Karratha
AIRPORT
Shire of ROEBOURNE

MASTER PLAN
& LAND USE PLAN
2013 - 2033

shire of ROEBOURNE
Karratha
Powerhouse of the Pilbara

TABLE OF CONTENTS

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Document Control Page

Revision	Date	Description	Author	Signature	Verifier	Signature	Approver	Signature
0	26/03/2013	DRAFT	JSS		BJH		BJH	
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GLOSSARY OF TERMS & ABBREVIATIONS

ACN (Aircraft Classification Number)	A number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade category.
ASV	Annual Service Volume
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 ERSA	Airservices Australia Aeronautical Information Package En-Route Supplement Australia
ANEF	Australian Noise Exposure Forecast
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.
ARP	Aerodrome Reference Point
ATC	Air Traffic Control
AWIS	Automatic Weather Information Service
BoM	Bureau of Meteorology
CAGR	Compound Annual Growth Rate
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.
CTAF	Common Traffic Advisory Frequency
EOC	Emergency Operations Centre
FAA	Federal Aviation Administration (United States Department of Transportation)
General Aviation (GA)	The sector of the aviation industry that does not include regular public transport (RPT) airlines and military aviation.
GSE	Ground Servicing Equipment
GPS	Global Positioning System

IATA	International Air Transport Association
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.
INM	Integrated Noise Model
IWI	Illuminated Wind Indicator
LIRL	Low Intensity Runway Lighting
LoS	Level of Service – a range of values or assessments of the ability of the terminal to meet demand
MPPA	Million Passengers Per Annum
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 instrument approach	An instrument approach and landing that uses lateral guidance but does not use vertical guidance.
OLS	Obstacle Limitation Surfaces
PAL	Pilot Activated Lighting
Pavement Classification Number (PCN)	A number expressing the bearing strength of a pavement for unrestricted operations by aircraft with ACN value less than or equal to PCN.
Payload	The total weight of passengers and cargo that an aircraft can carry.
PSI	Unit of pressure or stress (pounds per square inch)
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.
RFDS	Royal Flying Doctor Service
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 Strip	A defined area including the runway and stopway, intended to reduce risk of damage to aircraft running off a runway and to protect aircraft flying over it during take-off or landing operations.
SoR	Shire of Roebourne
DME	Radio navigation system: Distance-based measuring equipment

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.
WDI	Wind Direction Indicator

EXECUTIVE SUMMARY

Karratha Airport is a key asset of the Shire of Roebourne (SoR) that provides a vital economic and social service to the area. SoR wishes to be in a position to manage and develop its airport infrastructure in a manner that is commensurate with the expected growth of aviation activity over the next 20 years. The Master Plan and Land Use Plan's purpose is to set out a long-term framework for the development of all facilities within the airport site, to protect future development and maintaining its primary role as an airport. In developing this Master Plan, a wide range of stakeholders including SoR personnel, airport leaseholders, airlines, State Government organisations and resource companies with activities and interests in the region were consulted to gain an understanding of their activity in the context of airport development.

Planning Context

The SoR is central to the resources boom that has been occurring within the Pilbara over the last 10 years. Many large resource companies are constructing and operating major oil, gas and minerals projects within the Shire. Resource construction and operational activity requires considerable workforces, which is largely provided on a Fly-in, Fly-out (FIFO) basis. As a result, a large number of transient workers make up the total population of the area and more specifically represent a higher proportion of airport users.

All relevant local and regional plans have been reviewed to ensure the development of the airport, in the future, suitably integrates with the planned development of the Shire of Roebourne, the Pilbara region and the State of WA as a whole. The Shire of Roebourne wishes to develop the airport to support the future vision for Karratha as set out in the Karratha City of the North Plan.

Existing Situation

The current runway is of sufficient length and width to accommodate all present and most expected future operations, although some strengthening would be required for regular use by Airbus A330 or similar wide-body aeroplanes.

The runway is supported by a parallel taxiway and connection to the RPT apron suitable for B767 aeroplanes. The Regular Public Transport (RPT) apron itself can currently accommodate up to four Boeing 737-800 aeroplanes on self-manoeuvring power-in power-out contact positions. There are also remote three positions for smaller jet aircraft used primarily by charter operators.

A General Aviation (GA) apron is located to the east of the RPT apron. It accommodates the based charter operator, Karratha Flying Services (KFS), the WA Police Air Wing and all visiting GA aircraft, including business jets.

Both Shell and Air BP provide fuel facilities at the airport. Fuel hydrant points are located within the apron at each of the four contact parking stands. The fuel hydrant system is currently serviced by Shell Aviation. AirBP provides fuel via trucks to aircraft not able to utilise the fuel hydrant system.

To the west of the RPT apron is a precinct occupied by helicopter operators. Aprons are located adjacent to each of the lease areas. Additionally there is parking available for itinerant helicopter operations adjacent.

Karratha Airport's passenger terminal is located on the northern side of the runway adjacent to the RPT apron. The building has a floor area of approximately 4,700m^2 and comprises of a separate arrivals and departures area, check-in hall and baggage reclaim area. The airport has checked baggage and passenger screening. The terminal also has a café and licenced bar with a seating area. Six rental car companies operate desks within the terminal, and four of these have bases adjacent the northern boundary of the airport site.

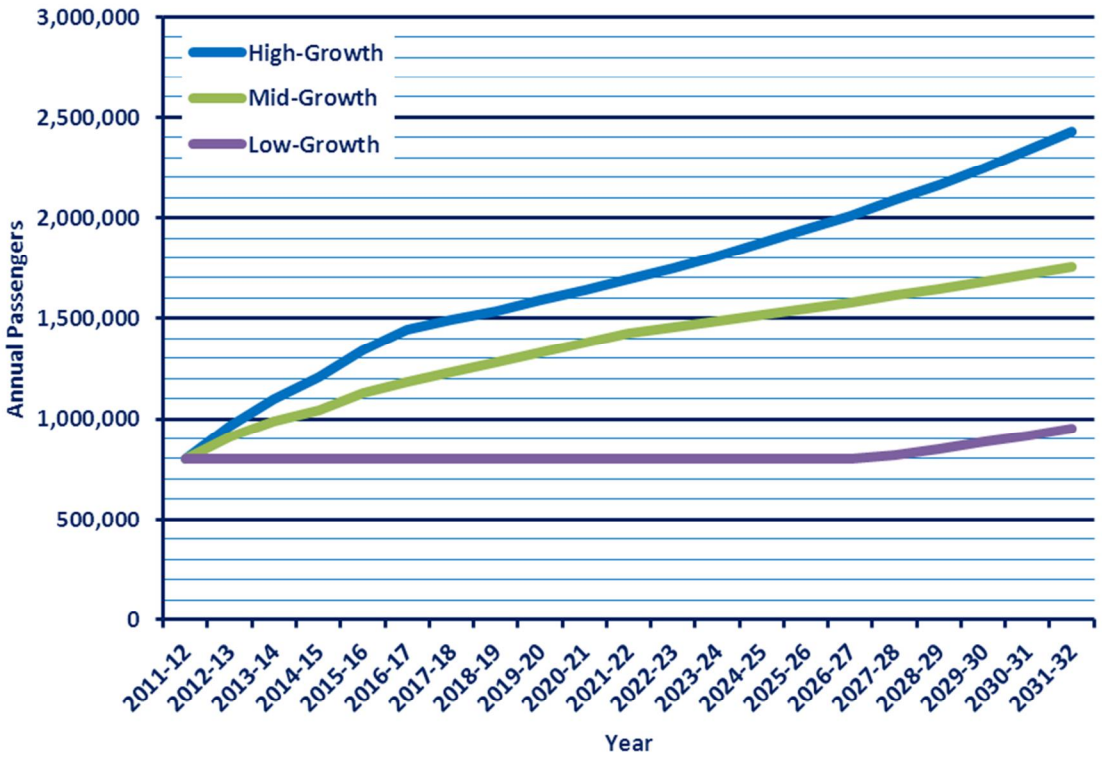
Outside the passenger terminal there is a passenger set-down and pick-up area and approximately 1,000 paid car parking spaces included within short- and long-stay, rental, bus and staff parking areas. Access to the airport is off the Dampier Highway along Bayly Avenue.

Aviation Activity Forecasts

Three overall growth scenarios representing low-, mid- and high growth have been developed to assist in determining the infrastructure requirements for the future Karratha Airport.. The forecasts were based on a range of assumptions regarding future resource-related projects in the area and the general growth of the region, derived primarily from consultations with stakeholders and review of other relevant documents, These forecasts are shown in Figure i. and indicate that in a high-growth scenario, Karratha Airport could be handling approximately 2.5 million passengers and 67,000 aircraft movements annually by 2031-32.Consistent with spatial safeguarding and budgeting objectives for the provision of facilities, the high-growth scenario has been considered as the most applicable with respect to infrastructure planning.

Some state-level industry projections foresee an overall decline for the Pilbara minerals and energy workforce as a result of a significant shift from construction to operational phases in a number of large projects. If this scenario eventuated, it may result in approximately static passenger numbers at Karratha over the next 15 years, until non-resource-related drivers eventually drive overall passenger numbers above current levels. Although this outcome is considered unlikely, a low-growth scenario representing it was incorporated in the forecasts. However, it is apparent that the workforce projections this is based on may not include some fundamental influences and drivers. A mid-growth scenario was therefore developed, which estimates approximately 1.8 million passengers at Karratha by 2031-32.

Figure i Forecast Passenger Traffic 2011-12 to 2031-32



Aeronautical Development Concept

Based on a set of critical planning parameters the airside infrastructure required to support the forecast aircraft operations and passenger movements consistent with the high-growth forecast scenario was assessed.

Capacity increases for the existing passenger terminal building (beyond the current refresh project) and for the RPT apron will be required. Some further capacity increases are possible, however there is only limited space available for expansion of both the passenger terminal and RPT apron, due to the proximity of existing GA operations to the east and west. Following maximisation of the capacity of either the passenger terminal or RPT apron, or both, the Master Plan safeguards an area to the south of the runway for the relocation of all passenger operations. General aviation facilities, including helicopter operations, are proposed to remain on the north side and be expanded as required, potentially utilising the existing RPT terminal and apron infrastructure.

As well as providing sufficient space for the expansion of the required aeronautical infrastructure, development of the passenger facilities to the south of the runway will also offer a commercial advantage for the development of the available airport land to the south of the runway.

The existing single runway is considered to have adequate capacity for operations at Karratha Airport into the future. The Master Plan also proposes a 220 metre runway extension to a total of 2,500 metres to accommodate medium- to long-haul international operations by 168 to 335 seat jet aircraft, along with incremental upgrade and expansion of the taxiway and apron network to support the development of further general aviation operations and aviation support businesses.

Planning Implications

The consideration of airport noise impact is an important factor in the development of this Master Plan. 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 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. An ANEF contour plan for Karratha Airport has been prepared based on the forecast number of movements to 2031-32.

'Number above', or 'N', contours have also been produced for Karratha Airport based on the 2031-32 forecast traffic, these illustrate the average number of events per day louder than 60Db(A) and 70Db(A).

The Master Plan also sets out requirements and restrictions that should be considered in relation to new development on the airport site and the land surrounding the airport site, to ensure that airport development and operations are not restricted. A building height restrictions plan, a bird and wildlife hazard plan and a lighting restrictions plan have all been developed.

Non-Aeronautical Development Concept

The Master Plan proposes the commercial development of available airport land that is not required for future aeronautical infrastructure to assist with generating non-aeronautical revenue streams through planning for the highest and best use of the airport site. Revenue raised through the use of non-aeronautical land can be used to contribute towards major capital investments at the airport and within the community.

A number of potential business activities and resultant land uses for the available land have been identified by the Master Plan through consideration of the gaps and opportunities in Karratha and the Shire as a whole. These land uses include aviation-support, aviation-related and non-aviation-related, as well as aeronautical.

An ultimate land use plan for the overall airport site has been developed. The plan identifies the commercial development of the available land to the north of the runway initially, expanding on the existing activities already located there. Business activities are anticipated to be largely aviation-related with potential for some non-aviation retail and/or commercial.

The Master Plan also sets out proposed land uses for the available land south of the runway, these are also comprised of aviation and non-aviation commercial uses. Commercial land development to the south of the runway is not necessarily dependent on the development of RPT passenger operations in this location, this should occur as demand requires. However, locating passenger operations to the south of the runway would likely assist in attracting a wider range of commercial activities to the area.

Commercial land should be developed as demand arises and in relation to other available commercial land within Karratha. The Master Plan has been developed to integrate with the overall long-term strategic development plan for Karratha and should not detract development away from other areas.

Ground Transport

The Master Plan includes proposals for the development of surface access arrangements to the airport site to serve the proposed development.

Highway access to the site will continue to be via Bayly Avenue from the Dampier Highway. The existing car parking and terminal access provision is anticipated to have sufficient capacity for a number of years with the potential for some further expansion to support future increases in capacity of the passenger terminal beyond the current refresh project. However, capacity at this location will potentially become restricted due to the surrounding development.

Commercial development to the south of the runway will be facilitated by a new intersection with the Dampier Highway. This will also serve passenger operations to the south of the runway in the future including access to the passenger terminal building and associated car parking facilities. In line with the Karratha City of the North Plan (KCNP), the Master Plan assumes an alternative access route to the east of the airport will be developed along the alignment of the existing Millars Road, which connects with Balmoral Road in Nickol West.

1.0 INTRODUCTION

Karratha Airport is a key asset of the Shire of Roebourne (SoR) that provides a vital economic and social service to the area. SoR wishes to be in a position to manage and develop its airport infrastructure in a manner that is commensurate with the expected growth of aviation activity over the next 20 years. REHBEIN Airport Consulting was commissioned by the Shire of Roebourne to prepare a detailed Master Plan and long-term Land Use Plan for Karratha Airport to achieve this strategic planning goal.

1.1 PURPOSE OF AN AIRPORT MASTER PLAN STUDY

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 effect of current decisions. Local government, industry and the community are informed of these intentions through the master plan, enabling compliant and compatible land-use planning and maximisation of any synergies across the local economy.

Master plans are not only developed to strategically guide the development of aeronautical-related aspects of the airport but also used to identify non-aeronautical opportunities for development. Airports are not merely pieces of infrastructure but businesses in their own right. Appropriate consideration and integration of aeronautical, aviation-support, aviation-related and compatible non-aviation land uses is key to guiding the successful development of an airport.

Consistent with these strategic considerations, the Airports Act 1996 summarises 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.

Although the Airports Act 1996 does not have statutory application to Karratha Airport, this does not reduce the relevance of these four key aims. The SoR has adopted a best practice model in conducting this detailed Master Plan Land Use Plan for Karratha Airport.

1.2 PLANNING OBJECTIVES

The Shire of Roebourne has identified several further specific objectives in commissioning the Master Plan, these are the desire to:

- Balance economic benefit, social and environmental impact;
- Ensure legislative requirements are considered and adhered to;
- Understand the future capacity requirements of the airport;
- Ensure the airport can meet the forecast air traffic demand over the next 20 years, whilst observing the required regulatory and policy settings for the airport;
- Develop infrastructure proposals that will satisfy the air transport needs of all sectors of the local economy;

- Maintain the airport as a major contributor to the regional economy and assist in the generation of regional economic growth;
- Allocate and assign land based on highest and best use principles, in keeping with the Shire's overall business objectives;
- Develop a staged implementation plan for possible airport development;
- Incorporate SoR's aspirations for Karratha Airport to have international capabilities and status;
- Implement and maintain appropriate risk management processes; and
- Seek key stakeholder support including the airlines.

1.3 METHODOLOGY

The Master Plan process has involved a series of interim studies, preliminary work and preparation for this Master Plan and Land Use Plan commencing with an airport site options assessment.

1.3.1 SITE OPTIONS ASSESSMENT

The airport site options assessment considered of a number of possible airport sites for the future development of Karratha Airport to meet SoR's growth aspirations and operational requirements. Three possible candidate sites for the long-term location of Karratha Airport were assessed in relation to their technical merits and potential costs. The existing airport site was considered technically suitable for the long-term development needs of Karratha Airport and the cost of replicating the existing infrastructure at any other site is likely to outweigh any advantages other sites may offer. It was therefore recommended that the Karratha Airport Master Plan be developed on the basis of the existing Karratha Airport site.

1.3.2 BACKGROUND REVIEW

The background review provided a contextual basis for the development of the Master Plan and Land Use Plan. It identified future opportunities for development and forecasts of aviation activities which were used as a direct input to the development of the Master Plan and Land Use Plan.

1.3.3 DETAILED MASTER PLAN AND LAND USE PLAN

The detailed Master Plan and Land Use Plan was developed subsequent to the background review and initially involved an assessment of the required future aeronautical infrastructure and the development of conceptual layouts of this infrastructure. Following the development of and Australian Noise Exposure Forecast (ANEF) noise model and applicable building height restrictions, the remaining available land was identified for various aviation-related and non-aviation commercial land uses. An overall ultimate land use plan for the airport site was then prepared.

1.3.4 IMPLEMENTATION PLAN

An implementation plan was developed to assist the SoR to realise the proposals set out within the detailed Master Plan and Land Use Plan. A priority list of future projects and anticipated staging for developments was provided, based on trigger points, together with estimated capital costs.

1.4 STAKEHOLDER CONSULTATION

Stakeholder consultation has been undertaken with a range of airport stakeholders to inform the study. Initially SoR Councillors, including the SoR Airport Advisory Group (AAG), and SoR officers were consulted to understand their objectives for the airport and define its strategic direction. Following this, a number of key external stakeholders were consulted to provide a basis for the development of the aviation activity forecasts. These included resource companies with construction and/or operational activities in the area, state government organisations, and incumbent airlines. Discussions were largely focussed on current and future workforce requirements within the area to assist in the definition of future aviation activity at Karratha Airport. Consultation was undertaken in Karratha, Perth and by telephone.

Following development of the detailed master plan and land use plan infrastructure layout and land use concepts, the SoR AAG was again consulted to discuss and agree on the proposals.

A complete stakeholder consultation schedule can be found at Appendix A.

This Preliminary Draft 2013 Master Plan and Land Use Plan will now be provided to SoR Councillors for their review and comment. When approved, this report will be put on public exhibition for 28 days before being finalised.

2.0 PLANNING CONTEXT

The following sections set out the planning context for the development of the Karratha Airport Master Plan and Land Use Plan.

2.1 SHIRE OF ROEBOURNE

The Shire of Roebourne is a Local Government Area in the Pilbara region of Western Australia. The Shire of Roebourne covers approximately 16,000 square kilometres and includes the towns of Karratha, Dampier, Roebourne, Wickham, Cossack and Point Samson. Karratha is the administrative and service centre of the Shire providing retail, commercial, educational and health services to the Shire population.

2.1.1 ECONOMY

The Shire of Roebourne is central to the resources boom that has been occurring in the Pilbara region over the last 10 years which has been driven by significant growth in China, Australia's key trading partner. The Pilbara contributes approximately 53% of the total value of minerals and petroleum in WA[1]. Over $200 billion of minerals and energy projects are committed or under consideration in the West Pilbara[2] including mainly iron ore and related infrastructure projects. The Carnarvon Basin is located approximately 190 kilometres north west of Karratha in the Indian Ocean. It is the location of significant natural gas reserves and gas fields which are currently being exploited. It is the largest gas reserve in Australia with approximately 95.5 Trillion Cubic Feet (TCF).

Many large resource companies are constructing and operating major oil, gas and minerals projects within the Shire. Dampier is located approximately 20 kilometres from the centre of Karratha and is a major export harbour. Iron ore, salt and natural gas are shipped from here to international ports. It is also the location of the Pluto LNG processing plant, processing product piped from gas fields in the Carnarvon Basin.

The recent softening in the iron ore price, in 2012, as a result of the slowdown in the Chinese market has resulted in a number of planned or considered resource and related infrastructure projects being pushed back a number of years. However, recent indications show that the Chinese manufacturing sector has begun to once again expand and the Chinese economy is beginning to turn around. In 2013 the iron ore price firmed again which could see a re-emergence of resource projects in the Pilbara. Forecasts indicate that WA's minerals and energy sector remains positive, despite recent fluctuations in commodity prices and it is acknowledge these resource activities are long term projects. State wide the mineral and energy workforce required is anticipated to peak in 2014[3]. Following this, employment in the sector will decrease as the current wave of construction activity, which requires a larger workforce, gives way to operations with it smaller workforce. This shift from construction phase to operational phase is already occurring in the SoR, with overall workforce numbers anticipated to decline from 2012[4].

As well as iron ore and gas, a small number of niche resource sectors are also developing in the area including the production of liquid ammonia fertiliser and algae bio-mass. Salt also continues to be produced and exported from the Karratha area.

The Shire of Roebourne's local Gross Regional Product (GRP) resulting from industry in 2011 was $2,669 million. The local GRP resulting from residents was $1,362 million[5]. There has been 288% growth in GRP over the last 10 years and 97% growth in the last 5 years. In 2011 the largest industry by employment was construction whereas the largest industry by value and output was mining.

[1] Source: DMP
[2] Source: ABARE August 2011
[3] Source: Source: WA State Growth Outlook, November 2012, Chamber of Minerals and Energy
[4] Source Pilbara Population and Employment Study, November 2012, Chamber of Minerals and Energy
[5] Source: Shire of Roebourne

Resource construction and operational activity requires a considerable workforce which is largely provided on a Fly-in, Fly-out (FIFO) basis, particularly for construction workforces. This has brought a significant number of additional people to the region, who are largely accommodated in worker camps that are located throughout the area. Operational workforces are estimated to still rely heavily on FIFO workforces; however, on average it is thought that 20% are Karratha residents. These FIFO and operational workforces create additional indirect impacts on the local economy as they and their families require support and services including retail trade, health, and education.

As is evident, the SoR's economy is heavily reliant on the resource sector. However, the SoR and other local and state organisations have recognised this and are beginning to take steps towards encouraging other business to the area and diversify the economy for a sustainable future in the area.

2.2 POPULATION

In 2011 the SoR's Estimated Resident Population (ERP) was almost 24,000[6]. SoR's ERP has seen growth of approximately 6.7% over the last 10 years. However, the ERP is not a true reflection of the total number of people the Shire of Roebourne serves and supports. The significant FIFO workforce makes up a significant proportion of the population which is not necessarily reflected in the ERP. The 2011 Census night data indicates that the total enumerated population in the Shire of Roebourne was 30,000 people, while the resident population was approximately 23,000. This indicates a possible total FIFO or transient workforce of approximately 7,000 people at any one time in the SoR.

The SoR therefore has a high "service" population, which means the services, facilities and infrastructure within the area needs to be capable of supporting all of these people rather than just the resident population.

One significant implication of the recent population growth is a shortage in accommodation. This has had an impact on accommodation prices. This results in difficulties attracting new businesses to locate to the area and limits attempts to diversify the economy.

2.3 INTEGRATION WITH OTHER PLANS AND PROJECTS

As part of the development of this Master Plan, all relevant local and regional plans have been reviewed to ensure the development of the airport, in the future, suitably integrates with the planned development of the town of Karratha, the Pilbara region and the State of WA as a whole.

The Shire of Roebourne wishes to develop the airport to support the future vision for Karratha as set out in the Karratha City of the North Plan. The commercial development of the airport in particular aims to complement the proposed development in other areas of the town, including the CBD and Gap Ridge, rather than compete against it.

In particular, the Airport Land Use Plan is an exercise in allocating land reserves and precincts on the site. This plan demonstrates the possible future sites uses, layouts and configurations that could occur. The plan is an indication and reservation of the land for aviation and non-aviation related uses. Each use will be further developed and tested to confirm its viability and commercial benefits before any development proceeds.

The following sections set out the key strategic plans and projects to the airport development.

2.3.1 KARRATHA CITY OF THE NORTH PLAN

The WA State Government's 'Pilbara Cities' vision includes a goal for Karratha to become a regional city of 50,000 residents by 2035. The vision for Karratha is for it to become a liveable, compact regional city with a diversified economy and a healthy local community which demonstrates demographic balance. The Karratha City of the North (KCN) Plan delivers a shared vision of the State Government and the SoR and provides a planning framework to assist in achieving this vision.

[6] Source: Australian Bureau of Statistics

The KCN Plan will guide the development of future housing, open spaces, commercial activities, tourist accommodation, entertainment and retail areas, as well as service infrastructure, transport, education, and community facilities. The Karratha Airport Master Plan and Land Use Plan has been developed in line with the KCN Plan and its objectives, taking into consideration the city growth plan and the infrastructure that is included within it.

2.3.2 SHIRE OF ROEBOURNE TOWN PLANNING SCHEME NO. 8

The Shire of Roebourne Town Planning Scheme No. 8 was originally gazetted on 22 August 2000.

The existing Town Planning Scheme No. 8 reserves the airport site for 'public purpose'. The land surrounding the airport site is largely zoned as 'rural' with an area to the east zoned as 'conservation, recreation and natural landscapes'. The airport site is bordered by the Dampier Highway to the west. Beyond this, a corridor of land is zoned as 'infrastructure' and to the south west is an area zoned as 'strategic industry' which encompasses the Gap Ridge Industrial development.

This scheme is now in the process of being redeveloped by the Shire of Roebourne. The land use outputs of the Karratha Airport Master Plan and Land Use Plan will inform the new Town Planning Scheme.

2.3.3 STATE AVIATION STRATEGY

At the time of writing this report the WA Government did not have a strategic aviation policy. This policy is currently in development and in March 2012, the WA State Aviation Strategy Issues Paper was released. The purpose of the Issues Paper was to initiate debate and discussion amongst stakeholders, as to the key issues faced by the WA aviation industry now and in the future, which will inform the development of the State Aviation Strategy (SAS).

The SAS's vision is for Western Australia to have a world-class aviation network and infrastructure that supports and promotes the State's economic and social development. Its objectives are:

- To support the economic and social development of Western Australia through the provision of safe, affordable, efficient and effective aviation services and infrastructure; and
- To provide a sound framework for policy setting, and future planning and investment in Western Australian international and domestic air services and airport infrastructure.

At the time of writing, the draft SAS is still awaiting Government approval for the release for public comment.

2.3.4 KARRATHA AIRPORT MASTER PLAN 2009

An Airport Master Plan for Karratha Airport was prepared in 2009. The 2009 Master Plan developed a 20 year plan for the airport including infrastructure upgrades over the short-, medium- and long-term. The Master Plan forecast 1.35 million passengers per annum in 2027-28 in a high-growth scenario. For 2011-12, 834,330 million passengers per annum were forecast. As a result of the continuation of the increased growth in the resource sector and the announcement of the Pilbara Cities of the North Plan, passenger numbers have continued to grow at an exceptional rate. As a result passenger numbers in 2011-12 of 798,301 RPT and charter passengers, plus approximately 53,000 helicopter passengers, are above those predicted by the high growth passenger forecast of the 2009 Master Plan. This new Master Plan is therefore being developed on account of the recent growth and further proposed investment in airport infrastructure.

2.3.5 TERMINAL REFRESH PROJECT

A terminal upgrade project was commissioned in October 2012 by SoR and is being run concurrently with this Master Plan and Land Use Plan project. The terminal refresh project is intended to address current shortfalls and operational issues of the building and provide a new look and feel to the terminal whilst remaining within the existing terminal footprint. This should provide, as a minimum, approximately an additional 7.5 to 10 years of life to the terminal. The outcomes of this Master Plan and Land Use Plan will feed into the terminal refresh project.

2.4 KARRATHA AIRPORT

Karratha Airport is owned and operated by the Shire of Roebourne (SoR). The land on which the airport site is located covers a total of 722 hectares and is a Reserve leased from the State of WA with management vested in the SoR for use as an airport. The primary function of the airport is to provide RPT and charter services to Perth and other major capital cities largely for the workforces employed in the resource industry in the area on a FIFO basis but also for residents, visitors, tourists and contractors. The airport is also the base for a number of helicopter operators that support offshore resource industry activities as well as charter operator Karratha Flying Services and the WA Police Air Wing.

2.5 HYDROLOGY

The Karratha Coastal Vulnerability Study (KCVS) (August 2012) was undertaken by JDA Consultant Hydrologists and was overseen by a Steering Committee that included the Department of Water, the Department of Transport and the Department of Planning.

The KCVS was prepared to assist the State Government and the SoR in developing land above the predicted future flood levels to achieve the shared vision for Karratha to be transformed into a vibrant city with a permanent population of 50,000 by 2035 as set out in the Karratha City of the North Plan.

The Study considers the combined impact of flood from rainfall and storm surge. The report is not a statutory document. However, the report's findings will be considered by statutory agencies in assessing future development proposals under the Shire of Roebourne's Town Planning Scheme and the WAPC's Statement of Planning Policy 2.6.

The airport site is located in a low-lying coastal area with salt flats to the west and tidal mud flats to the east adjoining the Indian Ocean. The 1 in 100 year flood mapping provided by the KCVS has been used as the basis for development proposals within this Master Plan.

2.6 CULTURAL & HERITAGE

The Ngarluma people are the original inhabitants of the coastal areas around Roebourne including Karratha and the Dampier Peninsula. The Ngarluma Aboriginal Corporation (NAC) is the prescribed body corporate for the Ngarluma Native Title holders.

As advised by the Department of Premier and Cabinet the airport reserve is unencumbered by native title. In preparing this Master Plan, there are not known to be any specific cultural and heritage issues relating to the airport site.

2.7 REGULATORY CONTEXT

The Civil Aviation Safety Authority (CASA) is the statutory authority that conducts the safety regulation of civil aviation operations in Australia, including the regulation of certified and registered aerodromes. The Manual of Standards (MOS) - Part 139 Aerodromes is made pursuant to Civil Aviation Safety Regulations (CASR) Part 139. CASR Part 139 sets out the regulatory regime for aerodromes used by aeroplanes conducting air transport operations. The MOS sets out the standards and operating procedures for certified, registered aerodromes and other aerodromes used in air transport operations. The existing facilities and any proposed future facilities included within the Master Plan must comply with the MOS.

The Aviation Transport Security Act 2004 establishes a regulatory framework to safeguard against unlawful interference with aviation. To achieve this purpose, the Act establishes minimum security requirements for civil aviation in Australia by imposing obligations on airport operators. The existing facilities and any proposed future facilities must comply with the Aviation Transport Security Regulations 2005 made under the Aviation Transport Security Act 2004.

3.0 EXISTING SITUATION

The following sections provide a summary description of the existing main infrastructure components and activities at the airport. Figure A at Appendix B shows these facilities.

3.1 AIRFIELD FACILITIES

3.1.1 RUNWAY 08/26

Runway 08/26 is 2,280 metres long and 45 metres wide with 7.5 metre wide shoulders. It has an asphalt surface which is grooved. In March 2009, the runway was extended and upgraded. As a result of this work the surface condition is reported to be very good. The runway has a pavement classification number (PCN) of 53/F/B/1500/T, which is suitable for aircraft similar to the Boeing 737-800 and Airbus A320 plus the Boeing 767-300 but not the A330-300.

Runway 08/26 sits within a runway strip that is 2,400 metres long. The AIP-ERSA indicates that the runway has a 300 metre wide runway strip, which makes the runway suitable for precision approach Code 4 operations.

90 metre by 90 metre runway end safety areas (RESA) are located at each end of the runway.

3.1.2 TAXIWAYS

The following points describe the taxiways at Karratha Airport:

- Taxiway A provides access between Taxiway F and the GA apron. It is 15 metres wide and is suitable for use by Code C aircraft with a wheelbase less than 18 metre.
- Taxiway B is the main taxiway that links the runway to the RPT apron. It is 23 metres wide with 7.5 metre wide shoulders and is suitable for Code D aircraft.
- Taxiway C provides access between Taxiway F and the eastern side of the Woodside helicopter apron. It is 6.5 metres wide and rated at 12,000 kilograms
- Taxiway D provides access between Taxiway F and the western side of the Woodside helicopter apron. It is 6.5 metres wide and rated at 12,000 kilograms
- Taxiway E connects Taxiway F to the runway at the eastern end. It is 23 metres wide with 7.5 metre wide shoulders and suitable for Code D aircraft.
- Taxiway F is the main parallel taxiway. It extends from the threshold of Runway 08 to approximately 465 metres from the threshold of Runway 26. It is 23 metres wide with 7.5 metre wide shoulders, which is suitable for use by Code D aircraft. The taxiway is used by fixed-wing aircraft taxiing to and from the runway. It is also used by helicopters for landing and take-offs during daylight hours of operations.
- Taxiway G provides access between Taxiway F and the western helicopter apron. It is 9.5 metres wide and rated at 12,000 kilograms
- Taxiway H links Taxiway K to the eastern part of the Bristow apron. It is 9.5 metres wide and rated at 12,000 kilograms
- Taxiway I (yet to be constructed) will link Taxiway K to the western part of the Bristow apron. It will be 9.5 metres wide and rated at 12,000 kilograms
- Taxiway K is a parallel taxiway and connects the RPT apron to the western helicopter apron, it intersects taxiway C, D and G. It is 9.5 metres wide and rated at 12,000 kilograms
- Taxiway L connects Taxiway F to the Runway 08 threshold. It is 23 metres wide with 7.5 metre wide shoulders and suitable for Code D aircraft.

3.1.3 APRONS

RPT Apron

The terminal is served by a sealed RPT apron which measures 230 metres by 145 metres. There are four power in, power out parking stands marked on the apron against the terminal building. These can accommodate aircraft up to Boeing 737-800 or Airbus A320 aircraft. There is also a secondary parking stand on the east of the apron for Boeing 767-300 aircraft.

There are a further three remote aircraft parking stands on the south side of the apron. This apron area is not currently part of the security screened apron and is primarily utilised by itinerant charter operators or as overflow parking. One of the three bays is a secondary parking position for a Boeing 767-300 aircraft.

Fuel hydrant points are located within the apron at each of the four aircraft parking stands fronting the terminal building.

The March 2012 Aerodrome Technical Inspection (ATI) report indicates that the apron is in good condition.

GA Apron

A General Aviation (GA) apron is located to the east of the RPT apron. It has a sealed surface and has a total area of approximately 28,000m^2. This apron accommodates all visiting GA aircraft, including business jets. The based charter operator, Karratha Flying Services (KFS), also park their aircraft on this apron.

There are also a number of helicopter parking stands which are currently used by Bristow, however this arrangement will soon be changing as Bristow relocate their passenger processing on completion of their new hangar.

Helicopter Aprons

Aprons are located adjacent to each of the helicopter operator lease areas to the west of the RPT apron. Additionally there is parking available for itinerant helicopter operations adjacent to the wash down bay.

3.1.4 VISUAL AND NAVIGATIONAL AIDS

Markers, Markings Signals and Signs

The runway strip is marked with standard white gables markers. Pavement markings in accordance with MOS are provided on the pavements as required.

There are three wind direction indicators (WDI). The ground signal area is located to the east of the GA apron.

Lighting

Runway 08/26 has Low Intensity Runway Lighting (LIRL) and a Precision Approach Path Indicator (PAPI). Lights are also provided on the taxiways. Lighting is controlled by Aerodrome Frequency Response Unit (AFRU) outside of published tower operational hours, the AFRU when initiated turns on the runway, taxiway, PAPI's, WDI's and 30 metre apron lighting towers, additionally there are two 20 metre light towers to the east and west of the terminal that are controlled by photoelectric cells.

The lighting control cubicle is at the western end of the terminal adjacent to the Ground Servicing Equipment (GSE) storage area there is an interface between the lighting cubicle and the control tower

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).

3.1.5 AIR TRAFFIC MANAGEMENT

The existing control tower is operated by Airservices Australia and is located to the east of the passenger terminal building. The Karratha tower provides air traffic services within Class D and E airspace below 5,500 feet Above Mean Seal Level (AMSL) during tower hours. The tower's operational hours (utc) are Monday to Friday 2245 to 1130, Saturday 2245 to 0645 and Sunday 0000 to 1130. Outside of tower hours, Karratha Class D and E airspace becomes Class G. Melbourne Centre operates Karratha Class E airspace above 5,500 feet AMSL at all times.

3.1.6 FUELLING FACILITIES

Both Shell and Air BP provide fuel facilities at the airport. They each have separate fuel facilities, both are located to the north of the car parking, on the northern boundary of the airport site.

Fuel hydrant points are located within the apron at each of the four aircraft parking stands fronting the terminal building. The fuel hydrant system is currently serviced by Shell Aviation. AirBP provide fuel via trucks to RPT and GA aircraft not able to utilise the fuel hydrant system.

A fuel corridor, including underground fuel pipelines, runs between the fuel farms and RPT apron.

3.2 PASSENGER TERMINAL

Karratha Airport's passenger terminal is located on the northern side of the runway adjacent to the RPT apron. The building has a floor area of approximately 4,700m^2 and comprises of a separate arrivals and departures area, check-in hall and baggage reclaim area. The check-in hall is equipped with common user check in desks. A small Qantas lounge is located behind the check-in area.

The airport has checked baggage and passenger screening. A single passenger screening point is located between the landside concourse and the departure lounge. A baggage make-up area is located behind the check-in desks and includes checked baggage screening equipment. Two baggage claim belts are located within the arrivals area of the terminal building.

The terminal also has a café and licenced bar with a seating area. This is operated by SoR. Six rental car companies operate desks within the terminal.

3.3 GENERAL AVIATION FACILITIES

3.3.1 HELICOPTER OPERATORS

Karratha Airport is home to substantial helicopter operations. To the west of the terminal building Woodside Energy, Bristow Helicopters, CHC Helicopters and Helicopters Australia each have a lease area with hangars and apron areas. All of these helicopter operators support the activities of the resource industry, in particular offshore oil and gas activities.

3.3.2 KARRATHA FLYING SERVICES

Karratha Flying Services are a based charter operator at the airport and are located on Lots 7 and 8 to the east of the main passenger terminal building. They have a total of 8 aircraft with the largest aircraft holding 17 passengers. They operate charter services largely in support of the resource activities in the area. They process their passengers through their own hangar/passenger facility.

3.3.3 WA POLICE WING

The WA Police Air Wing has a base at the airport located on a lot to the east of the passenger terminal building. The Police Air Wing supports frontline police through deployment of police personnel, crime detection and prevention, search & rescue and medical transfers. The Air Wing has a Pilatus PC12 aircraft based at the airport. The WA Water Police also operate from this site.

3.3.4 OTHERS

There are a number of other lease areas on the airport with airside access. These are used for a number of purposes including private aircraft storage and airfreight handling.

3.4 GROUND ACCESS

Outside the passenger terminal there is a passenger set-down and pick-up area and approximately 1,000 paid car parking spaces included within short- and long-stay, rental, bus and staff parking areas.

Four car rental companies also have bases on the airport site against the northern boundary of the site. These include office space, car preparation and storage area. Some areas of vacant land and parking areas are used for rental vehicle overflow parking.

Access to the airport is from the Dampier Highway which connects Dampier with Karratha. Bayly Avenue provides access from Dampier Highway to the passenger terminal, car parks and other airport facilities.

3.5 ENVIRONMENT

The airport site is largely cleared of vegetation as such most of the uncertainty with respect to flora and fauna is considered to have been removed. There are not thought to be any environmentally sensitive issues on the airport site, therefore, no baseline environmental assessments were considered necessary to be undertaken at the master planning stage.

The situation with respect to environmental impacts of proposed development should be confirmed through appropriate investigations as part of feasibility assessments to ensure any impacts are kept to an acceptable level.

4.0 AVIATION ACTIVITY

Passenger and aircraft movement forecasts provide the basis for the planning of many aspects of the airport development. Historical aviation activity has firstly been assessed, followed by a thorough review of the key drivers of the activity at the airport currently and in the future to allow a prediction of aviation activity to be forecast.

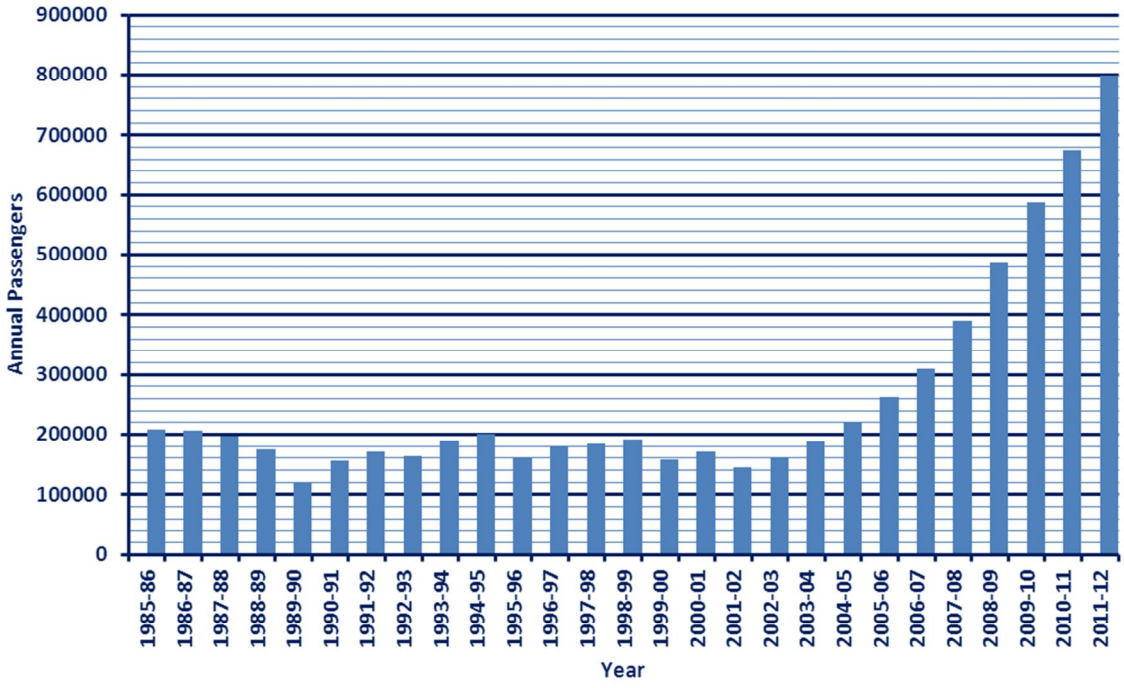
4.1 HISTORICAL AVIATION TRAFFIC

4.1.1 PASSENGER TRAFFIC

RPT & Charter

Passenger numbers including both Regular Public Transport (RPT) and charter passengers at Karratha Airport have increased from 207,458 in 1985-86 to 798,301 in 2011-12. This is shown in Figure 1. Over the entire 27-year period this is equivalent to a compound annual growth rate of 5.3%.

Figure 1: Historical RPT & Charter Passenger Traffic 1985-86 to 2011-12



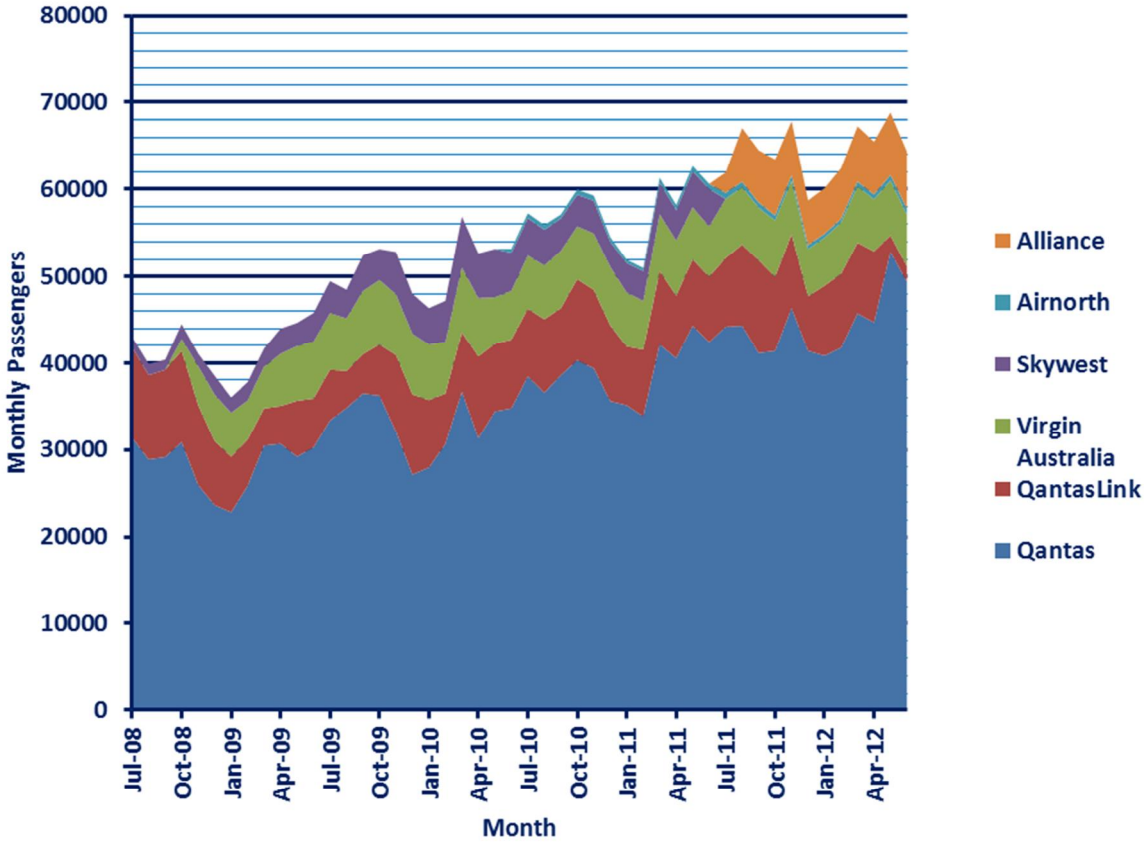
Source: Shire of Roebourne, BITRE

However, it is clear from Figure 1 that all of this considerable growth has occurred in the last 10 years, which has seen passenger traffic at Karratha Airport increasing from 144,885 passengers in 2001-02 to 798,301 passengers in 2011-12. This is equivalent to a compound annual growth of 18.3% over the decade. This growth can largely be attributed to the boom in the resource industry in the Pilbara region and the proliferation of the use of a fly-in, fly-out (FIFO) workforce for projects in the area. It is estimated that approximately 75% of all passenger traffic at Karratha Airport is directly related to resource activities in the area including FIFO workers, and contractors.

Based on available passenger information for the period July 2008 to June 2012, between 78% and 86% of all RPT passengers were carried by Qantas or QantasLink with the remainder carried by a number of other airlines. Figure 2 shows monthly RPT passengers by airline. Virgin Australia accounts for a much smaller proportion of the total passengers. In April 2013, Virgin Australia's purchase of 100% of Skywest has been approved

Figure 2 also indicates that there is a cyclical component to the traffic, with lower passenger numbers in December, January and February than for the rest of the year. This aligns with hottest three months of the year which form the main cyclone season. This period is when typically many workers leave town as well as being a holiday period for business. Figure 2 also demonstrates an increase in Alliance passengers and a decrease in Skywest passengers since July 2011. This is attributable the transfer of contracts from Skywest to Alliance at this time.

Figure 2: Monthly RPT Passenger Traffic by Airline



Source: Shire of Roebourne

Helicopter

Significant helicopter operations occur at Karratha Airport. In 2011/12 a total of 53,035 passengers were carried by helicopters in addition to the RPT and charter passengers shown in Figure 1 and Figure 2. Helicopter operations from the airport largely support offshore oil and gas activities, transporting passengers arriving into Karratha on RPT services out to the Carnarvon Basin. Figure 3 summaries the helicopter passengers passing through the airport by operator since 2008-09. There has been an annual average growth of approximately 9.5%. The transfer of the Woodside contract from Bristow to CHC accounts for the significant shift of operations between these two operators between 2010-11 and 2011-12.

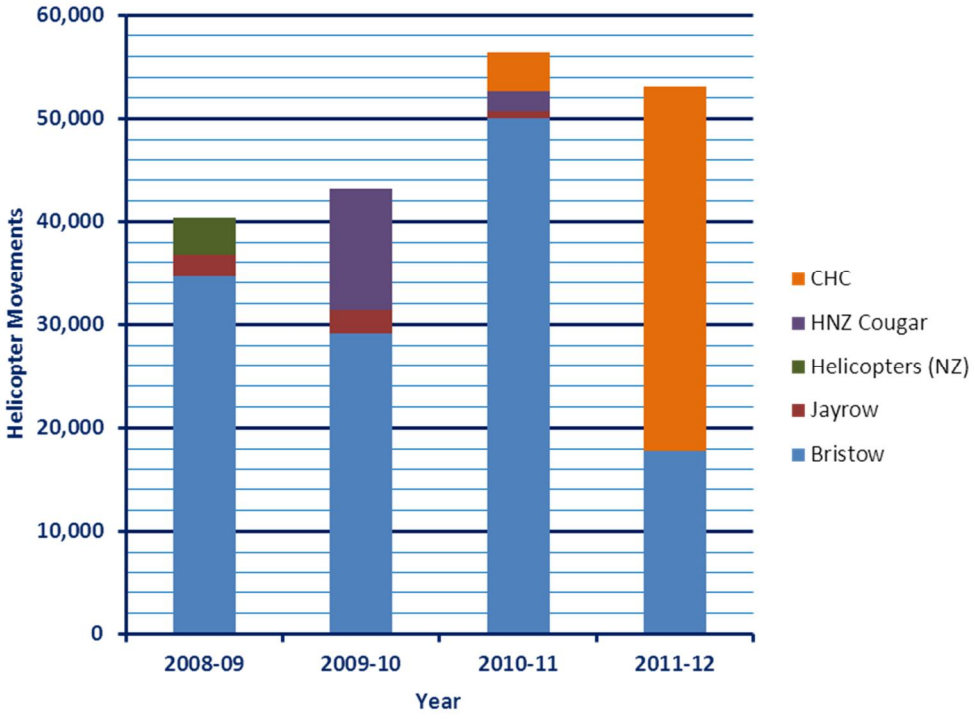
4.1.2 AIRCRAFT MOVEMENTS

Based on aircraft movement data[7] for Karratha Airport, there were 29,842 aircraft movements in 2011-12. Figure 4 shows that aircraft movements grew approximately 6.5% between 2009-10 and 2010-11, then in 2011-12 returned to approximately the same level as 2009-10. Qantas changed a number of the aircraft

[7] Provided by Avdata.

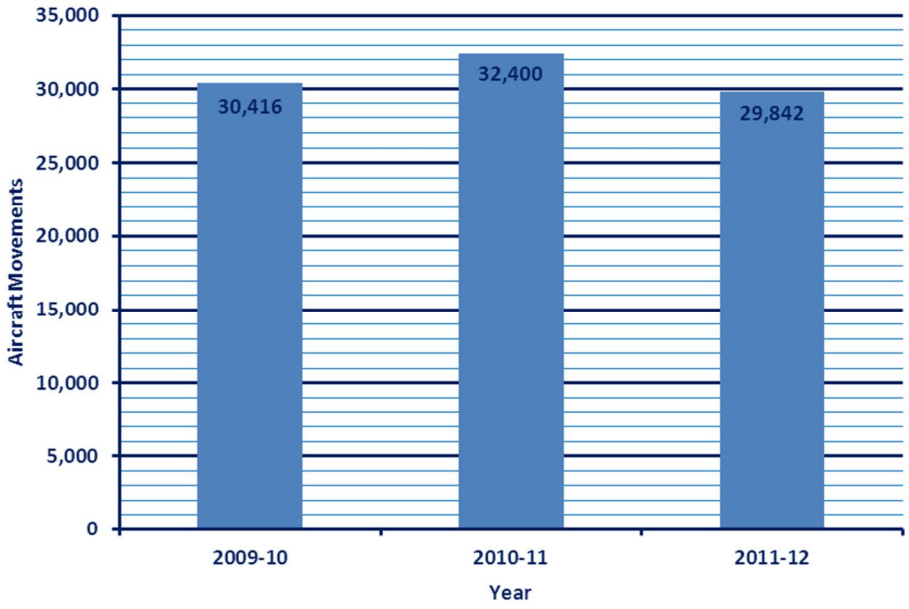
used to service Karratha from Boeing 717 to Boeing 737-800 in 2011-12. The B737-800 has a greater seating capacity therefore fewer flights can be made whilst maintaining the same number of available seats. This change may therefore have had an impact on aircraft movements. There were also changes in aircraft movement recording methodology when the ATC tower opened, particularly in relation to night-time helicopter operations that may no longer be captured within the data from 18 November 2010 onwards.

Figure 3: Helicopter Passengers by Operator



Source: Shire of Roebourne

Figure 4: Historical Aircraft Movements



Source: Avdata

By analysing the available aircraft movement data it has been possible to estimate, based on the registered operator of the aircraft, the type of activities undertaken by aircraft operating into Karratha Airport. Figure 5 shows the proportion of movements by type of activity in 2011-12.

RPT aircraft movements currently contribute approximately 29% of total aircraft operations at Karratha Airport. Qantas, QantasLink, Virgin Australia, and Alliance all operate services between Karratha and Perth. Approximately 92% of all RPT services are operated on the Perth route.

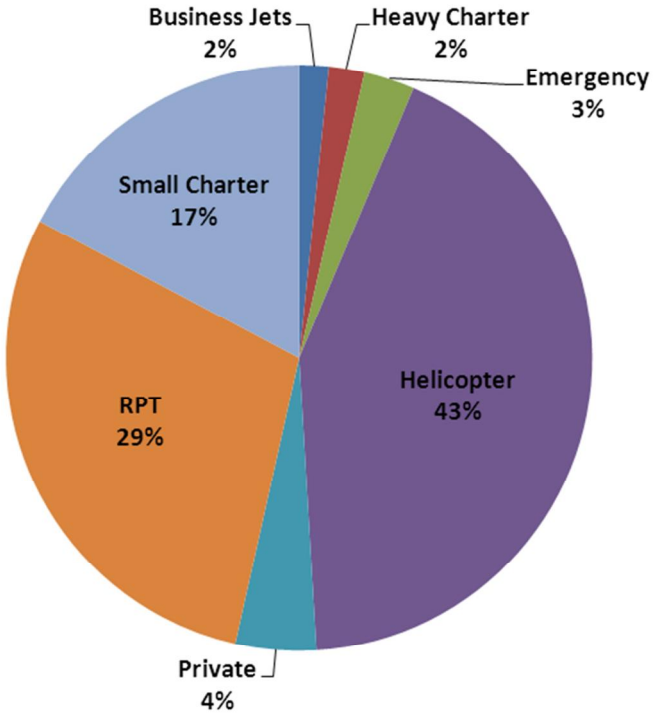
A number of passenger charters are operated into Karratha using passenger aircraft carrying more than 20 passengers, which have been termed heavy charters for the purpose of this report. In 2011-12, heavy charters accounted for approximately 2% of all movements.

Light charter movements, which include movements by aircraft carrying less than 20 passengers, accounted for approximately 17% of all aircraft movements in 2011-12.

Helicopter operations account for the largest proportion of all aircraft movements with approximately 43% in 2011-12. An approximate total of 12,800 helicopter movements were operated during the year.

Private aircraft movements accounted for approximately 4% of all movements at Karratha Airport during 2011-12. This includes recreational and private business aircraft operations using small aircraft.

Figure 5: Aircraft Movements by Activity 2011-12



A relatively large number of business jets operate into Karratha Airport. In 2011-12 they accounted for approximately 2% of all aircraft operations.

Karratha Airport supports the operations of the Royal Flying Doctor Service, Aspen Medical and the WA Police Air Wing. In 2011-12, emergency operations accounted for approximately 3% of all aircraft movements.

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 a 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 access requirements.

Future passenger numbers and growth rates at airports are related to a variety of factors including available seat capacity, load factors, slot availability, airline route economics and traffic growth at existing and potential destinations. At Karratha, these factors are clearly also closely related to the external economic system variables, specifically the future activities within the resource industry in the local area and the underlying international economic drivers of this activity, which are themselves largely based on the level of economic activity in China.

For this Master Plan, three passenger growth scenario forecasts were developed for Karratha Airport, with annual passenger throughput estimated to 2031-32 using a range of assumptions regarding future resource-related projects in the area and the general growth of the region. The key drivers affecting the forecast aviation growth are:

- Resource project variables such as scale of development, project phase (construction or operational), required workforce, nature of workforce (FIFO or residential), timing and project life; and
- Demographic relationships such as the impact of increasing or decreasing resident populations, work, education, leisure and health.

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

- Economic conditions affecting the Pilbara, Western Australia, Australia and key trading partners including China;
- Workforce requirements for resource-related projects with a potential impact on Karratha including those that are current, committed, under construction and under consideration based on information provided by resource companies themselves and Chamber of Minerals and Energy (CME) publications;
- Resource company operations in relation to human resources generally, and for specific projects, including tendencies towards FIFO or residential workers, and the resource companies' provision and use of their private airstrips;
- Historical and forecast data on passenger movements, aircraft movements, seat capacity and historical and future inbound/outbound travel between Karratha and Perth and Karratha and other domestic and potential international destinations;
- Airline activity forecasts for Karratha;
- The current Master Plan for Perth Airport;
- The Pilbara Cities of the North Plan including population forecasts; and
- Historical and forecast visitor numbers to the Shire of Roebourne including leisure and those visiting friends and relatives.

For forecasting purposes, helicopter passengers have been separated from all other passenger traffic. Based on the drivers highlighted and the information reviewed, three overall growth scenarios representing low-, mid- and high growth were developed to assist in determining the infrastructure requirements for the future Karratha Airport.

Although the resource workforce accounts for a significant proportion of passenger traffic at Karratha Airport, there are other sectors of passenger traffic with differing drivers and characteristics. To ensure these were captured within the forecasts, passenger activity has been segmented into its principal component sectors, each of which has differing prospects for growth at Karratha Airport. The passenger sectors and their primary drivers are shown in Table 1.

Table 1: Forecast Passenger Sectors and Drivers

Sector	Primary Driver
FIFO resource project construction workforce	Resource construction projects
FIFO resource project operational workforce	Resource operational projects
Resource project construction-related	Resource construction projects
Resource project operational-related	Resource operational projects
Resident	Karratha City of the North population growth aspirations
Other business-related	Population growth
Inbound Holiday/Leisure	WA tourism forecast
Inbound VFR	Population growth
Other inbound visitors	Population growth

Low-Growth Scenario

The Chamber of Minerals and Energy (CME) WA State Growth Outlook 2013 indicates an overall decline for the Pilbara minerals and energy workforce as a result of a significant shift from construction to operational phases in a number of large projects. This is based on construction and operational workforce projections included within both the 2010 and 2012 update of the Pilbara Industry Community Council's (PICC) employment and population projections to 2020. The 2012 update indicates that the overall minerals and energy workforce in the Shire of Roebourne will decline from 2012 and the decline will continue to increase through to 2020. Although there will be a corresponding increase in the operational workforce, it will not be large enough to offset the decline in the construction workforce.

It is estimated that, currently, construction FIFO workers account for approximately 70% of all passenger traffic at Karratha. The significant decline in construction activities in the Karratha area indicated by these CME and PICC projections therefore results in a substantial decline in passengers at Karratha Airport from 2012.

However, it is apparent that the PICC projections may not include some fundamental influences and drivers. Only projects that have reached the preliminary feasibility study (PFS) stage are included within the projections and there is potential for new projects, which are not currently at PFS stage to commence within the 2020 timeframe of the PICC projections. Therefore, these projections are considered to be very conservative in the level of activity predicted and the construction workforce may not decline at such a significant rate i.e. below the current passenger numbers. On this basis, it is suggested that in a low growth scenario, overall passenger numbers may remain roughly stable as the operational workforce and non-resource-related passenger growth offsets this decline in construction workforce passengers. On this basis, it is possible that there may be little or no overall growth for approximately 15 years until non-resource-related drivers will eventually drive overall passenger numbers above 2011-12 levels.

The 20 year forecast includes steady growth in the population of 4.7% in line with historical population growth and the Karratha City of the North Plan aspirations for Karratha with a population of 50,000 by 2035. It has also been assumed that there will be significant growth in tourism, considering the low base at which it currently sits. Growth in passengers visiting friends and relatives (VFR) and other visitors will grow in conjunction with population growth.

Overall, the low-growth scenario results in a total of approximately 950,000 passengers by 2031-32, an overall compound annual growth rate of 1% over the 20-year period.

Given that the low-growth scenario represents an unlikely, if possible, view of passenger traffic demand, medium- and high-growth scenarios have also been developed to ensure all possible drivers and influences on future traffic have been accounted for.

Mid-Growth Scenario

The mid-growth scenario has been developed on the basis that resource activity in the area continues to grow requiring the construction of new projects and a continuation of the requirement for a significant FIFO construction workforce in the area. To understand the potential workforce requirements, in addition to the PICC 2010 and 2012 employment and population projections, information was also gathered from the Department of State Development and resource companies themselves with regard to projects that are currently committed, under consideration and also projects that currently have no commitment but have some potential to develop during the planning period (as stated previously, many of which may not have been included within the PICC 2010 and 2012 projections). Information was gathered on the potential scale, timing and possible workforce requirements of these projects. The mid-growth scenario includes the commencement of construction of the following projects:

- Pluto LNG plant expansion, Woodside Energy;
- Stage 1 Anketell Port (4 berth/100 million tonnes per annum) and Strategic Industrial Area including rail line construction;
- Cape Lambert Port Expansion, Rio Tinto Iron Ore;
- Dampier Nitrogen Project, Incitec Pivot
- Expansion of the liquid ammonia plant, Yara Pilbara Fertilisers Pty Ltd;
- Balmoral South Magnetite Project, Australasian Resources; and
- Browse Basin processing plant at Dampier, Woodside Energy.

Due to the current economic conditions and the conceptual and speculative nature of some of these projects, the possible timing of their commencement is not known. To ensure that this growth forecast accounts for the highest possible peak in terms of workforce requirements the construction periods of each of the projects have been aligned, assuming a construction commencement of 2016-17 (this is based on the minimum possible lead time for some of the projects). Assumptions were made with regard to shift patterns, based on current industry practice, to estimate the number of passengers per annum for each project. To ensure a worst case scenario, it was also assumed that 100% of the construction workforces would operate on a FIFO basis. Beyond 2016-17, little information is available with regard to potential new resource projects. Therefore, assuming there is a continued increase in demand for resources from Australia's key trading partners, it has been assumed that a steady base level of construction activity will continue with a relatively low-level of annual growth of 1% in construction workforce passengers over the remaining 15 years to 2031-32. This equates to an overall compound annual growth rate of 2.4% in construction workforce passengers to 2031-32.

Operational workforce passenger forecasts to 2016-17 have been based on those provided in the PICC 2012 employment and population projection publication. From 2016-17 to 2021-22 they have been based on the completion and commencement of operations of the construction projects listed above. Beyond 2021-22 operational workforce passengers have been grown in alignment with the forecast growth in construction workforce passengers. In estimating the number of passengers created by the operational workforces, assumptions were also made with regard to shift patterns and a spilt of 80% of workers operating on a FIFO basis and the remaining 20% being residents. This is based on indications from resource companies and information provided in the PICC 2012 employment and population projection update.

Indirect construction and operational passenger sectors have been estimated based on the construction and operational workforce.

The scenario also incorporates steady growth in the population of 4.7% in line with historical population growth and the Karratha City of the North Plan aspirations for Karratha with a population of 50,000 people by 2035. It has also been assumed that there will be significant growth in tourism considering the low base at which it currently sits. Growth in passengers visiting friends and relatives (VFR) and other visitors will grow in conjunction with growth.

It is estimated that in a medium-growth scenario, there may be approximately 1.2 million passengers per annum by 2016-17, 1.4 million by 2021-22 and 1.8 million by 2031-32. This equates to an overall compound annual growth rate of 4.0% in passengers to 2031-32.

High-Growth Scenario

The peak workforce requirements, based on the simultaneous construction of most of the known projects currently in the pipeline and even those that are speculative, amounted to an equivalent compound annual growth rate of 8% over the next five years in the mid-growth scenario. This can be compared to the average 18% growth that has been seen over the last 10 years. Therefore, a high-growth scenario has been developed, to account for potential continuation of current growth trends, with growth over the initial five years based on the historical pattern of growth.

Despite the high compound annual growth rate over the last 10 years, year-on-year growth rates have actually been decreasing by an average of approximately 1.8% per year since the peak in 2007-08. On the basis that the high overall growth of the last 10 years is unlikely to continue as a result of the low base that this traffic has grown from, and the various forecasts for resource activity in the area, the declining trend in growth has been applied to construction workforce passengers for the first five years to develop a high growth scenario. This equates to a compound annual growth rate of approximately 13% to 2016-17.

Beyond 2016-17, it is assumed that in a high-growth scenario there will also be a continued demand for resources, new projects will commence and construction activities will continue at a steady rate with growth in construction workforce passengers slightly elevated above a mid-growth scenario, at a compound annual growth rate of 2% over the remaining 15 years to 2031-32. This equates to an overall compound annual growth rate of 4.6% in construction workforce passengers to 2031-32.

Operational workforce passengers have been forecast based on PICC 2012 projections to 2016-17 followed by sustained growth at a similar level for the remainder of the planning period, equating to 10% growth over the 20 year planning period.

The scenario also incorporates steady growth in the population of 4.7% in line with historical population growth and the Karratha City of the North Plan aspirations for Karratha with a population of 50,000 people by 2035. It has also been assumed that there will be significant growth in tourism considering the low base at which it currently sits. Growth in passengers visiting friends and relatives (VFR) and other visitors will grow in conjunction with growth.

Overall, the high-growth scenario projects that annual passenger numbers may reach approximately 1.4 million by 2016-17, 1.7 million by 2021-22 and 2.5 million by 2031-32. On the whole, an annual passenger growth rate of 5.5% is forecast over the 20 year period. This aligns with indications for growth at Karratha provided by airlines, the Boeing long-term industry outlook projections for the Oceania region and the Airbus Global Market Forecast for the Asia-Pacific region of 5.0% and 5.4% respectively. For comparative purposes, the overall Australian annual average growth for passengers between 1985-86 and 2011-12 was 5.2%[8]. For comparison purposes, between 2011 and 2012 calendar year, passenger numbers at Karratha grew by 10.6% i.e. double the overall Australian annual average growth for passengers.

Figure 6 summarises the annual passenger growth forecasts from 2011-12 to 2031-32 for Karratha Airport.

[8] Bureau of Infrastructure, Transport & Regional Economics

Figure 6: Forecast Passenger Traffic 2011-12 to 2031-32

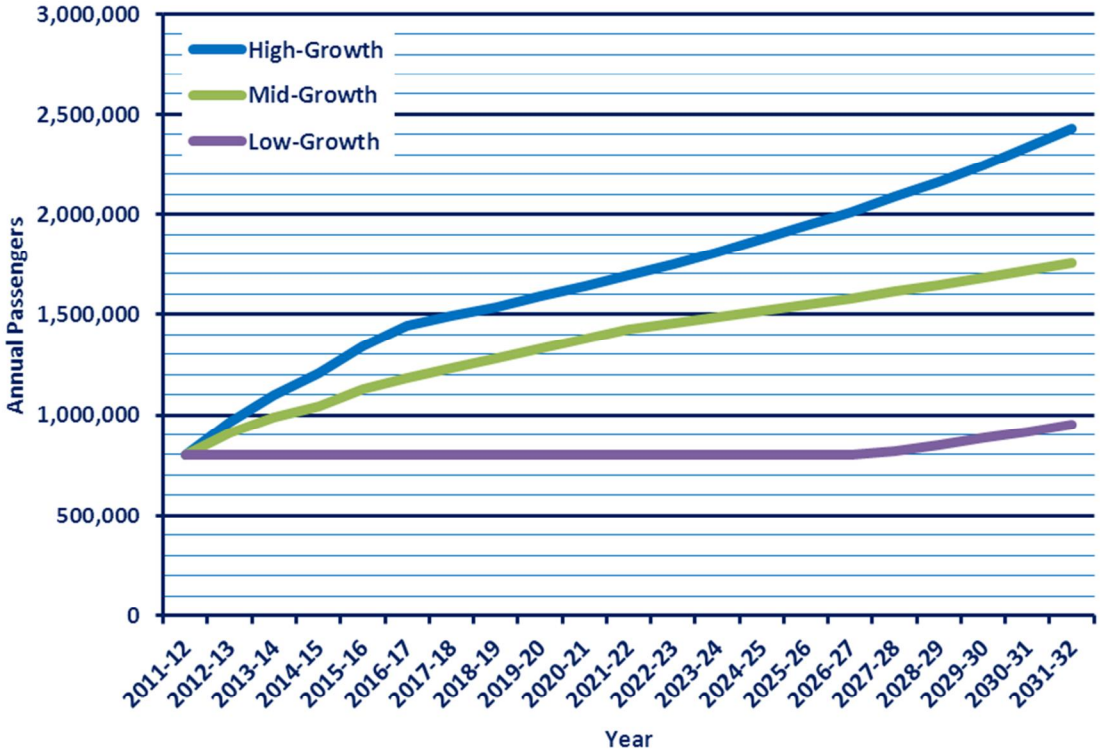
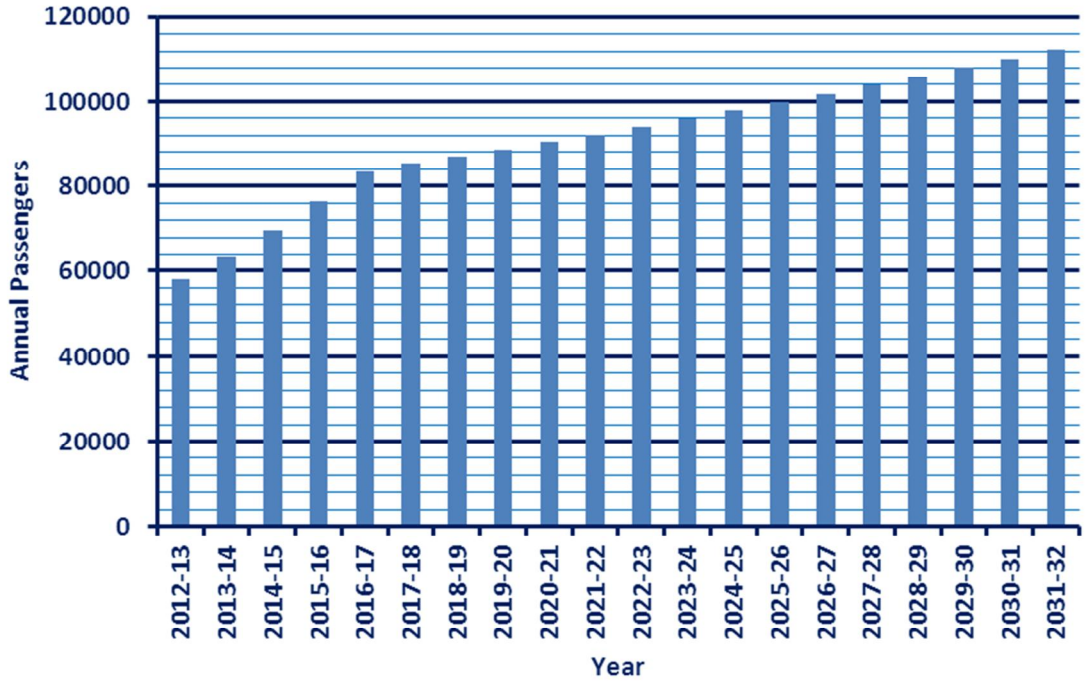


Figure 7: Forecast Helicopter Passenger Traffic 2011-12 to 2031-32



Helicopter Passenger Forecasts

A high-growth scenario helicopter passenger forecast has been developed based on historical growth, operation of the existing gas fields and possible future projects in the Carnarvon Basin. The initial five year period to 2016-17 has been forecast based on a continuation of the historical 9.5% growth rate in helicopter passengers seen over the last four years which was largely driven by the construction of the Pluto LNG project. This accounts for the potential for additional product being discovered to necessitate the expansion of the Pluto processing plant on the Burrup Peninsular. For the remaining 15 years of the planning period, helicopter passenger numbers have been forecast based on the corresponding growth over the same period in construction workforce passengers in the high growth scenario of 2%. This results in a compound annual growth rate of approximately 4% over the 20 year period.

Figure 7 shows the forecast helicopter passenger traffic to 2031-32 which is in addition to the RPT and charter passenger forecasts included in Figure 6. This results in a total of approximately 84,000 passengers per annum by 2016-17 and approximately 113,000 passengers per annum by 2031-32.

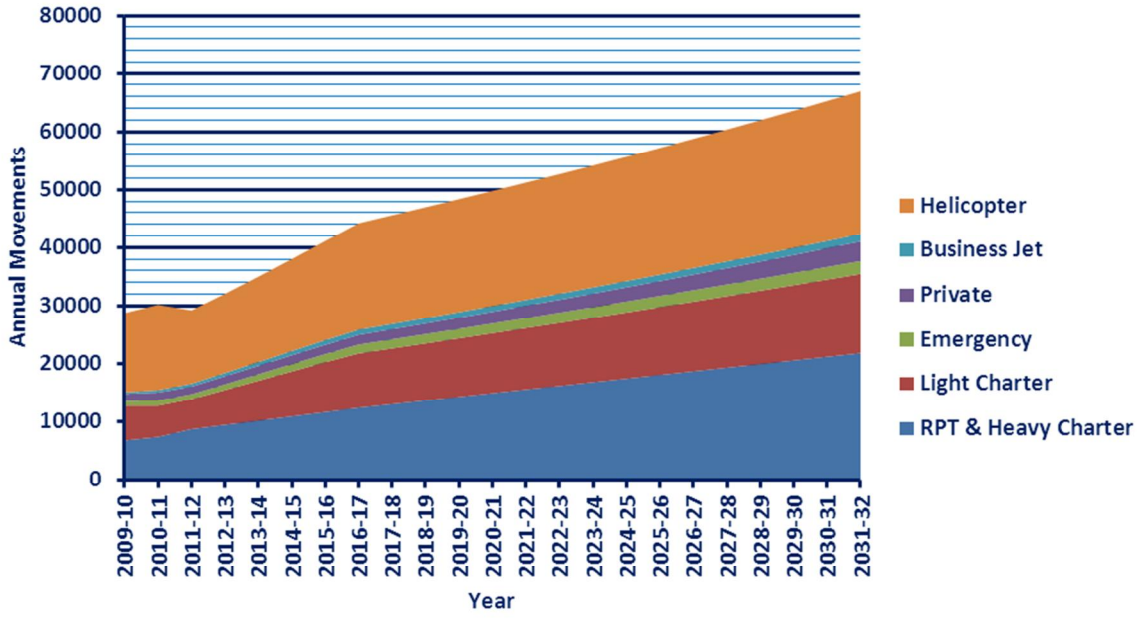
4.2.2 AIRCRAFT MOVEMENTS

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

- Regular Public Transport (RPT) and Charter;
- Business (including all business jets);
- Private;
- Emergency operations (including Royal Flying Doctor Service and Police); and
- Helicopters.

The forecast aircraft movement growth in each segment is shown in Figure 8. It is estimated that aircraft movements may grow to approximately 67,000 per annum in a high-growth scenario. This represents a compound annual growth rate of approximately 4.2% over the 20 year planning period.

Figure 8: Forecast Aircraft Movement Growth 2011-12 to 2031-32



RPT and charter have been considered together as it is unclear how the resource companies may operate their FIFO services in the future. RPT and charter aircraft movements were estimated by reference to the forecast passenger numbers for the high-growth scenario, from which an assumed flight schedule offering a high-level of frequency appropriate to that of the overall traffic.

Business jet operations are currently largely related to the activities of large resource companies in the area. Therefore it is estimated that business jet movements will grow at a similar rate as construction and operational workforce passenger numbers.

Private aircraft movements have been categorised as such as they are not necessarily directly driven by resource activities and in general are more likely to be driven by other activities and economic sectors within the Karratha area. On this basis, these movements have been forecast based on forecast population growth of 4.7%.

Emergency aircraft movements are driven by general population growth and resource industry activity. On this basis these aircraft movements have been forecast based on the continuation of the declining trend in growth in overall passenger numbers at the airport to 2016-17 which is largely driven by resource activities and then by the same rate as applied to construction and operational workforce passengers over the remaining period.

Future helicopter movements to 2016-17 have been forecast based on the growth seen between 2009-10 and 2010-11. Beyond 2016-17 for the remainder of the planning scenario helicopter movements have been forecast to grow at a similar rate to the forecast construction workforce growth of 2%.

5.0 AERONAUTICAL DEVELOPMENT CONCEPT

Figure B at Appendix B sets out the aeronautical development concept for Karratha Airport.

5.1 CRITICAL PLANNING PARAMETERS

Whilst the forecasts of overall passenger traffic and aircraft movements are useful for gaining an understanding of likely future activity levels, they are of only limited value as inputs to the planning of individual aeronautical facilities. Therefore, more specific key planning parameters have been developed consistent with these overall forecasts.

To determine the key planning parameters, which include terminal sizing requirements and aircraft parking capacity, a scenario-based approach was adopted which considered the potential impacts of varying combinations of passenger traffic and operating aircraft size/frequency in order to plan for the greatest possible requirements in terms of capital infrastructure development.

5.1.1 PLANNING SCENARIO ANALYSIS

Likely aircraft types, operating frequencies and schedules were determined through discussion with:

- The Shire of Roebourne, Karratha Airport Management;
- Incumbent RPT airlines including Qantas and Virgin Australia;
- Resource companies with existing and potential future projects in the area; and
- Perth Airport regarding existing capacity constraints and proposed future development.

Together with our industry knowledge and the application of a general understanding of airline operations nominal future flight schedules for a range of different scenarios were determined.

The key airline operational scenarios encapsulated in the schedules were based on the assumed high passenger growth scenario in line with the forecast passenger numbers for this scenario and the following frequency scenarios for key years over the planning horizon:

- High-frequency operations: –This scenario is based on indications from the incumbent airlines that their preference would be to maintain operation of current aircraft types on the majority of routes into Karratha. Thus to achieve high-growth passenger numbers this scenario assumes the use of existing smaller aircraft types such as the B737-800 on a high frequency basis; and
- Low-frequency operations: This scenario is based on the assumption that Perth Airport's current capacity constraints during the peak periods continue to worsen over a number of years, limiting the number of additional slots into and out of the airport. Therefore this scenario assumes the introduction of larger aircraft, such as the B767-300 or A330-300 on the Karratha-Perth route, to meet passenger demand within the peak periods and deliver the high-growth passenger numbers.

These planning scenarios were selected with the objective of covering the most demanding situation in terms of facility requirements at 2016-17 (5 years), 2021-22 (10 years) and 2031-32 (20 years), together with analysis of intermediate years to assist in the determination of likely trigger points for the implementation of new or expanded infrastructure. Considered as a whole, these traffic scenarios represent the widest practical range of potential traffic levels and related service frequencies.

For each scenario a base schedule detailing the typical weekly airline operations including airline, origin/destination, scheduled arrival/departure time and operating aircraft type was developed. These nominal schedules with peak aircraft load factors (assuming 85% - 90%) were used to determine the maximum number of passengers in the terminal at one time and maximum concurrent aircraft parking requirements, for planning purposes.

5.1.2 TERMINAL AND AIRCRAFT PARKING REQUIREMENTS

The planning scenario analysis was used to determine the maximum number of passengers in each key element of the passenger terminal during the peak period and the most demanding number and mix of aircraft on the RPT apron at any one time during the peak period at each key year. This provided the critical conservative planning parameters for the passenger terminal, RPT apron and the components of the runway and taxiway systems used by RPT and charter aircraft. The expected overall passenger throughput in each of these key years is expressed in million passengers per annum (mppa) based on the forecast high-growth scenario. .

The RPT and charter requirements are summarised in Table 2. This is based on a combination of the high and low frequency schedules that provides the most demanding outcome in terms of infrastructure requirements.

Table 2: Key RPT & Charter Planning Parameters

Passenger Scenario	Max. Total No. of Passengers in Terminal*	Max. Apron Parking Requirements (No. of aircraft#)				
		B737-800/A320-200	Embraer E190	Fokker 100	B767-300	A330-300
1.4 mppa (2016-17)	850	3		2	1	
1.7 mppa (2021-22)	1050	2	1	2	2	
2.4 mppa (2031-32)	1,200	6	1	2		1

** Includes both arriving and departing passengers, based on an assumed future flight schedule for a peak period of approximately 1.5 – 2 hours over which flight times are distributed in a similar manner to the current situation. The number includes the maximum total number of passengers in the terminal at one time but does not necessarily represent the design parameter for any individual functional area within the terminal building.*

 # Includes one additional aircraft above schedule requirements to account for potential off-schedule operations

Functional space requirements for the terminal were then developed by reference to the International Air Transport Association (IATA) *Airport Development Reference Manual* (9th Edition) for a Level of Service 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. It should be noted that design parameters for passenger and checked baggage security screening, where considered to be required, have been based on current Commonwealth requirements and experience at other regional airports in Australia.

An allowance for retail space anticipated to be required at Karratha Airport has been included, appropriate for a modern airport terminal of a similar nature. This allowance was based on industry best practice and benchmarking with other airports.

5.1.3 DESIGN AIRCRAFT CHARACTERISTICS

ICAO Aerodrome Reference Code

The dimensions, shape and layout of fundamental aerodrome 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 these 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 facilities for the critical aircraft likely to use them. Different facilities at the airport, such as those intended for RPT services and those intended solely for 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 aircraft envisaged to use the airport.

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/PCN is dependent on both the maximum weight of the aircraft and the number, type and configuration of the landing gear. The ACN/PCN also includes a component related to the tyre pressure of the main gear, which can often become the critical parameter in relation to pavement strength.

Principal Aircraft Parameters

Table 3 summarises the principal relevant planning parameters that relate to aeronautical facilities for each of the key aircraft types that might conceivably use Karratha Airport in the future. The Antonov 124 operates into Karratha on an infrequent ad-hoc basis, approximately 2 to 3 times per year. This aircraft is not adopted as a critical aircraft for planning and design purposes due to the infrequent nature of its operation. It will however, continue to be able to operate into Karratha Airport with appropriate exemptions from CASA.

Table 3: Principal Design Aircraft Key Parameters

Aircraft Type	Wingspan (m)	Tail Height (m)	MTOW (kg)	ICAO Aerodrome Reference Code	ACN (1)	Typical Passenger Capacity (Pax)
General Aviation Aircraft						
Cessna 172	10.9	2.7	1,160	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
Pilatus PC-12	16.2	4.3	4,740	2B	< 5,700 kg	N/A
Narrow-Body Aircraft						
ATR 72	27.1	7.65	22,000	3C	12	68
Bombardier Q400	28.4	8.3	29,257	3C	16	75
Bombardier Global Express	28.7	7.6	44,500	3C	28	19
Fokker 100	28.0	8.5	45,810	3C	24	107
Embraer E-190	28.7	10.5	46,990	4C	28	106
Airbus A320-200	33.9	11.8	73,500	4C	37	150
Boeing B737-800	35.8	12.6	70,535	4C	40	175
Wide-Body Aircraft						
Boeing B767-300	47.57	15.85	172,365	4D	53	269
Airbus A330-300	60.3	17.18	230,000	4E	60	304

(1) For flexible pavement on a medium (category B) sub-grade

5.2 RUNWAY

5.2.1 RUNWAY CAPACITY

The existing single runway is considered to have adequate capacity for operations at Karratha Airport into the future. Single runway systems, provided they are supported by suitable airspace design, air traffic management procedures and taxiway infrastructure, should have a peak hourly capacity in the region of 30 – 40 movements per hour, depending on the mix of arriving and departing traffic. This peak hourly capacity should be adequate to accommodate annual passenger movements in the range of 5 – 10 million, even allowing for the continued 'peaky' nature of traffic currently experienced at Karratha. High-intensity operations such as those associated with flight training facilities, which might push peak hourly demand above this level, are not anticipated at Karratha. The current single runway is therefore considered to represent the likely extent of required runway facilities at Karratha.

5.2.2 RUNWAY LENGTH & WIDTH

Runway Length

The current runway length of 2,280 metres is considered to be sufficient to accommodate operations by existing aircraft including the B737-800 to Perth, Brisbane, Sydney, Melbourne and some destinations in Southeast Asia, such as Singapore and Indonesia. It is also considered sufficient to support the operation of larger aircraft on these routes such as the B767-300 and A330-300. However, in order to reach more northerly destinations in Southeast Asia and China, such as Bangkok, Hong Kong and Shanghai, a runway extension to 2,500 metres would likely be required to support these operations by a B737-800/A320 and larger aircraft.

A runway extension of approximately 220 metres is therefore proposed to increase runway length. Due to the limited land available within the airport site to the west of the threshold of Runway 08 and the proximity to the Dampier Highway, this location was not considered suitable for runway extension. It is proposed that the runway extension occur to the east beyond the threshold of Runway 26 where land is available within the airport site boundary. It is estimated that a runway extension of 220 metres could be accommodated on the land to the east without requiring runway development within the area of land that is affected by the normal ocean tide.

The existing runway width of 45 metres with 7.5 metre shoulders will be sufficient to support future anticipated operations including Code E aircraft such as the A330-300.

Runway Strip and RESAs

The existing 300 metre wide runway strip is sufficient to support non-precision and precision approach operations of all aircraft anticipated at the airport including Code E aircraft. Based on the generally favourable weather conditions and proximity to available alternate airports including Port Hedland, a precision-approach runway is not considered a necessity for the future Karratha Airport. However, in planning for the future it should be recognised that developing technologies may allow greater precision operations without the need for extensive ground-based navaids. Wherever possible therefore, infrastructure should be developed to enable the upgrade of the runway to a precision approach in the event this is considered to be required and cost-effective in the future.

Runway End Safety Areas (RESAs) are required at both ends of the runway strip. The existing RESAs at Karratha Airport, being 90m x 90m, for Code 4 aircraft are sufficient for current operations and compliant with the CASA Manual of Standards Part 139 requirements. However, MOS Part 139 indicates that additional RESA length should be provided especially at international aerodromes, in accordance with the International Civil Aviation Organisation (ICAO) recommendations. Therefore, to accommodate Code 4 aircraft on regular international operations RESAs of 240 metres in length are proposed to be accommodated at both runway ends.

Pavement Strength

The runway pavement was upgraded in 2009 and has a PCN of 53/F/B/1500(218PSI)/T. This is sufficient strength to support operations by aircraft up to a Boeing 767-300. Use of the runway by aircraft larger than this, including the Airbus A330-300, will require upgrade works to strengthen the pavement to achieve a PCN of 60 (assuming a flexible pavement and Category B subgrade).

5.3 PASSENGER TERMINAL FACILITY

5.3.1 CAPACITY OF EXISTING FACILITY

Some areas of the existing terminal building are reportedly at capacity during peak periods. A separate terminal refresh project is currently underway to address identified shortfalls and operational issues currently experienced during these peak periods. The upgrade will include required modifications and expansion, largely within the existing terminal footprint, to provide a new look and feel for the terminal.

The concept design for the terminal refresh provides for an increase in size of the current building footprint from an enclosed area of 3,450m² to 5,300m² with a further 800m² for a first floor addition, totalling 6,100m². The plan also provides for an additional baggage make-up belt, providing for another 550m². The main developments include:

- Expansion of the departure lounge;
- An additional passenger security channel;
- Additional commercial and concession space;
- Management office and meeting rooms;
- Rental car company booths;
- Airline lounge space;
- Ground Support Equipment (GSE) storage area; and
- Facilities to accommodate international operations.

On the basis of the scenario planning and the design criteria for the terminal refresh, in general the existing terminal building post-refresh is likely to be adequate to accommodate approximately 1.4 mppa at IATA Level of Service C and up to 1.6 mppa at Level of Service D or below.

Following the terminal refresh, additional terminal space will therefore be required when passenger numbers reach this level, or when critical individual throughput areas again become congested at an unacceptable number of peak times.

5.3.2 LOCATION

The location of the existing terminal building at a distance of approximately 30 metres from the apron, with additional open space available to the southeast and southwest, could potentially provide sufficient area to expand the terminal building to meet demand of approximately 2.4 mppa.

It should be noted that if an expanded terminal was constructed in this location it would leave limited available space to accommodate the required expanded GSE storage requirements for the corresponding expected level of aircraft traffic, especially if this involves the use of wide-body aircraft and/or push-back operations. There would also be no further options for terminal expansion beyond this without significantly impacting on surrounding infrastructure, facilities and lease areas.

In addition, the existing space available for the RPT apron is limited and additional capacity will be required in the future. Due to the proximity of GA operations to the east and west, expansion of the existing RPT apron is problematic.

Therefore, to address these constraints the Master Plan proposes that space be preserved for a new terminal building, RPT apron and all related facilities to be established to the south of the runway. Development of these facilities will be required at the point when either the terminal or RPT apron

approaches maximum capacity during the peak periods, if further growth in peak period traffic is still projected at that time.

As well as providing sufficient space for the expansion of the required aeronautical infrastructure, development of the passenger facilities to the south of the runway will also offer a commercial advantage for the development of the available airport land to the south of the runway. A new passenger terminal precinct will result in a level of activity to the south of the runway that will assist in attracting other businesses to locate in the area. These businesses will likely include those indirectly related to airport activity as well others that are completely unrelated. Those businesses that are unrelated will benefit from the exposure provided by the passenger terminal precinct and the activity this creates.

5.3.3 FUTURE USE OF EXISTING TERMINAL BUILDING

Following establishment of the new passenger terminal precinct to the south of the runway it is proposed that the existing passenger terminal building be reallocated for commercial uses. The current terminal refresh project scope includes infrastructure provision that results in the existing terminal building having an estimated design life of approximately 40 years. Following its use as an RPT passenger terminal, the building has the potential to accommodate a number of uses including office space for aviation-related businesses or agencies, or a passenger facility for one or more rotary and/or fixed-wing based charter operators. Any of these uses would be consistent with the proposed land use plan for the surrounding precincts.

5.4 AIRCRAFT PARKING AREAS

5.4.1 EXISTING RPT APRON

The existing RPT apron is estimated to provide sufficient capacity to accommodate peak aircraft stand demand of approximately 1.4 to 1.7 mppa. Some reconfiguration of the existing RPT and GA apron, with alterations to line markings and possible minor strengthening of the westernmost section of the GA apron will be required, particularly to accommodate a primary parking position for wide-body Boeing 767 aircraft. The closure of Taxiway K, linking to the west of the apron, will allow the construction of permanent covered walkways to facilitate the use of the remote parking stands on the south side of the apron.

The use of wide-body aircraft will also require additional and larger ground service equipment (GSE) including baggage and cargo cans and transporters. Additional area surrounding the terminal and apron will be required for the storage of this equipment.

The requirement to accommodate more than one B767-300 aircraft simultaneously will result in the apron reaching its capacity earlier. At this point, push-back operations may need to be adopted to ensure sufficient capacity exists to support the capacity of the passenger terminal building. Alternatively, if this coincides with the passenger terminal building reaching capacity, this Master Plan proposes that an entirely passenger terminal precinct should be established to the south of the runway. The relocation would also support the SoR's objective of developing the airport site commercially including the area to the south of the runway.

Power-in/Push-back

By reconfiguring it for power-in and push-back operations, the existing RPT apron is likely to have sufficient capacity to accommodate peak aircraft stand demand of up to 2.4 mppa. The use of push-back for all RPT aircraft maximises the use of the available space on the existing apron. As well as the requirement for additional and larger ground service equipment (GSE) to support wide-body aircraft, pushback operations will also require the use of pushback tugs. Additional area surrounding the terminal and apron will be required for movement areas and storage of this equipment.

Significant apron expansion, and associated capital investment, will therefore be required when passengers reach approximately 1.4 to 1.7 mppa without push-back operations or approximately 2.4 mppa if push-back operations are adopted. Considering the well-developed nature of the area surrounding the existing RPT apron, expansion of the RPT apron cannot occur without significant disruption to the surrounding GA infrastructure. In line with the SoR's objective of developing the airport site commercially, including the area

to the south of the runway and the lack of available space to further expand the RPT apron, this Master Plan makes provision for all passenger facilities to be established to the south of the runway in the future in order to permit continued operations.

5.4.2 NEW RPT APRON

A new RPT apron to the south of the runway can be constructed to accommodate peak aircraft parking stand demand over the planning horizon and beyond. The availability of land allows all aircraft to be parked in contact with the terminal building. The apron size required at 2031-32 has been estimated based on a power-in/power-out scenario, however due to the number of aircraft, apron operations may be more efficient and economical with power-in/push-back parking stands, particularly considering the reduced apron area required to accommodate this method of operations and the expected increase in larger aircraft that require power-in/push-back.

5.4.3 GA APRON

Both the power-in/power-out and power-in/push-back apron options on the existing northern RPT apron include the reorganisation of the RPT and GA aprons, resulting in the westernmost portion of the existing GA apron being utilised for RPT aircraft parking. Currently this area of the GA apron is generally used for GA aircraft parking and has two helicopter parking stands which are used by Bristow Helicopters to load their passengers.

The reorganisation of the GA apron will not affect the existing Code B apron taxilane which is located to the east of this area of parking. This will provide aircraft access to the apron area adjacent to the site recently leased to the Royal Flying Doctor Service (RFDS) directly east of the passenger terminal.

The existing itinerant helicopter parking located to the south of the Karratha Flying Service (KFS) aircraft parking is proposed to be converted to Code C business jet parking. Up to two large Code C business jets, such as the Bombardier Global Express or Gulfstream V could be accommodated here or four smaller Code B jets, such as the Cessna Citation 550.

Expansion of the GA apron to the east is proposed to provide additional Code A and Code B aircraft parking whilst still maintaining access to the apron area located adjacent to Lot 9, leased to WA Police Air Wing.

When the passenger terminal precinct relocates to the south, the existing RPT apron could be divided between rotary and fixed-wing uses as demand requires at the time ensuring suitable separation of the two operation types to avoid conflicts.

5.4.4 ITINERANT HELICOPTER PARKING

It is proposed that all fixed and rotary wing operations are segregated, therefore a new itinerant helicopter parking apron is proposed by this Master Plan to the west of the existing RPT apron.

5.5 TAXIWAYS

An effective taxiway network is critical in maximising the operational capacity of the airfield. However, taxiway capacity is difficult to define precisely, in the same way as it is for runways. Instead, it is necessary to rely largely on experience, drawn from the operation of other airports, as to what constitutes an effective taxiway network.

5.5.1 EXISTING TAXIWAYS

Taxiway B

The existing main taxiway providing access between the RPT apron and Taxiway F has sufficient width to be classified as a Code D taxiway and can therefore largely remain unchanged for future operations. However, the existing shoulders would require widening to accommodate Code E aircraft. This taxiway may also require strengthening with regular Code D or E operations.

Taxiway F

It is proposed that Taxiway F be extended to the Runway 26 threshold to accommodate Code C aircraft and provide a full parallel taxiway prior to the development of the full parallel taxiway to the south of the runway.

If regular Code E aircraft operations occur whilst the existing RPT apron is in use, the Taxiway F shoulders will require widening to upgrade it from Code D to a Code E.

Taxiway K

It is proposed that Taxiway K between Taxiway C and the RPT apron be closed to allow for permanent passenger walkways to be provided around the edge of the apron when the remote aircraft parking stands to the south of the existing RPT apron are in frequent use. Closure of this section of taxiway may impose some operational impediment on helicopter and smaller fixed-wing operations, however access to the RPT apron and other airside facilities to the east is maintained via Taxiway F.

It is also proposed that Taxiway K be extended to the west with the development of Precinct B, the rotary-wing GA and GA support area. This taxiway can be developed in line with demand for further development of this precinct.

5.5.2 PROPOSED TAXIWAYS

Taxiways M, N & P

It is proposed that a new apron be developed for Precinct C. It is anticipated that potential activities in this area may include aircraft up to Code C size. It is proposed that this apron will be connected by three new Code C taxiway links as follows:

- Taxiway M - To Taxiway F to the west;
- Taxiway N – To Taxiway F to the east; and
- Taxiway P - To the Runway 26 threshold.

Taxiways Q, R, S, T & U

Taxiway Q is proposed to be a parallel taxiway on the south side of the runway providing access to Precinct F and eventually Precincts G and K. It is proposed that land is safeguarded for a Code E taxiway however, it may only require development to Code C standard if Taxiway F has already been upgraded to Code E. Taxiways R, S, T & U are proposed to link Taxiway Q with the runway.

Taxiways V & W

New taxiway links will be required to provide access between the RPT apron and Taxiway Q. Due to the number of simultaneous forecasted operations on the apron, multiple taxiway accesses may be required. Taxiways V & W are proposed to provide this access.

Taxiways Y & Z

New taxiway links will also be required to provide access between Taxiway Q and the Precinct K apron. Taxiways Y & Z are proposed to provide this access.

5.6 AERODROME LIGHTING

The runway lighting was upgraded in March 2009 and will support forecast operations. Extension to the runway edge lights and relocation of the PAPI lights will be required with the 220 metre extension on the eastern end of the runway. The runway end and threshold points will also be required to be relocated with the extension.

Taxiway edge lighting on the existing taxiways will be sufficient for future operations and should be extended with the extension of Taxiway F to the existing Runway 26 threshold. The Master Plan also proposes that taxiway edge lighting will be installed on the new taxiway network to the south of the runway as required.

The existing apron flood lighting will require expansion to the south of the apron when the aircraft parking bays in this area are in regular night use. Flood lighting should also be installed on the new RPT apron to the south of the apron as required.

5.7 AVIATION SUPPORT FACILITIES

5.7.1 FUEL FACILITIES

The Master Plan proposes that the existing fuel hydrant system be reorganised and expanded to provide for the additional aircraft parking bays to the east of the existing RPT apron. The hydrant system could potentially also be expanded to the remote stands on the south side of the apron. Alternatively these stands could continue to be serviced by mobile fuel tankers to reduce the required investment prior to relocating RPT operations to the south side of the runway.

There is also potential for the fuel hydrant system to also extend to the west further in the rotary precinct, as required by the operators that may locate there.

The GA apron can continue to be serviced by the mobile fuel tankers as it is currently or there is potential for an Avgas fuel dispenser to be located on the GA apron.

It is proposed that the new RPT apron to the south of the runway be fitted with a fuel hydrant system. Provision has been made within the Master Plan for fuel facilities to be located within Precinct G adjacent to the RPT apron if required by the fuel providers. However, the existing fuel facilities may remain in their current locations.

5.7.2 BUREAU OF METEOROLOGY WEATHER STATION

The Bureau of Meteorology (BOM) weather station is located to the west of the Aerodrome Rescue and Fire Fighting Service (ARRFS) access road. Generally weather stations require clearance of at least 100 metres from all objects to ensure accurate wind readings can be taken. Buildings within 300 metres can also potentially interfere with the operation of the station, however BOM are able to undertake calculations to establish any readings interrupted by objects between 100 and 300 metres from the station. The existing primary wind indicator is located at approximately 90 metres from the weather station and the control tower is located at approximately 150 metres. Despite the proposal to expand the existing GA apron to the east towards the weather station, no development is proposed closer than existing objects. Therefore, it is not anticipated that the weather station will be required to be relocated.

5.7.3 AERODROME RESCUE AND FIRE-FIGHTING SERVICE

The Master Plan retains the Aerodrome Rescue and Fire Fighting Service (ARFFS), provided by Airservices Australia (AsA), in its current location adjacent to the ATC tower. Karratha Airport is currently determined to be Level 1, Category 7 ARFFS coverage. With the introduction of frequent operations by wide-body aircraft this category may increase to Category 8 or 9. The current provision of three fire-fighting vehicles at the Airservices Australia Fire Control centre (FCC) already provides the minimum requirements for the potential level of activity over the planning horizon. However, Airservices Australia may increase the number of vehicles beyond the minimum requirement and therefore expansion of the existing Fire Control Centre may be required. The Master Plan assumes that this will occur within the existing Airservices Australia lease area, however any ARFF facility expansion or relocation will need to be negotiated with Airservices to meet the relevant response criteria.

5.7.4 VISUAL AND NAVIGATIONAL AIDS

Non-Directional Beacon

The Master Plan proposes to maintain the NDB in its current location to the north of the runway. It is proposed that the surrounding land will be sub-divided and developed commercially, however the required clearances will be maintained including the 60 metre diameter clearance zone around the towers and the building height limitations beyond this to 26.25 metres.

VOR/DME

The existing VOR/DME is centrally located in relation to the runway in the southern section of the airport site. Although not strictly adhered to currently, in accordance with the MOS Part 139, the VOR requires at least 300 metre radius clearance from all taxiways and roadways plus limits on building heights between 300 metres and 600 metres from the VOR below a one degree slope from the VOR. In locating the new southern passenger terminal precinct, a number of options have been considered to model the necessity to relocate the VOR/DME or not and thus limit the overall cost of the development to the south of the runway.

Based on these assessments, the Master Plan proposes that the VOR/DME needs to be relocated to the southeast of the runway. At this location the required clearances can be maintained without limiting the aeronautical facilities. There will be some limits on building heights within the commercial areas beyond this which will need to be adhered to, however this is not considered to have a significant impact on the types of development that can occur in the surrounding area and has been considered in the allocation of land uses and sub-division.

Any proposed changes to the VOR-DME location will need to be subject to a full and detailed assessment including negotiation of a new lease site. Any relocation of the the VOR/DME will also require redesign of all procedures based on this navaid.

Automatic Dependence Surveillance - Broadcast

Karratha Airport has an Automatic Dependence Surveillance – Broadcast (ADS–B) ground station, operated by AsA and has ADS-B coverage to ground level. The ground station is located within AsA's lease area. It is not anticipated that Master Plan proposals will impact upon this facility.

Illuminated Wind Direction Indicators

The existing illuminated wind direction indicator (IWDI) located to the north of the Runway 08 threshold is currently located within the 300 metre runway strip. The Master Plan proposes that this IWDI is relocated to the north of Taxiway F to ensure it sits outside of the runway strip and beneath the OLS.

6.0 PLANNING IMPLICATIONS

6.1 AIRCRAFT NOISE

The consideration of airport noise impacts 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 and in setting building code requirements. 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 possible responses e.g. constructing built forms to mitigate noise penetration.

The provision, in this section of the Master Plan, of information on projected noise impacts for Karratha Airport, is intended, firstly, to enable SoR to make informed choices for the development and implementation of the airport Master Plan and the Town Planning Scheme to ensure that:

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

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 Karratha Airport.

The noise forecasts in this section have been developed based on an understanding of aircraft flight paths developed from consultation with aircraft operators and air traffic control. It should be noted that the selection and adoption of the specific flight path for any particular movement is the responsibility of the aircraft pilot and Airservices Australia, taking into account safety, weather and other considerations, and thus actual flight paths may vary on occasion from the standard flight paths assumed in the modelling.

6.1.1 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.

The ANEF noise contours have been developed using the Integrated Noise Model (INM) version 7.0(c). The model has been constructed to produce the Australian Noise Exposure Forecast (ANEF) metric defined in AS2021-2000.

6.1.2 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 has been prepared based on the forecast number of movements to 2031-32. Overall, the 2031-32 forecast has been estimated to reach approximately 67,000 movements per annum.

The draft Karratha Airport ANEF contours developed as part of this Master Plan are shown in Figure C at Appendix B. The inputs used to develop the contours have been agreed and the contours and model have now been sent for endorsement by Airservices Australia in the manner of endorsement approved by the Minister for Infrastructure, Transport, Regional Development and Local Government on 17 April 2012.

The ANEF shows the contours that are significant under AS2021-2000 including the 20, 25, 30 and 35 ANEF:

- The 30 and 35 ANEF contours are contained within the existing airport boundary and do not extend beyond the aircraft movement area of the airport;
- The 25 ANEF contour is largely contained within the existing airport boundary, extending over the boundary to the east over mud flats and to the west over the Dampier Highway and salt flats. Within the airport boundary some of the proposed GA and aviation support development sub-division falls within this contour; and
- The 20 ANEF contour also extends over the boundary to the east over mud flats and to the west over the Dampier Highway and salt flats. The contour extends slightly over the airport boundary to the north over undeveloped land. Within the airport boundary some of the proposed GA and aviation support, aviation-related and light industrial sub-division falls within this contour.

AS2021-2000 indicates that the following building types are acceptable within the following ANEF contours:

- 20 ANEF: Residential, school, university, hospital, nursing home;
- 25 ANEF: Hotel, Motel, Commercial
- 30 ANEF: Light Industrial
- All ANEF: Other industrial.

The land uses proposed by this Master Plan are compliant with those set out under AS2021-2000 for each ANEF level. Any sensitive land uses proposed, such as hotel accommodation, are located outside of the relevant contour.

6.1.3 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 over flights 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.

'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.

As stated above the ANEF system is a 'one size fits all' in that it does not take into consideration building requirements which respond to local conditions. For example buildings in Karratha are constructed to withstand Category 5 Cyclones and very hot climatic conditions; additional insulation and thicker glass are

typical. These requirements have the potential to make buildings in Karratha more impervious to exterior noise events. The AS2021-2000, 'N' Contours and therefore this report have not considered these local factors.

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, 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 4.

Table 4: 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 5 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 (70 dB(A)) or washing machine (65-70 dB(A)), for example, above that of a vacuum cleaner (85-90 dB(A)).

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 events 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*.

The Western Australia Environmental Protection Agency recognises this and 'number above' noise contours (N60 and N70 contours) are generally requested by them in relation to any potential rezoning of surrounding land. They have also proven to be a good way to produce a 'whole of airport' picture of single event aircraft noise patterns which can be easier for the general public to understand.

The 'Number Above' noise contours are produced using the Transparent Noise Information Package (TNIP).

N60 and N70 contour plans for Karratha Airport based on the 2031-32 forecast traffic have been produced and are shown in Figure D and Figure E respectively.

Figure D shows some areas within the airport boundary and areas outside of the airport boundary, to the east and west, are expected to experience between 65 and 95 events of 60 dB (A) or greater on an average day in 2031-32. Affected areas outside of the airport site are currently either salt plains or mudflats and unlikely to ever be developed. Precincts within the airport site with potentially sensitive land uses, such as hotel and other accommodation, are unlikely to be impacted by a significant number of events.

Figure E shows the majority of the airport site is expected to experience between 5 and 50+ events of 70 dB (A) or greater on an average day in 2031-32. Undeveloped land to the east and west of the airport are also expected to experience between 5 and 50+ events of 70 dB (A) or greater on an average day in 2031-

32. Future proposed suburbs to the north of Balmoral road, as set out in the Karratha City of the North Plan, may experience 5 events of 70 dB (A) or greater on an average day in 2031-32 on the northern fringes.

As indicated in Table 5, a number of other typical daily tasks are likely to exceed these noise levels several times per day in 2031-32.

6.2 LAND USE PLANNING

The following sections set out requirements and restrictions that should be considered in relation to new development on the airport site and the land surrounding the airport site. To ensure that airport development and operations are not restricted the requirements set out here should be incorporated as required into future town planning schemes.

6.2.1 BUILDING HEIGHT RESTRICTIONS

Figure F at Appendix B provides an Obstacle Limitation Surface (OLS) plan that indicates limits on building and other object heights surrounding the airport. This has been developed based on a 2,500 metre long, Code 4 precision approach runway. This has been upgraded from the existing OLS plan, which accounts for a Code 4 non-precision approach runway, to ensure that all future potential operations can be safe-guarded for. The new OLS plan is based on a 1.6% take-off surface as opposed to a 2% take-off surface, as advised by CASA MOS Part 139. This plan should be reviewed to understand if any existing buildings and/or objects impinge on the future OLS. It should also be incorporated into future town planning schemes to ensure that any future developments do not impact on the OLS.

6.2.2 BIRD & WILDLIFE HAZARD

Birds (and other wildlife) on or around airfields should be regarded as a potential hazard to aircraft safety. The majority of aircraft collisions with birds occur near the airfield during take-off, landing and associated phases. For example, birds can be sucked into aircraft jet engines causing damage that may impact on the pilot's ability to manoeuvre the aircraft.

The prevention of bird strike requires careful consideration during master planning phase to identify potential land uses that may attract birds. Master planning considerations include the land use inside the boundaries of the airport and the surrounding land uses that should be avoided to reduce the risk of bird strike. It is essential that the SoR planners incorporate this into future town planning schemes to minimise the bird strike threat associated with land use.

While consideration of land uses within and adjoining the airport is essential for decreasing bird strike risk, operational procedures and control measures are applied to reduce the existing threat of birds. Targeted maintenance and management activities are necessary to reduce of habitat or food sources that attract birds.

Master Plan Considerations

Land use and the environment surrounding aerodromes can attract birds and bats. Waterways, agriculture, landfills and even golf courses often provide attractants that contribute to transit issues where birds and bats traverse the airfield while moving between nesting areas and feeding or foraging sites. Development near airfields that provides refuge, feeding or breeding opportunities for large numbers of birds or bats contributes to an increased risk of bird strike.

Figure G in Appendix B shows the boundaries of buffer zones, within which certain activities around Karratha Airport should be controlled as set out within Table 6. Land use development restrictions within these boundaries should be implemented by the SoR.

Table 5 below identifies land uses that have the potential to attract large birds (water fowl, raptors) that pose a risk to aircraft operation.

Table 6 provides guidance on buffer distances (as the crow flies) from the runway for various activities that traditionally attract birds. Within these buffers it is recommended that some activities are excluded whilst others have control measures.

Figure G in Appendix B shows the boundaries of buffer zones, within which certain activities around Karratha Airport should be controlled as set out within Table 6. Land use development restrictions within these boundaries should be implemented by the SoR.

Table 5: Planning assessment criteria for bird and bat strike potential

Land Use Category	Description
Group A	Putrescible waste disposal site
Group B	Sewerage treatment facilities Commercial fish processing Bird sanctuaries and fauna reserves Artificial water body (including water mgt structures such as detention basins or wetlands and dams or unenclosed tanks) Aquaculture Turf farming Animal farming with potential to attract birds/bats Fruit farming Food processing plants
Group C	Race Tracks Fairgrounds Outdoor theatres Drive-in restaurants Sports Grounds

NB: Group classifications have been adopted from the *Queensland State Planning Policy 1/02: Development in the Vicinity of Certain Airports and Aviation Facilities*

*Artificial water bodies may include:

a) Water management structures, such as detention basins and constructed wetlands

b) Large agricultural dams and non-enclosed tanks.

Table 6: Planning recommendations to limit bird and bat strike

Land use	Recommendation	Design response recommendation
Group A	Should be avoided within 13 km of the runway	Recommend no development
Group B	Should be avoided within 3 km of the runway and where located between 3 km and 8 km of the runway, should include measures to discourage wildlife	Potential food/waste sources are covered/collected so that they are not accessible For fruit, animal farming and turf production, wildlife deterrence measures are used (e.g. bird scarers or netting) Artificial water body design shall minimise habitat opportunities for birds (e.g. careful selection of landscaping, water body edge treatments, etc)
Group C	Where located within 3 km of the runway, should include measures to manage waste disposal	Potential food/waste sources are covered/collected so that they are not accessible to wildlife

Current land uses within the buffer zones should be reviewed, including agricultural land use, to identify any existing non-compatible land uses that increase bird strike risk. Consultation with land-owners and operators of non-compatible land uses may identify suitable management practices to reduce the bird presence. Existing infrastructure associated with incompatible land uses, such as existing SoR facilities including the

waste disposal site, will not require relocation but suitable management practises may require additional management and enhancement if bird and wildlife hazards from these and similar become an issue.

6.2.3 LIGHTING RESTRICTIONS

Section 9.21 of the MOS Part 139 provides advice with regard to the design and provision of lighting systems for use at or in the vicinity of an aerodrome, with the intention of minimising the potential hazard to aircraft operations from the lighting. Anyone proposing to install a lighting system within the vicinity of the aerodrome should be made aware of the requirements by the airport operator.

CASA has the power, through regulation 94 of the Civil Aviation Regulations 1988 (CAR 1988), to require lights which may cause confusion, distraction or glare to pilots in the air, to be extinguished or modified. Ground lights may cause confusion or distraction as a result of their colour, position, pattern or intensity of light omission above the horizontal plane. The advice provided by CASA is applicable to lighting installations within a 6 kilometre radius of the airport. The lights within this radius fall into a category most likely to be subjected to the provisions of Regulation 94 of CAR 1988. Within the 6km radius, a primary area exists which is divided into four light control zones labelled A. B, C and D. These zones reflect the degree of interference ground lights can cause as a pilot approaches to land. Figure H at Appendix B shows the primary area and zones in relation to Karratha Airport within which limits on intensity of light emissions (at 3 degrees above the horizontal plane) should be maintained. The emission intensity limits are also shown on the plan, expressed in candela (the common candle emits light at an intensity of roughly one candela) and are as follows:

- Zone A: 0 candela (cd);
- Zone B: 50 cd;
- Zone C: 150 cd; and
- Zone D: 450 cd

6.2.4 WIND FARMS

Any applications for the development of wind farms or similar facilities should be subject to an aeronautical assessment, regardless of their location. These assessments are routinely required prior to approval being granted. CASA and Airservices Australia will provide input on the proposed development and the assessments will take into consideration any potential impact on Karratha Airport.

7.0 NON-AERONAUTICAL DEVELOPMENT CONCEPT

Airports with available land that is not required for future aeronautical infrastructure have the potential to generate non-aeronautical revenue streams through planning for the highest and best use of the airport site. These developments can also be economic generators for the community. Revenue raised through the use of non-aeronautical land can be used to contribute towards major capital investments at the airport and within the community.

In terms of the wider economic benefit to the area; the airport and the businesses located there employ local people. Furthermore, airports also invest relatively large amounts of capital to meet new requirements, maintain their infrastructure and expand capacity. These investments often utilises local services, construction and equipment.

The Karratha Airport site has significant available land which this Master Plan and Land Use Plan has identified the potential to develop commercially. Karratha Airport currently accommodates only aviation-related activities on the airport site, however, subject to freehold acquisition of all, or part, of the site by the SoR, the potential to develop the site commercially for both aviation and non-aviation purposes exists. Development of surplus, non-aviation related land, will assist in providing an increase in and a wider range of income streams to return improving contributions to the Shire of Roebourne, and thus the community, while supporting airport and other infrastructure development. At the same time providing significant areas of commercial land for development close to Karratha supports its aspirational city status development in the future.

7.1 ECONOMIC SECTORS & BUSINESS ACTIVITIES

A land-use visioning workshop was undertaken to explore the future potential of the airport as an economic generator for Karratha and the Shire of Roebourne. The key current and future economic sectors of the SoR and their relative importance were identified to estimate potential demand and assist with the allocation of compatible land uses on the airport site. Table 7 shows the results of this discussion with the economic sectors ordered by size as measured by number of jobs.

Table 7: Current and Future Economic Sectors

2012	2017	2022	2032
Construction	Construction	Mining	Mining
Mining	Mining	Construction	Construction
Public Administration/Safety	Public Administration/Safety	Public Administration/Safety	Public Administration/Safety
Retail Trade	Retail Trade	Retail Trade	Retail Trade
Transport	Transport	Transport	Transport
Education & Training	Education & Training	Education & Training	Education & Training
		Health	Health
			Accommodation/Food
			Tourism/Recreation

Notes: 1. Construction includes resource project construction
2. Mining includes resource extraction and processing operations

It was identified that the current economy of the SoR relies heavily on the resource sector construction and operational activities, both directly and indirectly. A number of other sectors were identified but it was evident that these only have a very small position in the economy and are also partly driven by the resource activity in the area.

The workshop determined that the same sectors, in the same order of importance, were identified as being the most important for the economy in 2017. By 2022, although the resource sector still prevailed as the key driver of the economy, it was thought that operational mining may overtake construction as the dominant economic sector due to the finalisation of a number of resource construction projects and the movement of these projects into an operational phase. Non-resource and resource construction would remain an important sector which would continue to both support and be driven by population growth and the provision of associated infrastructure towards the Karratha Cities of the North Plan. It was also thought that the health sector is an increasingly important economic sector at that time with the potential for the development of additional health facilities and services in the area to serve the growing Karratha population as well as providing health support for the rest of the Shire and beyond.

By 2032, the economy is still expected to be dominated by resource mining and construction. Other key sectors would remain similar, with the addition of accommodation and food, and tourism and recreation. This would be as a result of the current aim to diversify the existing economy away from resources to ensure other drivers exist and the local economy can continue to prosper and grow when the resource sector slows. The tourism sector in the area is currently under-developed and has significant potential to grow from its current low base.

Potential business opportunities based on the identified economic sectors shown in Table 7, and current gaps in the Karratha market were then identified. The business activities included a wide variety that were not necessarily airport or aviation-related.

Based on the business activities the focus was then drawn towards the airport more specifically and the relevant business opportunities sectored into four specific sectors of activity that have the potential to develop at Karratha Airport in the future, including:

- Aeronautical;
- Aviation-support;
- Aviation-related; and
- Non-aviation-related.

The individual relationships between each of the opportunities were also mapped to provide an indication of potential synergies that could be achieved through the co-location of such activities within dedicated precincts of development at the airport.

7.2 ECONOMIC POTENTIAL

The establishment of a new RPT passenger facilities precinct to south of runway will assist in stimulating commercial development in this area. The available land to the south of the runway will allow the development of the commercial activities that are often seen at airports including hotels and offices as well as those opportunities that are unique to Karratha. Retention of the passenger facilities in their current location would likely stifle the development and take up of these indirect commercial activities that feed off the airport's activity, due to the lack of available land in close proximity to the passenger terminal.

There is significant Australian and international interest in the concept of creating diverse synergistic non-aviation revenue streams which grow at various rates 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, contributes to major investments and expenditure growth.

Revenue from ground access, offices, hotels, conferences, retail, education, residences, emissions trading, electricity, water, and even carbon credits can help make aeronautical charges a much smaller percentage of the total revenue in this business system.

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.

Provision for future revenue growth through effective land-use allocation can help minimise risks, change the mix of aviation and non-aviation related revenues and maximise the reward to a diverse range of stakeholders.

The available land within the airport site also has the potential to assist with stimulating the development of small business within the Karratha area by providing land and commercial space to act as a 'Business Incubator' for the area. The intention would be to attract businesses to start-up in the area to fill the large number of opportunities and gaps that currently exist in the Karratha market.

The development of the airport site compliments surrounding land uses and particularly the development of light and heavy industrial land within the Gap Ridge development to the southwest of the airport site.

The SoR intend to the develop Karratha Airport within the context of the Shire and the town of Karratha, taking into consideration the range of other commercial developments that are occurring in the area. The airport land can be commercially developed to align with and support the other proposed developments and will reflect absorption rates of new stock for light industrial and commercial space. SoR intends to integrate the development of the airport within the planning context of the rest of the town.

The Master Plan recognises that it is important not to detract from the viability of the CBD. Commercial development at the airport should not detract potential trade away from the CBD, this could potentially be detrimental to achieving the overall vision for Karratha as set out in the Karratha City of the North plan.

7.3 PROPOSED DEVELOPMENT PRECINCTS AND LAND-USE

Based on the visioning workshop and the preliminary work conducted in preparation for this Master Plan and Land Use Plan, key economic sectors and activities for Karratha and the airport were identified. A number of potential business activities and opportunities were then identified and mapped in relation to the airport. Following this a Preliminary Land Use Concept was developed identifying a number of potential development precincts for the existing airport site.

The preliminary land use plan was revisited and revised to reflect aeronautical facility requirements as well as consideration of potentially viable commercial sub-division offerings and access requirements. The proposed land uses are summarised below and indicated by precinct on Figure I at Appendix B:

- RPT Passenger operations;
- General Aviation & Aviation Support (Rotary-Wing);
- General Aviation & Aviation Support (Fixed-Wing);
- Aviation-related Light Industrial;
- Non-Aviation Light Industrial;
- Airline Support;
- Retail/Commercial;
- Commercial.

Demand for particular land-uses and the availability of the 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 over time. As a concept and for commercial viability analysis, land within each precinct was sub-divided into separate lease plots, the size of which was based on the anticipated activities and likely market for each precinct.

Accordingly, flexibility is essential in reviewing the proposed distribution of land uses and extents of each development precinct. In developing the precincts, it has been assumed that all land within the airport site, excluding the aircraft movement areas, will become available for non-airport related development on the basis that SoR will initiate and follow through with the process of acquiring the land, all or parts, on a freehold basis from the State of WA.

7.3.1 PRECINCT A – PASSENGER OPERATIONS

Precinct A includes the existing passenger facilities including the terminal building, aircraft apron, car parking and ground transport activities. It is assumed that this precinct will continue to accommodate these facilities in the medium-term with the possible future transition to a commercial facility that could potentially accommodate a rotary- or fixed-wing based charter operator passenger facility and/or commercial office space, following the possible relocation of RPT passenger activities to the south of the runway. The precinct has the following characteristics:

- Total precinct area: 98,000m^2 (including access)
- Includes terminal building/commercial building with a potential total lease area of 6,650m^2 (following terminal refresh project completion) and approximately 1,170 car parking spaces.

7.3.2 PRECINCT B – GENERAL AVIATION & AVIATION SUPPORT (ROTARY-WING)

Precinct B accommodates the existing rotary-wing activities including potential expansion to the west for additional rotary-wing, general aviation operators and aviation support businesses. All lease sites within this precinct have airside access. It is anticipated that charter operators; fixed-base operations; aerial work including emergency services, aeromedical, aerial survey and agricultural operations; and aircraft maintenance could all operate from this precinct. An indicative layout for the precinct has been developed and has the following characteristics:

- Total precinct area: 75,000m^2 (including access)
- Total possible number of lease sites: 15
- Existing lease sites occupied: 9
- Number of possible lease sites available: 6
- Lease site size assumption: 2,500m^2

7.3.3 PRECINCT C – GENERAL AVIATION & AVIATION SUPPORT (FIXED-WING)

Precinct C includes the existing fixed-wing general aviation activities to the east of the existing passenger terminal and the available area to the east of the existing development. This precinct will provide sub-divided lease areas, all with airside access, with a range of lease sites accommodating up to Code E aircraft. Activities envisioned within this precinct include charter operators; fixed base operations; aerial work including emergency services, aeromedical, aerial survey and agricultural operators; and aircraft maintenance. An indicative layout for the precinct has been developed and has the following characteristics:

- Total precinct area: 120,000m^2 (including access)
- Total possible number of lease sites: 23
- Existing lease sites occupied: 5
- Number of possible lease sites available: 18
- Lease site size assumption: 2,500m^2 - 9,000m^2

7.3.4 PRECINCT D – AVIATION-RELATED LIGHT INDUSTRIAL

Precinct D is located along the northern site boundary to the northeast of the existing passenger terminal building and includes some existing commercial activities including the Air BP and Shell fuel facilities. Development within this precinct includes non-aeronautical activities directly related to aviation operations and may include activities such as rental car facilities and storage in addition to fuel facilities. It is anticipated that there may be some synergies between the aeronautical activities within Precinct C that can be taken advantage of by locating aviation-related activities adjacent to it in Precinct D. An indicative layout for the precinct has been developed and has the following characteristics:

- Total precinct area: 180,000m^2 (including access)
- Total possible number of lease sites: 17

- Lease site size assumption: 2,500m^2 - 10,000m^2

7.3.5 PRECINCT E – NON-AVIATION LIGHT INDUSTRIAL

Precinct E is has been identified for non-aviation light industrial activities and is located in the northeast corner of the airport site. The area is quite significantly impacted by the estimated future 1 in 100 year flood level. Preparation of this area to provide flood immunity would result in the development of these sites as financially unviable. The area has therefore been identified to accommodate certain types of non-aviation light industrial activities which would not be significantly impacted by a flood event or for which the sites could be cleared relatively easily and quickly prior to a flooding event. Potential activities may include equipment lay-down and storage areas. The existing NDB is located within this precinct and is proposed to be retained at this location. The Master Plan identifies the required development clearance zone. An indicative layout for the precinct has been developed and has the following characteristics:

- Total precinct area: 260,000 m^2 (including access but excluding NDB clearance zone)
- Total possible number of lease sites: 26
- Lease site size assumption: 7,500m^2 - 40,000m^2

7.3.6 PRECINCT F – PASSENGER OPERATIONS

Precinct F has been identified for the development of new passenger facilities and infrastructure when they are relocated from north of the runway. The area will provide long-term RPT passenger terminal building and associated facilities including car parking, ground transport and rental car collection and drop-off. The location of this precinct is central to the proposed commercial development in the southern portion of the airport site. The relocation of passenger operations to this precinct will stimulate development within other precincts on the south of the runway as aviation-related support business develop along-side non-aviation related businesses that are located to the area to take advantage of the opportunities offered by this hub of activity and the passing trade. The total precinct area (excluding airside areas) is approximately 260,000m^2.

7.3.7 PRECINCT G – AIRLINE SUPPORT

Aviation support facilities associated with airline operations have been allocated to Precinct G. It is anticipated that activities such as air freight facilities, airline maintenance facilities, aviation fuel depots and in-flight catering could all locate within this area. This precinct is conveniently located directly adjacent to the proposed new RPT apron. An indicative layout for the precinct has been developed and has the following characteristics:

- Total precinct area: 145,000 m^2 (including access)
- Total possible number of lease sites: 11
- Lease site size assumption: 9,000m^2 - 18,000m^2

7.3.8 PRECINCT H & I – RETAIL/COMMERCIAL

Precincts H and I have been identified for the development of retail/commercial activities to accommodate prime 'Gateway' retail and commercial activity. These precincts' location, adjacent to the Dampier Highway will provide maximum exposure to passing vehicles as well as those accessing the airport and other activities within the airport site using the internal access road system. It is anticipated that businesses that may develop within this precinct include a service station with mini-mart/express supermarket; retail car yards, showrooms and service facilities; fast-food outlets, 'Flagship/Regional HQ' office buildings; and a hotel. An indicative layout for Precincts H and I has been developed and has the following characteristics:

- Total precinct area: 430,000m^2
- Total possible number of lease sites: 46
- Lease site size assumption: 3,000m^2 – 20,000m^2

The Master Plan recognises that it is important not to detract from the viability of the CBD. Commercial development at the airport should not detract potential trade away from the CBD, this would be detrimental in the short-term.

7.3.9 PRECINCT J – COMMERCIAL

Precinct J, located to the south of proposed new passenger terminal, has been identified for the development of commercial activities. This precinct could include offices/business park; services offices; 'Business incubator' office space; café/restaurant; and potentially a hotel. Precinct J provides a prime location for this sort of development in close proximity to the passenger terminal and could be an example of an airport city hub which have been developed at other airports. Activities located within this area will maximise the benefit gained from their proximity to the air services available from the airport. An indicative layout for the Precinct J has been developed and has the following characteristics:

- Total precinct area: 620,000m^2
- Total possible number of lease sites: 56
- Lease site size assumption:4,000m^2 - 28,000m^2

7.3.10 PRECINCT K – GENERAL AVIATION & AVIATION SUPPORT (FIXED-WING)

Similar to Precinct C, Precinct K has been identified for the development of fixed-wing general aviation operators and aviation support-businesses including charter operators, fixed base operations, aerial work including emergency services, aeromedical, aerial survey and agricultural operators; and aircraft maintenance. These activities make best use of the precincts location adjacent to the aircraft movement area. A number of the lease areas will be developed with direct airside access.

- Total precinct area: 42,500m^2
- Total possible number of lease sites: 17
- Lease site size assumption: 2,500m^2

7.3.11 PRECINCT L – AVIATION-RELATED LIGHT INDUSTRIAL

Similar to Precinct D, Precinct L has been identified for the development of non-aeronautical activities directly related to aviation operations. Activities that may occur in this precinct include rental car facilities and a commercial taxi/bus/shuttle depot. Potential synergies with the aeronautical activities within Precinct K may attract businesses to be located within this precinct. It is proposed that direct vehicular access will be provided between this Precinct and the new passenger terminal facilities in Precinct F to allow rental vehicle companies to effectively operate between the two areas.

Due to terrain and predicted future coastal inundation flood levels, the eastern portion of Precinct L will potentially be impacted to a degree which would make the required scale of earthworks and site preparation in this area to protect from flooding in the future 1 in 100 year event an uneconomic investment proposition. These areas may however be used for commercial activities for which flood immunity is not imperative. This area will therefore have uses which could possibly include rental car storage and equipment lay-down.

- Total precinct area: 370,000m^2
- Total possible number of lease sites: 35
- Lease site size assumption: 78,000m^2 - 18,000m^2

7.3.12 PRECINCT M – RETAIL

Precinct M is located in the southeast corner of the airport site where the new airport access road meets the new internal access road. This area has been identified for possible retail development which may include a supermarket, local services, speciality retail a services (incorporating possible 'business incubator' space); and other large format retail such as a hardware or furniture store. This location is close to the residential suburb of Nickol West as well as providing for passing trade accessing the airport or other airport site activities.

However, due to terrain and predicted future coastal inundation flood levels, it may be uneconomic to provide the required levels of flood immunity for this type of activity unless the business case is particularly strong.

- Total precinct area: 120,000m^2
- Total possible number of lease sites: 4
- Lease site size assumption: 20,000m^2 - 35,000m^2

7.3.13 PRECINCT N – NON-AVIATION LIGHT INDUSTRIAL

A further area of airport land has been identified for non-aeronautical activities not related to aviation operations. Precinct N is located on the southern boundary of the airport site and could include activities such as long-term parking, automotive/marine maintenance and transport, logistics and warehousing. The easternmost two-thirds of Precinct N is estimated to be potentially impacted by 1 in 100 year flood levels to such a degree that site preparation in this area to protect from flooding would require earthworks of a scale that would likely result in an unviable investment. This area will therefore have limited uses which could possibly include car yards, vehicle storage and long-term parking.

- Total precinct area: 410,000m^2
- Total possible number of lease sites: 44
- Lease site size assumption: 5,000m^2 - 18,000m^2

7.4 UTILITIES & CIVIL INFRASTRUCTURE

In preparing the overall land use plan, taking into consideration the proposed land uses, the Master Plan includes for the provision of required upgrades to the utilities and civil infrastructure within and connecting to the airport site. The following paragraphs describe proposed upgrades to the trunk infrastructure. Connections to these trunk supplies have been considered and captured in the development cost for each of the proposed precincts.

7.4.1 WATER

The airport site currently has a special exemption to connect to the water supply on Dampier highway on the basis that it is for 'Airport Use'. With the proposals to develop the land for commercial purposes, this connection will no longer be allowed. A new connection from the airport boundary to a town water supply source at Gap Ridge, 6.5km away will be required.

7.4.2 SEWER

The new waste water treatment plant located to the north of the runway is considered to have sufficient capacity to support the aeronautical and commercial development in this area. Development to the south of the runway will however require the development of a new waste water treatment in this area to support the proposed commercial development in this area.

7.4.3 POWER & TELECOMMUNICATIONS

No specific allowance has been made for the upgrade of any trunk infrastructure relating to power and telecommunications. It is assumed that connections will be made to the existing supplies along the Dampier Highway. More detailed assessments should be undertaken when development is set to occur, particularly to the south of the runway.

7.4.4 STORMWATER DRAINAGE

The Master Plan makes provision for the development of adequate stormwater drainage with the development of each of the precincts. No allowance has been made for detention/retention of stormwater runoff due to the increase in impervious area. In addition, no allowance has been made for the reduction in flood storage volume due to the placement of fill on allotments within the existing flood prone areas located within the airport boundaries.

8.0 GROUND ACCESS

8.1 HIGHWAY ACCESS

Access to the airport is currently via the northwest corner of the airport site via the Dampier Highway, which has recently been upgraded to a dual-lane road. The airport is accessed via an intersection with Bayly Avenue. It is proposed that this intersection be maintained and will continue to provide access to the passenger terminal precinct while it is located to the north of the runway. After relocation of the terminal precinct to the south of the runway, it is proposed that this intersection continue to provide access to the GA activities that will remain in the area. When the RPT passenger precinct relocates to the south of the runway and the commercial development expands in its vicinity it is proposed that this existing Bayly Avenue and Dampier Highway intersection will be downgraded in importance. It is proposed that the main highway access to the airport will be via a new intersection south of the existing, closer to the new passenger terminal precinct. This is discussed further in Section 8.4.1.

In line with the Karratha City of the North Plan (KCNP), the Master Plan assumes an alternative access route to the east of the airport will be developed along the alignment of the existing Millars Road, which connects with Balmoral Road in Nickol West. Millars Road is currently an unsealed road that provides access around the eastern boundary of the airport site. The KCNP indicates this road entering the airport site from the south and crossing the proposed land reserved for any runway extension. The Master Plan proposes the new road be located further to the east to accommodate the possible future runway extension to 2,500 metres and connect with the extended Bayly Avenue in the northeast corner of the airport site as shown on Figure I at Appendix B.

Access to the east of the airport site via this road from the residential suburbs in the Nickol/Baynton area and Karratha CBD will help to stimulate commercial development within this area of the site. It will also provide an alternative access to the airport for passengers, minimising the airport's impact on the Dampier Highway.

8.2 EXISTING TERMINAL ACCESS AND CAR PARKING

The existing car park and terminal forecourt area upgrade was completed in 2011.

8.2.1 TERMINAL ACCESS & FORECOURT

The recent redevelopment of the terminal access and forecourt provides vehicular access to the terminal building via Bayly Avenue, to the north of the main car park, then via a one way access road that runs around the eastern side of Long-stay Car Park A and on to the terminal forecourt. The terminal forecourt has two segregated lanes for passenger pick-up and set-down including taxis and shuttle buses. Vehicle waiting areas (limited to two minutes) are located adjacent to each of the forecourt lanes to allow vehicles to pull off the trafficable lane out of the traffic. The lane closest to the terminal has capacity for approximately 20 standard cars which are controlled at peak times by kerbside officers. The second lane has an access control system to allow only authorised ground transport vehicles through. This lanes capacity the length of approximately 30 standard cars; however this lane is mainly used by shuttle buses.

It is anticipated that this recent upgrade to the terminal access and forecourt will provide sufficient capacity to match that of the terminal following the current refresh project, to approximately 1.4 to 1.6 mppa. Further investment should be limited in advance of the relocation of the passenger terminal to the south of the runway.

8.2.2 CAR PARKING

Following the recent upgrade a total of approximately 1,170 parking spaces are available. Controlled parking provides short-stay, long-stay, rental, ground transport and staff car parking areas. The existing car parking spaces are categorised as follows:

- Long-stay: approximately 750 spaces;

- Short-stay: approximately 120 spaces;
- Rental vehicles: approximately 200 spaces; and
- Staff: approximately 50 spaces.

It is estimated that the existing spaces will provide sufficient capacity to at least match the capacity of the terminal building following the terminal refresh and upgrade. However, if additional capacity is required further parking capacity can be provided between Bayly Avenue and the existing coach parking. This could possibly provide a further additional 150 parking spaces, subject to the size of the vehicle. Significant investment should be limited in advance of the relocation of the passenger terminal to the south of the runway.

8.2.3 COACH PARKING

There is currently a dedicated coach parking area to the east of the passenger terminal at the corner of Norman Street and Rowell Street, which is marked for approximately 25 coach parking spaces. This parking area has recently been sealed and should provide sufficient capacity for a number of years. However, in the event that additional capacity is required prior to the relocation of the passenger terminal, capacity exists to extend the existing parking area to the north towards Bayly Avenue.

8.3 PROPOSED TERMINAL ACCESS & CAR PARKING

With the development of a new passenger terminal to the south of the runway, terminal access and car parking will need to be appropriately developed.

The terminal access road will need to provide terminal forecourt access to the general public, taxis and buses. Bus and coach set-down, pick-up and parking will also be required.

It is estimated that between 2,000 and 2,500 parking spaces maybe required to support approximately 2.4 mppa. These would be split between short-stay, long-stay, rental vehicles, ground transport vehicles and staff as they are currently. A Premium covered car parking area could also be developed with a corresponding fee scale.

8.4 INTERNAL ROADS

8.4.1 NEW INTERNAL ROUTE

The proposed development of the airport site as described in Section 7.0 requires the development of a comprehensive internal access road network. It is proposed that a new main internal access route through the western and southern portion of the airport site will connect with Bayly Avenue, close to its existing intersection with the Dampier Highway, and run along an alignment parallel to the Dampier Highway before turning east and running parallel to the runway. It is proposed that this road will connect with the proposed alternative access route, as indicated by the KCNP, to the south east of the airport site. This road will provide the benefit of drawing vehicles through the airport site providing increased exposure to the businesses developing within the various precincts.

The land uses identified in Section 7.0 were applied as a basis to calculate the likely trip rate from each of the precincts, when fully developed, to indicate that a dual lane road with a central median (i.e. two lanes each side of the median) might be required to support the development to the south of the runway including the passenger terminal and commercial development. Therefore the road reserve indicated on Figure I at Appendix B should be safeguarded for the future development of this road. Due to the scale of this road no direct access to individual development sites will be provided. A network of minor roads has therefore been proposed to provide access to the individual sites.

With the relocation of the passenger facilities to the south of the runway it is proposed that a new intersection with the Dampier Highway be developed at the southwest corner of the airport site as indicated on Figure I at Appendix B.

Overall a complete access loop will circumnavigate the airport site providing comprehensive access to each of the land uses from both the east and west.

8.4.2 BAYLY AVENUE

Bayly Avenue is currently a single-lane road (i.e. one lane in each direction). It is estimated that it has sufficient capacity to provide access between the Dampier Highway and the passenger terminal precinct to match the capacity of the passenger terminal following the current terminal building refresh project. There appears to be sufficient road reserve to potentially accommodate some upgrades to this road, including turning lanes, rollover kerbing and shoulder strengthening to enhance the flow of traffic along this route as commercial development expands to the east of the passenger terminal precinct.

However, it is recommended that any upgrades to this road are limited to only those that are essential e.g. at the connection to the Bayly Avenue to Dampier Highway node and retail developments at the western end of Precinct I. When the passenger terminal precinct is relocated to the south of the runway, the majority of traffic will no longer require use of the majority of Bayly Avenue as the new internal road will be utilised. The development of the new external access from the east, along the current alignment of Millars Road, will attract vehicles away from the Dampier Highway and thus the existing western section of Bayly Avenue. Therefore, the existing western section Bayly Avenue, in its current state, should provide sufficient capacity to provide sufficient access to the GA and other commercial activities to the north of the runway whether or not the existing intersection with Dampier Highway is relocated to the south of the runway. It is proposed however, that Bayly Avenue be extended to the east to intersect with the proposed external eastern airport access along the alignment of Millars Road.

APPENDIX A

STAKEHOLDER CONSULTATION SCHEDULE

APPENDIX B

FIGURES

Organisation	Name	Title	Date	Location
Shire of Roebourne	Cr Fiona White-Hartig	Shire President	13/09/2012	Karratha
	Chris Adams	Chief Executive Officer		Karratha
	Cr Peter Long	Deputy Shire President	13/09/2012	Karratha
	Cr John Lally	Councillor	13/09/2012	Karratha
	Simon Kot	Director Strategic Projects & Strategic Business	13/09/2012	Karratha
	David Pentz	Director Development, Regulatory and Infrastructure Services	13/09/2012	Karratha
	John Verbeek	Principal Economic & Business Improvement Advisor	13/09/2012	Karratha
	Mitchell Cameron	Executive Manager Strategic Business – Karratha Airport	13/09/2012	Karratha
	Jenni Brown	Senior Project Officer	13/09/2012	Karratha
	Sean Shields	Project Manager	13/09/2012	Karratha
	Allan Wright	Airport Operations Manager	14/09/2012	Karratha
Airlines				
Qantas	Darren Batty	Manager Airports Commercial Projects	05/11/2012	Sydney
	Nathan Reed	Manager Infrastructure Assessment	05/11/2012	Sydney
Virgin Australia	Grahaem Duff	Manager Commercial (WA Ports)	04/10/2012	Brisbane
	Brian Lewis	Airport Planning Manager, Operations Planning	04/10/2012	Brisbane
Cobham Airlines	Neil Sutcliffe,	Deputy General Manager	20/11/2012	Email

Organisation	Name	Title	Date	Location
Resource Companies				
Chevron (Gorgon Joint Venture, Barrow Island)	Cara Babb		12/10/2012	Telephone
Rio Tinto Iron Ore	Helen Pittendreigh	Government Relations Team		Telephone
	Gary Sahi	Principal Business Analyst	16/10/2012	
Australian Premium Iron Joint Venture (Aquila Resources)	Piers Goodman	Manager Environment & Community	16/10/2012	Telephone
Fortescue Metals Group (FMG)	Steve Fewster	Head of Infrastructure Services	08/11/2012	Perth
Woodside Energy Ltd	Jeff Davie	Logistics Manager	06/11/2012	Perth
Apache Corporation	David Parker	Government & Public Affairs Manager	30/10/2013	Telephone
Airport Users/Lease holders				
Aspen Medical	Brian Carruthers	Project Manager, Karratha	11/10/2012	Karratha
Karratha Flying Services	Michael Ardagh	Director/Pilot	13/09/2012	Karratha
	Andrew Gray	Director/Pilot		
Bristow Helicopters	Ron Scherpenzeel	Commercial Manager	22/11/2012	Telephone
	Peter McDonald	Pilot in Charge Karratha	14/09/2012	Karratha
CHC Helicopters	Christian Kittleson	Finance Director & CFO (Asia Pacific)	04/10/2012	Email
Air BP Pty Ltd	Rebekah Leeson	Property & Network Planning	28/11/2012	Email
Shell Company of Australia	Jason Haack	Karratha Airport Manager	19/12/2012	Email
Karratha Air Logistics	Colin McKenney		05/02/2012	Email

Organisation	Name	Title	Date	Location
Toll Group	Teree Bradley		05/12/2012	Email
WA Police Air wing	John Raphael, Steve McLeod & Peter Morrissey		28/11/2012	Email
Woodside Energy	Christopher Elliot		28/11/2012	Email
Government Departments & Organisations				
Karratha & Districts Chamber of Commerce	Robin Vandenberg	President	13/09/2012	Karratha
	John Lally	Chief Executive Officer		
Department of Regional Development & Lands	Peter Broekmeulen	Team Leader Pilbara	03/10/2013	Telephone
Landcorp	Mike Maloney	General Manager, Regional WA	04/11/2012	Perth
	Matt Read	Business Manager		
Department of State Development	Dean Britton	Anketell General Manager	06/11/2012	Perth
	Peter Kiossev	General Manager, Policy Development	20/11/2012	
Pilbara Development Commission	Teena Shervington	Principal Project Officer	08/11/2012	Perth
	Gus Tampalini	Project Manager, Infrastructure Coordination		
	Keith Anthonisz	Pilbara Cities	30/10/2012	Telephone
Airservices Australia	Peter Hay	Aviation Relations Manager, WA	20/11/2012	Telephone
	David Horn	Unit Tower Supervisor – Karratha ATC – Regional Services	11/03/2013	Telephone
Chamber of Minerals & Energy	Warren Pearce	North West Manager	01/11/2012	Telephone
Department of Premier & Cabinet, Native Title Unit	Simon Davis	Principal Policy Officer	20/11/2012	Telephone
Others				
Perth Airport	Guy Thompson	General Manager, Integrated Planning & Major Projects	06/11/2012	Perth

Organisation	Name	Title	Date	Location
Europcar Karratha	Tom Foreman	Owner	05/12/2012	Telephone
Dampier Enterprises T/A Kanga Van	Shari Kyle		05/12/2012	Telephone
Northwest Aviation Services	John Bevan	General Manager Business Development	13/12/2012	Telephone
Monadelphous Group – Skystar Airport Services Pty	Natalie May	Airport Manager – Karratha	13/12/2012	Telephone
Wheeler Nominees	Tony Travis	Administrator	19/12/12	Telephone
Northfleet	Michael Simms	Managing Director	05/12/2012	Telephone
Consultants				
Imani Development (International Consultancy Services)	David McCormick	Associate (Director)	09/11/2012	Telephone
NS Projects	Damian Fasher	Director	12/02/2013	Perth
Integral Project Creation	Richard Johnston	General Manager	12/02/2013	Perth
Sander Turner Ellick Architects	Steve Turner	Director	07/11/2012	Karratha

Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
EXISTING FACILITIES

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Drawn: LT | Checked: JSS | Approved: BJH

Rev	Date
2	13/06/13
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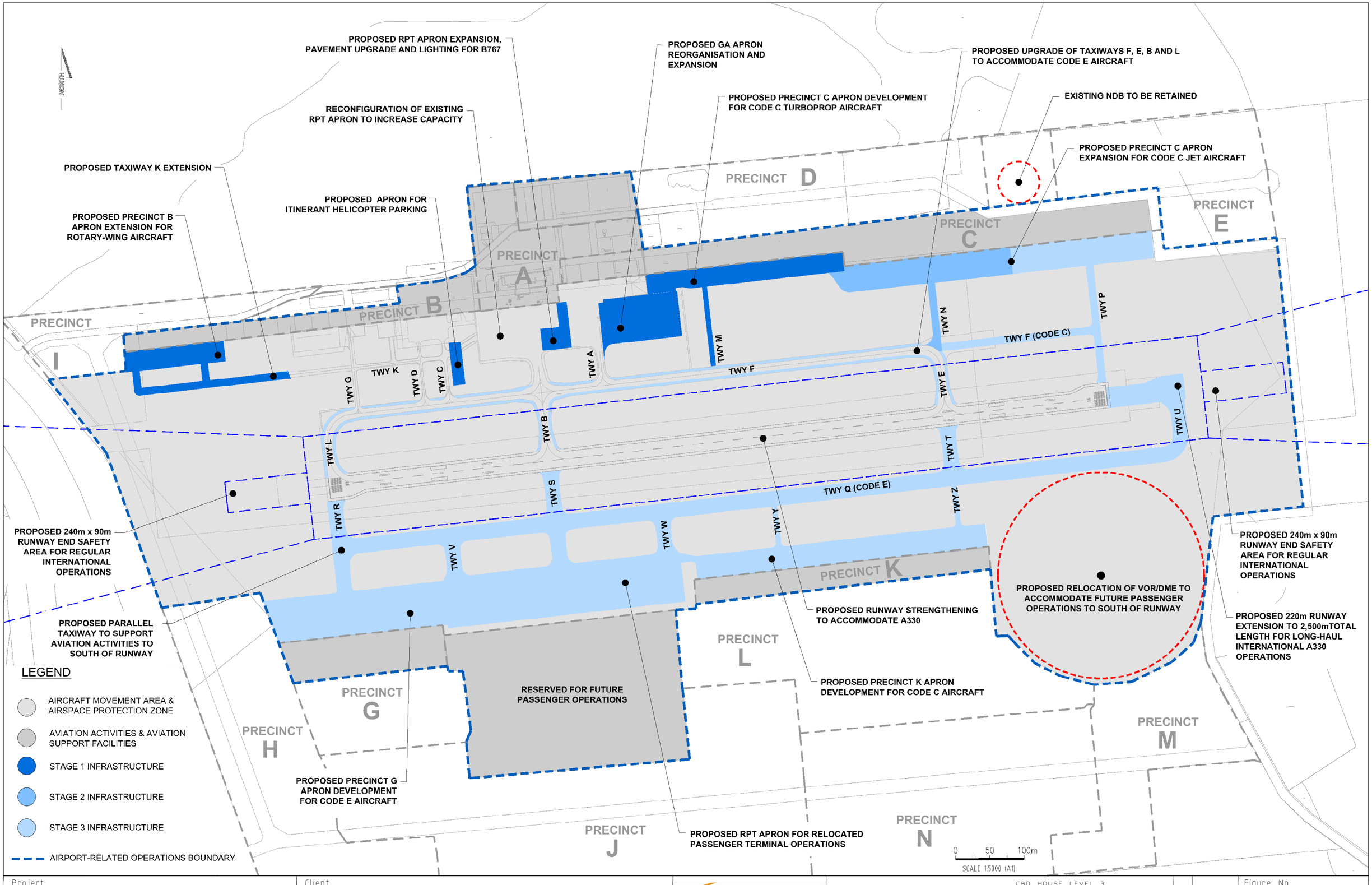
Figure No:
FIGURE A

Scale: 1:5000 A1

File Ref: B12254

Sheet Size



Project:
PRELIMINARY DRAFT 2013 KARRATHA AIRPORT MASTER PLAN AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
AERONAUTICAL INFRASTRUCTURE DEVELOPMENT 2013 - 2033

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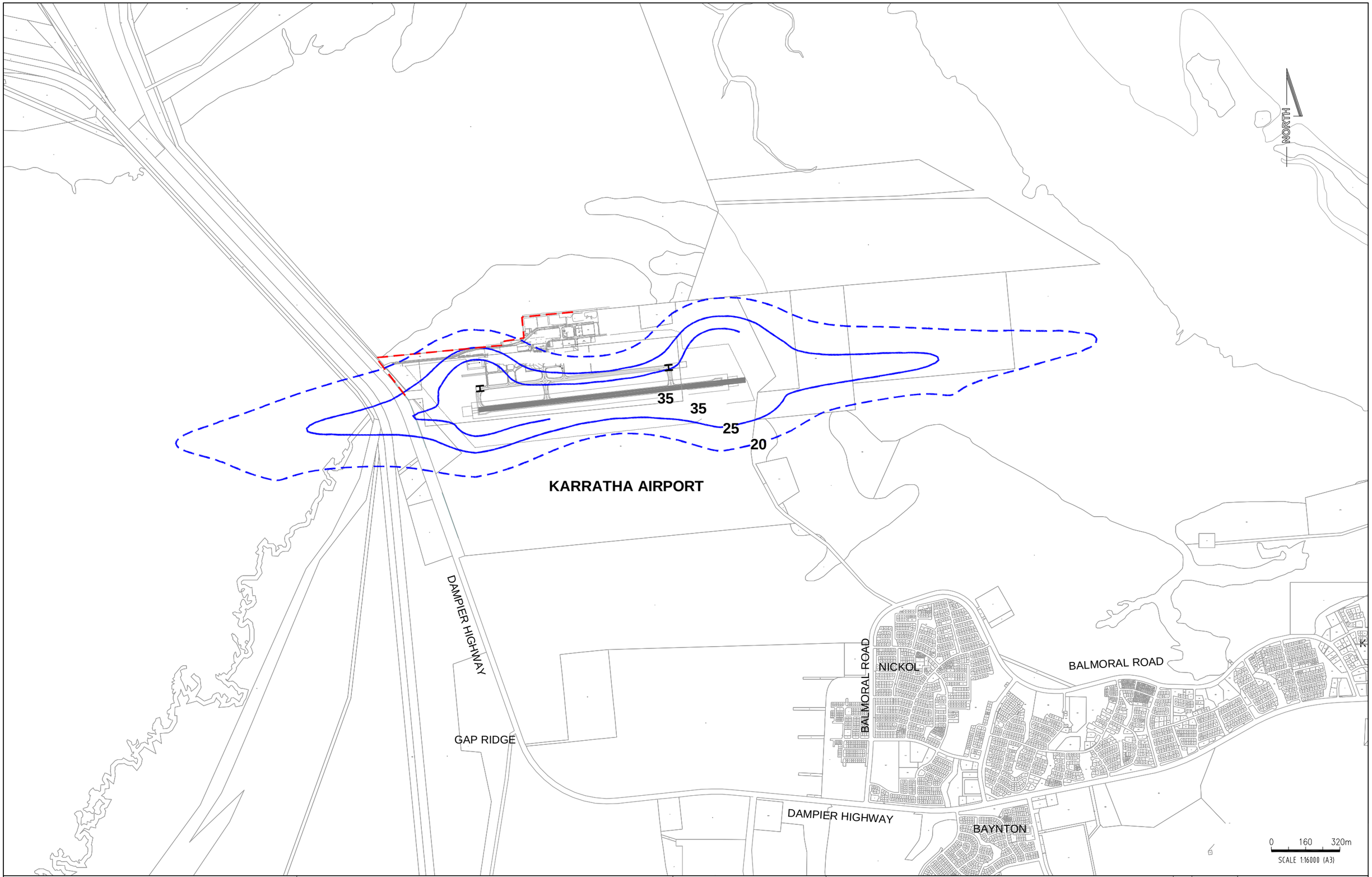
Figure No:
FIGURE B

Scale: 1:5000 | Sheet Size: A1

File Ref: B12254



Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
2032 ANEF CONTOURS

Karratha AIRPORT
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Figure No:
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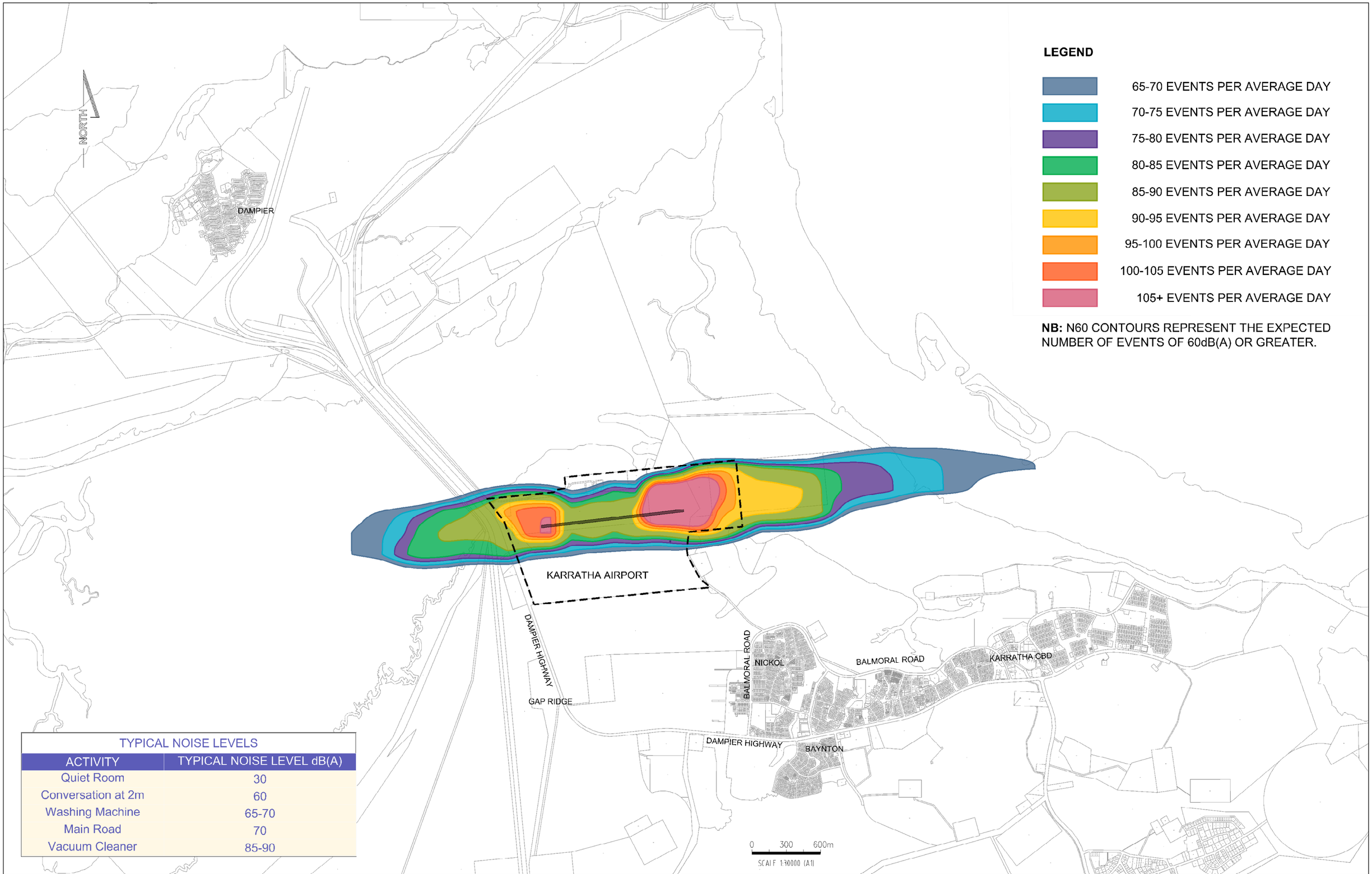

TYPICAL NOISE LEVELS	
ACTIVITY	TYPICAL NOISE LEVEL dB(A)
Quiet Room	30
Conversation at 2m	60
Washing Machine	65-70
Main Road	70
Vacuum Cleaner	85-90

Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
2033 N60 CONTOURS

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Figure No.
FIGURE D

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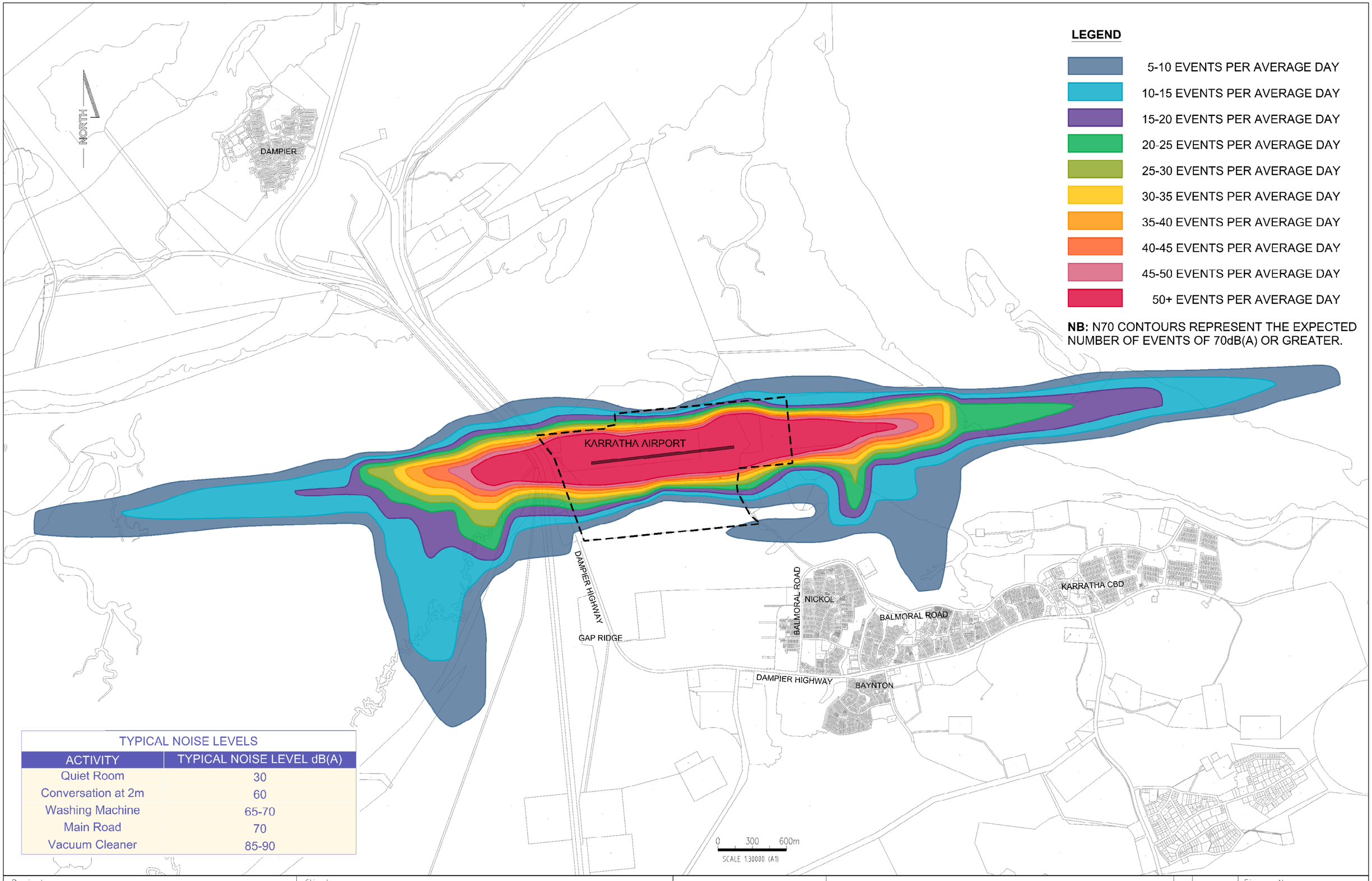

LEGEND

- 5-10 EVENTS PER AVERAGE DAY
- 10-15 EVENTS PER AVERAGE DAY
- 15-20 EVENTS PER AVERAGE DAY
- 20-25 EVENTS PER AVERAGE DAY
- 25-30 EVENTS PER AVERAGE DAY
- 30-35 EVENTS PER AVERAGE DAY
- 35-40 EVENTS PER AVERAGE DAY
- 40-45 EVENTS PER AVERAGE DAY
- 45-50 EVENTS PER AVERAGE DAY
- 50+ EVENTS PER AVERAGE DAY

NB: N70 CONTOURS REPRESENT THE EXPECTED NUMBER OF EVENTS OF 70dB(A) OR GREATER.

TYPICAL NOISE LEVELS	
ACTIVITY	TYPICAL NOISE LEVEL dB(A)
Quiet Room	30
Conversation at 2m	60
Washing Machine	65-70
Main Road	70
Vacuum Cleaner	85-90

Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
2033 N70 CONTOURS

Karratha AIRPORT
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Figure No.
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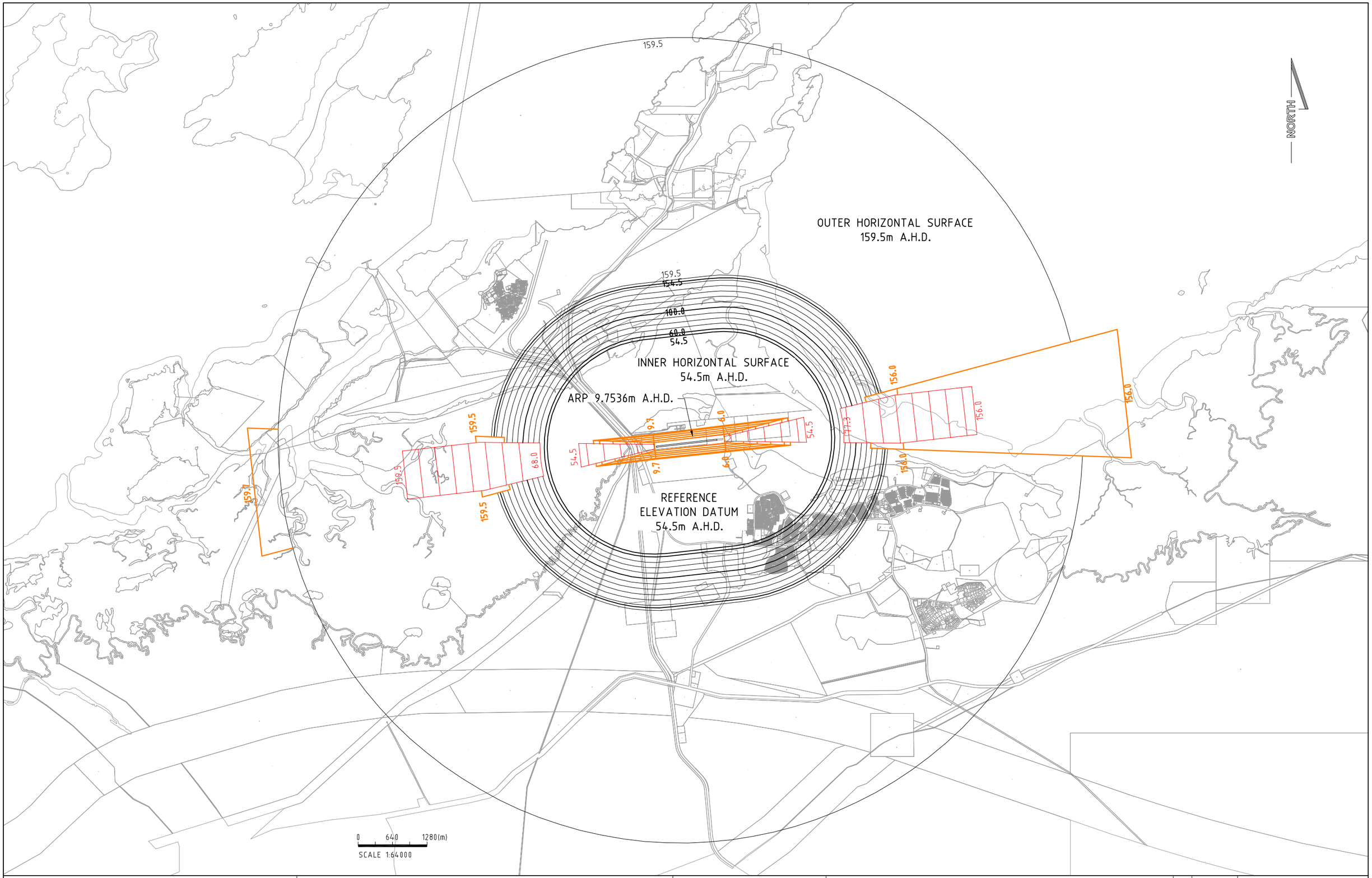

Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
BUILDING HEIGHT RESTRICTIONS PLAN

Karratha AIRPORT
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FIGURE F

Scale: 1:64000 | A1 (Sheet Size)

File Ref: B12254

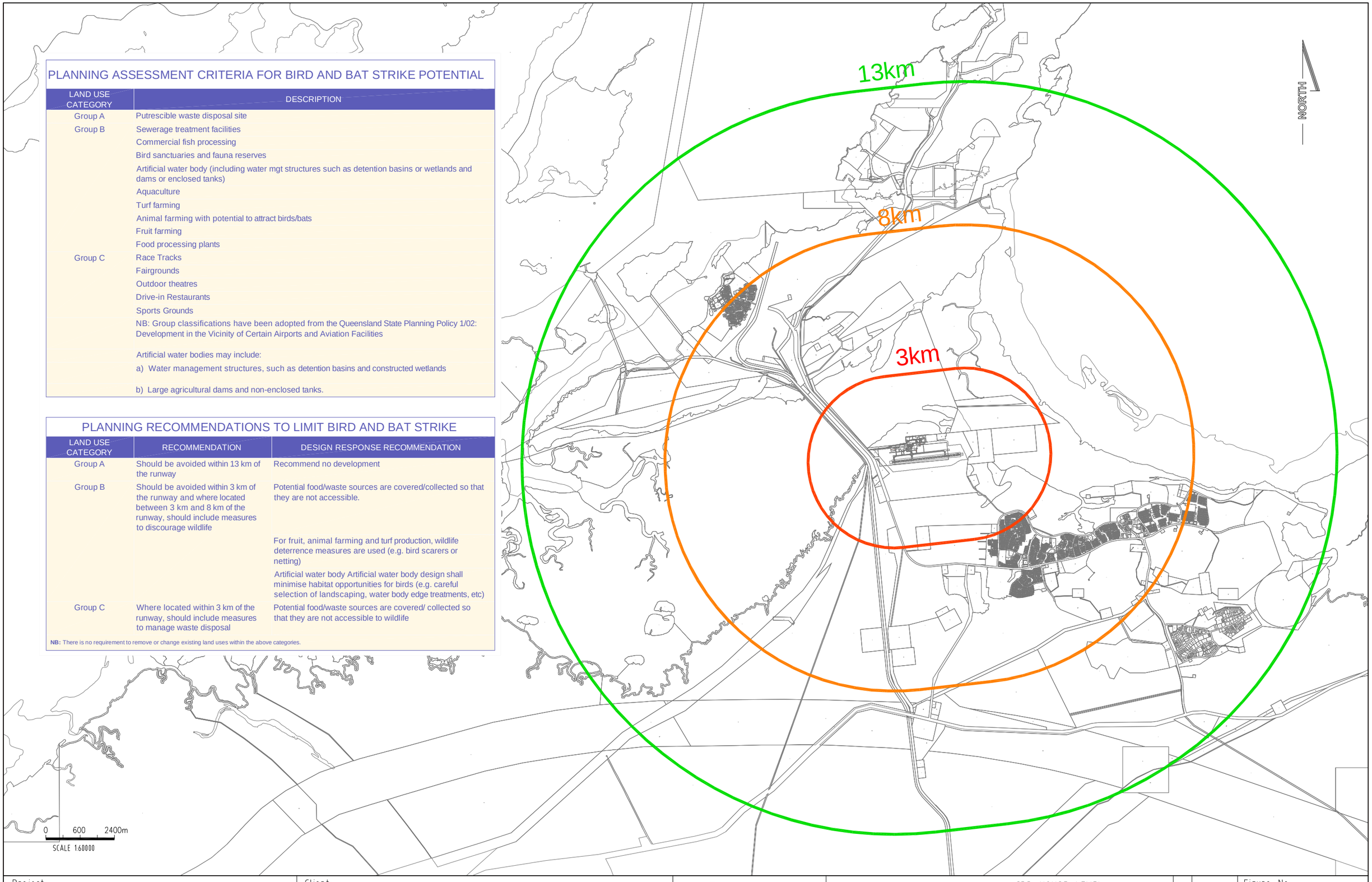
PLANNING ASSESSMENT CRITERIA FOR BIRD AND BAT STRIKE POTENTIAL

LAND USE CATEGORY	DESCRIPTION
Group A	Putrescible waste disposal site
Group B	Sewerage treatment facilities
	Commercial fish processing
	Bird sanctuaries and fauna reserves
	Artificial water body (including water mgt structures such as detention basins or wetlands and dams or enclosed tanks)
	Aquaculture
	Turf farming
	Animal farming with potential to attract birds/bats
	Fruit farming
	Food processing plants
Group C	Race Tracks
	Fairgrounds
	Outdoor theatres
	Drive-in Restaurants
	Sports Grounds
	NB: Group classifications have been adopted from the Queensland State Planning Policy 1/02: Development in the Vicinity of Certain Airports and Aviation Facilities
	Artificial water bodies may include:
	a) Water management structures, such as detention basins and constructed wetlands
	b) Large agricultural dams and non-enclosed tanks.

PLANNING RECOMMENDATIONS TO LIMIT BIRD AND BAT STRIKE

LAND USE CATEGORY	RECOMMENDATION	DESIGN RESPONSE RECOMMENDATION
Group A	Should be avoided within 13 km of the runway	Recommend no development
Group B	Should be avoided within 3 km of the runway and where located between 3 km and 8 km of the runway, should include measures to discourage wildlife	Potential food/waste sources are covered/collected so that they are not accessible.
		For fruit, animal farming and turf production, wildlife deterrence measures are used (e.g. bird scarers or netting)
		Artificial water body Artificial water body design shall minimise habitat opportunities for birds (e.g. careful selection of landscaping, water body edge treatments, etc)
Group C	Where located within 3 km of the runway, should include measures to manage waste disposal	Potential food/waste sources are covered/ collected so that they are not accessible to wildlife

NB: There is no requirement to remove or change existing land uses within the above categories.



Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
BIRD & WILDLIFE HAZARDS

Karratha AIRPORT
Shire of ROEBOURNE

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Drawn: LT | Checked: JSS | Approved: BJH

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0	10/04/13

Figure No:
FIGURE G

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File Ref: B12254
Sheet Size: A1

NORTH

6km RADIUS - LIGHTS WITHIN THIS AREA ARE SUBJECT TO THE PROVISIONS OF REGULATION 94 CAR 1988.

4500 m
3000 m
2000 m
1000 m

1500m
1200m
900m
600m

A
B
C
D

AERODROME BOUNDARY

MAXIMUM INTENSITY OF LIGHT SOURCES MEASURED AT 3° ABOVE THE HORIZONTAL	
ZONE A	0 cd
ZONE B	50 cd
ZONE C	150 cd
ZONE D	450 cd

*cd = Candela (the common candle emits light at an intensity of roughly one candela).

0 250 500m
SCALE 1:25000

Project:
PRELIMINARY DRAFT 2013
KARRATHA AIRPORT MASTER PLAN
AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
LIGHTING RESTRICTION

Karratha AIRPORT
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FIGURE H

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Sheet Size

LEGEND

- AIRCRAFT MOVEMENT AREA & AIRSPACE PROTECTION ZONE
- AVIATION ACTIVITIES & AVIATION SUPPORT FACILITIES
- COMMERCIAL LAND USES - NORTHERN ZONE
- COMMERCIAL LAND USES - SOUTHERN ZONE
- INTERNAL CIRCULATION

NORTH

TO DAMPIER

DAMPIER HIGHWAY

PROPOSED INTERSECTION WITH DAMPIER HIGHWAY

PRECINCT A

PRECINCT B

PRECINCT C

PRECINCT D

PRECINCT E

PRECINCT F

PRECINCT G

PRECINCT H

PRECINCT I

PRECINCT J

PRECINCT K

PRECINCT L

PRECINCT M

PRECINCT N

CONNECTION TO PROPOSED UPGRADE OF MILLARS ROAD

TO NICKOL WEST AND KARRATHA CBD

TO GAP RIDGE AND KARRATHA CBD

0 60 120m

SCALE 1:6000 (A1)

LAND USE CATEGORY

PRECINCT	LAND USE
A	PASSENGER OPERATIONS
B	GENERAL AVIATION & AVIATION SUPPORT (ROTARY-WING)
C	GENERAL AVIATION & AVIATION SUPPORT (FIXED-WING)
D	AVIATION-RELATED LIGHT INDUSTRIAL
E	NON-AVIATION LIGHT INDUSTRIAL
F	PASSENGER OPERATIONS
G	AIRLINE SUPPORT
H	RETAIL/COMMERCIAL
I	RETAIL/COMMERCIAL
J	COMMERCIAL
K	GENERAL AVIATION & AVIATION SUPPORT (FIXED-WING)
L	AVIATION-RELATED LIGHT INDUSTRIAL
M	RETAIL
N	NON-AVIATION LIGHT INDUSTRIAL

Project:
PRELIMINARY DRAFT 2013 KARRATHA AIRPORT MASTER PLAN AND LAND USE PLAN

Client:
SHIRE OF ROEBOURNE

Title:
20 YEAR LAND USE PLAN (2013-2033)

Karratha AIRPORT Shire of ROEBOURNE

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FIGURE I

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