGRAM DENOTES OLS SURFACES BUT DOES NOT SHOW ANY PENETRATIONS THAT MAY EXIST.
2. ALL ELEVATIONS BASED ON AHD.

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
WAGGA WAGGA AIRPORT
EXISTING OBSTACLE LIMITATION SURFACE

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
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FORTITUDE VALLEY QLD 4006
A.C.N. 126 939 768
TELEPHONE (07) 3250 9000
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EMAIL mail@lar.net.au

Drawn: CMF | Checked: KCM | Approved: BJH

Rev.	Date
B	22.01.10
A	29.10.09

Drawing No: B09065A030
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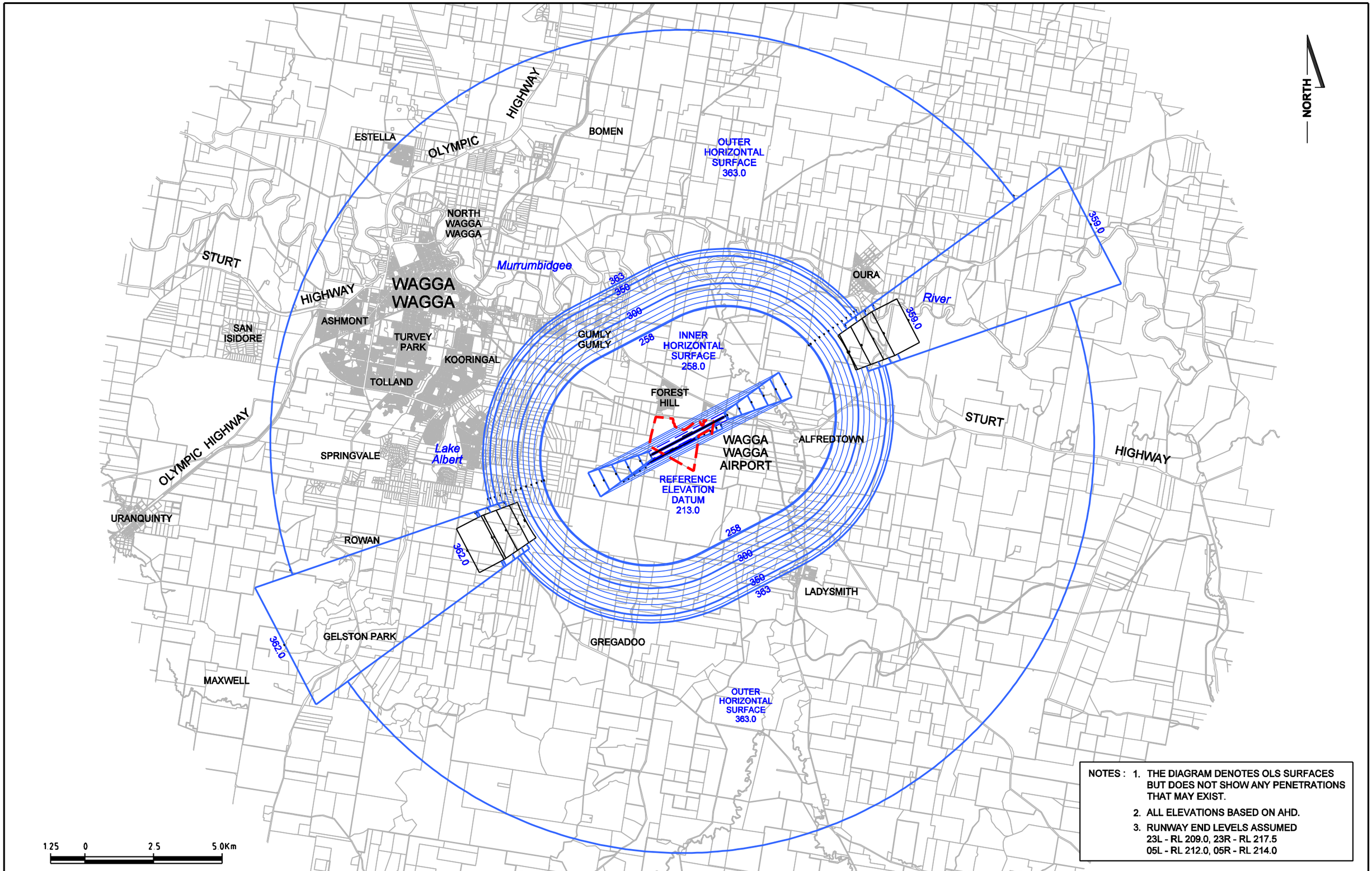

NOTES :
1. THE DIAGRAM DENOTES OLS SURFACES BUT DOES NOT SHOW ANY PENETRATIONS THAT MAY EXIST.
2. ALL ELEVATIONS BASED ON AHD.
3. RUNWAY END LEVELS ASSUMED
   23L - RL 209.0, 23R - RL 217.5
   05L - RL 212.0, 05R - RL 214.0

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
WAGGA WAGGA AIRPORT
FUTURE OBSTACLE LIMITATION SURFACE

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
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Rev.	Date
B	22.01.10
A	29.10.09

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Scale: 1:125,000 | A3 Sheet Size

Drawn: CMF | Checked: KCM | Approved: BJH

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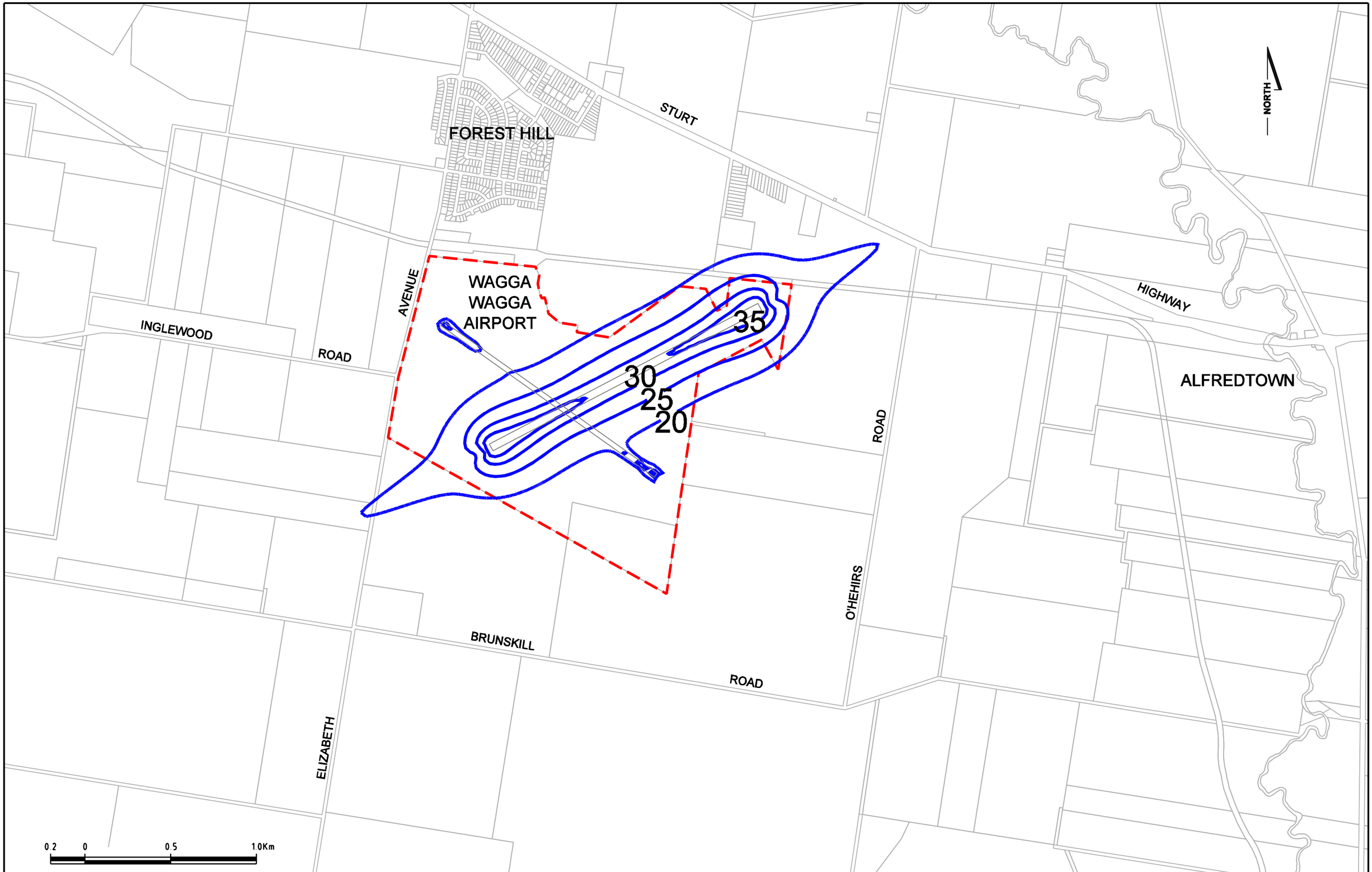

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
2008 / 09 ANEI CONTOURS

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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EMAIL mail@lar.net.au

Rev	Date
C	10.03.10
B	02.02.10
A	18.12.09

Drawing No: B09065A301

Drawn: CMF | Checked: MW | Approved: BJH

Scale: 1:20,000 | A3 Sheet Size

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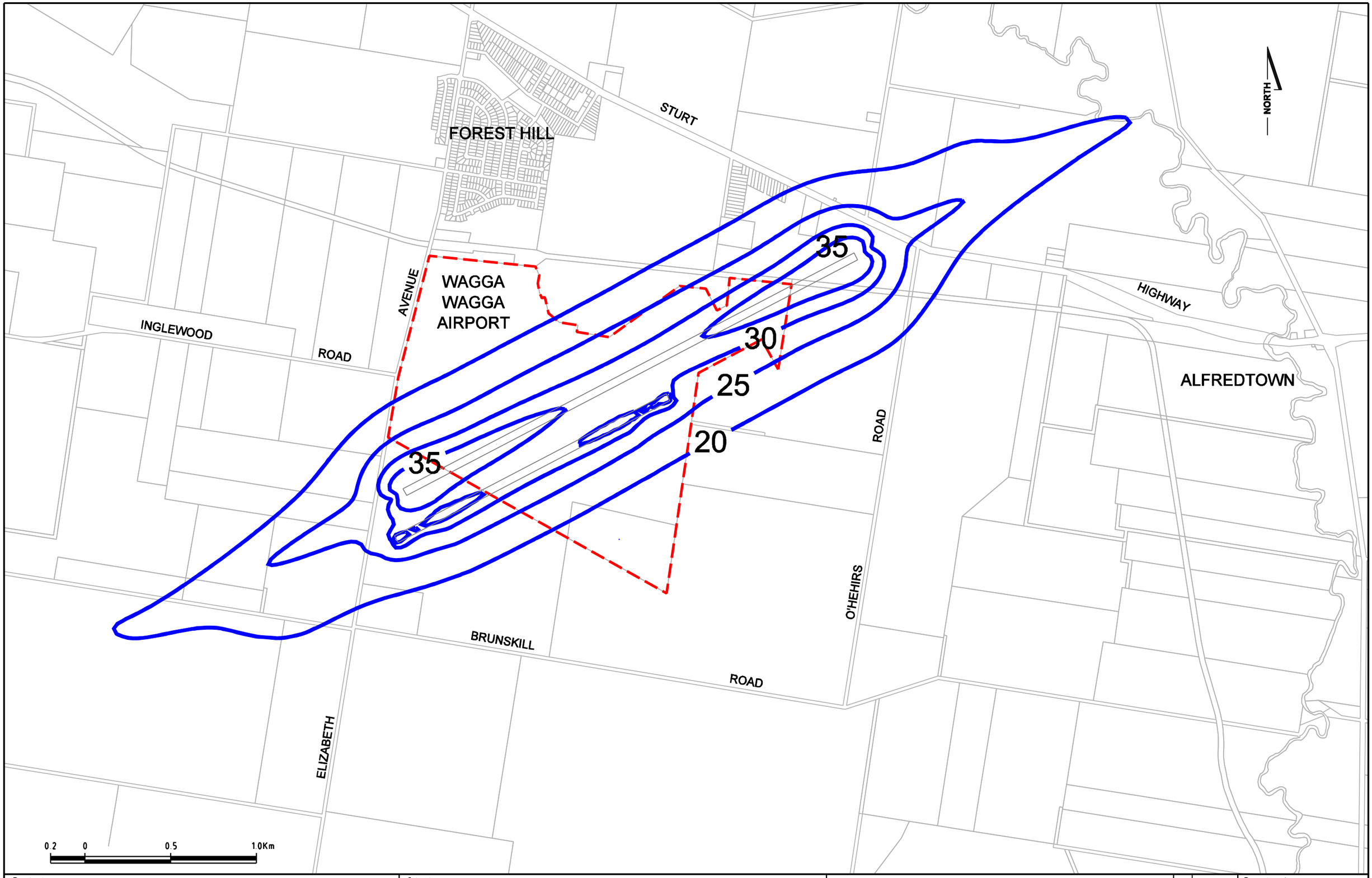

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
2029 / 30 ANEC CONTOURS

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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Rev.	Date
C	17.03.10
B	13.01.10
A	18.12.09

Drawn: CMF | Checked: MW | Approved: BJH

Drawing No:
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Scale: 1:20,000 | A3 Sheet Size

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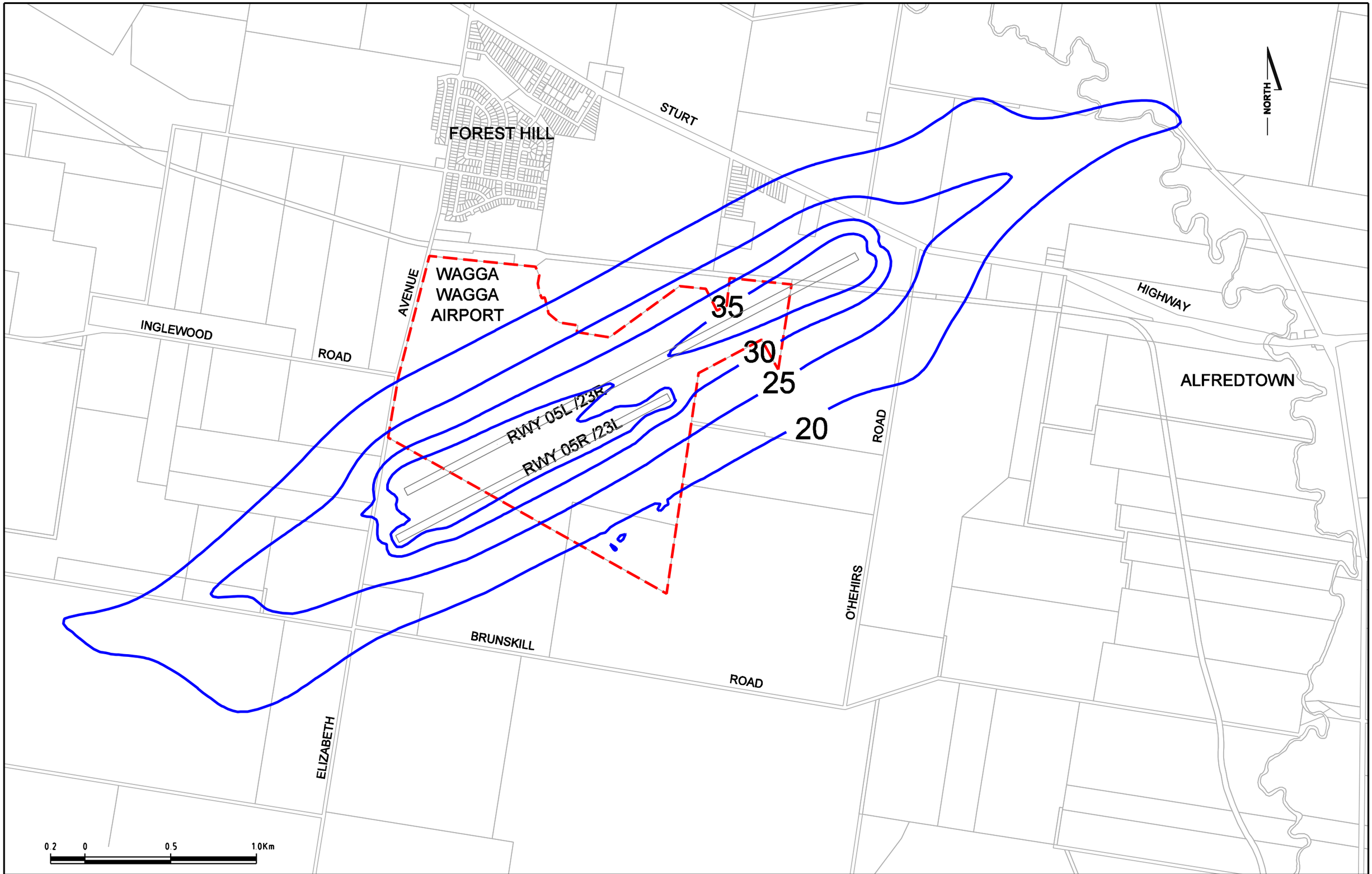

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
ULTIMATE CAPACITY ANEF CONTOURS

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
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FACSIMILE (07) 3250 9001
EMAIL mail@blar.net.au

Rev.	Date
C	10.03.10
B	02.01.10
A	18.12.09

Drawn: CMF | Checked: MW | Approved: BJH

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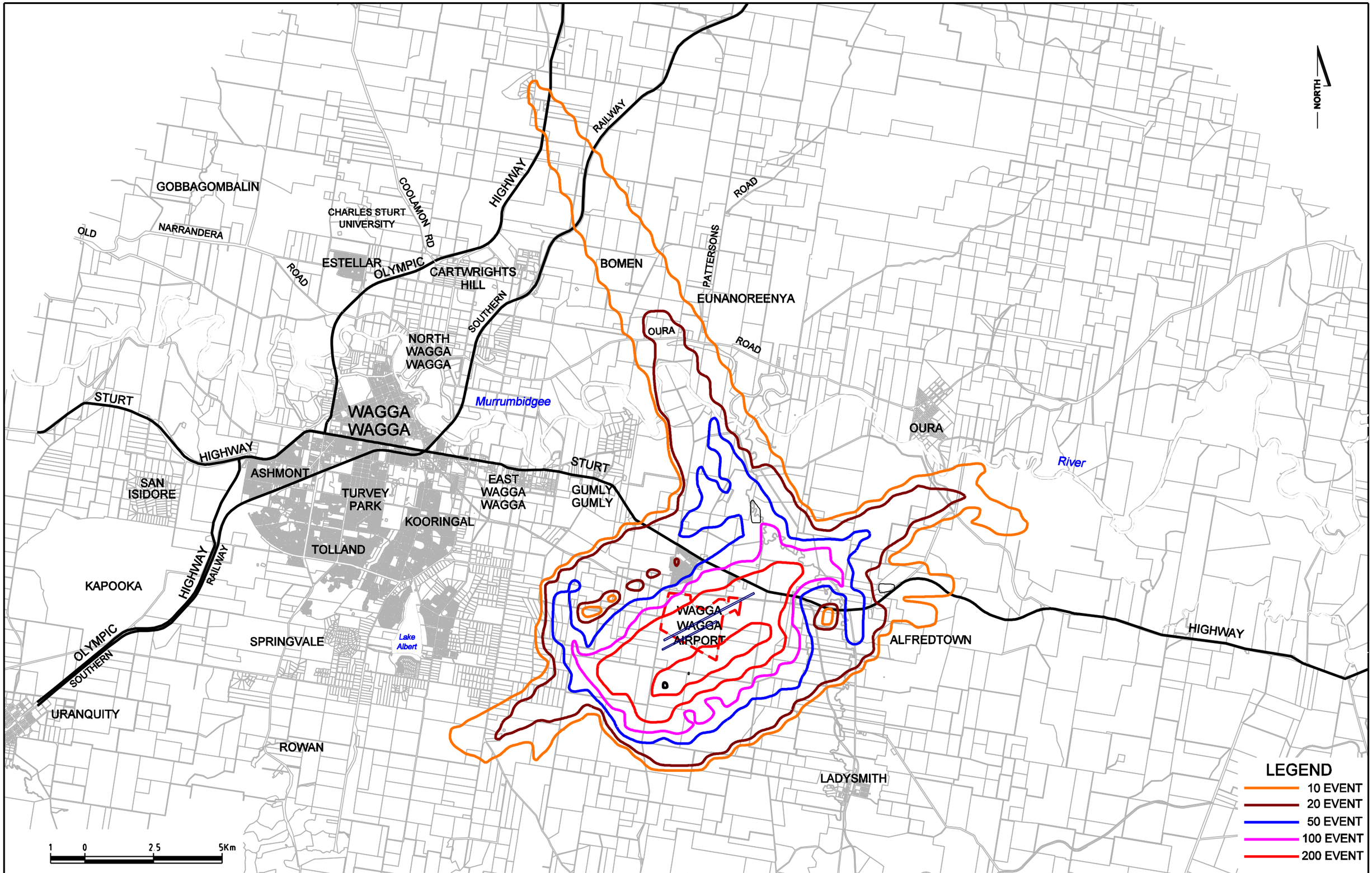

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
ULTIMATE CAPACITY N60 CONTOURS

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
FORTITUDE VALLEY QLD 4006
A.C.N. 126 939 768
TELEPHONE (07) 3250 9000
FACSIMILE (07) 3250 9001
EMAIL mail@lar.net.au

Rev.	Date
C	17.03.10
B	02.02.10
A	18.12.09

Drawn: CMF | Checked: MW | Approved: BJH

Drawing No:
B09065A304

Scale: 1:100,000 | A3 Sheet Size

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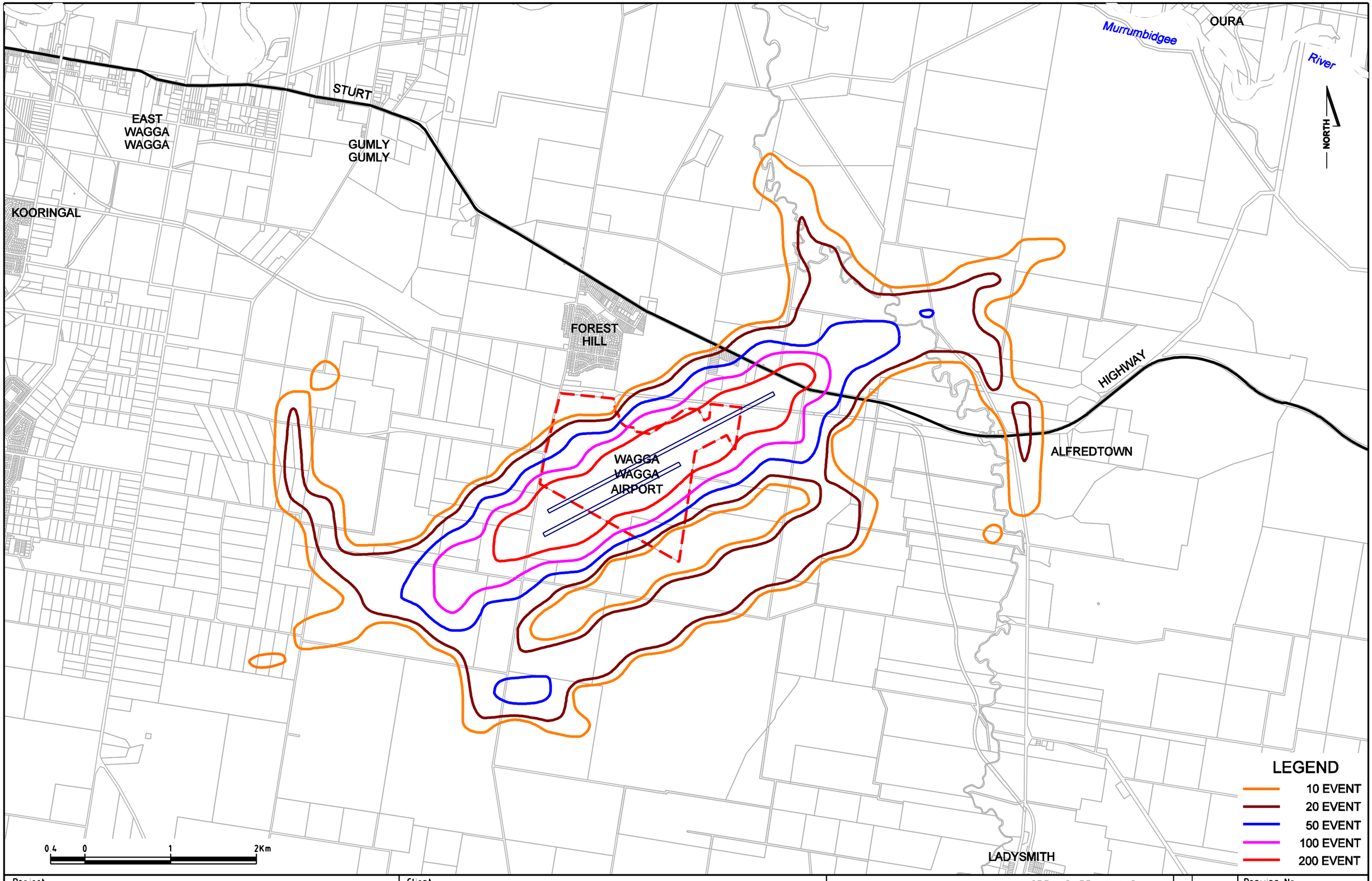

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
ULTIMATE CAPACITY N70 CONTOURS

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
FORTITUDE VALLEY QLD 4006
A.C.N. 126 939 768
TELEPHONE (07) 3250 9000
FACSIMILE (07) 3250 9001
EMAIL mail@lar.net.au

Drawn: CMF | Checked: MW | Approved: BJH

Rev	Date
C	17.03.10
B	02.02.10
A	18.12.09

Drawing No: B09065A305
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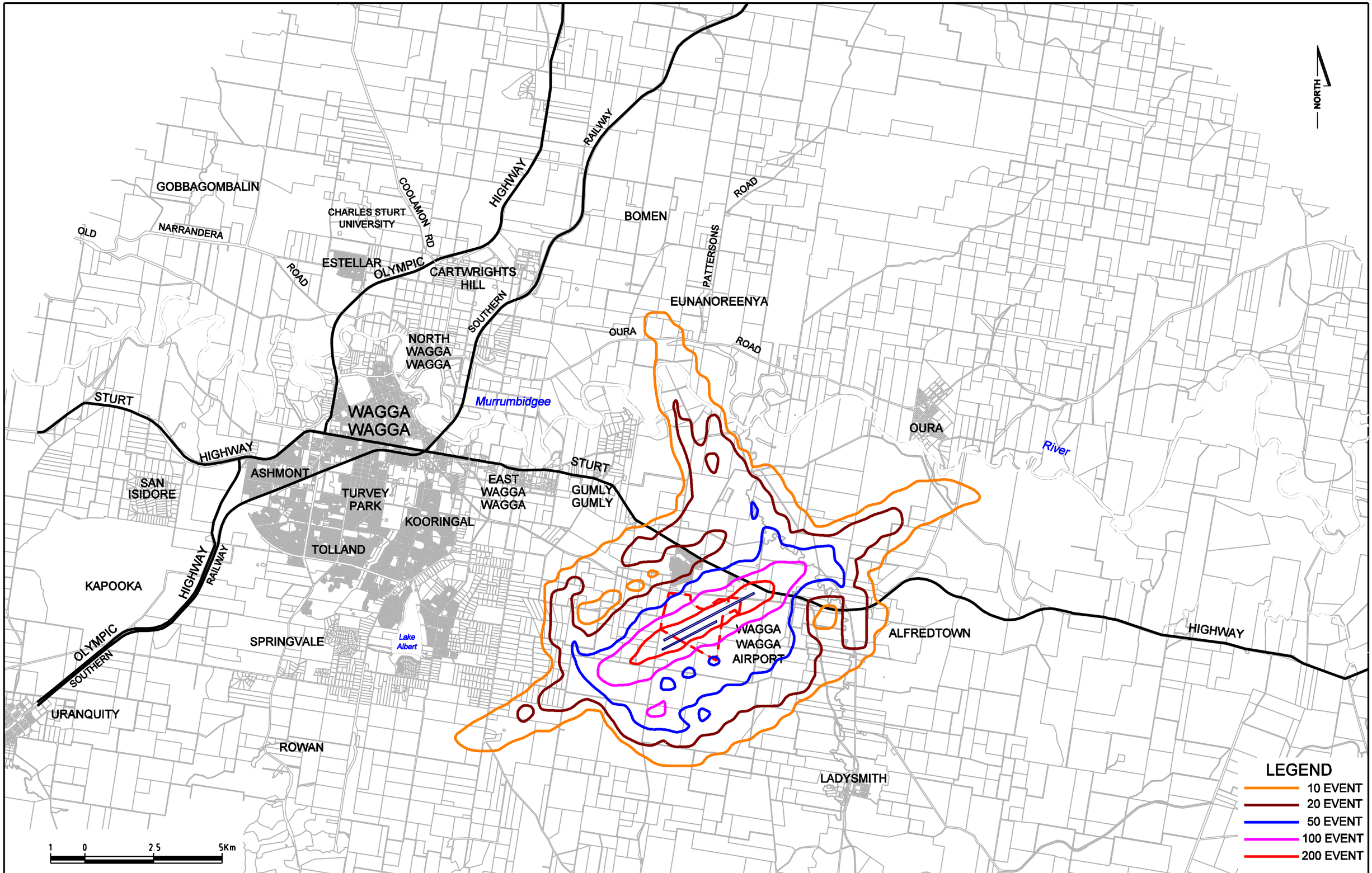

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
2029 / 30 N60 CONTOURS
Day (0700-1900Hrs)

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
FORTITUDE VALLEY QLD 4006
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TELEPHONE (07) 3250 9000
FACSIMILE (07) 3250 9001
EMAIL mail@lar.net.au

Drawn: CMF | Checked: MW | Approved: BJH

Rev.	Date
C	17.03.10
B	04.02.09
A	18.12.09

Drawing No: B09065A306
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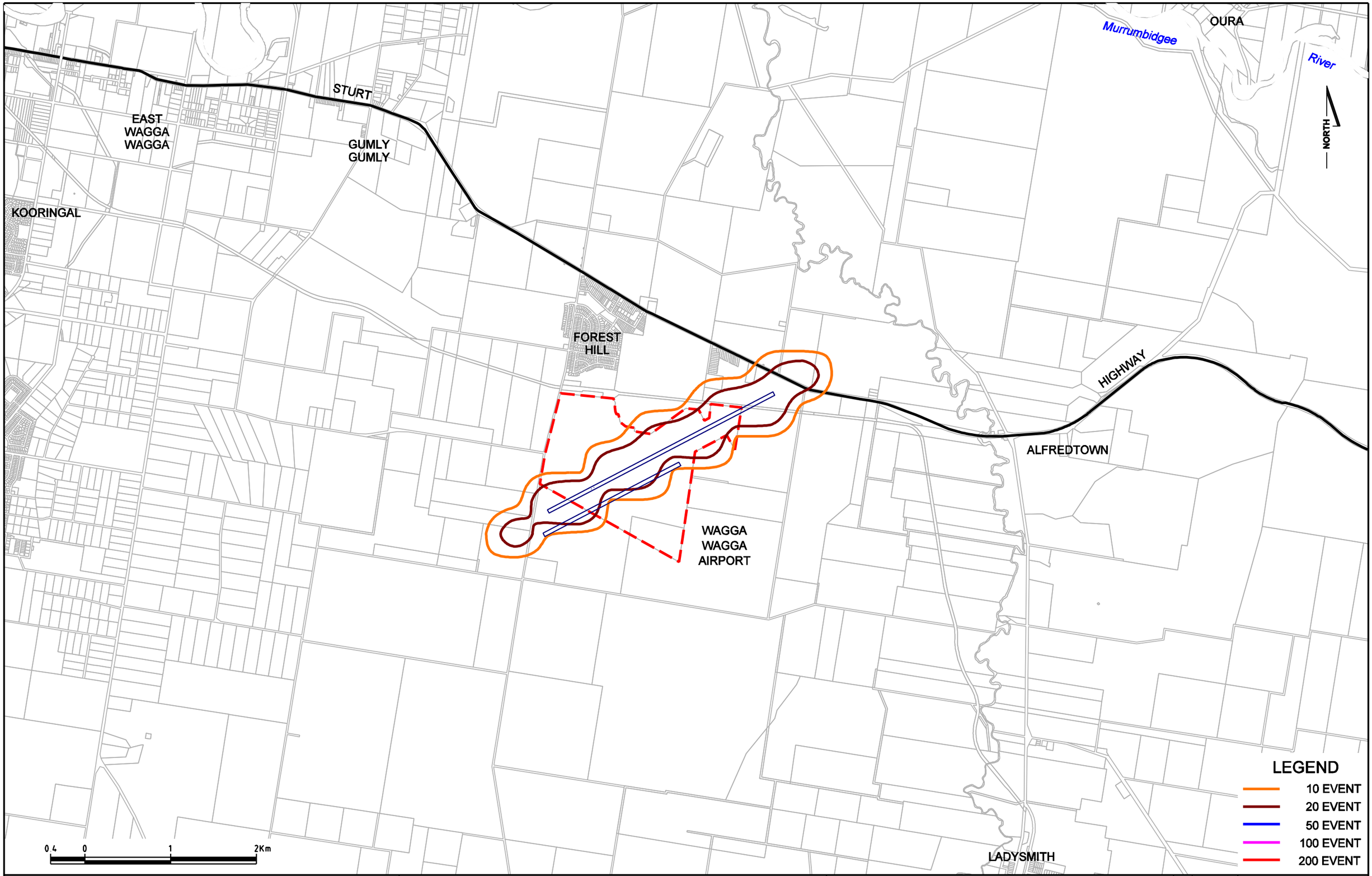

Project:
WAGGA WAGGA AIRPORT
MASTER PLAN 2009 - 2030

Client:
WAGGA WAGGA CITY COUNCIL

Title:
2029 / 30 N70 CONTOURS
Night (1900-0700Hrs)

REHBEIN AOS Airport Consulting
THE ASSOCIATION OF CONSULTING ENGINEERS AUSTRALIA
CBD HOUSE, Level 3
120 WICKHAM STREET
FORTITUDE VALLEY QLD 4006
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TELEPHONE (07) 3250 9000
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EMAIL mail@lar.net.au

Drawn: CMF | Checked: MW | Approved: BJH

Rev	Date
C	17.03.10
B	04.02.10
A	18.12.09

Drawing No: B09065A307
Scale: 1:40,000
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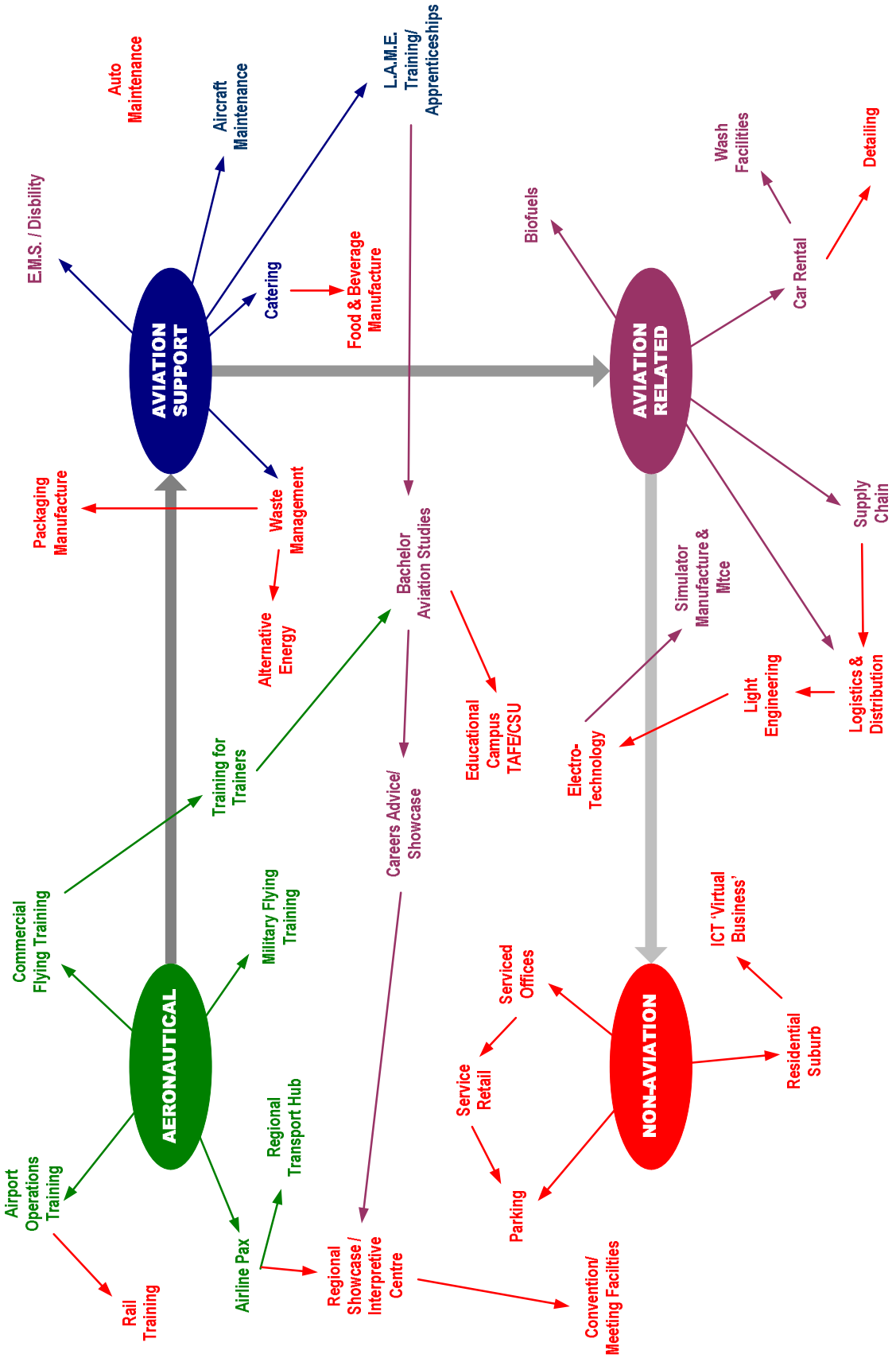
Sheet Size: A3

APPENDIX C

VISIONING WORKSHOP ECONOMIC OPPORTUNITIES MAP


AVIATION SUPPORT
AVIATION RELATED
AERONAUTICAL
NON-AVIATION
Auto Maintenance
Aircraft Maintenance
L.A.M.E. Training/ Apprenticeships
E.M.S. / Disbility
Catering
Food & Beverage Manufacture
Biofuels
Wash Facilities
Detailing
Car Rental
Packaging Manufacture
Waste Management
Bachelor Aviation Studies
Supply Chain
Alternative Energy
Simulator Manufacture & Mtce
Educational Campus TAFE/CSU
Light Engineering
Logistics & Distribution
Electro-Technology
Training for Trainers
Careers Advice/ Showcase
Commercial Flying Training
Military Flying Training
Serviced Offices
ICT 'Virtual Business'
Service Retail
Residential Suburb
Airport Operations Training
Regional Transport Hub
Parking
Airline Pax
Regional Showcase / Interpretive Centre
Rail Training
Convention/ Meeting Facilities

APPENDIX D

PUBLIC CONSULTATION COMMENTS AND RESPONSES

All comments received during the public exhibition period have been reviewed and taken into consideration by Council. Those comments requiring a response have been scheduled below.

Comments	Response
Passenger Terminal	
1. The construction of a new passenger terminal in a new location in Stage 2 (post 2020) will provide clear advantages however, it will be important to ensure that any such new terminal delivers clear benefits to passengers and airlines to justify the costs associated with replacing terminal infrastructure.	The significant cost of terminal relocation is recognised by the Master plan and the concern relating to this acknowledged. Cost benefit analysis will be carried out as well as appropriate funding structures considered and agreed with all stakeholders prior to implementation.
2. Air Force has indicated that there is support for the proposed location of the future terminal precinct for security reasons.	Council acknowledges this comment and will work with Defence and Air Force to ensure the development of the airport maintains security for both the airport and Defence.
Support/Ancillary Facilities	
3. It is strongly recommended that any move to locate a new terminal facility to Precinct 6 be carried out in conjunction with the relocation of the heavy maintenance facility to the same area.	The timing of and opportunities for developments around the airport will be considered in agreement with existing tenants.
4. The relocation of the Non Directional Beacon (NDB) may incur costs for military only approaches, which would be of some concern to Defence. Therefore any relocation of the NDB will require further discussion with Defence.	This is acknowledged and further discussions will be initiated with Defence on this topic as this development is taken further.
Surface access	
5. The Roads and Traffic Authority generally supports the implementation of Stage 1 of the master plan subject to the intersections of Elizabeth Avenue and the Sturt Highway and Elizabeth Avenue and Allonby Ave being upgraded to accommodate the expected increased traffic demand through this intersection and address potential conflict issues due to the close proximity of the intersections.	The performance of existing intersections will be monitored closely throughout Stage 1. The timing and nature of possible solutions to future capacity issues will be reviewed to prevent unnecessary expenditure on existing infrastructure with respect to the proposed alternative link from the Sturt Highway to Don Kendell Drive. This link will accommodate traffic accessing the airport in the future when the existing intersections reach capacity, as described in Section 10.3.1 of the Master Plan.

Comments	Response
6. In Stage 2, the RTA questions the justification for the relocation of the airport terminal to the east with access to be via O'Hehirs Road as this will further expand the urban limits of Wagga Wagga and represent an increased travel distance of up to 5 km for vehicle movements to the airport from Wagga Wagga.	In its current location, the terminal can not be expanded sufficiently and the Master Plan has identified Precinct 6 as providing the most beneficial location considering the many competing complexities including the need to plan for the growth of other airport precincts and infrastructure.
7. The relocation of the terminal will generate increased traffic movement along the Sturt Highway through Forest Hill with impacts on residential properties, the Forest Hill Public School and the access to the RAAF Base.	In its current location, the terminal can not be expanded sufficiently and the Master Plan has identified Precinct 6 as providing the most beneficial location considering the many competing complexities including the need to plan for the growth of other airport precincts and infrastructure. Potential negative effects will be considered and planned for to ensure they are carefully mitigated through the implementation of suitable measures.
8. The relocation of the terminal will represent increased travel times to the terminal and increased costs of travel for both private and public transport options. It will also increase the response times for all emergency services to the site.	In its current location, the terminal can not be expanded sufficiently and the Master Plan has identified Precinct 6 as providing the most beneficial location considering the many competing complexities including the need to plan for the growth of other airport precincts and infrastructure. With regard to emergency services' response times, even with the development of the terminal in Precinct 6 emergency services will still have access to the airport site from Elizabeth Avenue as currently is the case, leaving response times to the site unchanged. It should also be considered that as the airport site developments and the supporting road infrastructure develops along with it there will be opportunity to provide improved access for emergency service vehicles.
9. The relocation of the airport terminal to the east with access to be via O'Hehirs Road will potentially add approximately 10,000 VKT (Vehicle Kilometres Travelled)/day based on current traffic volumes in Don Kendell Drive and 28,000 VKT/day based on the projected 2030 figures.	In its current location, the terminal can not be expanded sufficiently and the Master Plan has identified Precinct 6 as providing the most beneficial location considering the many competing complexities including the need to plan for the growth of other airport precincts and infrastructure.
10. Currently it is plausible that all movement to the Airport from land to the south of Fay Ave Kooringal would be via Inglewood Road. To relocate the terminal without the construction of the southern ring road around the airport will move the majority of this traffic to the Sturt Highway. Any traffic congestion or incident on the Sturt Highway through Forest Hill will significantly impact on access to the airport. It would also reduce alternatives for emergency services to manage an event at the airport that may require evacuation of the site.	The Master Plan has reviewed the future road traffic issues related to the development of the airport on a strategic basis and has suggested some possible road traffic developments at this very preliminary stage. However, it is recognised that a more detailed overall traffic/road network study is required to inform the Master Plan. Detailed road traffic impact assessments will be undertaken in the preliminary design phase along with stakeholder engagement.

Comments	Response
11. The relocation of the terminal means that all access to the airport will be through Forest Hill via the Sturt Highway unless the construction of the O'Hehirs Road extension is undertaken as part of this stage. This new road construction will represent a significant capital cost for the project.	A traffic/road network study is required to inform the Master Plan to identify and address any issues. Detailed road traffic impact assessments will be undertaken in the preliminary design phase along with stakeholder engagement.
12. In Stage 3, the current road layout as indicated on the Master Plan for Inglewood Road, Elizabeth Ave and the proposed new road west of Forest Hill does not provide for ease of movement of traffic between these roads. To extend the runway to the south west across Elizabeth Ave and relocate Elizabeth Ave may provide for a better integrated solution for passenger and freight movement from the airport and surrounding precincts.	A traffic/road network study is required to inform the Master Plan to identify and address any issues. Detailed road traffic impact assessments will be undertaken in the preliminary design phase along with stakeholder engagement.
13. A detailed Traffic Impact Study should be undertaken to investigate and provide solutions for the impacts of the proposed development on the existing and proposed road network with particular attention to the Sturt Highway. Such a study may prove to be beneficial to the assessment and determination of this project.	A traffic/road network study is required to inform the Master Plan to identify and address any issues. Detailed road traffic impact assessments will be undertaken in the preliminary design phase along with stakeholder engagement.
14. The multiple precincts for the location of commercial, industrial and business activities and the terminal appear to be disjointed in their relative placement around the site. This will necessitate additional vehicle traffic movement between the precincts.	Land uses assigned to each precinct have been carefully considered to ensure optimum location within the airport development. Detailed traffic assessment studies will be carried out throughout implementation stage.
15. Appropriate design provisions are required to address visual and amenity issues along the Sturt Highway and to minimise distraction to the motorist on the Highway.	The Master Plan recognises these issues (see section 6.1.1 of the Master Plan) which will be further addressed in the implementation stage.
16. Facilities are to be provided for alternative modes of access (other than the motor vehicle) to and within the vicinity of the Airport, e.g. walking and bicycle shared pathways, to service the needs of workers. Consideration should be given to providing these facilities separate to the roadways due to the concentration and characteristics of traffic on the Sturt Highway.	During the undertaking of a detailed traffic impact study of the highway network to and around the airport site, alternative travel modes will be considered and included where practicable as part of new or upgraded highway developments. Consideration will also be given to the provision of infrastructure of non-motorised modes within the airport site also when detailed design for landside precincts is undertaken.

Comments	Response
17. The plans indicate connections to both a proposed northern bypass and possible future southern bypass. Any proposal for the location of any future bypass of Wagga Wagga will need to be the subject of further discussions between the RTA and the Wagga Wagga City Council.	This is a proposal for the long-term vision for the airport and will require pre-feasibility investigation in association with the RTA and Wagga Wagga City Council.
18. The scale of the airport Master Plan including the commercial and industrial estates has the potential to generate significant traffic both within and to the site given its remote nature from Wagga Wagga. The RTA requests that the Master Plan provide a strategy for the provision of road related facilities to address the impacts that are likely to be generated by the proposed Master Plan both within the Forest Hill area and upon the road network that services it and minimise access to and intersections with the classified road network.	The Master Plan provides for strategic infrastructure within and around the airport site. Detailed traffic impact assessments will form part of the development application process for individual developments. Any issues related to the wider road network will be addressed as part of the approval process by Wagga Wagga City Council strategic planners.
19. The Sturt Highway is likely to be re-routed around Wagga and the current highway intersection with Elizabeth Drive will become a local intersection and airport access point. A roundabout would be a sensible item at this location in the short term. More and more residents and visitors will fly through this portal, therefore it should be attractive and easy to drive to and park.	A detailed traffic assessment study will be carried out in the implementation stage to identify and address any issues with the implementation of upgraded junctions where it is considered necessary. The Master Plan acknowledges the importance of the attractiveness of the airport access infrastructure in providing a welcoming atmosphere for residents and visitors.
20. If the terminal is relocated to Precinct 6, this will increase the cost of transport between the city centre and the airport. Taxi fares have increased over the past few years. Prices will be expensive in comparison to city (Sydney) prices.	Several drivers for the relocation of the passenger terminal exist, including the need to ensure future development is not restricted. Potential negative effects and disadvantages of relocation will need to be carefully mitigated through the implementation of suitable measures.
21. Relocation of the terminal will result in increased traffic travelling past the primary school.	Several drivers for the relocation of the passenger terminal exist, including the need to ensure future development is not restricted. Potential negative effects and disadvantages of relocation will need to be carefully mitigated through the implementation of suitable measures.
Noise	
22. The terminal, apron should be moved to the south of Runway 05/23 as soon as possible so that taxiing aircraft and aircraft at the terminal are not facing north/south.	Several drivers for the relocation of the passenger terminal exist. Relocation of facilities will occur as soon as reasonably viable.

Comments	Response
23. Engine run-ups and all operations creating ground noise should be moved as far south as possible.	Current arrangements for engine run up areas to be located at the most southerly point of the taxiway system will be retained as identified in the Stage 2 Master Plan Drawing B09065A012.
24. Consideration should be given to the relocation of the NDB so that the expected increase in training and light aircraft operations do not fly over Forest Hill.	Decommissioning of the NDB is anticipated by this Master Plan.
25. Training aircraft including helicopters should not be allowed to fly circuits over the near-by residential area.	In-flight aircraft operations are governed by a range of safety considerations established by CASA and Air Services Australia. The Master Plan anticipates the provision of a parallel runway to the south of the existing runway upon which the majority of training movements will occur. Circuits on this runway will not overfly residential areas.
26. There is no need for a loud speaker system on the outside of the terminal creating unnecessary noise for local residents	This issue is being dealt with currently, outside of the Master Plan. There is a need for a speaker on the outside of the terminal. Its times of operation and volume are being considered as an interim step to this Master Plan.
Runway 05L/23R extension	
27. The RTA strongly objects to the extension of the airport runway to the north east due to the resulting close proximity to the Sturt Highway. This has the potential to cause distraction to motorist travelling along the Sturt Highway and in particular those motorists making the turning manoeuvre into O'Hehirs Road.	The Master Plan recognises this as an issue (Section 6.1.1). It should be noted that this extension is not anticipated as a short- or medium-term requirement. It may only be required in the long-term and this issue will be taken into consideration when making the decision to implement this aspect of the Master Plan.
28. From contour plans it appears that the level of the land falls approximately 10m when heading north east from the current runway towards the intersection of the Sturt Highway and O'Hehirs Road. Therefore any extension of the runway will require significant earthworks to elevate the runway in this locality in close proximity of the Sturt Highway. To extend the runway to the south west and relocate Elizabeth Ave may prove to be a practical alternative option.	If runway extension beyond that proposed in Stage 2 proves to be required, the option for extension to the northeast is considered to be most appropriate with advantages from an airport operations perspective. The practicality of this and other options will require consideration.

Comments	Response
29. The attractiveness of commercial development within precinct 1 due to the exposure to the passing traffic on the Sturt Highway is understood. However the extension of the runway in stage 3 will negate the ability to provide for any internal road and pedestrian connectivity between the terminal from Stage 2 and the service type activities such as motels and food outlets envisaged for this precinct.	A variety of engineering solutions are available to ensure appropriate connectivity between Precinct 1 and 6. This will be considered in detail during the implementation stage.
30. Rex has no objection to the eventual extension of Runway 05L/23R, however it is felt the full 600m extension would not be necessary for jet operations up to 737-800 size servicing the short sectors to Sydney and Melbourne and would only come into contention when longer stage lengths are introduced.	Relative costs and benefits of a full 600 metre extension will be assessed in detail as part of the investment case for runway extension.
31. As the extended runway would be located over the boundary of Defence land, alternative security fencing may be required to restrict uncontrolled access to Defence land.	This comment has been noted and the issue will be dealt with in the detailed design stage.
32. The widening of the primary 05/23 runway strip to 300m specified for runway aligned instrument approaches will infringe on the existing helicopter training area, which is excluded from the leased area. This inconsistency between the current lease boundary and additional land required for the proposed widening of runway 05/23 will need to be resolved. Any necessary adjustment to the location of the helicopter training area and the corresponding amendment to the current lease agreement will need to be approved by Defence prior to any work being undertaken to widen the runway. Similarly, with regard to the need to acquire additional land on the north-east boundary to facilitate the upgrading of Taxiway A needs to be clarified as to whether it is intended to acquire this land by way of an adjustment to the current boundary of the land leased from Defence. Defence would be concerned about any changes to the existing lease boundary in the vicinity of the area where Taxiways G, E and A intersect.	Concern regarding this issue has been noted. Any changes to the lease boundary in this area would be subject to further negotiations between Defence and Council.

Runway 05R/23L	
33. Rex agrees with the parallel runway concept and would like to see consideration of the parallel runway brought forward and notes that the timing of the items in the Master Plan are flexible depending on the trigger points. Rex will keep Council fully appraised of developments at AAPA to allow flexible planning for the future.	The timing of runway developments are based on demand trigger points to ensure efficient operations and value for money development. All of the information provided to Council by AAPA and other sources in relation to demand at the airport will be carefully assessed. Runway development will be brought forward if required by demand.
34. The sketches provided, including those in the draft master plan, do not appear to provide adequate separation between the parallel runways. The Design of this upgrade needs to comply with Manual of Standards (MOS) Part 139 and Australian Defence Force Publication (ADFP) 602-Defence Aerodrome Design Manual (DADM).	The parallel runways will operate as non-instrument and will accommodate simultaneous operations. In line with MOS Part 139 (and ADFP 602-DADM), a separation of 210 metres is required and this is accommodated in this Master Plan. It should be noted that when meteorological conditions require the use of ILS on Runway 05L/23R, Runway 05R/23L will be closed as the separation between the runways is not adequate to accommodate such operations but also because VFR will not be applicable in such conditions to allow use of Runway 05R/23L.
Runway 12/30	
35. Unhappiness with regard to the closing of Runway 12/30 and converting into a taxiway. The runway should be sealed as indicated in the early stages of the plan, as early as possible. This runway would serve two purposes including; to remain open for use in cross wind conditions; and be able to be used as a sealed taxiway as an alternative to Taxiway C, in the event of an accident on Taxiway C (at present, in the event of an incident on Taxiway C, the airport will be closed to RPT aircraft).	Council recognises the benefits that the availability of this runway provides to some airport users and is seeking to provide an all weather solution in the short-term to enhance that benefit. In the long-term the constraints on further development presented by retaining Runway 12/30 need to be balanced against the value of retaining it.
36. The cross-strip should be retained as long as possible to allow light aircraft to operate when there are strong NW breezes. The cross strip also provides the ability for training aircraft to make cross-wind practice landings when 05/23 are favoured.	Council recognises the benefits that the availability of this runway provides to some airport users and is seeking to provide an all weather solution in the short-term to enhance that benefit. In the long-term the constraints on further development presented by retaining Runway 12/30 need to be balanced against the value of retaining it.

37. It would be a backward move to abandon Runway 12/30. There are a significant number of occasions when the use of Runway 12/30 is required for safety reasons due to cross wind facture being too great for use of Runway 05/23. It is also important to have the ability to access Runway 12/30 for cross wind training and practice. There appears to be no necessity to use Runway 12/30 as a taxiway as proposed, with Taxiway C still being readily accessible from the current terminal and GA area. Keeping Runway 12/30 available for use is not likely to create conflict with the proposed parallel runways 05/23 because by that time it is very likely that Wagga will again become controlled air space due to higher usage and access to Runway 12/30 will be controlled.	Council recognises the benefits that the availability of this runway provides to some airport users and is seeking to provide an all weather solution in the short-term to enhance that benefit. In the long-term the constraints on further development presented by retaining Runway 12/30 need to be balanced against the value of retaining it.
38. Australian Airline Pilot Academy (AAPA) have not utilised Runway 12/30 significantly in the time the school has been at Wagga Wagga and agrees with the analysis of crosswind conditions and the eventual retirement of the crosswind runway. AAPA however, does not see the need to seal the cross runway as an interim measure and would prefer to see the funds put towards advancing the introduction of the parallel runway. Dependent on movement growth Rex has a preference to accelerate Stage 2 for Runway 12/30 and the parallel runway and omit the works proposed under Stage 1.	Council sees both the provision of a parallel runway and provision of an alternative all weather access to the existing runway as essential to the ongoing growth and operation of the airport. Relative priorities will continue to be assessed on the basis of changes in forecast demand.
39. Defence's support for the sealing of a portion of Runway 12/30 is on the basis that this will not result in any changes to the current flight paths for this runway. Defence would be concerned if the sealing of a portion of the runway resulted in changes to the flight paths over the Ground Defence Training Area (GDTA) located to the south of the airport. Any increase in air traffic movements over the GDTA would also be of concern to Defence as it could impact on the activities carried out in that area. It needs to be noted that there is pyrotechnic use within the GDTA.	Council notes these concerns. No significant changes to the flight paths for Runway 12/30 are planned. Sealing only a portion of the runway will result in a displaced southerly threshold which will result in the relative height of aircraft over the GDTA increasing. No significant increase in movements on this runway is anticipated however the existing runway is unusable in wet conditions and once sealed this runway will be usable in all weather.
40. Defence does not have a requirement (currently or foreseen) for Runway 12/30 and therefore has no objection to its closure.	Council acknowledges this comment. Discussions will continue with Defence and Air Force with regard to these developments as the Master Plan is taken forward.

Taxiway System	
41. The proposals in the plan to upgrade the taxiway system to allow for a full length Code C parallel taxiway to the main runway and for two Code C taxiways accessing the existing RPT apron from the main runway are fully supported by Rex. Rex would like to see provision of for a Code B taxiway from Precinct 2a to the proposed Runway 05R/23L that avoids 05L/23R and prevents delays caused by aircraft crossing the main runway.	The cost of provision of such a taxiway would be significant and would involve significant extended taxi distances to circumnavigate extended Runway 05L/23R and associated OLS. Further assessment will be undertaken when making implementation decisions at this stage.
42. AAPA would like to see the introduction of several small Code B engine run up bays for training aircraft as part of the new taxiway system.	This will be considered as part of the infrastructure for the new parallel runway 05R/23L and development of the taxiway system.
43. The new taxiways are to be designed so that they do not intrude any further into RAAF Base Wagga Wagga airside land, which is outside the area leased to Council.	It is not thought that the taxiways will intrude on RAAF Base Wagga Wagga airside land. Consultation with stakeholders will be undertaken in the development of this proposal.
GA operations	
44. CASA and Air Services should be consulted, with a matter of urgency, with regards to whether Recreational Aircraft and pilots flying with Recreational Pilots Certificates can continue to operate into Wagga and in the surrounding area (from farm strips within the radius of the controlled airspace resulting from the tower) in the longer term when a tower is in place. Some sort of dispensation for local residents with recreational aircraft to continue to operate in and around Wagga once a tower is in place should be sought, and potentially also to plan a recreational access corridor into Forest Hill.	Discussions with CASA and Air Services Australia have been initiated with regard to this matter and it is intended to further engage with stakeholders in this matter as the dialogue progresses.
45. The proposed new GA area needs to be supplied with services as soon as possible. Without services connected to this part of the airport, the proposed GA area will fail to attract tenants.	To be dealt with as part of implementation stage.
46. The GA area needs an all weather taxiway to a runway access point, such as Taxiway B.	An all-weather taxiway between the new light aircraft precinct and the runway system will be developed.
47. Long-term AAPA would like to see the provision for operators to erect covered parking spaces on the GA apron.	This will be considered as part of the implementation of the apron.

Enhancing the city/region	
48. It is important that Precinct 6 include opportunities for the interpretation and enhanced understanding and acknowledgement of our local heritage and cultural diversity; to reference the significant investment that Council has already made to cultural infrastructure and to maximise culturally motivated visitations in and around the City.	To be considered as part of the design of Precinct 6.
49. Opportunities also exist for Public Art installations at the Sturt Highway entry (long-term), and the Elizabeth Drive Entry (short-term). The Public Art Opportunities should be managed, selected, and developed in conjunction with Wagga Wagga City Council Public Art Panel. The Public Art Panel see the airport entrance way (terminal and approaches) as an important initial indicator of Wagga as a city (first impression) therefore giving the opportunity for public art to culturally determine the site.	To be considered as part of the detailed design of works.
50. Planning should begin now for open space within the Airport City, to ensure the provision of quality passive and active recreation opportunities to residents, workers and travellers.	To be considered as part of the detailed design of works.
51. As the airport is a major gateway for business and tourism into the area, quality landscape treatments should be a priority at the major entries to the airport including entry boulevards, as well as car parks and terminal surrounds to create favourable first impressions.	To be considered as part of the detailed design of works.
Defence Facilities	
52. Whilst Defence does not object to the proposal to relocate the Ordnance Magazine there are a number of matters that must be considered. Council's suggestion that the Ordnance Magazine could be relocated within the area identified as Precinct 5 ('Uranga East' Ground Defence Training Area) on the maps provided by Council will only be considered by Defence if the relocation to this area does not impact on the safety, operations and overall utilisation of this area as a Ground Defence Training Area (GDTA).	Council acknowledges this concern and will discuss with Defence options for the relocation of the Ordnance Magazine to ensure an optimal location is found that does not disadvantage its safety, operation and utilisation while at the same time allowing the airport to develop as required.

53. Council's suggestion that the helicopter training area could be relocated to the proposed Precinct 5 may not be an option due to the constraints this would place on the use of the "Uranga East" GDTA and the potential land use conflicts. Any relocation of the helicopter training area would be subject to a detailed evaluation under Defence's Site Selection Process.	Council acknowledges Defence's concern with regard to the relocation of the helicopter training area. Further discussions will be initiated with Defence to consider in detail the best location for this area.
54. Precinct 5 comprises Defence land that is used as a GDTA. The assumption in respect of Precinct 5 being a suitable location for Defence activities within and around the existing airport that might be dislocated as a result of the proposals in the Master Plan is highly speculative and may not be able to be achieved when all the various safety aspects are fully considered. Defence will not consider any relocation of activities into Precinct 5 if it would restrict the operational and/or safety requirements of the GDTA.	Relocation of Defence facilities will only occur following detailed discussions regarding these aspects.
General	
55. Critical items within the Master Plan are the early relocation of the Bureau of Meteorology, building of a completely new airport terminal and better road access to the terminal.	The Master Plan identifies these as important issues. Council will work to implement these developments as fast as reasonably possible and viable.
56. The flying schools will become more important and need to have flying associated with these schools and other aviation integrated with commercial flights. I believe that the airport is one of the most important facilities in our city and needs to be kept at the forefront of aviation best practice.	The importance of flight training and aircraft operations form the essential basis of this Master Plan.
57. Prior to approving the Master Plan, Council should seek the approval from the relevant Commonwealth departments and agency stakeholders, including the Bureau of Meteorology, regarding the proposed changes to the layout of the airport and associated operational procedures.	Council have consulted with the relevant stakeholders and made the draft Master Plan available to all for comment.
58. Overall the construction of a parallel runway, extensions to Runway 05/23, new taxiways and sealing a section of Runway 12/30 are all seen as improvements to the existing facilities and therefore are supported by Air Force.	Council acknowledges these comments. Discussions will continue with Defence and Air Force with regard to these developments as the Master Plan is taken forward.