GERALDTON AIRPORT

MASTER PLAN

To 2030

(Update: February 2016)

CITY OF GREATER GERALDTON, WESTERN AUSTRALIA

GERALDTON

TAKE A FRESH LOOK

Contents

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Master Plan Technical Amendments

In relation to Federal agencies, and most particularly Departments of Infrastructure and Transport, Airservices Australia (Airservices), the Civil Aviation Safety Authority (CASA), and the Office of Transport Security (OTS), the City has continuing operational engagement. As and when those agencies issue plans, regulatory or technical guidance or formal determinations that may affect elements of this Master Plan, the City will amend this plan accordingly and issue revised editions. The City regards such revisions *as technical amendments resulting from agencies with competent jurisdiction including, where necessary, obligations to consult industry and/or the broader community and therefore not requiring community or aviation stakeholder consultation by the City before making consequential amendments to this Master Plan.*

With passage of time, editions of the master plan age, and it is necessary to update them from time to time, to reflect progress made in implementation of particular initiatives identified in the original edition of a master plan. With time, new technologies emerge, presenting opportunity to replace old capabilities with new. As well, with time, circumstances change, giving rise to changes in areas of emphasis and priority for enhancement of particular capabilities, and changes to forecast timing for development of particular capacity - but ***not*** changing the strategic capacity and capabilities as envisaged in the original edition of the master plan. The City regards such revisions as *technical or administrative amendments*, not requiring community or aviation stakeholder consultation by the City before making consequential amendments to this Master Plan document. Such updates are provided to enable stakeholders to be informed about development progress, and likely nearer-term developments, within the longer term time horizon of the Master Plan.

Users of this document should check to ensure that they access the current edition of the Geraldton Airport Master Plan, available via the City website.

PREVIOUS VERSIONS	ISSUE DATE
2.0 Updated the master plan, to reflect progress in implementation of planned initiatives since the prior edition of January 2013, and included consideration of options for staged development.	November 2014
2.1 Updated the master plan, to reflect minor amendments to detail of options for staged development,	February 2015
THIS VERSION	
2.2 Updates the master plan, to reflect progress in development of the Greenough Passenger Terminal, with building extension to provide a new Departures lounge.	February 2016

EXECUTIVE SUMMARY

Airport Strategy

Airport Master Plans envisage the Future ultimate potential development of an Airport, in terms of aviation and enabling/supporting infrastructure, to accommodate forecast passenger numbers, and aircraft movements in terms of aircraft numbers and types. That vision serves to guide infrastructure and services design and development over time.

Most importantly – design for ultimate future development of an airport enables protections to be put in place to Future-Proof the airport against incompatible land uses and development in adjacent land areas, to ensure that the local economy and its community maintains the flow of social and economic benefits of its airport. Those protections typically include designation of buffer zones around airports via town planning schemes or local planning policies, reflecting the obstacle limitation surfaces and noise forecast contours based on ultimate design aircraft, and forecast numbers of aircraft movements. Master plans are strategic documents.

Updates to the 2012-2030 Master Plan for Geraldton Airport in the period to 2016 have not changed the ultimate development plan, as originally published in 2012. This update makes only minor amendments. The Master Plan for Geraldton Airport envisages that *at some time in the future*, the airport will require development of a new runway, with sufficient length and capacity to accommodate operation of Code 4E aircraft types, with international standard RESA provisions. In a whole-of-network context, ideally that runway and associated taxiways and aprons, could include design features enabling restricted operation of Code 4F (A380) types, enabling them to land when unable to land at Perth airport. The new runway is envisaged parallel to existing main runway 03/21, and the existing runway would revert to use as a parallel taxiway.

For the purposes of land use planning controls to prevent incompatible development encroachment on Geraldton Airport, this master plan envisages future development of a new 2700x45M runway. For that design, OLS and noise incidence and frequency profiles have been prepared for the purposes of future-proofing that future ultimate development and use. Timing of such future development will depend on the rate and nature of local and regional economic growth, and associated population growth.

This plan includes an outline of potential development stages (and options) for aviation infrastructure in the intervening years. The 1981x45M main runway 03/21 last had a pavement overlay in 1999. Runway pavement PCN=34 with Medium strength subgrade. Currently, Code 3 C types such as F100/B717 have unrestricted operations, while Code 4C types such as B737/A320 may operate from the runway with pavement weight concessions. Pavement renewal is required before 2018.

Staged enhancement of current runway 03/21 capacity would see:

- enhancing pavement strength to enable *unrestricted* operation of Code 4C types (PCN>40), then
- enhancing pavement strength and extending runway length to 2400 metres, to enable at least *restricted* operation of smaller Code 4E types such as A330.

Within the land currently available, and without needing to utilise the additional land acquired to enable future development of the future 2700M runway, existing runway 03/21 can be extended from 1981 to 2400M with appropriate RESA provisions. Such extension would push need for a new 2700M runway out beyond 2025.

Development options require consideration of cost/risk/benefit profiles, including assessment of air traffic growth rates, and associated aviation revenue considerations. Whole-of-network considerations, such as alternate landing airport needs for Perth Airport, may have bearing on timing of enhancements, requiring consultation with operators, and State agencies.

For a 45M wide runway, asphalt overlays are costly, requiring mobilisation of high-volume asphalt plant, required to be onsite for the duration of a runway overlay project. Technical assessment of overlay requirements was undertaken during 2015, including technical evaluation of the structure and load bearing strength of the existing pavement.

Capacity to first finance, then service the finance, for stages of aviation infrastructure capacity development is a constraining factor for all regional airports, in the context of capacity/willingness of the airline industry to pay, and the flow-on of increased aviation fees and charges to air fares, with consequent effects on the community and local business.

Timing of developments will depend on local economic development and rate of population growth. The City envisages an asphalt overlay on runway 03/21 to at least renew the runway pavement at current capacity, in 2016-2017.

Developments completed in 2014 - 2016:

- relocation of car hire operations to new sites west of Gordon Garratt Drive
- new airport short term and long term car parks (with introduction of pay parking),
- new Apron ‘Charlie’ with pavement capacity to 22T,
- extension of taxiway ‘Bravo’ to intersect with taxiway ‘Alpha’,
- construction of a major extension to the Greenough RPT Terminal, to create a new sterile departure lounge, and relocate the passenger and carry-on baggage security screening facilities into the previous departures lounge area, allowing expansion of the usable area of the public lounge.

Airservices Australia relocated and upgraded navigation aids at Geraldton Airport during 2014-15. The Very High Frequency Omni Range (VOR) aid was upgraded from conventional CVOR to Doppler DVOR, and the Distance measuring Equipment (DME) transponder was upgraded in conjunction with the VOT upgrade.

Changes

In February 2016 Virgin ARA phased out operation of Fokker F50 types, operating all RPT services with F100 jets. QantasLink replaced its Q400 services with F100s in 2015.

Short Term Developments

In 2015-16 the City is investing about $1M to install a new Fire water main for the airport, with new firefighting water distribution and hydrants for the Terminal and Hangars precincts.

INTRODUCTION

City of Greater Geraldton

Geraldton Airport is owned and operated by the City of Greater Geraldton, located on the coast of Western Australia (WA), 420 km (200 nautical miles) north of the State capital city Perth.

The City of Greater Geraldton had a resident population exceeding 42,000 people. It has a rich and vibrant local economy based on mining, agriculture, fishing, tourism, minerals processing, light industry and manufacturing, professional and government services and a busy export shipping seaport. Its rate of growth in population has been as rapid as that of Perth and has one of the higher population growth rates in regional Australia. By 2030 the resident population is forecast to reach between 80,000-100,000 with emergence of the Mid West region of WA as a minerals and energy province of global significance.

The City Council views Geraldton Airport as *essential regional transport infrastructure*, an integral part of the National and State aviation infrastructure network, and is committed to ensuring that its Airport is developed with the infrastructure and facilities needed to enable and support the growth in aviation activity that will accompany rapid regional economic development and population growth.

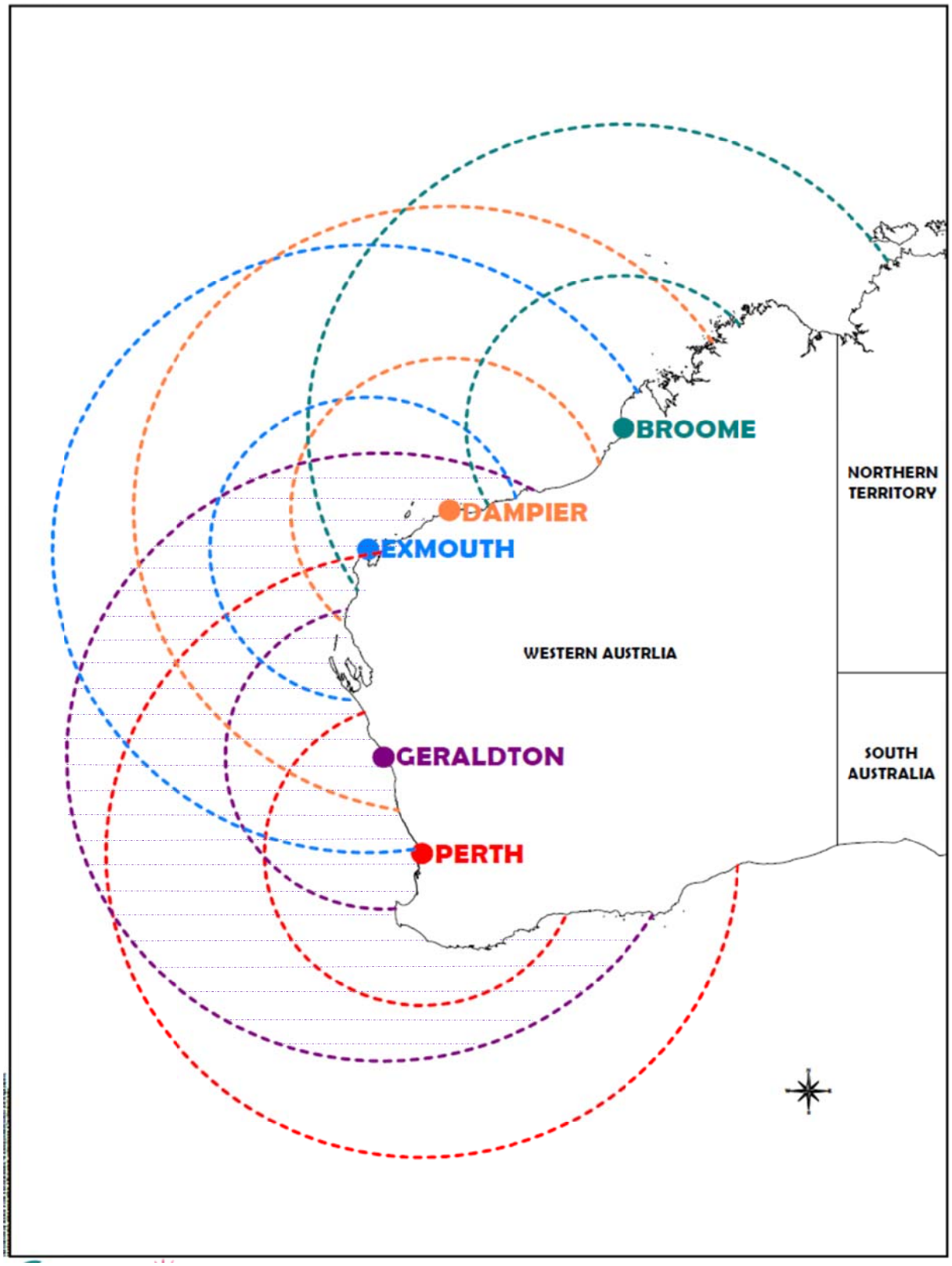
The first edition of this 2012-2030 Master Plan was drawn from the City's *Geraldton Airport Master Planning Report* of October 2012. It established the strategic development framework for the Geraldton Airport with a time horizon looking to 2030. It replaced the previous Master Plan that was published in 2007. ***This February 2016 update reflects progress and contemporary assessment of development timeframes and priorities***.

Stakeholder & Community Consultation

A comprehensive master planning review and strategic assessment was undertaken for Geraldton Airport during 2011 and 2012. The City was assisted in 2011 by the professional services of *Forte Airport Management* and *Kneebush Planning* with subsequent technical engineering design services and advice from *Aerodrome Management Services* in 2012.

A draft master plan was published for the purposes of aviation stakeholder and general community consultation in September 2011. The draft plan was advertised in the State and Local print media and on the City website, with digital copies available for download. Digital copies were emailed to aviation stakeholders including Regular Public Transport (RPT) airlines inviting submissions. Hard copies were made available to the community from the City offices, and were also delivered directly to aviation stakeholders resident at the airport and to members of the Geraldton Airport User Group.

General community feedback was minimal, but positive. No submissions were received setting out any issues of significant concern regarding proposed master planned developments from RPT airlines, Federal or State agencies, or local commercial and private General Aviation (GA) operators. As at the 2012 date of first publication of this master plan, there were *no unresolved issues* arising from submissions from either the general public or aviation stakeholders in response to publication and advertising of the draft master plan for community consultation. No community or aviation stakeholder submissions indicating concerns have subsequently been received in the 4 year period to February 2016.



1000 & 500 Kilometre Arcs from WA Coastal Cities

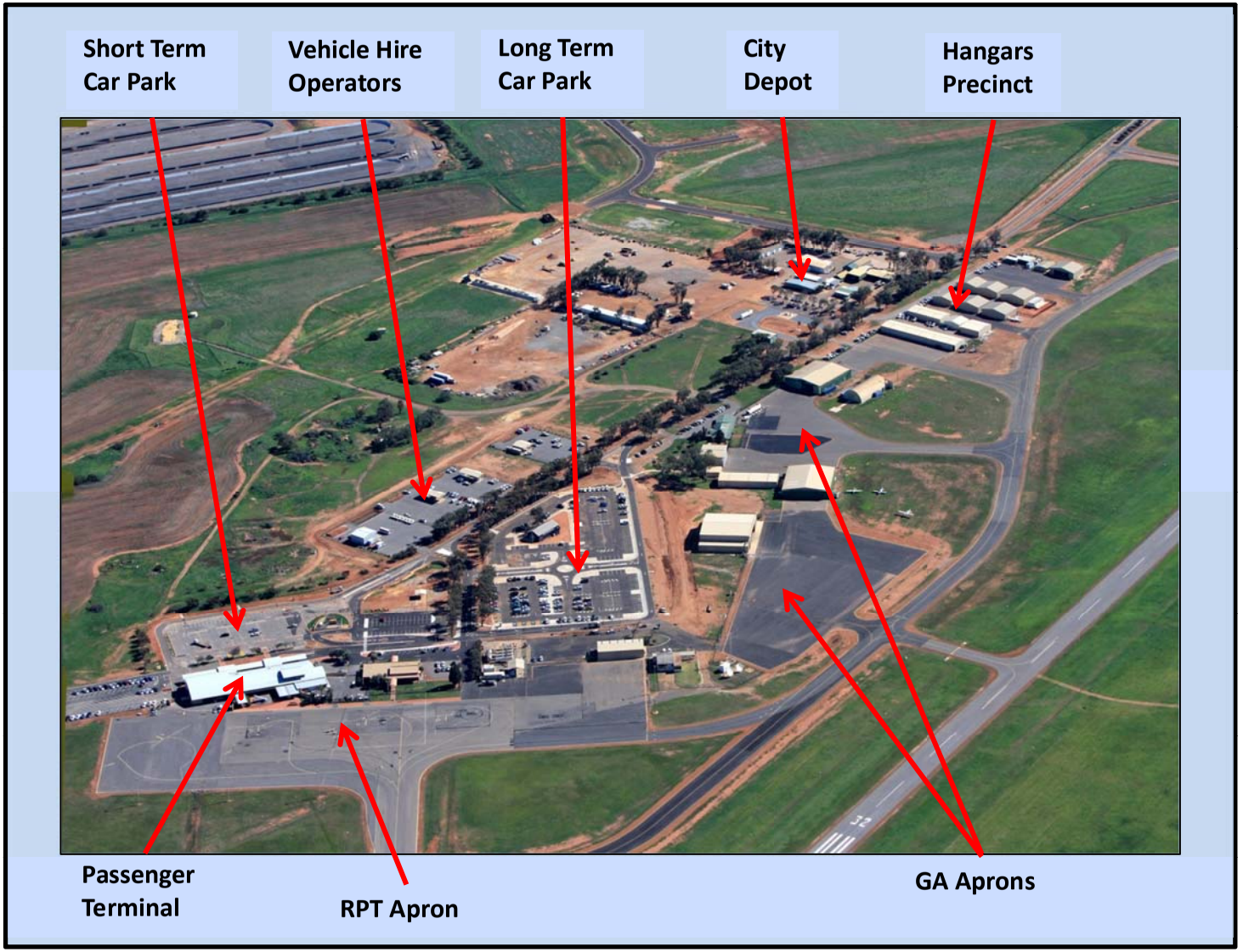
AIRPORT DESCRIPTION

Geraldton Airport Runway Infrastructure

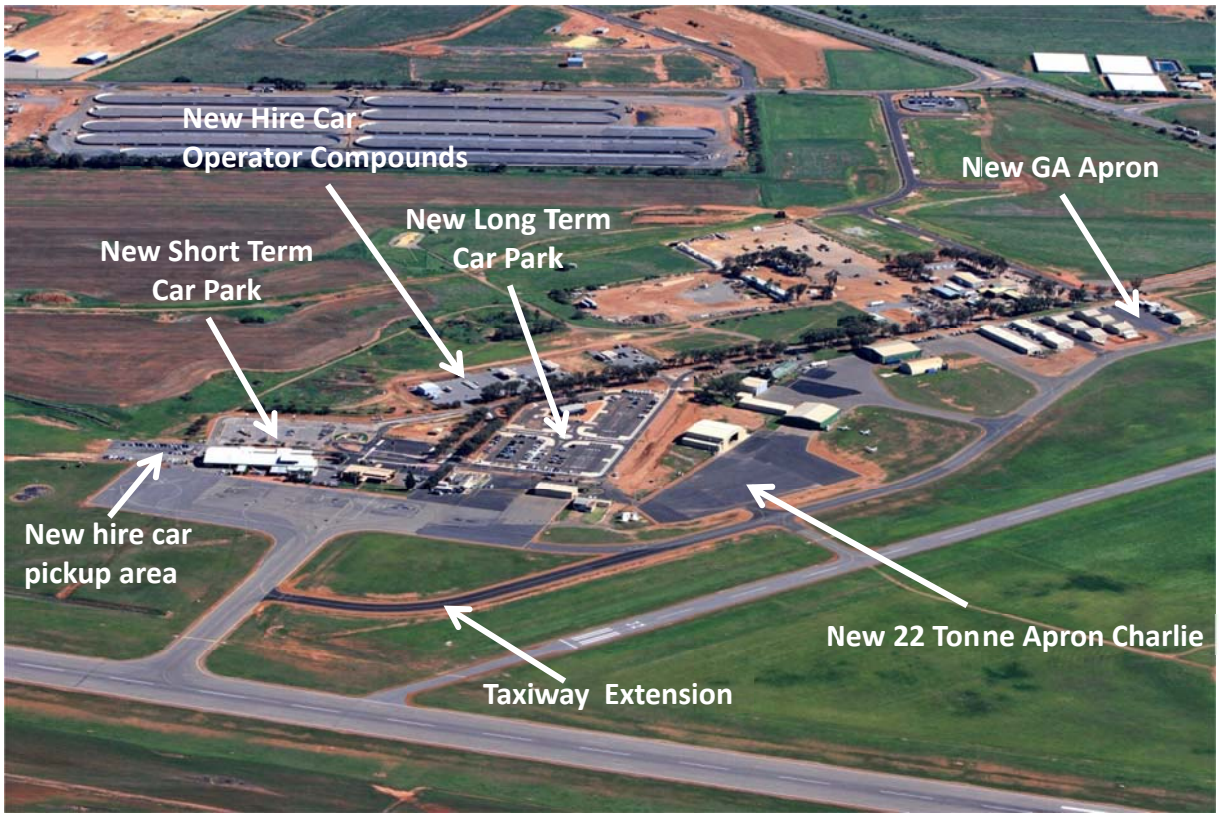
Geraldton Airport – Looking West

Geraldton Airport – Looking North

Geraldton Airport – RPT Terminal, Aprons & General Aviation Precinct


Short Term Car Park
Vehicle Hire Operators
Long Term Car Park
City Depot
Hangars Precinct
Passenger Terminal
RPT Apron
GA Aprons

Infrastructure Investments 2012-2016



Since adoption of the 2012 Geraldton Airport Master Plan, the City has invested in:

- New Long Term Car Park, with secure fencing, lighting, CCTV security.
- New Short Term Car Park, with secure fencing, lighting, CCTV security.
- Pay Parking introduced on short and long term car parks.
- New GA apron servicing GA charter and training operators now located at the northern end of the Hangars precinct, with direct access to Taxiway Bravo. GA operators no longer utilise the old Brearley terminal or the primary Apron.
- New 22 Tonne Apron 'Charlie' accessed off Taxiway Bravo.
- Extension of Taxiway Bravo, intersecting with primary Taxiway Alpha, enabling smaller aircraft types exiting Main runway 03/21 to avoid entry to the primary apron which is now reserved for RPT aircraft and larger aircraft types.
- The ex-Airservices building refurbished as a visiting operators terminal (Terminal Charlie), accessed from the new 22 Tonne Apron Charlie, for amenity of crews and passengers of visiting non-RPT operators.

In 2015:

- Construction was completed for extension of the main terminal building, for new sterile RPT departure lounges, including dedicated toilet amenities, and in-lounge café, with entry via new security screening lounge. The new RPT security screening and departure lounges enabled expansion of the public terminal lounge area.

2015: New RPT Departures Lounge & Security Screening Hall

Air Transport Operations

Regular Public Transport (RPT) services through Geraldton are provided by Virgin Australia Regional Airlines [previously Skywest] and QantasLink, both utilising Fokker F100 jet aircraft. Both Virgin and the Qantas group provide multiple daily services on the Geraldton-Perth route.

Shine Aviation is a fixed base charter operator operating various aircraft to 19 passengers, servicing resource industry FIFO charters, the Abrolhos islands, and general charters.

Geraldton Air Charter is a fixed based operator with various aircraft to 8 passengers, servicing the Abrolhos Islands fishing industry, and general charters.

Runways

Three runways are in operation:

Runway	Length (Metres)	Width (Metres)	Development
03/21	1981	45	Asphalt surface, unrestricted 3C, pavement concessions for 4C types
14/32	844	18	Asphalt surface, non-instrument 1B <5700Kg MTOW
08/26	900	18	Gravel, aircraft <5700Kg MTOW day operations

Main Runway 03/21

The main runway is asphalt surfaced 1,981 metres x 45 metres wide and it is presently developed to unrestricted Code 3C standard.

There is no threshold widening (i.e. turning nodes) for Code 4C aircraft operations and the runway shoulders are unsealed.

Runway 03/21 strip width is declared at 300 metres (graded). Compliant 90 metre length Runway End Safety Area's (RESA's) exist as graded areas beyond the runway strip ends.

Approach and take off surfaces on runway 21 are clear to 1.45% and on runway 03 clear to 1.83%.

Published pavement strength rating is **PCN 34/F/B/1600/T** being suitable for unrestricted operations of B717-200 aircraft, where;

Pavement PCN = ACN = 34

Pavement type is flexible = F

Subgrade is medium strength rating between 8-13 CBR = category B

Tyre Pressure = 1600 Kpa

PCN rating if determined by technical means = T or U if unrated.

Unrestricted operations of an aircraft are permitted when the manufacturer determined ACN for a particular aircraft is equal to or less than the PCN for a runway.

To illustrate: aircraft operations of B737-800 at MTOW (70,750 kg[1]) with an ACN of 39 on a B category subgrade would require approval of a pavement concession from the airport operator as this delivers a 115% loading on the existing pavements.

Secondary Runway 14/32

Runway 14/32 is asphalt sealed 844 metres x 18 metres wide and is suitable for day operations. It has a published pavement strength rating of PCN 9/F/B/450/U being suitable for 5,700 kg MTOW operations and below.

Approach and take off surfaces on runway 14 are clear to 1.20% and on runway 32 clear to 2.71%.

This runway is published as non-instrument Code 1B. This planning standard will be retained as it suits aircraft type up to Beechcraft 200 'King Air' (5,700kg MTOW) operation.

The existing runway seal width of 18 metres would need to be widened to 23 metres for Code 2B operations, which is *not necessary* at Geraldton as aircraft greater than 5,700kg MTOW typically have 15 knot cross wind tolerance and can operate in all hours on the main runway 03/21 which has 96% usability.

Secondary Runway 08/26

Runway 08/26 is gravel 900 metres x 18 metres wide and suitable for day operations of aircraft below 5,700 kg subject to it being 'dry to depth'.

Approach and take-off surfaces on runway 08 are clear to 2.21% and on runway 26 clear to 3.02%.

This runway has the least usability of the three runways with 93% usability not reached until cross wind tolerance of aircraft is 30 knots, which is excessive for light aircraft, and most particularly for ultra-light sports aircraft types. Its intersect alignment at threshold of runway 21, restricted use for wind, and under-developed status suggest there is minor benefit to the overall operational functionality of the Geraldton Airport – but continuing retention is desirable to enable safety in operation for lighter aircraft unable to handle cross-wind conditions on runways 03/21 or 14/32 that may prevail at certain times during the year. The City has no plans to finance sealing of runway 08/26.

With projected growth of RPT and charter aircraft operations, both turbo-propeller and jet, runway 08/26 tends to create an undesirable circuit to accommodate within the matrix of the patterns flown by larger aircraft that would be using either of the other two runways and this may emerge as a future safety issue as air movements of larger aircraft including RPT jets increase.

Note that Geraldton has neither a control tower, nor remote aircraft traffic surveillance and management facilities. Safety thus ultimately depends on strict adherence by all pilots with regulations, published procedures and best practice airmanship protocols.

CASA monitors levels and mixes of aircraft activity, and as changes occur will undertake air safety reviews as necessary. The City will act on the future advice and directions of CASA in relation to runway 08/26.

[1] Heavier versions of the B737-800 exist and ACN accordingly may be up to 46 on a B grade subgrade

Taxiways

Taxiway Alpha is the main stub taxiway that connects runway 03/21 to the RPT apron. This is a sealed taxiway 22 metres in width. This is the only suitable taxiway for RPT aircraft operators.

Taxiway Bravo provides a link from Taxiway Alpha to runway 08 and 32 thresholds and the general aviation area, enabling smaller aircraft types to avoid entering the RPT apron.

Taxiways Charlie, Delta and Echo extend from Bravo into general aviation apron parking areas.

Taxiway Foxtrot is sealed and provides a connection from runway 32 threshold to runway 03/21.

Taxiway Golf connects runway 21 threshold to runway 26 threshold.

Aprons

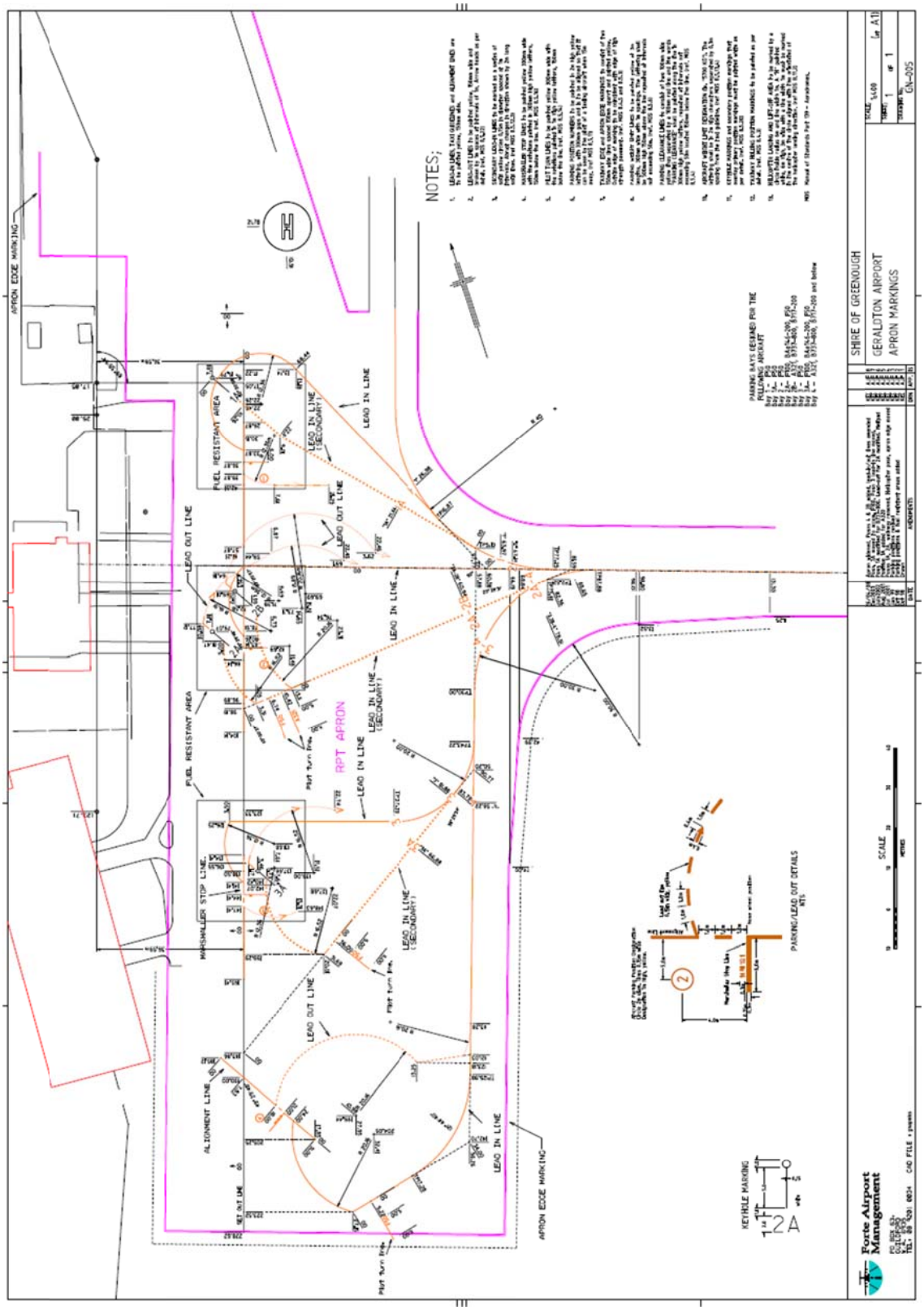
The RPT Apron is directly adjacent to the Greenough passenger terminal and it has parking capacity for four RPT aircraft up to B737-800 series.

Apron use:

- Bays 1, 2 & 3 are principally designated for F100 aircraft parking.
- Bay 2B and Bay 4 are designated suitable for B737-800 and below.

Off taxiway Bravo, a new Apron Charlie has been constructed with pavement capacity to 22T, for use by non-RPT aircraft. GA aircraft are no longer permitted to park on the northern section of the RPT apron

Additional apron parking exists adjoining the existing hangar developments (including newer developments at the northern portion of hangar development with addition of apron to enable GA operations from another dedicated single-operator terminal building), and the main designated General Aviation Terminal.


RPT APRON
NOTES;
SHIRE OF GREENOUGH
GERALDTON AIRPORT
APRON MARKINGS
Forte Airport Management
FUEL RESISTANT AREA
LEAD IN LINE
LEAD OUT LINE
LEAD IN LINE (SECONDARY)
MARSHALLER STOP LINE
ALIGNMENT LINE
APRON EDGE MARKING
PARKING/LEAD OUT DETAILS
KEYHOLE MARKING
SCALE

RPT APRON

Navigation Aids

All radio navigation aids are owned by Airservices Australia and are located on leased sites on the airport and depicted on the Airservices Australia aerodrome facility chart YGEL.

VOR (Very High Frequency Omni Range)

Navigation aid with a ground to air range limited to 'line of sight' reception. It is located in the triangle of the three runways where it is free of reflecting objects and provides maximum line of sight coverage. The VOR enables a pilot to select, identify, and locate a line of position of the aircraft from or to the VOR beacon. This radio facility is also used in the provision of one of the INPA procedures for runway 03 and runway 21.

(Upgraded by Airservices in 2014 from Conventional CVOR to Doppler DVOR).

DME (Distance Measuring Equipment)

A ground transponder provides a radio pulse enabling distance to be measured between the aircraft and the ground beacon. It is located adjoining the VOR.

(Upgraded by Airservices in 2014, in conjunction with the VOR upgrade).

NDB (Non Directional Beacon)

Located at the south western end of the airport and is used to provide an INPA procedure for runway 03 and runway 21.

SGS (Satellite Ground Station)

Facility located to the north of the main apron and used to re-transmit VHF air to ground communications to and from the Melbourne operations centre.

GPS (Global Positioning System)

Instrument non-precision approach system is designed for runway 03 and 21. It makes use of satellite technology and has no ground systems.

Airfield Lighting

Runway Edge Lighting:

Elevated low-intensity level runway edge lighting is provided for main runway 03/21 and its associated stub taxiway Alpha. The runway lighting is at 90 metre longitudinal interval spacing which does not meet current MOS Part 139 requirements for 60 metre spacing. However, CASA dispensation has been provided as a pre-existing installation.

Precision Approach Path Indicator (PAPI):

Exists on both approaches to runway 03/21 providing visual slope guidance. This is a mandatory visual aid for Jet aircraft operations, and of benefit to current operators flying Fokker 50 and Dash-8 Q400 turboprop aircraft.

Pilot Activation

Both the runway lights and PAPI are pilot activated on **VHF frequency 126.8** and are also capable of being manually switched.

Apron Lighting

Seven apron floodlight towers provide illumination to the RPT apron.

Standby Power

Emergency standby power exists for airfield lighting, which includes supply to apron and PAPI lights.

Illuminated Wind Indicators

There is a primary illuminated wind indicator adjoining the apron and secondary illuminated wind indicators at both runway thresholds of RWY 03 and 21.

For the purposes of compliance with straight-in Instrument Non-precision Approaches (INPA), wind information is provided to pilots via automated weather information broadcast (AWIB) on **VHF frequency 131.65** utilising information provided from the Department of Meteorology site located at the Southern end of the Airport.

Terminal Facilities

There are four airport-owned terminal buildings:

Greenough RPT Passenger Terminal

Originally constructed at a cost of $3.6 million dollars in 2001 and extended in 2010-11 ($2.6m) to cater for full passenger and checked baggage security screening operations. It has outdoor and indoor seating, meeting facilities, security equipment for screening of passengers and checked bags, baggage conveyance, licensed café, hire car and associated public amenities.

Work was completed in April 2015 on a $3M project to extend the terminal, with construction of a new sterile Departures lounge with café and amenities, including an IT/WiFi room, and new departure gates to the RPT apron. A new security screening hall was created in place of the previous departures lounge

Brearley Terminal

Brick terminal originally constructed in 1979 and refurbished in January 1995. Replaced as the main RPT terminal by the Greenough Terminal. It is currently used by air freight contractors, and for office accommodation, no longer utilised as a passenger terminal.

GA Terminal

A general aviation terminal, located on the northern general aviation apron, was built in 1995 by the Shire of Greenough, and is used exclusively under long term lease by a single fixed base charter operator. Its construction preceded the development of the new RPT terminal. Shine Aviation conduct 70-100 movements a week of which approximately 20 movements would be associated with flying training and the remainder charter, including FIFO services for the resources industry.

Terminal Charlie

The building previously utilised by Airservices, located north of the main RPT apron, was refurbished during 2014 to serve as a visiting operators terminal, with adjacent airside access to Apron Charlie, with 22T pavement capacity.

Private terminal buildings have been constructed by Geraldton Air Charter, and Kelmac Aviation, in the northern section of the hangars precinct, with access from a dedicated apron to taxiway Bravo.

Car Parking

New long term and short term car parks were constructed in 2013-2014, with Pay-Parking facilities.

24 hour CCTV surveillance system monitors all aspects of the car parks and RPT terminal.

Aircraft Fuel

Mobil Oil has 110,000 litres of storage for Jet Al fuel type and 110,000 litres storage capacity for Avgas fuel and their agent carries out the major refuelling. All storage is above ground and the facility is normally manned through business hours with a call out service for after-hour sales. All aircraft are serviced by fuel tanker.

Shine Aviation Services has its own 68,000 litre above-ground compliant tank for Avgas, located adjacent to their leased GA terminal. They purchase Avgas directly from Mobil at the Airport. In addition most general aviation operators have small fuel storage trailer units.

A landside credit-card bowser outlet operates for supply of ULP (utilised by some sports aircraft). *Operators are responsible for use of compliant containers and practices for transport of ULP fuel airside*.

Engineering Services

Mains power is supplied from Western Power transmission lines to a point of entry at the airport. The electrical service to the airport has a stand-by generator supplying emergency power in the event of mains power failure. Mains supply for the airport precinct was upgraded from 11kV to 33kV during 2014.

Water supply is via the town supply. In 2016 a new Fire main is under construction, separate from the potable water main, with new distribution and hydrant points for the Terminal and hangars precincts. A storage tank with booster pumps enables high pressure delivery to fire hydrant outlets.

The City has an established works depot on airport land west of the main access road to the terminal. It comprises administration offices, large bulk material storage areas, workshops and undercover equipment shelters.

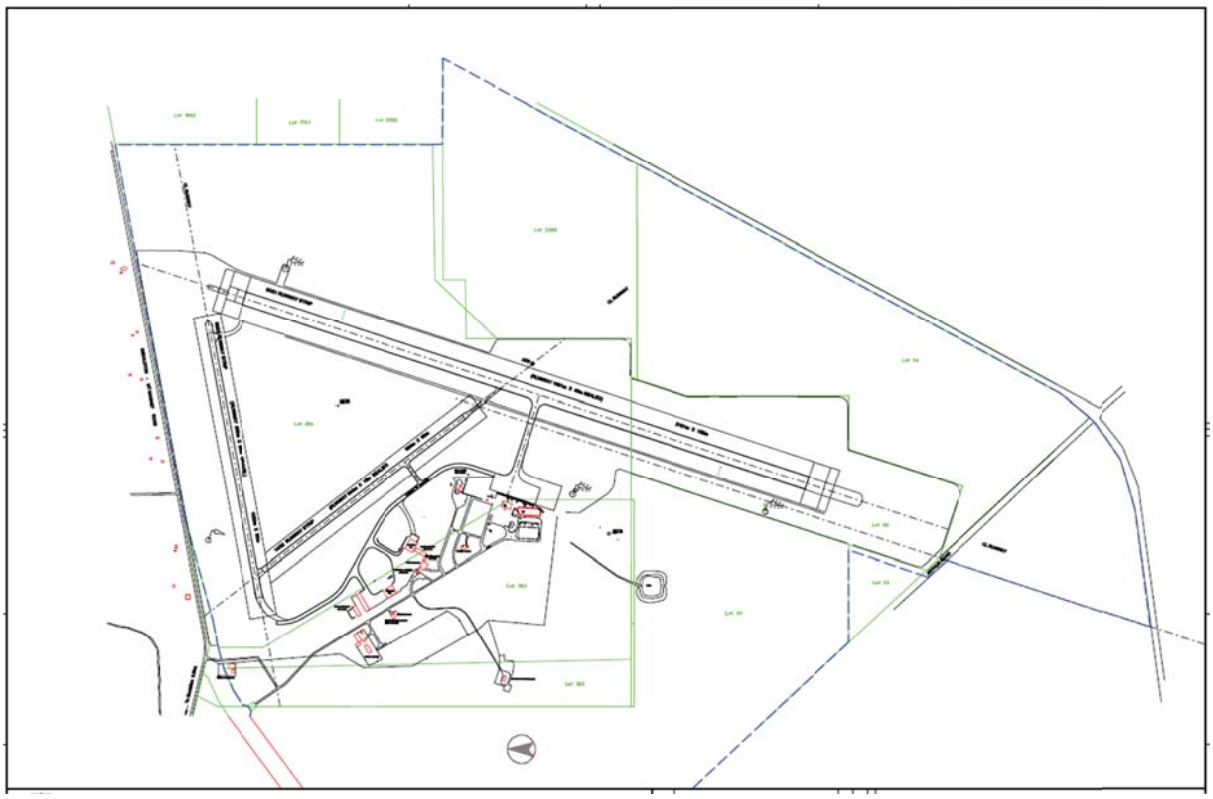
Hangars

There are multiple privately owned hangars on leased land sites within the GA area northwest of the Greenough RPT terminal.

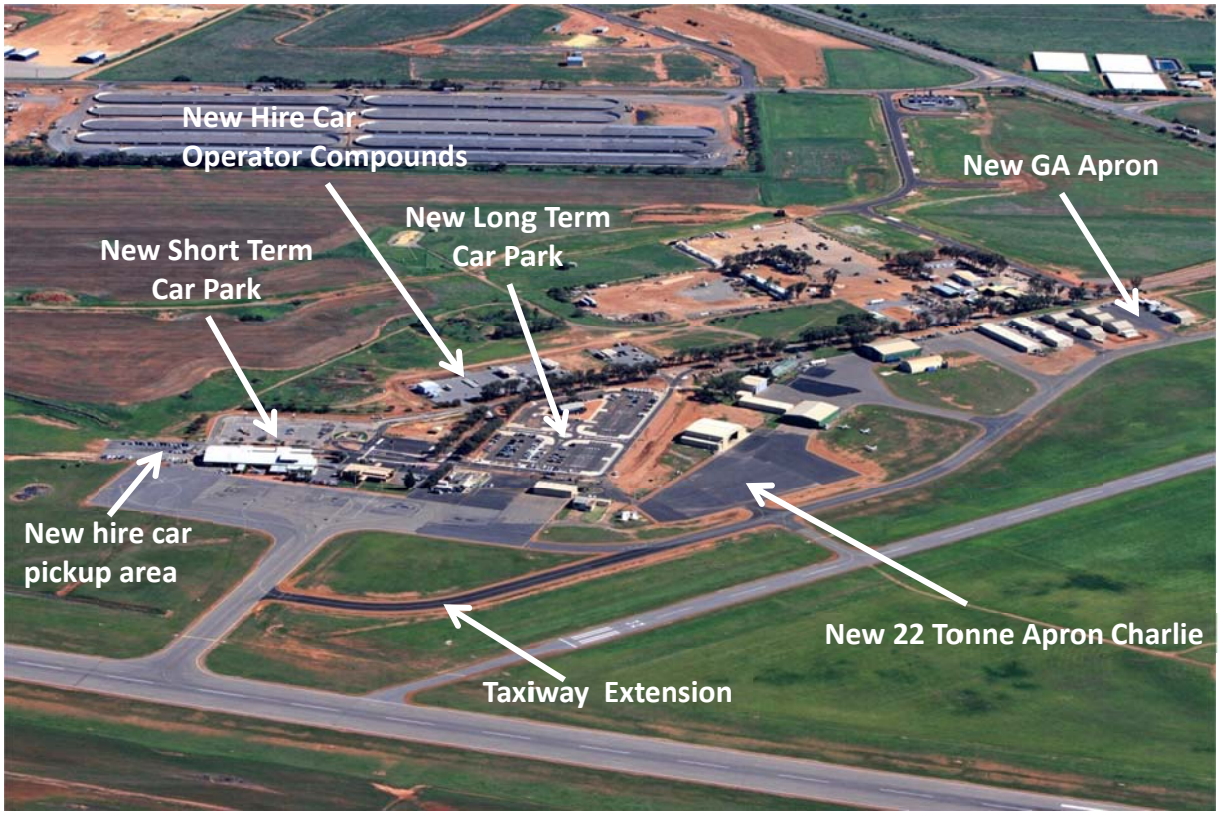
The Geraldton Airport has five main large hangars that are situated at the northern general aviation apron accessed via Taxiway Delta and Echo.

The larger three hangars (110, 117 and 116) are 1008 square metres in area and are owned by the City. They are leased to General Aviation operators for aircraft storage and maintenance.

The City also owns and manages the Patient Transfer Hangar utilised by Ambulance operators, for patient access to services of the Royal Flying Doctor Service (RFDS).



Geraldton Airport Configuration 2012



Changes 2012 to November 2015

Airspace

As a consequence of commencement of operation of a second RPT airline through Geraldton, in late 2011 CASA commissioned an air safety review for Geraldton. The report (reference EF11/6658) was released in January 2012

Findings:
At current traffic levels, including the new QantasLink services, the collision risk is within the tolerable range. As noted in the report, the calculation is conservative and also reflects some uncertainty about actual movement rates for Visual Flight Rules (VFR) aircraft.

On this basis, the existing Class G classification is satisfactory.

The following recommendations were made:

1. CASA and the aerodrome operator should collect more accurate data on VFR movements including circuit traffic (touch and go).

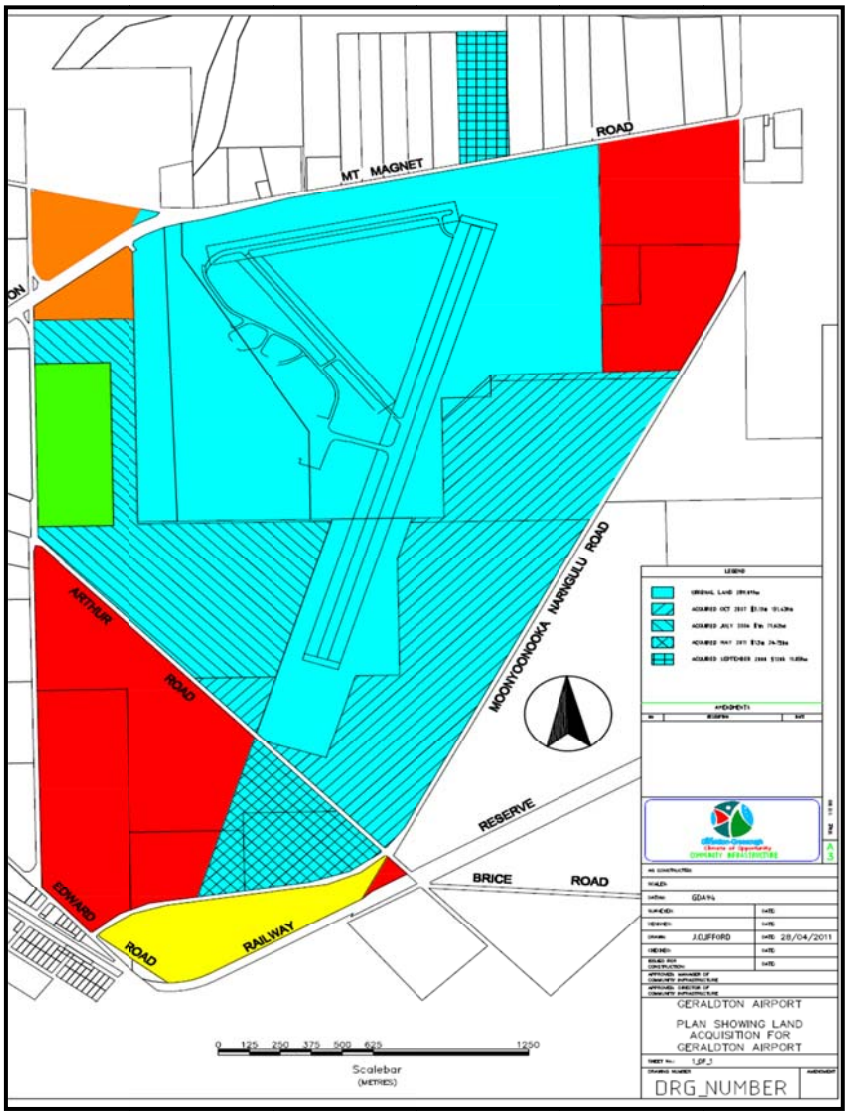
2. CASA should monitor changes to scheduled services and FIFO operations at intervals of not more than six months and the risk level be further assessed in light of increases of more than 10% in any category of movements.

3. Educational material should be incorporated into the Flight Safety Australia magazine and CASA's Aviation Safety Seminars to remind pilots of the requirement to monitor and broadcast on the CTAF when transiting near non-controlled aerodromes.

CASA OAR engaged AvData Australia to monitor and record aircraft movements at Geraldton commencing in April 2012.

Airport Land

Since acquisition of the Airport in freehold from the Commonwealth, at the time comprising some 290HA of land, the City has progressively purchased additional freehold land to bring total land area of the airport to 532HA:



Original Land 290.59HA

Acquired 2000 11.83HA

Acquired 2006 71.62HA

Acquired 2007 131.43HA

Acquired 2011 26.75HA

Airport Land: 532.22HA

AVIATION ACTIVITY & FORECASTS

RPT Services

The Geraldton-Perth RPT air transport operators are Virgin Australia Regional Airlines (Virgin) and (since November 2011, following deregulation of the air route for intrastate services by the Western Australian State Government) the Qantas group.

Previously, Skywest – later acquired by Virgin Australia - had exclusive license for intrastate RPT services through Geraldton.

Recent RPT Services History

Recent history is provided as context for activity forecasts.

In 2010-11 RPT operator Skywest Airlines provided 30 services a week to Perth, and Port Hedland (connecting to Bali), of which 8 utilised F100x100 seat aircraft, and 22 utilised 46 seat F50 turboprop aircraft. (The 2007 Geraldton Airport Master Plan reported 35 weekly return F50 services by Skywest).

In 2011-12 Skywest also serviced Port Hedland and Karratha, through Geraldton, and provided a weekly return service to Denpasar Bali via Port Hedland.

Prior to changes to intrastate air services arrangements in 2011, Skywest also provided F50 services to Kalbarri, Shark bay and Carnarvon, but those services were subsequently taken on by Skippers Aviation. Those smaller ports lacked security screening facilities at the time of introduction of compulsory passenger and baggage security screening for RPT aircraft with MTOW exceeding 20T.

In addition to RPT services, in 2012 Skywest also operated Perth-Geraldton return charter services three times per month, and charter services to Paraburdoo and Brockman, some via Carnarvon, 3-4 times per week. Weekly RPT service seat capacity for Skywest thus changed from about 1600 to 1800 seats per week (3200 to 3600 return seats/week or +18%) in the 2007-12 period.

On entry to the Perth-Geraldton route in November 2011, the Qantas group commenced QantasLink services utilising Dash-8 Q400 75 seat turboprop aircraft, offering 12 return services per week. In November 2014, Qantas changed to services on the route using a different subsidiary - Network Aviation F100 jet aircraft are now utilised for QantasLink services.

Skippers Aviation services Carnarvon, Kalbarri and Shark Bay, with three Dash-8 36-seater return services per week through Geraldton, since mid-2011.

In aggregate, the number of RPT services per week on the Perth-Geraldton route increased from 35 to 45 (from 70 to 90 return service movements) across the 2007-2012 period. However, from the time of deregulation of the Perth-Geraldton intrastate RPT services route and introduction of compulsory security screening on RPT service aircraft over 20T, Geraldton lost outbound RPT services to destinations other than Perth, most particularly losing scheduled RPT services to Pilbara airports.

The 2012 level of air transport represented an increase in available weekly aircraft seating capacity from 1610 to 2820 (or 3220 to 5640 return passenger movements), a capacity increase of about 75% over 2007 levels. Theoretical maximum passenger movements through the terminal with that available seating capacity would be of the order of 290,000 passenger movements per year.

RPT passenger movements through the Greenough Terminal in 2011-12 were about 136,500 so with 2012 RPT schedules on the Perth-Geraldton route there was surplus seating capacity – and potentially unsustainable yield levels for the RPT operators, in terms of sustainability of the numbers of services offered.

Introduction in late 2011 of competition in terms of airline choice, fares, aircraft types and service schedules clearly stimulated release of latent demand for passenger services. Annual passenger movements increased from about 105,700 in 2010-11 to 136,500 in 2011-12, a year on year increase of about 29%, after only 7 months of a 2nd operator on the Perth-Geraldton route. This coincided with significant local economic development activity associated with port and rail infrastructure upgrades. RPT passenger movement numbers subsequently fell away to 131,980 in 12/13 and further to 126,160 in 2013-14 but still some 19% higher than 2010-11, prior to deregulation of the Perth-Geraldton route.

As at November 2014, frequency of RPT services on the Perth-Geraldton route:

- Virgin – 22 F50 services/week (@ 46 seats: 1012 outbound seats/week)
- Qantas – 12 Q400 services/week (@ 75 seats: 900 outbound seats/week)

This provided a total 1912 one-way seats/week deployed by the two RPT airlines enabling 3,824/week maximum passenger movements, or annual capacity of 198,848 passenger movements. With only 126,160 passenger movements in 2013-14, against that capacity the average yield across both airlines would be about 63%. At industry level, nationally, domestic RPT demand has declined as the economy has softened with the commodity cycle downturn, and slowdown in rate of economic development in China, so short-term prospects for domestic RPT passenger growth are low.

The 2012 edition of this Master Plan noted that when a 2nd RPT operator enters a regional market, there is typically a consolidation and adjustment period for both operators. Coincidentally, at national level, the Qantas and Virgin groups embarked on a competitive capacity battle in the 2012-14 period, with some subsequent/consequent rationalisation of services across interstate and intrastate networks. The economic downturn since 2012 adds pressure to the process of service rationalisation by the RPT airlines.

As at date of preparation of this edition of the master plan, it is noted that:

- Virgin withdrew services on the Perth-Learmonth route during 2014, with Qantas group subsequently replacing its turboprop services on that route with 100-seat jets;
- The Qantas Group commenced using F100 aircraft for weekend services to Geraldton in November 2014, and ceased QantasLink Q400 75 seat turboprop services on the Perth-Geraldton route, in March 2015, replaced with services upgraded to F100 jet services;
- Virgin ceased use of F50 turboprop types in WA in February 2016, replaced with F100 jets on the Perth-Geraldton route;
- Virgin ceased providing F50-based FIFO services from Geraldton in February 2016, contracting Skippers Aviation to provide those services.

General Aviation

General aviation encompasses all civil aircraft operations other than scheduled airline operations and includes private flying, charter flying, agricultural spraying, flight training and aerial work operations. Military and rotary wing are also essentially general aviation but statistically usually recorded separately.

Fixed base general aviation operators at Geraldton Airport include:

- Shine Aviation Services, provides charters for the mining and corporate markets, offers charter and regular fly-in fly-out services, pilot training and scenic tours.
- Geraldton Air Charter, providing business and tourism air charters, including services to the Abrolhos Islands for the fishing industry and tourists
- Dunn Aviation, catering for aerial spraying and spreading.
- Midwest Aviation, aircraft equipment maintenance and parts
- Prestige Helicopters provide helicopter services.
- Kelmac Aviation provides Tecnam Aircraft Sales and pilot training.
- The Mid West Aero Club has fewer than 20 active members including both private and commercial aircraft operators, ranging from ultra-light to multi engine and helicopters.

The Royal Flying Doctor Service in Western Australia utilises the airport on an as required basis and has an aircraft hangar which is vested in the City adjacent to the General Aviation terminal.

Presently, General Aviation activity accounts for about 18,000 aircraft movements per annum, which includes estimates of non-billed touch and go flying training movements.

Aircraft up to 1000kg MTOW and training aircraft to 1200kg utilised by resident pilot training companies do not currently (2013-14 and 2014-15 fiscal years) pay landing fees at the airport. That arrangement is at Council discretion and is subject to review each year during City budget processes.

Helicopter Operations

Prestige Helicopters operates a small fleet of resident helicopters. Geraldton Airport is also serviced by away-base helicopters and is utilised by visiting helicopters during periods of high activity in mineral exploration, support to offshore operations, natural disaster responses such as the 2011 Gascoyne/Murchison floods, and during fire-bombing operations for bush fires.

Geraldton Airport as an Alternate Landing Port

Geraldton Airport is utilised as an alternate landing port by domestic RPT airlines, in the event of emergencies or severe weather events at Perth Airport, with aircraft up to and including A320 and B737-800.

Geraldton Airport is designated as an alternate landing port by several International airlines operating A320 or B737 aircraft into Perth airport.

Australian Defence Force

Flying training squadrons from RAAF Pearce use Geraldton Airport as an away destination for PC9 and Hawk jet training, conducting circuits and cross-country navigation exercises.

Geraldton is visited on an occasional basis by other RAAF aircraft, including C-130 and VIP Squadron A320 aircraft.

Economic Outlook

The City of Greater Geraldton is the main regional centre for the Mid-West region with a population of about 40,000 that grew at an annual rate of 2.6% over the period 2004-09.[2] Geraldton and the Mid-West region are strategically located between Perth and the Pilbara with strong underlying economic connections between the two regions, as identified by recent surveys.

There are a number of economic drivers for growth in the Mid-West outlined in the Mid-West Investment Plan 2011-2021[3]. Of significance is potential future infrastructure investment associated with Oakajee Port and Rail estimated at $6+ billion, requiring 2,600 contractors for construction. Major regional mining projects (Mid West development Commission Major Projects Summary) include the following:

Mid-West Major Projects		Budget	Number of Workers	
Project	Status Feb. 2011	A $m	Construction	Operation
Barrambie	Committed	629	400	250
Coburn	Planning	169	200	120
Extension Hill	Planning	2000	1000	350
Extension Hill	In production	73	150	100
Jack Hills Expansion Project	Planning	1500	2000	1300
Karara Iron ore Project	Construction	2000	1500	700
Lake Maitland	Planning	94	450	180
Mount Magnet	Planning	45	110	120
Weld Range	Committed	1600	1020	850
Wiluna	Planning	162	350	170
Windimurra	Construction	296	400	200
Yalgoo Iron	Planning	720	1000	293
		$9.288B	10,580	5,033

Iron ore, gold, uranium, vanadium, copper, platinum, rare earths and mineral sand mining, the Square Kilometre Array international science project, and NBN rollout add further investment stimulation potential.

Collectively the level of investment associated with resource-driven demand is substantial and it will bring with it transformation of the Mid-West's economy from its traditional agriculture, fishing, manufacturing, commerce and tourism based industries. Iron ore, mineral sands and wheat exports are well established.

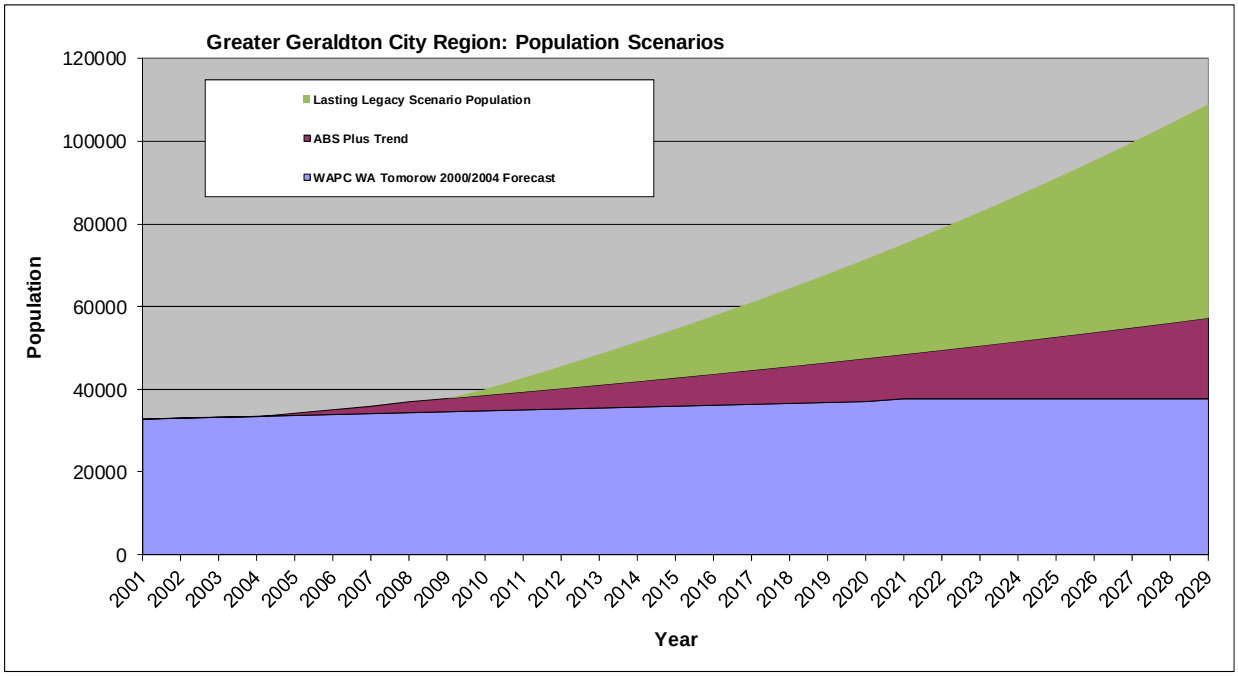
The growth and diversity of the region's economy will lead to population expansion and with it continued demand for the RPT air transport services

[2] Midwest Population and Economy: City of Geraldton-Greenough Submission to 'A Sustainable Population Enquiry for Australia' – MacroPlan Australia.

[3] Mid West Investment Plan 2011-2021, Mid West Development Commission.

Population scenarios developed by the City (see graph overleaf) indicate potential population growth beyond current ABS trend forecasts, with a high-case estimate exceeding 105,000 people by 2029.

For strategic planning purposes, the City has adopted a medium case population growth range of 80-100,000 resident people by 2030.



Greater Geraldton Population Growth Scenarios

In 2010-11 the City in collaboration with the Mid West Development Commission, commissioned an "Invest-ability" study for the region, to identify potential impacts from investments in infrastructure and services, and to inform setting of priorities for significant infrastructure investments.

The study produced growth forecasts across industry sectors based on historic trends and known investment:

- **without** *Invest-ability* interventions in the period 2010-2021 – that is, business as usual, and
- **with** *Invest-ability* interventions.

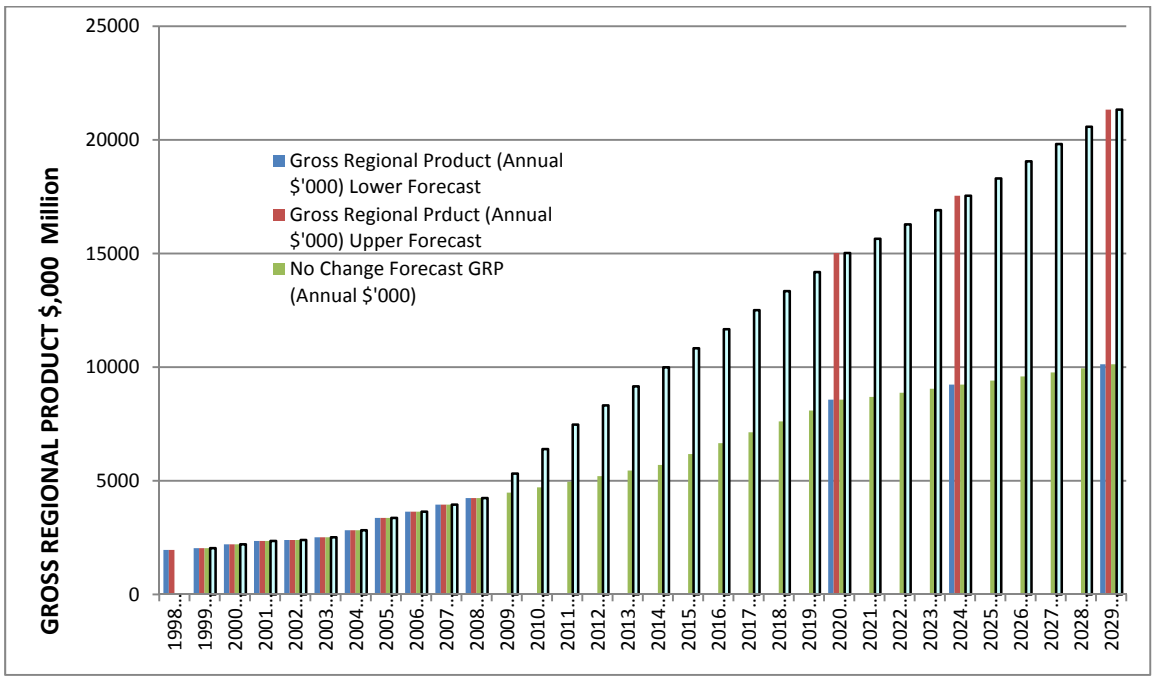
The tables overleaf show the projected industry values for these growth scenarios from the study, accompanied by graphical representation of the Lower, No-Change and Upper forecasts of Gross Regional Product out to 2029.

Activity	Year base	Year base	Projections	
	2006	2009	2015	2021
GRP	$3.49b	$4.53b	$5.70b	$8.57b
Agriculture	$582m	$582m	$650m	$724m
Mining	$2.25b	$2.5b	$3b	$5b
Forestry	$0	$0	$0	$0
Fishing	$145m	$150m	$165m	$179.8m
Manufacturing	$383m (01/02)	$512.6m	$583.7m	$708.3m
Building/construction	$207m	$237m	$300m	$380m
Retail	$565m	$570m	$664.8m	$920.5m
ICT	0	-	$50m	$175m
Renewable energy	N/A	$10m	$25m	$100m
Tourism (03/04)	$202m	$220m	$264.5m	$383.5m

Projected Mid West industry values - Without 'Invest-ability' intervention

Activity	Year base	Year base	Projections	
	2006	**2009**	**2015**	**2021**
Gross Regional Product	$3.49b	$4.8b	$8.24b	$15.02b
Agriculture	$582m	$610m	$734m	$929m
Mining	$2.25b	$2.5b	$5b	$10b
Forestry	$0	$0	$0	$0
Fishing	$145m	$150m	$185m	$200m
Manufacturing	$383m	$512.6m	$695m	$938.25m
Building/construction	$207m	$237m	$390m	$480m
Retail	$565m	$570m	$802m	$1.048b
ICT	0	-	$50m	$175m
Renewable energy	-	$10m	$50m	$225m
Tourism	$202m	$220m	$334.5m	$459.65m

Projected Mid West industry values - With Invest-ability intervention



The "Invest-ability" study was followed by formulation by the Mid West Development Commission (after consultation with local government authorities, and with State agencies) of a Mid-West Investment Plan (MWIP), identifying infrastructure investment priorities for consideration by the State Government.

For flagship and high priority projects identified in the MWIP, the WA State Government has allocated $220 million from Royalties for Regions funding, to be expended over 4 years from 2011-12.

Significantly, development of the Geraldton Airport, to handle larger aircraft, and with development of its ancillary facilities including access roads and car parking, have been identified as high priority projects for the Mid West region.

This Economic Outlook section of the Master Plan will be reviewed and updated subsequent to final State Government endorsement of the Mid West Regional Blueprint, produced by the Mid West Development Commission. The Blueprint identifies upgrade of Geraldton Airport capacity as a priority requirement. Aligned with the development themes of the Blueprint, during 2016, the City is working in collaboration with State agencies including MWDC, on a City region Growth Plan, and that will inform the review of this section of the Master Plan.

Air Services Historical Activity Levels

Historic records of RPT passenger and aircraft movements recorded by the Bureau of Infrastructure, Transport and Regional Economics[4] are provided in the tables and graphs overleaf.

The general aviation movement statistics were extracted from airport records.

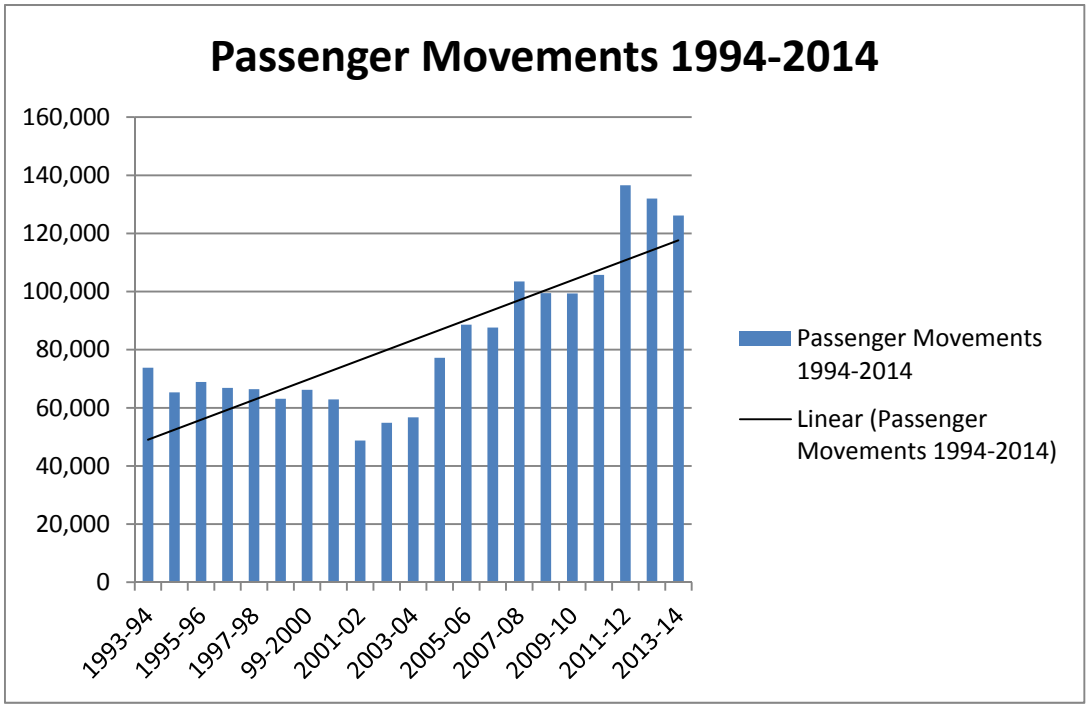
[4] © Commonwealth of Australia, 2010

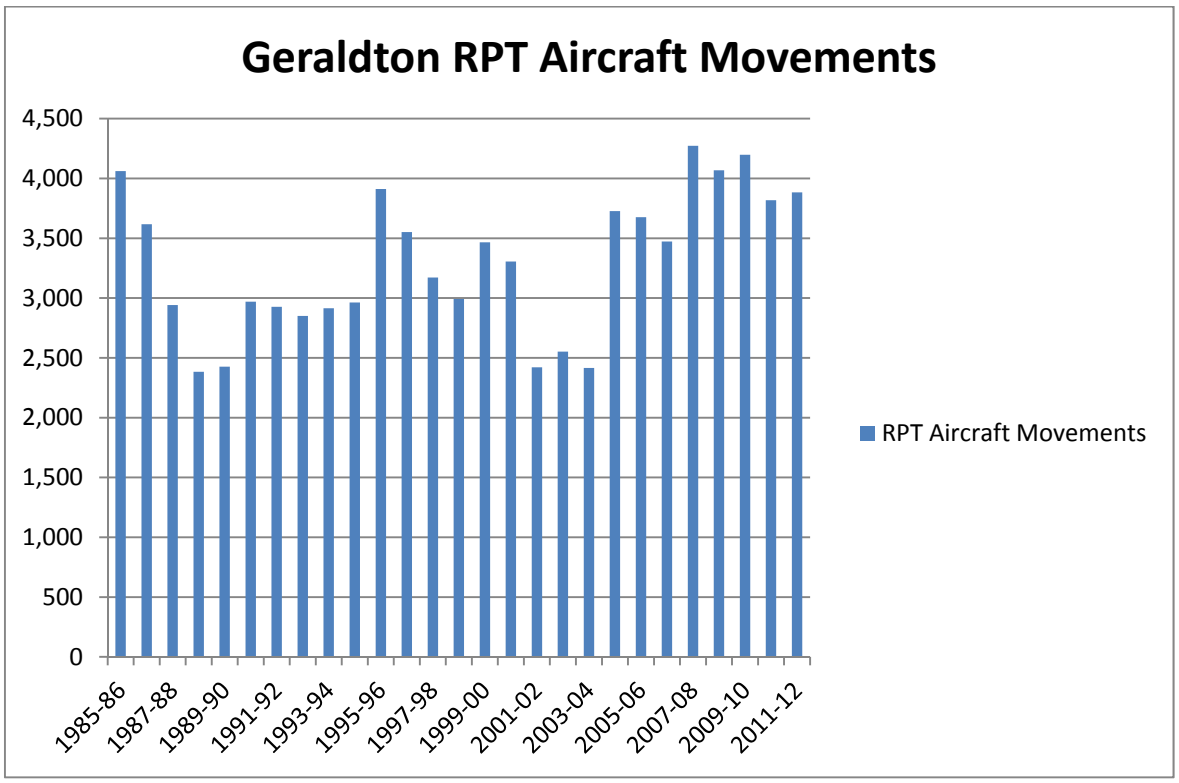
Financial Year to 30th June	Number RPT Passenger Movements	Passenger Annual Change %	Number RPT Aircraft Movements	RPT Aircraft Annual Change%				
1992	65,744	-5.60%	2,927	-1.40%				
1993	67,958	3.40%	2,850	-2.60%				
1994	73,813	8.60%	2,915	2.30%				
1995	65,323	-11.50%	2,963	1.60%				
1996	68,891	5.50%	3,911	32.00%				
1997	66,872	-2.90%	3,552	-9.20%				
1998	66,445	-0.60%	3,172	-10.70%				
1999	63,129	-5.00%	2,992	-5.70%				
2000	66,230	4.90%	3,466	15.80%				
2001	62,878	-5.10%	3,306	-4.60%				
2002	48,774	-22.40%	2,421	-26.80%				
2003	54,880	12.50%	2,552	5.40%				
2004	56,707	3.30%	2,416	-5.30%				
2005	77,235	36.20%	3,727	54.30%				
2006	88,610	14.70%	3,676	-1.40%				
2007	87,634	-1.10%	3,473	-5.50%				
2008	103,455	18.10%	4,273	23.00%				
2009	99,479	-3.80%	4,068	-4.80%				
2010	99,364	-0.10%	4,198	3.20%				
2011	105,718	6.40%	3,818	-9.05%				
2012	136,562	29.53%	3,884	1.73%				
2013	131,972	-3.36%	3,516	-9.47%				
2014	126,157	-4.41%	3,762	7%				

Y/E 30 June 1995 through 2014	Average Number RPT Passengers	Average Annual Passenger Growth	Average Number RPT Aircraft Movements	Average Annual Aircraft Movements Growth
20 Year Average	83,816	3.54%	3,457	3%
15 Year Average	89,710	5.69%	3,504	3%
10 Year Average	105,619	9.22%	3,840	6%
5 Year Average	119,955	5.61%	3,836	**-1.32%**

(Colour coding relates the 5-10-15-20 year data to Averages)

Geraldton – Historical RPT Passenger and Aircraft Movements Data





The long term graphical representations for the period since 1985 indicate disruption to airline services during two significant events:

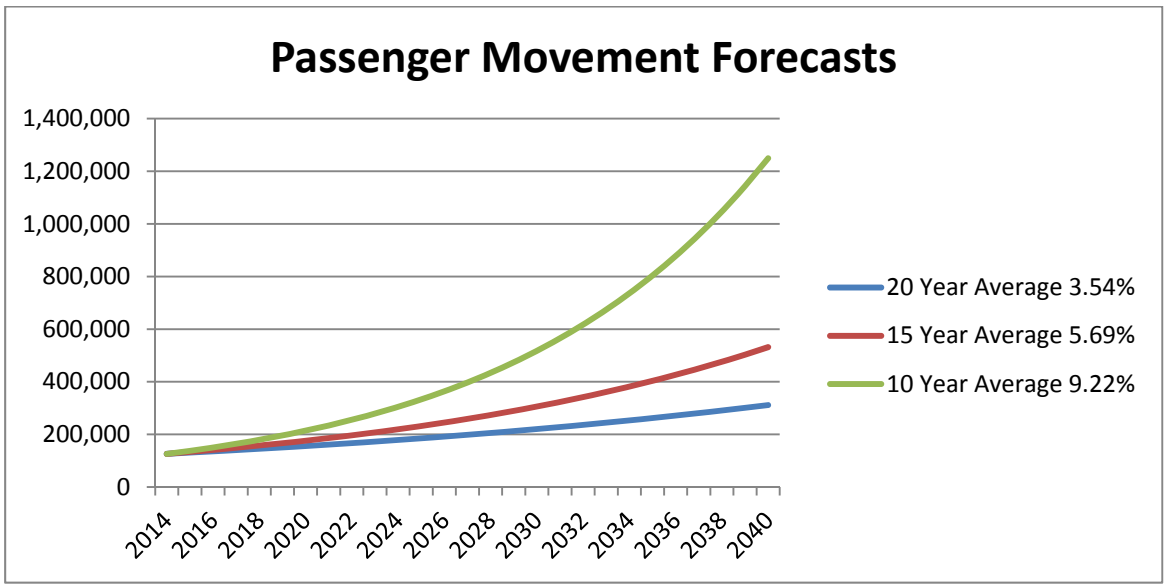
- The national pilots' dispute in 1989-90; and
- The collapse of Ansett Airlines in September 2001 causing a significant activity drop.

It took several years to restore the activity levels that preceded these events, with resurgence in activity from 2005 and sustained growth thereafter.

Geraldton Air Services Growth Projections

The table below sets out linear projections of potential growth in RPT passenger movements, based on the historical 20 year average annual growth rate of 3.54%, the 15 year average annual growth rate of 5.69% and the average annual growth rate across the most recent 10 years of 9.22%.

Year	20 Year Average +3.54%	15 Year Average +5.69%	10 Year Average +9.22%
2014	126,157	126,157	126,157
2015	130,623	133,335	137,789
2016	135,247	140,922	150,493
2017	140,035	148,941	164,368
2018	144,992	157,415	179,523
2019	150,125	166,372	196,075
2020	155,439	175,839	214,153
2021	160,942	185,844	233,898
2022	166,639	196,419	255,463
2023	172,538	207,595	279,017
2024	178,646	219,407	304,743
2025	184,970	231,891	332,840
2026	191,518	245,086	363,528
2027	198,298	259,031	397,045
2028	205,317	273,770	433,652
2029	212,586	289,348	473,635
2030	220,111	305,811	517,304
2031	227,903	323,212	565,000
2032	235,971	341,603	617,093
2033	244,324	361,040	673,989
2034	252,973	381,583	736,130
2035	261,928	403,295	804,002
2036	271,201	426,243	878,131
2037	280,801	450,496	959,094
2038	290,742	476,129	1,047,523
2039	301,034	503,221	1,144,104
2040	311,690	531,854	1,249,591



Passenger Movements Projections Based on 20 Year, 15 Year, and Most Recent 10 Year Historical Average Growth Rates.

The long term (20+ years) annual growth in RPT passengers at Geraldton Airport averages +**3.54%**. The ten years through 2012 consistently delivered stronger growth, but the subsequent downturn in global, national and State economic development activity saw RPT passenger numbers begin to decline as demand softened. Average growth across the most recent 5 years has fallen away from the higher 10 year average, back towards the 15 year average growth rate.

On the most conservative forecast applying the 20 year long term annual average increase rate of 3.54% per year, passenger movements through Geraldton Airport can reasonably be expected to exceed 150,000 between 2020-25 and exceed 200,000 by 2030.

Peaks and corrections associated with economic cycles are normal and to project future growth for master planning purposes the *long term average* is generally utilised by the aviation sector as the most reliable indicator.

The post-GFC difficulties in the Eurozone, slower than expected recovery in USA, and the consequent slowdown of economic development in China, dampened levels of resources industry development in the Mid West after 2012. Deferment of development of the proposed new port at Oakajee, and development of Murchison iron mines dependent on new heavy rail infrastructure connection to that new port, reflects the commodities cycle downturn.

The City will monitor growth rates on a regular basis to identify if demand changes warrant bringing forward airport infrastructure build requirements, potentially driven by a future upturn in the global commodities cycle, and associated growth in demand for WA resources from China.

Geraldton Airport infrastructure currently enables unrestricted operation of jets such as F100 or B717. Code 4C types (A320/B737) may operate but with pavement concessions. Larger jet aircraft operations warranting development to full unrestricted Code 4C (A320/B737) infrastructure standards might be anticipated after annual RPT passenger numbers consistently exceed 150,000. Earlier investment in upgrade of capacity may become warranted in the event of State and regional tourism and trade development initiatives.

AVIATION MOVEMENTS AREA PLANNING

Design Aircraft

The design aircraft type establishes the dimension and configuration characteristics of an aerodrome, the structural runway, taxiway and apron pavement needs, the airspace needs and the terminal building capacity needs.

The Civil Aviation Safety Authority (CASA) and its Civil Aviation Safety Regulations (CASR's) Part 139 detail obligations for aerodrome design, aerodrome safety and aerodrome operations. In support of the CASR's is the Manual of Standards, Part 139 – Aerodromes (MOS-139). It is this document from which planning criteria are referenced.

Aerodrome geometric design is assisted by grouping various aircraft type together having similar operating characteristics. Each group is represented by an Aerodrome Reference Code (ARC). Examples:

- ARC 1A-1B includes general aviation aircraft below 5,700 Kg such as Cessna 172 and Beechcraft 200 (King Air).
- ARC 2A-2B includes general aviation aircraft above 5,700 Kg such as Beechcraft 1900.
- ARC 3C includes 50 to 100 seat RPT aircraft type E170, F100, F50 and BAe146-300.
- ARC 4C includes 100-165 seat RPT aircraft type E190, B737-800 and A320-200.
- ARC 4E includes 250 seat RPT wide body aircraft type A330-200, B787 (intended B767 replacement in Qantas fleet) and B777.

The codes do not relate to passenger carrying capability, rather they establish common design characteristics for runway, taxiway and apron dimensions.

Geraldton Airport is required to meet all the requirements of each code category in its ultimate development form.

The B737-800, B717-200, A320-200 and E190 are all Code 4C aircraft.

However, CASA advise that both the B717-200 and the B737-700 may be considered Code 3C for aerodrome planning purposes due to their approved US Federal Aviation Administration (FAA) performance characteristics.

Similarly, the Dash 8-Q400, a turbo-propeller regional airliner in the Qantas fleet is a Code 3D aircraft and CASA advise that this aeroplane will be considered Code 3C for aerodrome planning purposes because it has been fully certified by Transport Canada to operate on 30 metre wide runways.

Code 3C aircraft include E170, F100, F50, BAe146 and ATR72. The latter is a turbo-propeller aircraft introduced into the fleet of Virgin Australia for regional routes flown in the Eastern States. Indications are this aircraft may operate in Western Australia in future years.

The B737-800 and the A320-200 are the largest passenger capacity *narrow-bodied* aircraft currently available. They form part of the Qantas Airways and Virgin Australia fleets and they are Code 4C.

Wide-body passenger aircraft such as the A350, B787, and smaller B767 and A330 are all Code 4E and require the same **45** metre runway width.

The runway length for optimum international range with ideal passenger and freight yield and necessary fuel load should be 2,600 metres, for comfortable range from Geraldton to Singapore and Bali with Code 4C B737-800 and A320-200 aircraft, but neo-engine B737 and A320 models are able to operate off shorter runways e.g. 2,400m.

With the ability of narrow-body aircraft, such as the B737-800 and A320-200, to reach international destinations such as Singapore, Indonesia and New Zealand from Geraldton, short term focus is on the development requirements for *at least regular Code 4C aircraft operations*, but must consider infrastructure works based on airlines responding to anticipated medium term demand for introduction of wide body Code 4E aircraft types – *and for broader State aviation infrastructure network needs, to create Perth-Alternate landing airport capabilities* at Geraldton. A320 and B737 4C types make up about 40% of International landings at Perth, and smaller 4E types A330 and B767 types make up a further 30%.

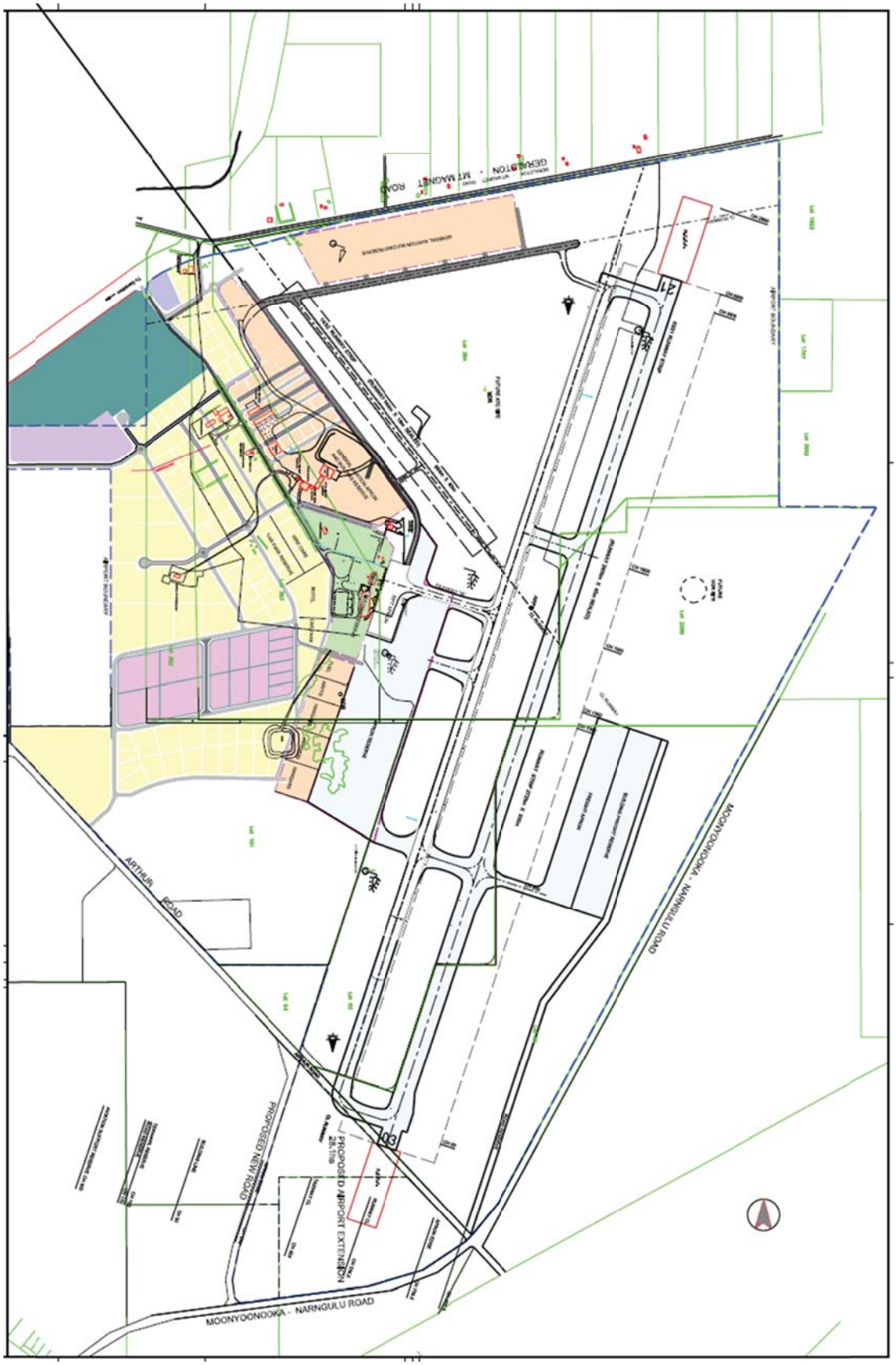
It is a requirement for runways serving wide body aircraft (ARC 4D and 4E) to have **7.5** metre sealed shoulders whereas the shoulder width requirement for narrow body aircraft is only 3.0 metres.

Significantly, Geraldton Airport is already utilised by Code 4C aircraft on an occasional basis by charter operators, and is used as an emergency alternate landing port by both RPT and charter operators in the event of severe weather events or emergencies at Perth Airport for aircraft types to A320/B737.

As a secured airport, passengers from domestic RPT flights diverted to Geraldton are able to disembark and reboard via the security screening lounge facilities, in the event of a prolonged holdover.

For the purposes of Master Planning to long-term ultimate airport development, it is appropriate that the City adopt Code 4E for design and development of the proposed new runway 03/21 to Instrument Non-Precision Approach operational standard. The designated design aircraft for Geraldton Airport is the Boeing B787-800.

Concept design for development of the aviation movement area with addition of a new Code 4E runway 03/21 with *minimum* length of 2600M plus ICAO compliant RESA provisions, with old runway 03/21 to revert to use as a full length parallel taxiway, is depicted overleaf. The City has purchased the additional land required, south of Arthur Road, and structure planning has been approved for the necessary road diversion.



Concept Design: New *Minimum* 2600M Code 4E Runway Configuration

Movement Area Geometric Requirements to Code 4E

The table below outlines the geometric requirements of an aerodrome's movement area relative to the design Aerodrome Reference Code.

AERODROME MOVEMENT AREA SPECIFICATIONS	C172 B200	Beech 1900	F50 F100	A320-200 B737-800	A330-200 B787-800
Aerodrome Reference Code (ARC)	**1A-1B**	**2A-2B**	**3C**	**4C**	**4E**
Runway Length (metres) *	1000	1200	1800	2300	2600
Runway Width (metres)	18	23	30	45	45
Runway Shoulders (metres)	optional	optional	3.0	3.0	7.5
Runway strip width requirement (metres)	90	90	150	300 Graded 150	300 Graded 150
Approach Inner Edge Instrument Non-Precision	90	90	150	300	300
Take-off Inner Edge width (metres)	60	80	180	180	180
Minimum separation (m) Runway centreline to Taxiway centreline	52.5	57	93	168	182.5
Taxiway width requirement (metres)	7.5	10.5	15	18	23
Taxiway Shoulders (metres)	optional	optional	3.5	3.5	10.5

***** Approximate and subject to aircraft performance and operating conditions.

Development Planning

Geraldton Airport's ultimate movement area has been planned to allow for a new main runway 03/21 to Code 4E, the existing 03/21 runway being used as a parallel taxiway. Sealed secondary runway 14/32 to be maintained to its current non-instrument Code 1B standard, and unsealed secondary runway 08/26 to be maintained to current daylight operations standard for aircraft <5700kg MTOW.

Long term development planning, OLS and aviation noise modelling for the ultimate capacity of the Geraldton aerodrome is based upon:

- Main runway 03/21 with *minimum* length of 2,600 Metres and preferred 2700M, with International RESA provisions, developed to Code 4E standard;
- Secondary runways 14/32 and 08/26 remaining in current configurations;

- The adopted design *ultimate* movement capacity of Geraldton Airport is 100,000 aircraft movements per annum.

Full parallel taxiway and high speed runway exits will be required, and air traffic control capabilities, before movements reach ultimate activity levels. Aircraft noise contour modelling to 2030 assigns 15,000 of the ultimate 100,000 annual aircraft movements to RPT aircraft types of differing makes, with the balance of 85,000 movements per annum spread over charter, helicopters, aero-medical, agriculture, flying training and general aviation.

Future: New Code 4E Main Runway

2700 Metre Runway

Ultimate future development envisages a new 2700M Code E runway 03/21, to be constructed parallel to existing runway 03/21 with a pavement width of 45 metres with minimum 7.5 metre wide shoulders, as per Code E standards. The shoulders are recommended to be sealed forming a 60 metre overall constructed and sealed width.

Subgrade & Wider Shoulders

Wider *weight-bearing* sealed shoulders would be required for Code 4F Alternate landing port designation on an otherwise Code 4E-compliant runway. Construction of the runway subgrade for full weight bearing capability to 60M wide plus Code 4F equivalent shoulders provision is therefore recommended to avoid future re-work.

Runway Strip

The runway is to be centrally positioned within a 300 metre wide runway *strip*. It is mandatory for a minimum graded 150 metres portion of runway strip with the balance clear to 'flyover' standards if required. The Code 4E runway *strip* will extend beyond both ends of the 2,700 metre runway by 60 metres for an overall runway strip length of 2,820 metres.

Centreline Separations

For strategic future-proofing, and to enhance utility of the airport as an alternate landing port for Perth, it is recommended that centreline separation between the new Code 4E runway 03/21, and old runway 03/21 which will revert to use as a parallel taxiway, be determined to Code 4F standards. This is possible, without compromising the clear 300M wide runway strip requirements to the east, within the available City-owned airport land. Incremental cost of such a future-proofing strategy is thus confined to modest extra length of connecting taxiways between new runway 03/21 and old runway 03/21.

Runway End Safety Areas (RESA)

Runway End Safety Areas (RESA's) are provided beyond the runway strip as cleared and supportive ground areas in the event of undershoot or overshoot of an aircraft operating at the airport. The minimum RESA provision for domestic operations is 90 metres by 90 metres. To accommodate **international operations**, provision of 90 metres width (twice runway width) by 240 metres length is included in the 2700M runway design.

Interim Development of Existing Main Runway 03/21

Timing of future development of the new main runway will be dependent upon the timing and rate of regional economic growth, associated population growth, rate of growth in demand levels for RPT services on the Perth-Geraldton route, timing of re-establishment of RPT services between Geraldton and other destination airports e.g. in the Pilbara region, and

associated demand levels. In the interim period, development will focus first on maintenance and renewal of the existing runway – then, as and when demand justifies the investment, the enhancement of capacity of existing main runway 03/21.

Development Options for Existing Runway 03/21

	Runway 03/21 Infrastructure Options to 2020	Issues/Observations
1	**Maintenance Only:** The first option is to make *no* capital investment in either renewal or enhancement of current aviation infrastructure before 2020, and just continue a *maintenance* regime that addresses runway, taxiway and apron pavement damage problems as they arise.	The existing asphalt overlay on runway 03/21 pavement is about 15 years old. The current pavement patching and crack sealing regime will continue pending asset renewal or enhancement expenditure. Preliminary assessment in 2013 indicated likely need for a pavement overlay in 3-5 years. In second half 2014 and 2015 the City commissioned detailed technical condition assessments of the runway pavement, with the view to informing design of a future pavement overlay, and scheduling associated project work. That work indicated the requirement to at least renew the runway pavement by 2018. Without renewal investment, maintenance it is likely to be increasingly costly, with clear risk of disruption to regular air services, having regard to age, and wear and tear on the current asphalt overlay. The driving factor in decision making is ***aviation safety***. Current 03/21 pavement is considered incapable of accommodating grooving to enhance surface friction. An interim mitigation solution to potentially extend pavement life beyond 2-3 years with a surface reseal treatment was planned for 2013-14 but it was *cancelled on independent engineering advice*, following adverse experiences with loss of runway surface friction, and consequent aircraft safety risks, when applying that surface treatment solution at several other Australian airports. Renewal is essential by 2018. Option 1 is discounted accordingly.

2	**Runway Pavement <u>Renewal</u> Only:** The 2nd option is to invest before 2018, say in 2016-17, to construct a basic pavement overlay on the main runway which should give a further life of at least 15 years, but *maintaining current pavement capacity level* only, using only the existing mix of aircraft and RPT and FIFO air services, for unrestricted operation of Code 3C aircraft (in effect up to F100/B717 types).	This capacity renewal option would maintain the current pavement strength rating of runway 03/21 at PCN=34 on a Medium strength subgrade. A320/B737 types using Geraldton would continue *restricted* operations with pavement weight concessions. Geraldton would remain *unavailable* as an alternate landing port for A330/B767 and larger 4E types.
3	**Runway Pavement Capacity <u>Enhancement</u> (4C):** The 3rd option is to remediate the substructure and construct an asphalt overlay on the existing 1981m main runway which should give a further life of at least 15 years, *upgrading current pavement capacity level to allow unrestricted Code 4C operations*. [Note: *Mobilisation costs will be significant for any of options 2-5 because of need to have a high volume hot mix asphalt batching plant onsite, and wide-run paving machines, neither available in-region.* *Mob/Demob cost estimate $250,000. The need to minimise disruption to aviation services will require all pavement work to be undertaken during the night, with removal of all plant and equipment from the 300M wide runway strip each morning to enable resumption of aviation operations]* Note: Intent to further enhance pavement strength as envisaged in Option 4 but achieved via staged development through Option 3, would require substructure remediation/ strengthening in Option 3 sufficient to enable just a further asphalt overlay to be applied to achieve the outcomes of Option 4.	This option would aim to *increase* the pavement strength rating of runway 03/21 from PCN=34 to PCN>40. A320/B737 types using Geraldton would have operations enabled without pavement concessions, and with takeoff weight restrictions based only on runway length considerations. NOTE: Replacement of runway lighting will be required for Options 3-5. Current lights are at 90M separations, remaining compliant under regulation grandfather clauses, but runway *enhancement* will require installation of new runway lights with 60M separations. This adds a significant cost element. Geraldton would remain **un**available as an alternate landing port for even smaller Code 4E types (e.g. A330) for Perth Airport. This option would deliver superior whole-of-network benefits compared to Option 2, with increasing inquiries from international operators of new-model long range A320/B737 types for use of Geraldton as their designated alternate landing port for Perth. However – frequency of use of the capacity by Code 4C types (and thus generation of landing fees revenue) would be low, reflecting frequency of storm/lightning/fog incidents at Perth Airport. Grant funding from Federal and State Governments should be sought.

4	**Pavement Capacity <u>Enhancement</u> (4D/Smaller 4E):** The 4th option is to remediate and strengthen the substructure and construct an asphalt overlay which should give a further life of at least 15 years, *upgrading pavement capacity* of the runway and associated taxiways and apron, and shoulder sealing, for at least restricted Code **4D/ and smaller 4E** operations.	As with Option 3, this would enable unrestricted operation of A320/B737 types without pavement concessions. Upgrade for PCN>60 would be desired to enable operation of B767 and A330 types. <u>This option is preferred over Option 3</u> because of the significantly increased whole-of-network benefit deliverable for the cost increment, enabling use of Geraldton as an alternate port for B767 and A330 types, with CASA concessions if necessary. In particular this alternate landing port capability would service international flights inbound to Perth from Africa, India, Middle East, China, South East Asia, satisfying international airline desired requirements for an alternate landing airport located within one hour flight distance of Perth. Frequency of use of the capacity by Code 4C and 4E types (and thus generation of landing fees revenue) would be relatively low, reflecting frequency of storm/lightning/fog incidents at Perth Airport. Grant funding from Federal and State Governments should be sought. The number of aircraft movements per incident would be higher, with smaller Code 4E types, not just 4C types, able to utilize the airport. Any trend of increased frequency of diversion events would require consideration of investment in new apron space for aircraft parking.
5	**Runway Extension and Capacity Enhancement & Extension** The 5th option is to remediate and overlay the existing runway pavement, to the same pavement standard as Option 4, but to also *extend the runway length to 400 metres*. The extension would require construction of new emergency runoff safety area RESA at the end of the new extension. [The sub-option is Staged Development: Undertake Option 4, and at a later time construct the 400M runway extension, but a single combined project would avoid multiple instances of Mob/Demob costs].	This would enable CASA-compliant operations of A320/B737 types, and A330/B767 types, satisfying runway capacity needs for alternate landing port requirements for Perth Airport for: • Domestic flights inbound to Perth, whether east-west transcontinental or in the north-south corridor; and • international flights inbound to Perth from Africa, India, Middle East, China, South East Asia. This option would enable ***deferment*** of the master planned construction of a new 2700m runway (est. $80-$100M), to beyond 2025.

The Mid West Regional Blueprint prepared by the Mid West Development Commission in conjunction with other State agencies and RDA, envisages capacity expansion for regular services by larger aircraft types beyond 2025.

That timing broadly embraces options 3, 4 and 5 above, noting capacity for Code 4C types to currently operate through Geraldton with pavement concessions.

Staged enhancement as envisaged in options 3 through 5 can be planned to respond to interim growth in RPT demand, before considering construction of the new 2700M runway, proposed for ultimate development of this airport site, sometime after 2025.

The City envisages need to progress at least through option 3 before 2020, and advocates moving directly to Option 4 (rather than staging through option 3), to optimize TCO, and for whole-of-network benefits, assisting Perth Airport traffic.

In the whole-of-network context in Western Australia, there is no doubt that capacity enhancement of Geraldton Airport to enable its use as an alternate landing port for Perth Airport, well within one hour flight radius, would greatly enhance the State network.

The emergence of highly prospective international tourism and trade opportunities during 2015, being further explored in 2016, presents potential for progress to Option 5 before 2020.

In the absence of financial assistance from Federal and/or State government, timing of staged development of the main runway will depend on availability of internal funding, with inevitable lag behind the State aviation demand curve.

Secondary Runway 14/32

Runway 14/32 at Code 1B is master planned to be retained to meet the operational needs of the general aviation fixed base operators, several of which operate flying training and provide light aircraft charter services. It is 844 metres x 18 metres width within a 90 metre runway strip.

This existing standard has been retained for future planning given the runway has a secondary status for cross wind purposes and suits operations of light to medium weight general aviation aircraft only. During the summer period strong east to south east winds can prevail during the mornings and optimum alignment to wind is runway 14. With no demand for increased runway length, but a need to ensure optimum operational flexibility for light general aviation aircraft, this runway is retained as currently developed.

Secondary Runway 08/26

This 900 metre gravel runway, utilised by light GA aircraft in periods of strong westerly or easterly winds, will be retained as a gravel runway for the foreseeable future. Current utilisation levels do not warrant consideration of sealing the runway surface. Longer term safety considerations associated with contention between large jet RPT and Charter aircraft, and light GA aircraft, will be monitored by CASA as development of the major new runway 03/21 and conversion of old runway 03/21 into a taxiway progresses, and as the quantum and mix of air traffic movements changes over time.

TAXIWAYS

All taxiways serving new runway 03/21 are depicted at 23 metre width for Code E aircraft operations. Treatment of taxiway shoulders differ according to the aircraft type but must be constructed to be resistant to engine jet blast erosion.

The taxiway width for Code C aircraft is 18 metres with sealed 3.5 metre shoulders and incremental build width maybe considered for taxiways. Also the taxiway width may be reduced to 15 metres (CASA concession for aircraft with a wheel base less than 18 metres) provided fillet widening is undertaken to accommodate aircraft tracking at the runway and apron intersections. Taxiways must be central within a taxiway strip, the central portion graded. For Code E taxiways overall width of 95 metres is required with minimum of 44 metres graded.

This Geraldton Airport Master Plan converts existing 03/21 runway to a parallel taxiway with linkage to the proposed new runway 03/21. The runway/taxiway centreline offset distance must be 182.5 metres for minimum taxiway separation from a precision approach runway Code E. (Construction design may reflect wider centreline separation to accommodate Code 4F A380 operations – for alternate landing airport needs - in future)

Parallel taxiways improve runway capacity by removing back-tracking movements. The construction of a southern extension of the existing runway in the form of a parallel taxiway may be deferred for staged development when demand warrants.

Construction of the parallel taxiway link to runway 03 threshold would provide opportunity to construct this section of taxiway pavement to high strength with associated linkage to a dedicated high strength apron parking area. This manoeuvring area would suit movement of Code 4E type aircraft in the short term pending strength improvement of existing pavements.

The pavement strength of the existing runway 03/21, when it reverts to parallel taxiway, will eventually need upgrading for aircraft operations of Code E types. This may be deferred if turning nodes are provided and Code E type aircraft are permitted to back track on the runway and have a dedicated taxiway route and apron bay.

Provision for turning nodes for aircraft to Code 4E size should be made at detailed design stage, for interim operation before staged extension of old runway 03/21 as a full length parallel runway with pavement enhanced for Code 4E aircraft.

Consideration of Geraldton as an International services Alternate port for Perth, for Code 4E aircraft, and potentially for Code F aircraft such as A380, will require redesign of the proposed apron extension and access taxiway provisions.

Taxiways serving secondary runway 14/32 are planned for use by general aviation aircraft up to Code 1B and need only be 7.5 metres width.

Taxiway Bravo is required to be 10.5 metres so as to permit medium size (up to Code 2B) aircraft to access existing hangar, GA apron and service areas. Taxiway Bravo previously connected to the north end of the RPT apron, but was extended in 2014-15 to intersect Taxiway Alpha, enabling smaller aircraft types to avoid entering the RPT apron area.

APRONS

Proposed new Runway 03/21 connection to the apron parking areas is via the parallel taxiway and associated stub taxiways.

Apron expansion and supplementary stub taxiway connections would be developed according to demand for apron parking and perhaps influenced by the introduction by airlines of parallel scheduling. Current parking area capacity is adequate and provides for up to four F50/B737-800 type aircraft.

Operations by heavier Code 4C/4E (or possibly A380 Code 4F) aircraft would demand pavement strength to suit and incremental expansion of the apron to the south would permit purpose built infrastructure.

Aerodrome standards require parking areas to be located at sufficient distance offset from the runway strip such that the tail of aircraft parked or taxiing does not infringe the arising 1:7 transitional surfaces from the declared runway strip edge. The introduction of a new offset runway alleviates this planning concern by providing ample separation for tail height clearances.

To accommodate four additional Code 4C and below aircraft in the current RPT apron reserve precinct requires an apron length of about 250 metres and the incremental southern expansion to provide this capacity is depicted on the Movement Area plan. This additional apron capacity is unlikely to be required until after 2020 with use of the current four marked apron bays being optimised for the RPT mix of aircraft type – but development *will be required* if operators require overnight parking, or if Geraldton is designated as a Code E or F Alternate port.

Adjoining the additional planned apron is a landside/airside surface access corridor which can also enable an easement for provision of engineering services.

Consideration of Geraldton as an International services Alternate port for Perth, for Code 4E aircraft, and potentially for Code F aircraft such as A380, will require purpose design of the proposed apron extension and taxiway provisions.

Current apron parking design envisaged taxi-in/taxi-out movements. Introduction of tug services in lieu of taxi-out parking design would enable better utility of available apron space.

New Apron Charlie with 22 tonne pavement capacity was constructed in 2014-15, north-west of the RPT apron, and is accessed by connection off Taxiway Bravo. It is available for use by commercial charter and other GA operators, and ADF aircraft to 22T.

FUELLING FACILITIES

Wide bodied aircraft operations require hydrant refuelling for time-efficient turn around for regular services operation. Pipe work along the apron edge to specific parking bays can readily be achieved from the proposed future fuel storage and dispense site depicted, making use of the adjoining access and easement for services.

Beyond the RPT apron reserve is a further 450 metre reserve for southern extension of apron. It is envisaged that this apron could double as apron space for Alternate and overnight charter aircraft parking and with hydrant fuel points recommended.

Principally, this apron reserve is planned to cater for future growth in aircraft parking and facilities and services requiring direct access to the apron, such as refuelling vehicles, rescue and fire response vehicles, aircraft maintenance and overhaul hangars and ground handling companies.

Freight associated with the RPT passenger aircraft services will also require apron area for receipt and unloading.

Perth Airport for example has developed apron parking for over 120 aircraft that overnight on their tarmac. If Fly-in Fly-out charter services are to mature from Geraldton the ability to overnight-park FIFO fleet aircraft will be very important.

The master planned apron reserve depth is depicted at 200 metres width, which will allow an aircraft taxi-lane to be provided through the apron area and overnight parking on the runway side. With multiple taxiway connections to/from the apron reserve and an apron taxi-lane this will ensure aircraft parking and movement is not restricted.

Apron reserve width and length may require extension, should Geraldton be considered as Perth Alternate for International Code 4E and Code F aircraft such as A380. There are no limitations on extension of primary apron to the south.

AIR FREIGHT

A dedicated airfreight apron is depicted for future development on the east side of the new runway to serve the potential needs of the resource and agriculture sector in the Mid-West region. For instance freight handling that presently occurs at Perth Airport with goods destined for the Mid West or Pilbara could readily be direct freighted to and from Geraldton.

Although freight demand may not currently exist it is the potential for the development of such dedicated apron and storage facilities that is important and as such facility space has been depicted in the ultimate master plan.

The City notes that offshore interest in development of a fresh agricultural and market garden produce processing and packaging facility, for export of fresh food products. As a significant regional economic development initiative, leveraging the already strong fresh produce capacity of the near-region, as well as clear opportunity for processing and exporting fresh produce from the Gascoyne, the City will continue to pursue this potential with emerging proponents.

GENERAL AVIATION AREAS

There are opportunities for general aviation growth in the Geraldton Airport catchment. The airport is already home to a diverse collective of businesses ranging through agriculture air work, aircraft maintenance and several SME air charter operators. There are prospects for future growth in FIFO work for hinterland mines, for Geraldton-based resource industry employees, and employees of entities servicing mines, utilising aircraft in the 10-20 seat range.

To accommodate parking of Code 3 itinerant/charter (non-RPT) aircraft, safely separated from the RPT and freight apron areas, new Apron Charlie with 22T pavement capacity, was constructed in 2014-15, north-west of the RPT apron. Access is off Taxiway Bravo.

The building previously utilised by Airservices, located at the northern end of the RPT apron, has been renovated during 2014-14 for use as a terminal building, for amenity of aviation users of Apron Charlie – and has been designated Terminal Charlie. Areas within this building include common-user amenities, as well as rooms able to be utilised on a hire basis for duration of projects, training etc.

Expansion of general aviation apron areas for light to medium aircraft is possible in the alignment of runway 14/32 through to the 14 runway threshold, making due provision for the approach/take-off splay. Apron areas may be associated with 'spine' hangar development, or broader apron parking area for itinerant pilots.

In 2011-12 a new paved 'spine' apron area was constructed to enable location of a new GA operators terminals/hangars area north of the previous northern-most set of hangars.

Development of further 'spine' apron and associated access road development in the northern GA area is subject to demand assessment. Timing of associated new apron or road pavement development will be dependent upon an adequate user-pays revenue stream from tenants via lease rents and/or aviation charges to service the development funding.

PAVEMENT REQUIREMENTS

The approximate pavement thickness needs for unrestricted operations of particular aircraft types, over a subgrade with CBR of 15%:

- **B737-800 (Code 4C): 420 mm**
- **B787-800 (Code 4E): 610 mm**.

An **asphalt wearing-surface finish of at least 50mm** with structural capacity, and additional thickness for grooving is also required.

The surface would need to the textured by grooving to meet frictional characteristics.

High strength pavements built to this standard are proposed for the future new runway, new taxiways and apron for the design aircraft **B787-800.**

The Pavement Classification Number (PCN) strength rating would be:

PCN 60/F/A/1500/T where;

Pavement PCN = ACN = 60

Pavement type is flexible = F

Subgrade CBR strength rating is +15 = Category A

Tyre Pressure = 1500 Kpa

PCN rating is determined by technical means = T

Should pre-design geotechnical evaluation of the natural earth (subgrade) under the new runway construction site determine a weaker subgrade CBR, then the PCN requirement for the design aircraft will increase, and pavement structure design will reflect the necessary sub-base and base course layer structure and thicknesses.

Industry studies conducted preparatory to introduction of Code F A380 aircraft suggest that, because of the A380 undercarriage configuration and design, and the number of tyres spreading aircraft weight, runway pavement strength designed for Code 4E aircraft should be adequate for A380 operations.

Should circumstances evolve where the proposed staged 2700M new runway development for Geraldton requires purpose-design for use as a Perth-Alternate for Code F aircraft, the City's consultants will consult further with industry on pavement strength requirements during detailed design.

For strategic reasons, the City has determined that construction design of the subgrade for its proposed 2700x45M Code 4E runway *should include full-depth subgrade development to full 60M width, with surface treatment, to ensure weight-bearing capacity for 2x7.5M inner shoulders, to facilitate development for potential A380 alternate-port capabilities.*

AIRFIELD LIGHTING

Fixed electric runway and taxiway lights with Pilot Activation Lighting (PAL) are required for the movement and manoeuvring areas.

Runway lights for compliance are to be positioned at 60 metre longitudinal intervals along the runway edges and threshold lights are required at the runway ends.

Operation of electric lighting necessitates a main supply power feed to an aerodrome lighting control cubical, within which would be distribution control to the various lighting circuits, isolating transformers and protection. The extensive taxiway network would require a review of the load requirements for ultimate layout lighting and associated mains supply at the time of design.

The location of the primary Illuminated Wind Indicator (**IWI**) would be required to be repositioned outside of the apron area and between the taxiways linking the parallel taxiway.

Secondary IWI's are to be positioned 100 metres upwind from the runway thresholds on the left hand side for an aircraft approach.

An alternative to the provision of threshold visual IWI's is the provision of a radio broadcast of wind speed and direction on VHF frequency using automatic weather information. Known as an Automatic Weather Information Broadcast (AWIB) the technology is preferred by pilots but is dependent upon establishment of Automatic Weather Station (AWS) equipment.

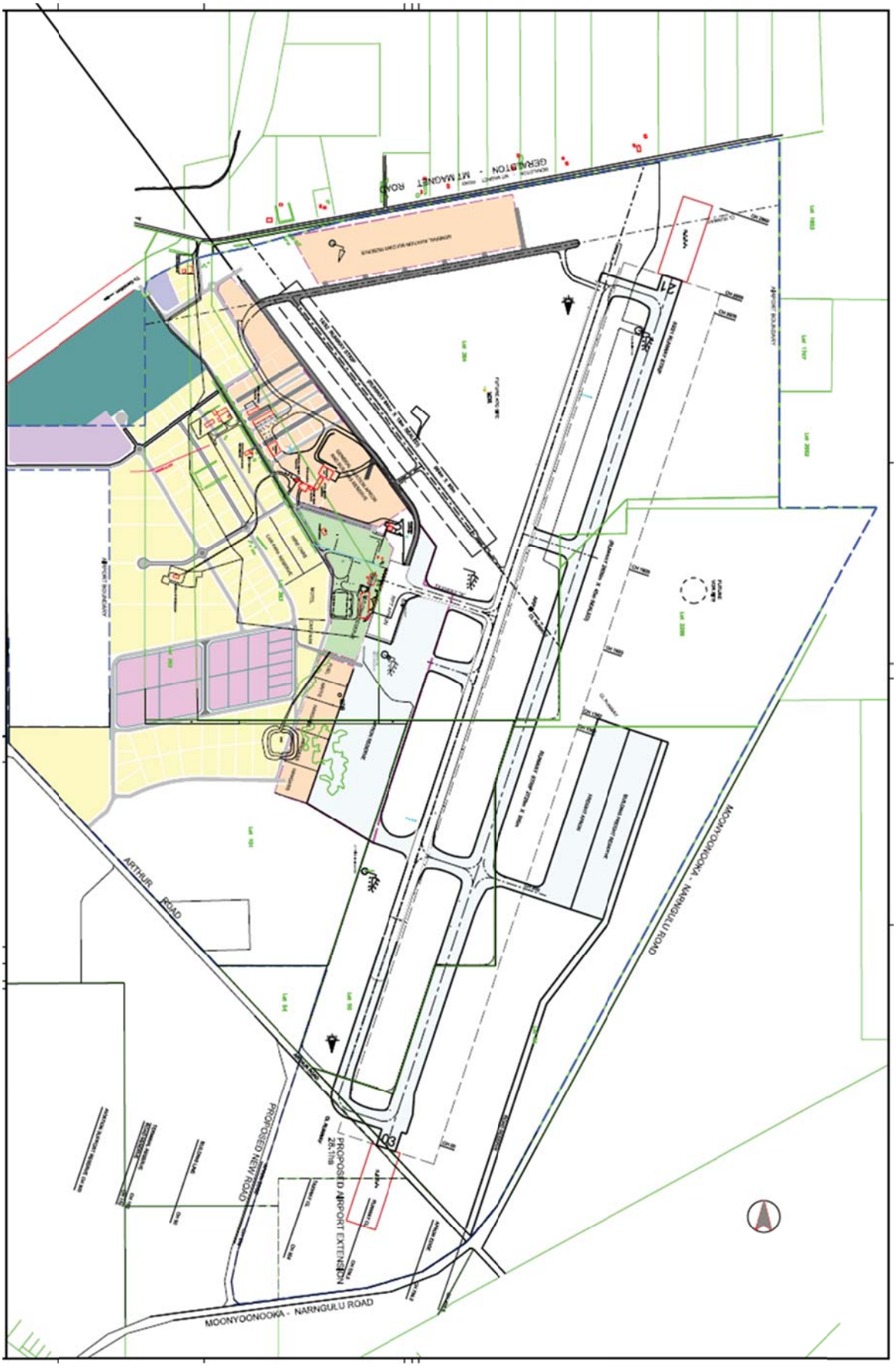
Precision Approach Path Indicator (PAPI) is a visual approach slope indicator system providing the pilot with visual cues about actual descent paths versus desired descent path. PAPI is used both day and night by high capacity aircraft and is mandatory for jet aircraft operations.

PAPI will need to be available at both approaches to the runway and double sided for international operations.

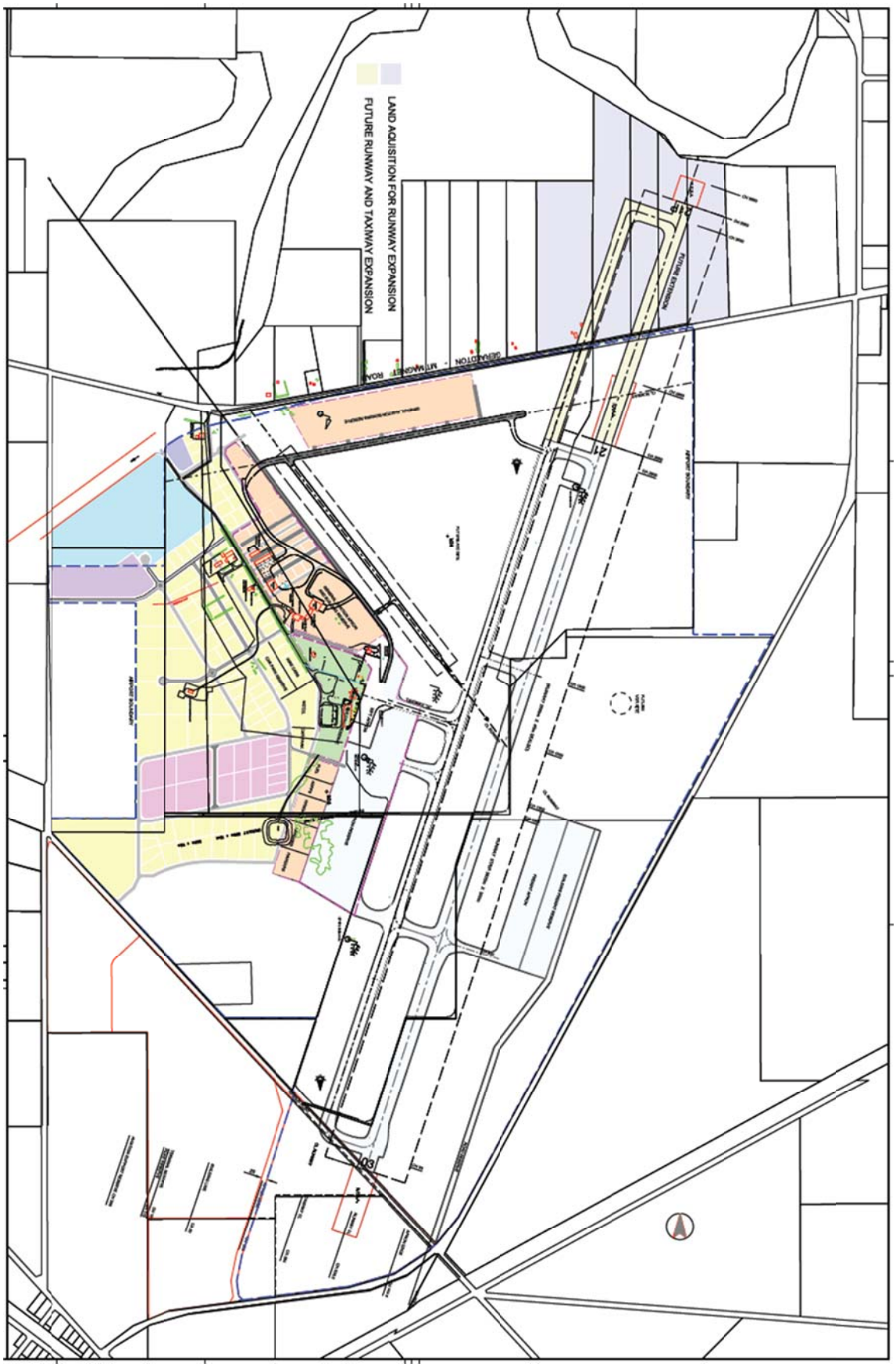
Activation of the PAPI is a link into the PAL VHF frequency with separate manual activation switching as required.

Apron lighting would be provided by floodlight towers.

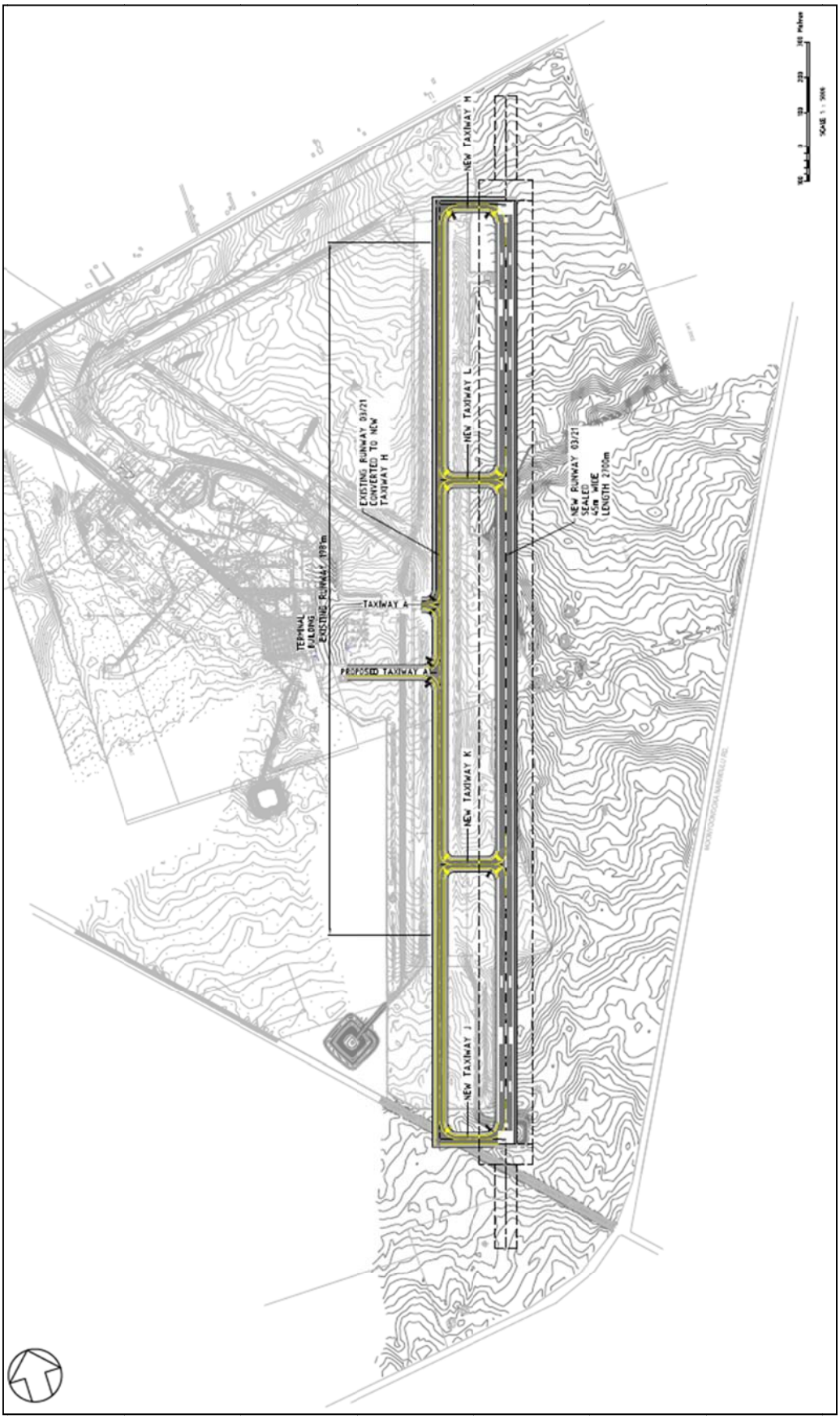
Emergency generator power is required to meet airfield lighting and essential power needs of the terminal building and associated support facilities. The airport currently has an emergency generator. Emergency generation capacity will need to be reviewed in conjunction with expansion works.



Concept Design – Code 4E *Minimum* 2600M Runway Development



Concept Design - Ultimate *Potential* Development of the Topography



Construction design 2012 – 2700M Code 4E Runway Development

PROTECTING FUTURE AIRPORT OPERATIONS

To ensure their continuing viability as *essential transport infrastructure assets for the Community*, airports require protection against developments on land in the vicinity of the airport that are incompatible with continuing airport operations. Safeguards are required via land use planning and building controls to prevent:

- protrusions into airspace surrounding airports that could jeopardise the safety of aircraft operations; and
- encroachment of incompatible land uses on land surrounding the airport.

The primary mechanisms utilised to inform the development of land use and building controls – typically manifested in Planning Schemes and Planning Policies - related to land in the vicinity of airports are:

- Obstacle Limitation Surfaces (OLS); and
- Aircraft Noise Exposure Forecasts – with contours developed at ultimate airport development and operations level for *Levels* of noise exposure, and Frequency (number) of noise events at different exposure levels.

Under the Geraldton Aerodrome Deed entered into between the Commonwealth and the City in 1991, ceasing Commonwealth involvement in Geraldton Airport as part of conclusion of the Aerodrome Local Ownership Plan (ALOP), the City is obliged to "..take such action as is within its power to:

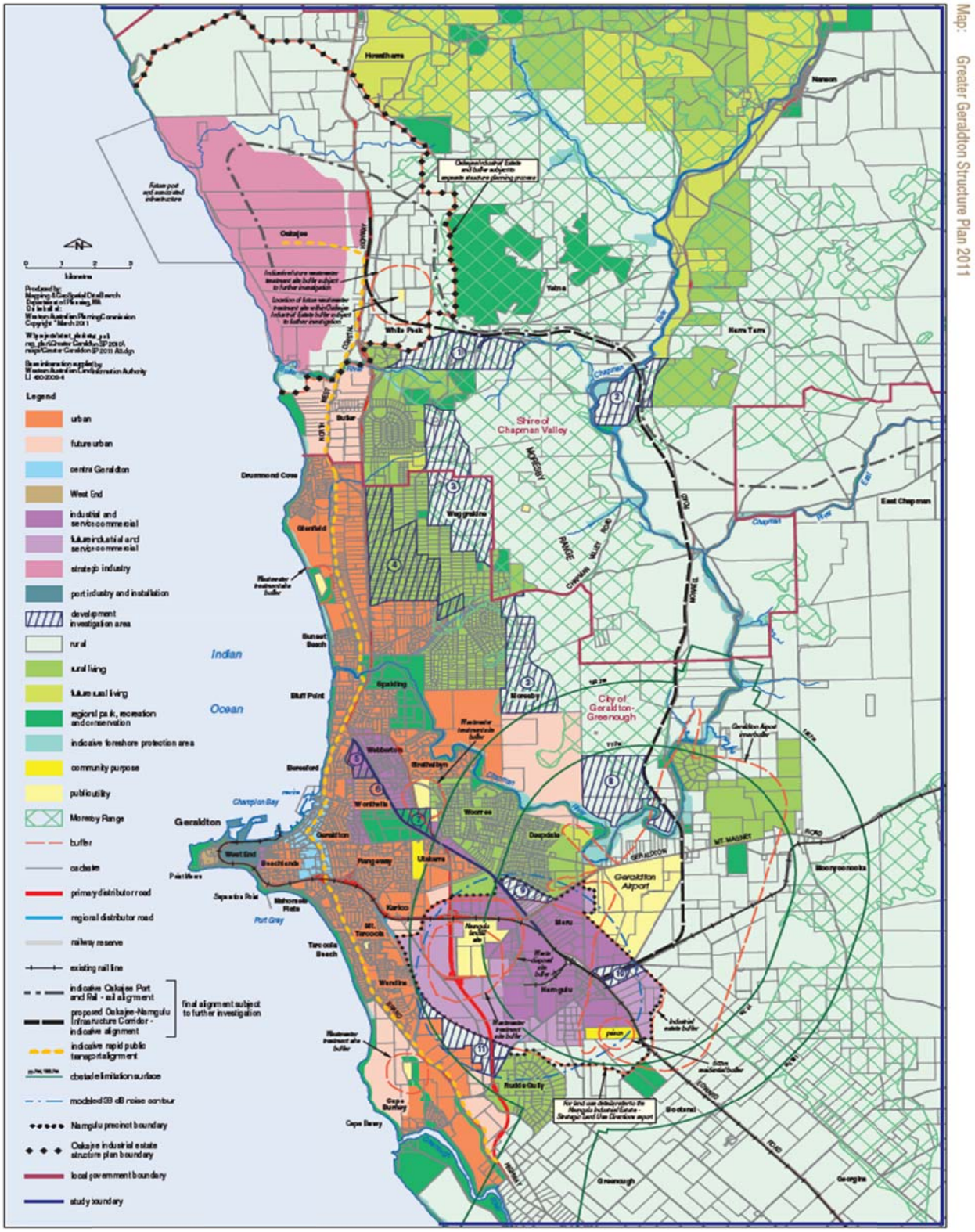
- Create land-use zoning around the aerodrome which will prevent residential and other incompatible development in areas which are or which may be adversely affected by aircraft noise; and
- Prevent the introduction of activities likely to create a hazard to aircraft including activities likely to attract birds; and
- Prevent developments which would be incompatible with…air navigation and communications facilities."

Obstacle Limitation Surfaces (OLS)

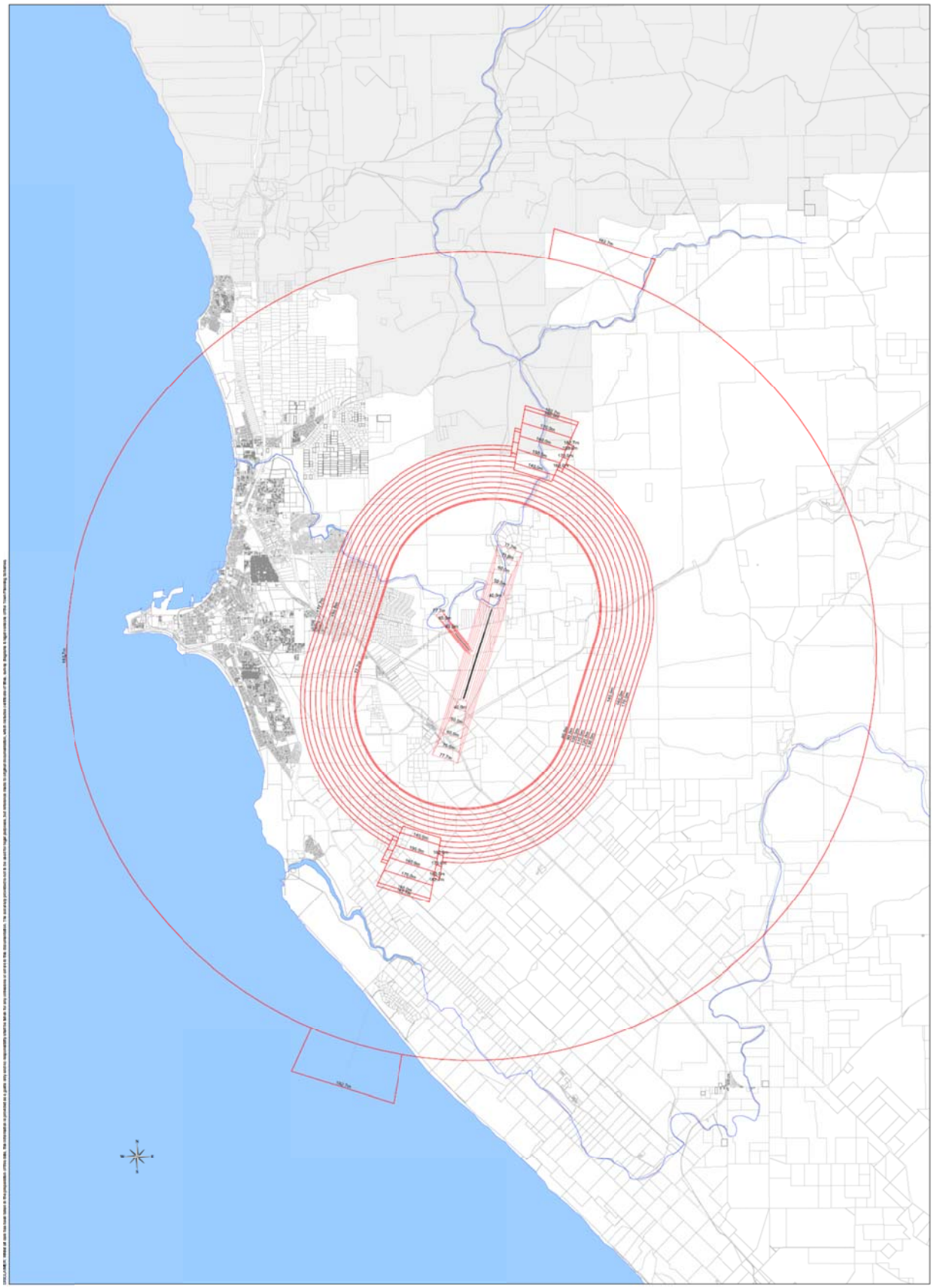
OLS surveys from 2005-07 were utilised to define airport buffer zones for land use and building control purposes, in the Greater Geraldton Structure Plan 2011.

OLS contours have been developed for ultimate possible development of Geraldton Airport as envisaged in this 2012-2030 Master Plan, as illustrated in the graphics on the following pages. Since 2012, the City has adopted a new Planning Scheme, consolidating and updating provisions of schemes from amalgamated Councils, reflecting a revised airport buffer zone based on the OLS for master planned ultimate development of the airport. As well, in February 2016 the City adopted a new Local Planning Policy defining the land use and building control requirements for the airport buffer zone, to protect future use of the airport from incompatible uses and developments on land in the vicinity of the airport.

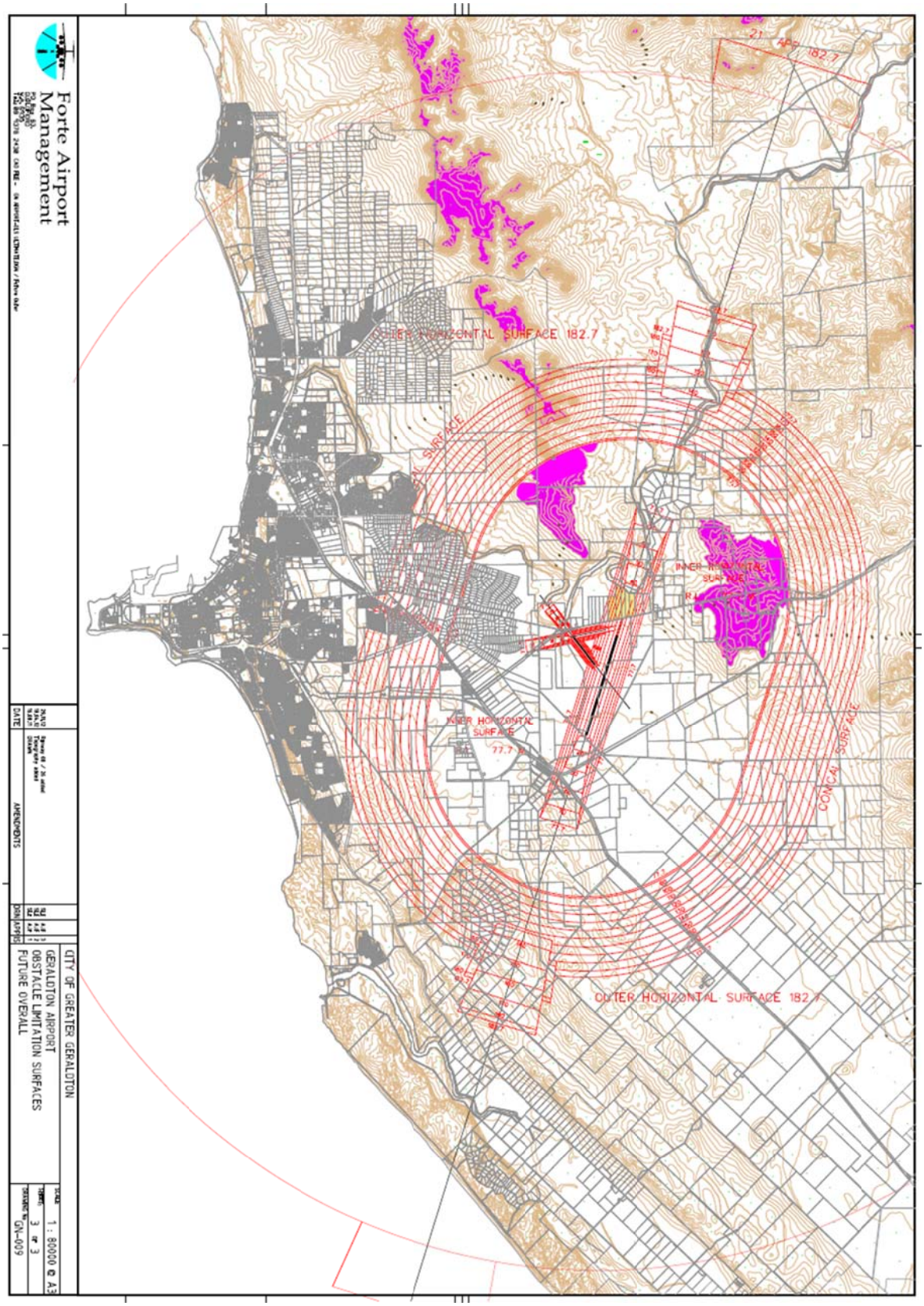
Greater Geraldton Structure Plan – Airport Buffer Zone



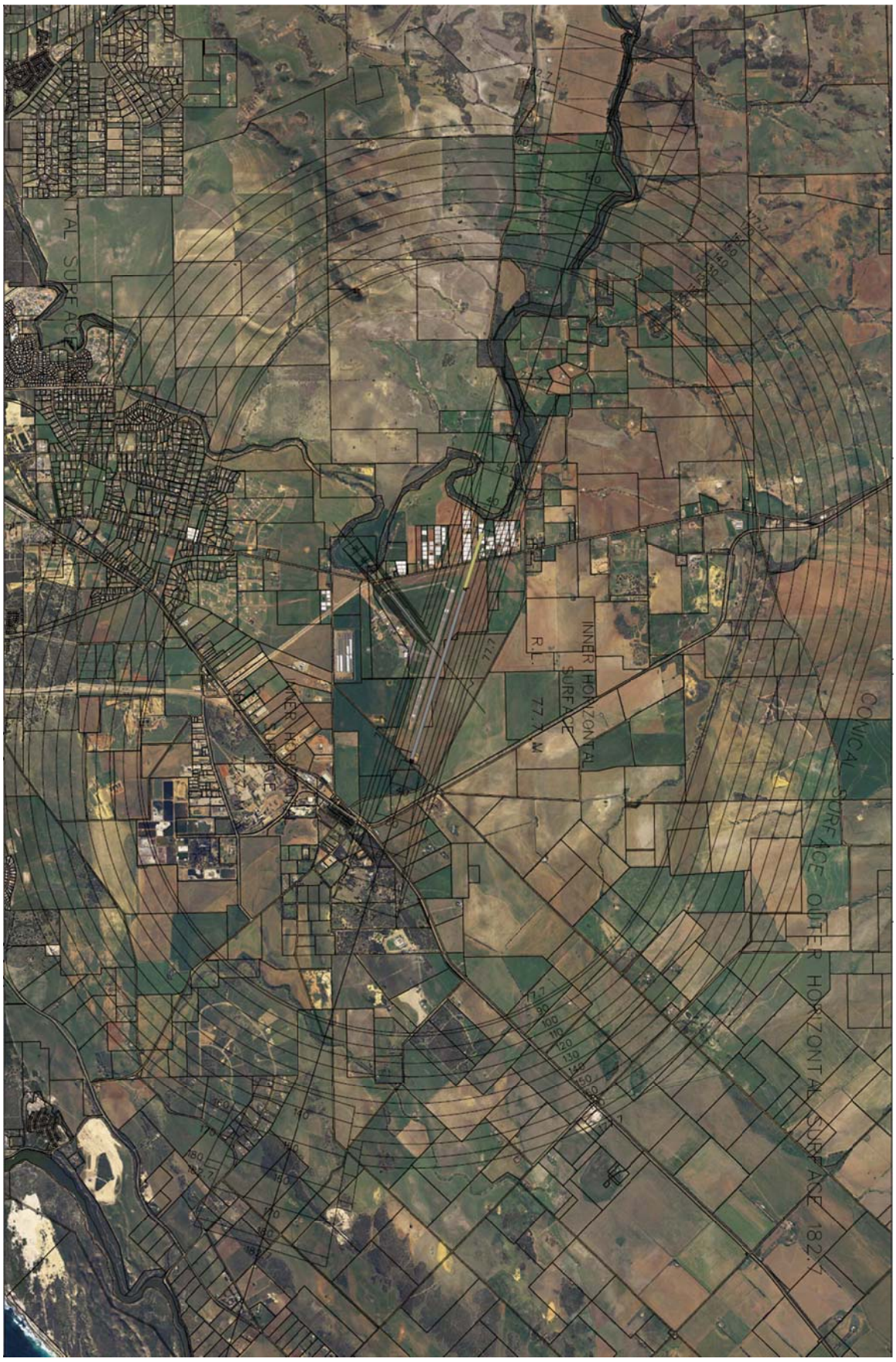
Greater Geraldton Structure Plan 2011 with 2007-based Airport Buffer Zone Defined.



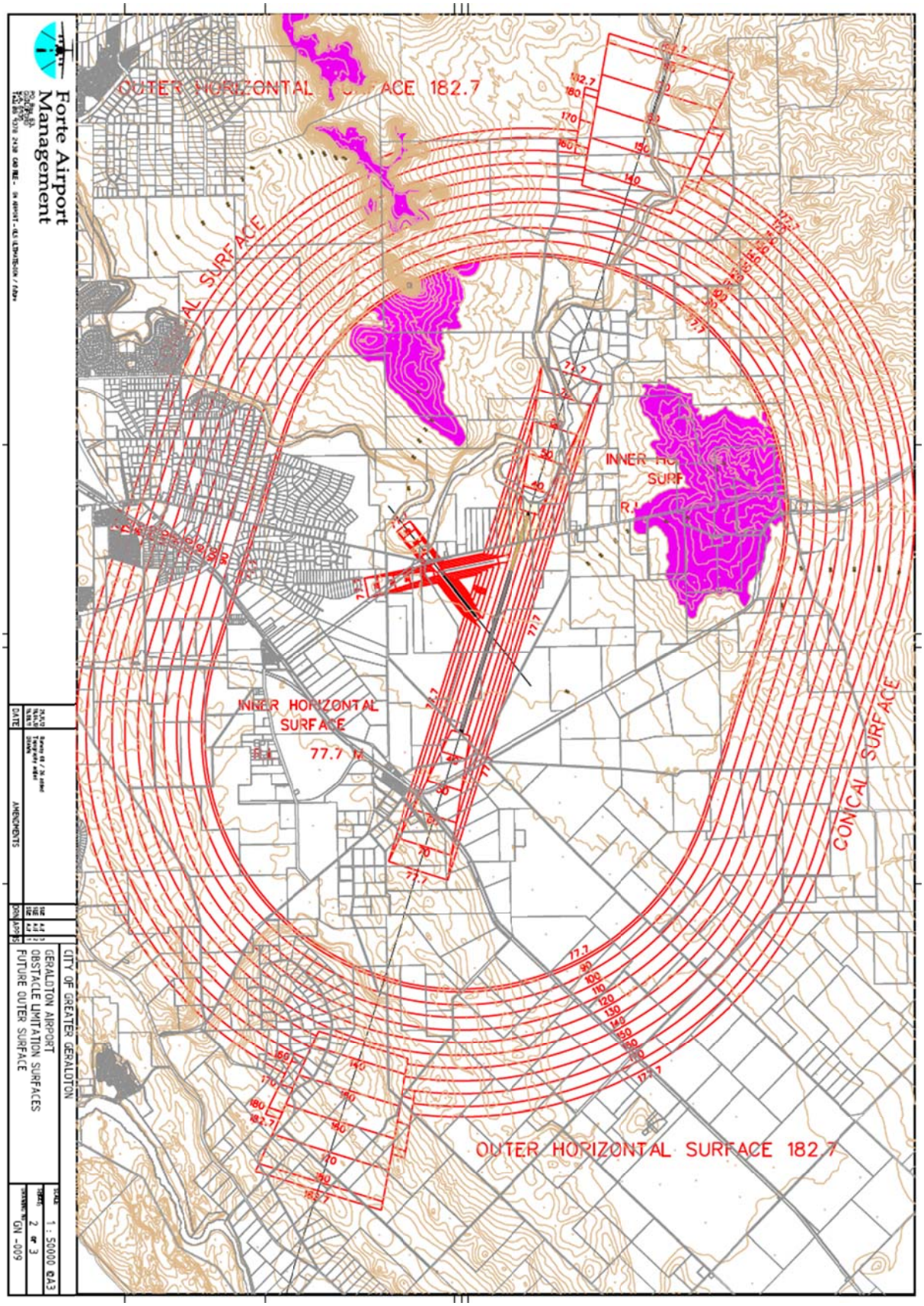
Geraldton Airport Ultimate Development: Obstacle Limitation Surfaces



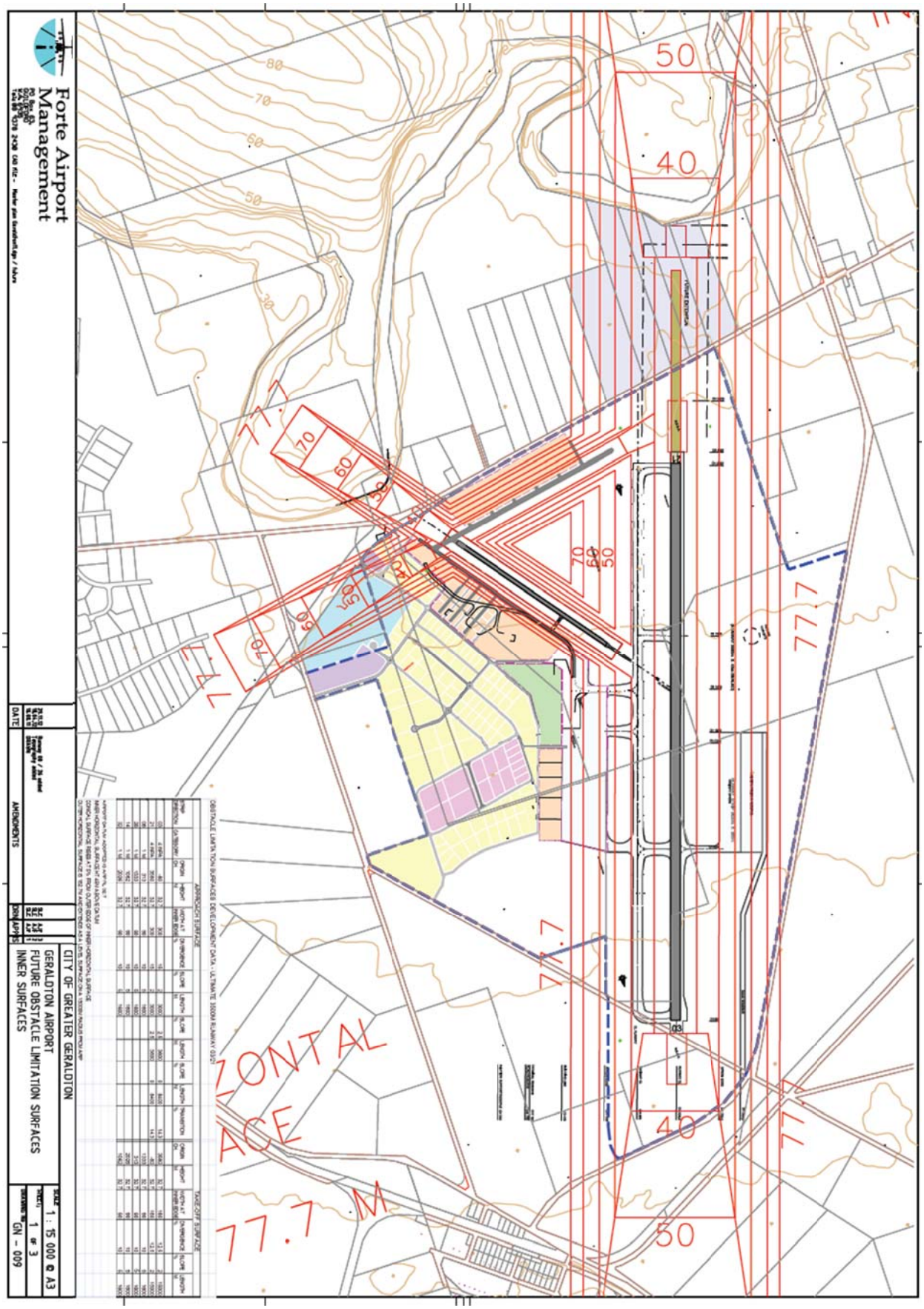
Geraldton Airport Ultimate Development OLS & Significant Topography



Geraldton Airport Ultimate Development Outer OLS (Aerial Overlay 1)



Geraldton Airport Ultimate Development Outer OLS



Geraldton Airport Ultimate Development Inner OLS

Noise Exposure Forecasts

For master planning purposes, for ultimate development and operations of Geraldton Airport, the following aircraft noise exposure forecasts were developed:

- ANEF Australian Noise Exposure Forecast
- Frequency of noise events – at 70 Decibels (N70)
- Frequency of noise events – at 60 Decibels (N60)

Reports were prepared by consultants *Kneebush Planning Pty Ltd* on the development and use of the Australian Noise Exposure Forecast (ANEF) for the ultimate capacity of Geraldton airport, reflecting staged development of a minimum new 2600x45m Code 4E runway *and its subsequent future ultimate possible extension to 3500 metres*.

Land use controls surrounding the airport can be enforced through the support of the *Australian Standard AS 2021-2000 'Acoustics – Aircraft Noise Intrusion – Building Siting and Construction'.* These recommendations are summarised in the Table below. This is a summary only and the Australian Standards should be consulted for full details of the land use recommendations, and associated notes and conditions.

The *Kneebush Planning* reports also outline the noise modelling undertaken to prepare noise event frequency contours for 60 and 70 decibel events (N60 and N70) for this master plan for Geraldton Airport.

Building Site Acceptability Based on ANEF Zones

Building Type	ANEF Zone of Site		
	Acceptable	Conditionally Acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

1. 'Acceptable' means that noise attenuation is usually not required to reduce aircraft noise.

2. 'Conditionally Acceptable' means noise attenuation may be required to reduce aircraft noise.

3.'Unacceptable' means that the development should not normally be considered.

4. The Note 1 associated with Table 2.1 in AS 2021-2000 states:

The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour. Clause 2.3.2 relates to "conditionally acceptable" development and sets out the procedure for determining noise attenuation measures.

It is industry-acknowledged that the ANEF system has limitations/deficiencies. Even land under very busy flight paths can be considered as "acceptable" for residential use and other noise sensitive uses when assessed using the ANEF system. Experience in recent years has demonstrated that the aircraft noise problem is not confined to areas inside the ANEF noise contours. In fact, most complaints about aircraft noise at Australian airports come from people who live outside the published ANEF noise contours. As a result, a number of supplementary approaches to describing and assessing aircraft noise impacts have emerged.[5] These include "Number Above" or noise event frquency contours, which indicate the number of aircraft noise events louder than a certain noise level (typically 60 or 70 decibels) which are likely to occur on the average day.

With significant changes in the planned ultimate form of Geraldton Airport since 2007 planning, now envisaged with a new 03/21 2700-3500M runway with old runway 03/21 becoming a full length parallel taxiway, the ANEF contours for the planned airport configuration *differ significantly from past studies utilised for the previous 2007 master plan.*

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[5] Refer to *Expanding Ways to Describe and Assess Aircraft Noise*, Department of Transport and Regional Services, March 2000, and *Going Beyond Noise Contours*, Department of Transport and Regional Services, October 2003.

Australian Noise Exposure Forecast (ANEF) Geraldton Airport Ultimate Development

Frequency of Noise Event Contours

The N70 contours developed in the Kneebush study depict the number of aircraft noise events louder than 70 dB(A) on an average annual day.

N70 contours broadly follow the ANEF contours in terms of their shape and dimensions but generally cover a larger area. For application in land use planning, frequency-above N70 contour lines are able to be utilised in conjunction with ANEF countour lines, to enable the ANEF-related AS2021 building recommendations to be utilised during assessment of development and building applications, particularly as they relate to 'conditionally acceptable' conditions outside but near to the ANEF 20 contour.

The N70 metric is regarded as appropriate for major Jet and RPT airports. In this regard the "*Going Beyond Noise Contours*" Discussion Paper[6] states:

These number of events based metrics, commonly called the N70 in Australia, have recently been introduced as a tool for providing aircraft noise information around major jet airports. These report the number of noise events louder than 70 dB(A) over a specified time period. A sound pressure level of 70 dB(A) is considered to be a useful 'trigger level' since an external noise of this magnitude equates to approximately 60 dB(A) inside a house with open windows.

60 dB(A) is the sound pressure level at which noise events may become intrusive to speech and hence may interfere with activities like telephone conversations and watching the TV. This is commonly called the Speech Interference Level (SIL).

While 70 dB(A) is commonly used as the reporting level for major jet airports, for GA airports where the number of noise events per day is often very significantly higher than for a person living around an RPT airport, lower noise level metrics such as the N60 (the number of events louder than 60 dB(A) are likely to be more indicative of the noise regime. This is because the small aircraft involved in performing training circuits normally generate outdoor sound pressure levels at houses which are around 60 dB(A).

Further, the document "*Guidance Material for Selecting and Providing Aircraft Noise Information*"[7] states:

There is generally a significant difference between the aircraft noise environment in the vicinity of major jet (RPT) airports and that around General Aviation (GA) airports. At GA airports the community, particularly residents of areas under training circuits, are exposed to noise from much quieter aircraft but the number of overflights is often significantly greater. Therefore, while a level of 70 dB(A) has been adopted as an indicator for RPT airports, given that a level of 60 dB(A) is typical of the noise level of aircraft in training circuits around a GA airport, the N60 is considered to be a more appropriate descriptor for these airports.

Note 1 to Table 2.1 in AS 2021-2000 justifies the use of the N70 contour, as well as the Commonwealth Government's reports *"Expanding Ways to Describe and Assess Aircraft Noise", "Going Beyond Noise Contours" and "Guidance Material for Selecting and Providing Aircraft Noise Information"* [8].

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[6] *Going Beyond Noise Contours*, Department of Transport and Regional Services, October 2003.

[7] *Guidance Material for Selecting and Providing Aircraft Noise Information*, Department of the Environment and Heritage and the Department of Transport and Regional Services, 2003.

[8] *Expanding Ways to Describe and Assess Aircraft Noise*, Department of Transport and Regional Services, March 2000, *Going Beyond Noise Contours*, Department of Transport and Regional Services, October 2003 and *Guidance Material for Selecting and Providing Aircraft Noise Information*, Department of the Environment and Heritage and the Department of Transport and Regional Services, 2003.

The N60 metric is considered to be an appropriate noise descriptor for general aviation airports. However, given that the City's plans for the airport are focussed on growing RPT and Charter passenger services, with growth in use of larger Jet aircraft by both RPT and Charter airlines, then formal adoption of the N70 metric is appropriate and justifiable for inclusion in planning and development controls.

The City, as the owner and operator of the Geraldton Airport, is responsible for its ongoing protection as an essential regional infrastructure asset that has existed as an operating aerdrome since before World War 2, and is of growing social and economic significance for the Mid West region. The City is also responsible for providing land use planning certainty for owners and developers of land in the vicinity of the Airport, and for providing guidance to residents, based on Standards, regarding noise attentuation measures they can implement in areas of airport noise influence.

To meet these imperatives, the City should define zones for building type acceptability either within its Planning Scheme or in Local Planning Policies as appropriate, recognising the geographic relationship of land sites relative to the Geraldton Airport site, and the likely aircraft noise exposure profile associated with Airport operations. The ANEF and AS 2021-2000 establish a structured framework for determining 'acceptable', 'conditionally acceptable', or 'unacceptable' uses for a site, and enabling development control guidance for specifying noise attenuation measures for 'conditionally acceptable' developments, depending on specific location of a site.

Note 1 under Table 2.1 of AS2021 states: *"The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour."* Clause 2.3.2 relates to "conditionally acceptable" development and sets out the procedure for determining noise attenuation measures.

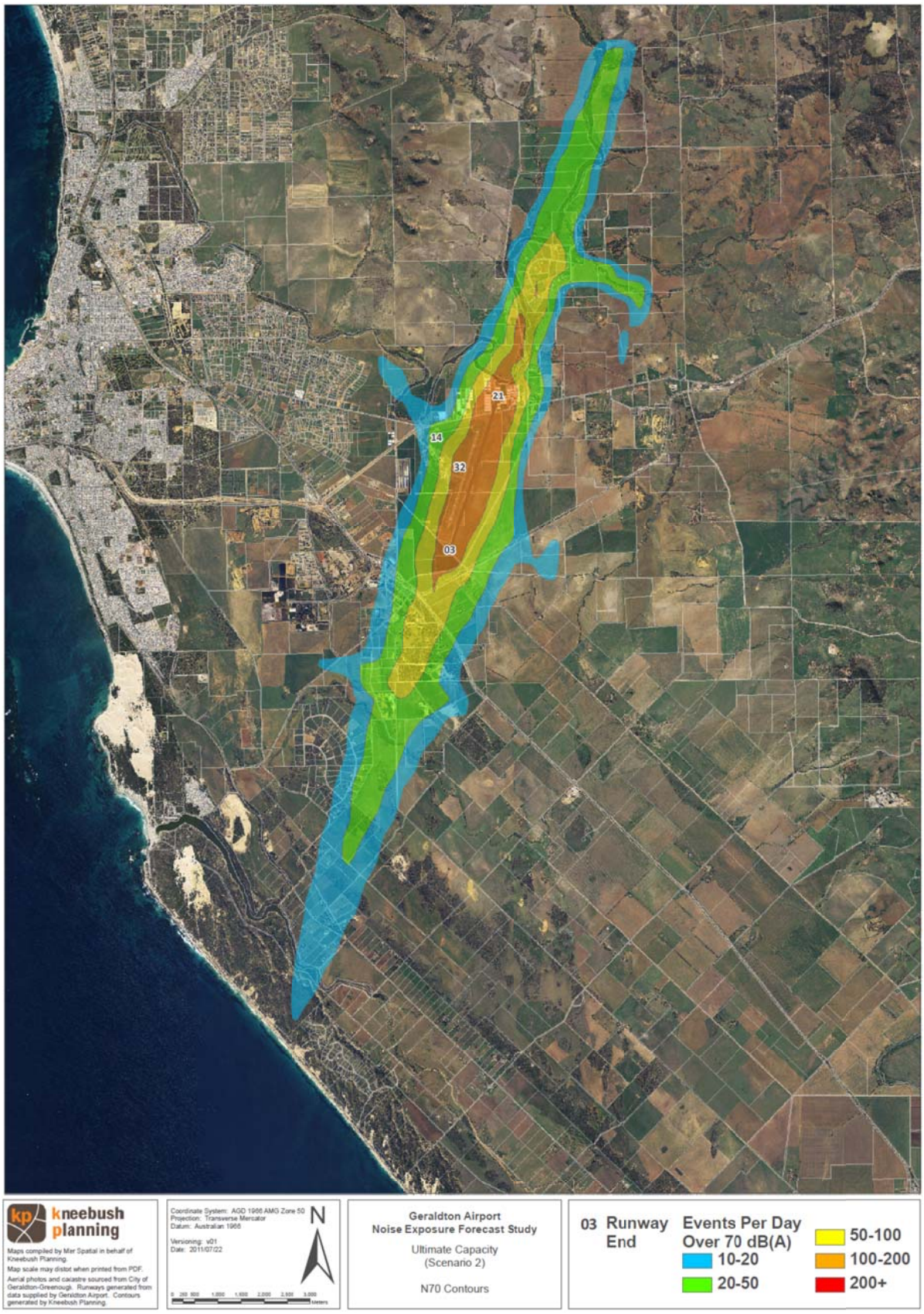
To address this issue, sound planning practise is to treat the land outside the 20 ANEF contour, but between the 20 ANEF contour and the N70 contour, in the same manner as land between the 20-25 ANEF contours.

Pending resolution of NASAG draft guidelines and recommendations by the State Government – see later section 8.5 – the recommended practise is to:

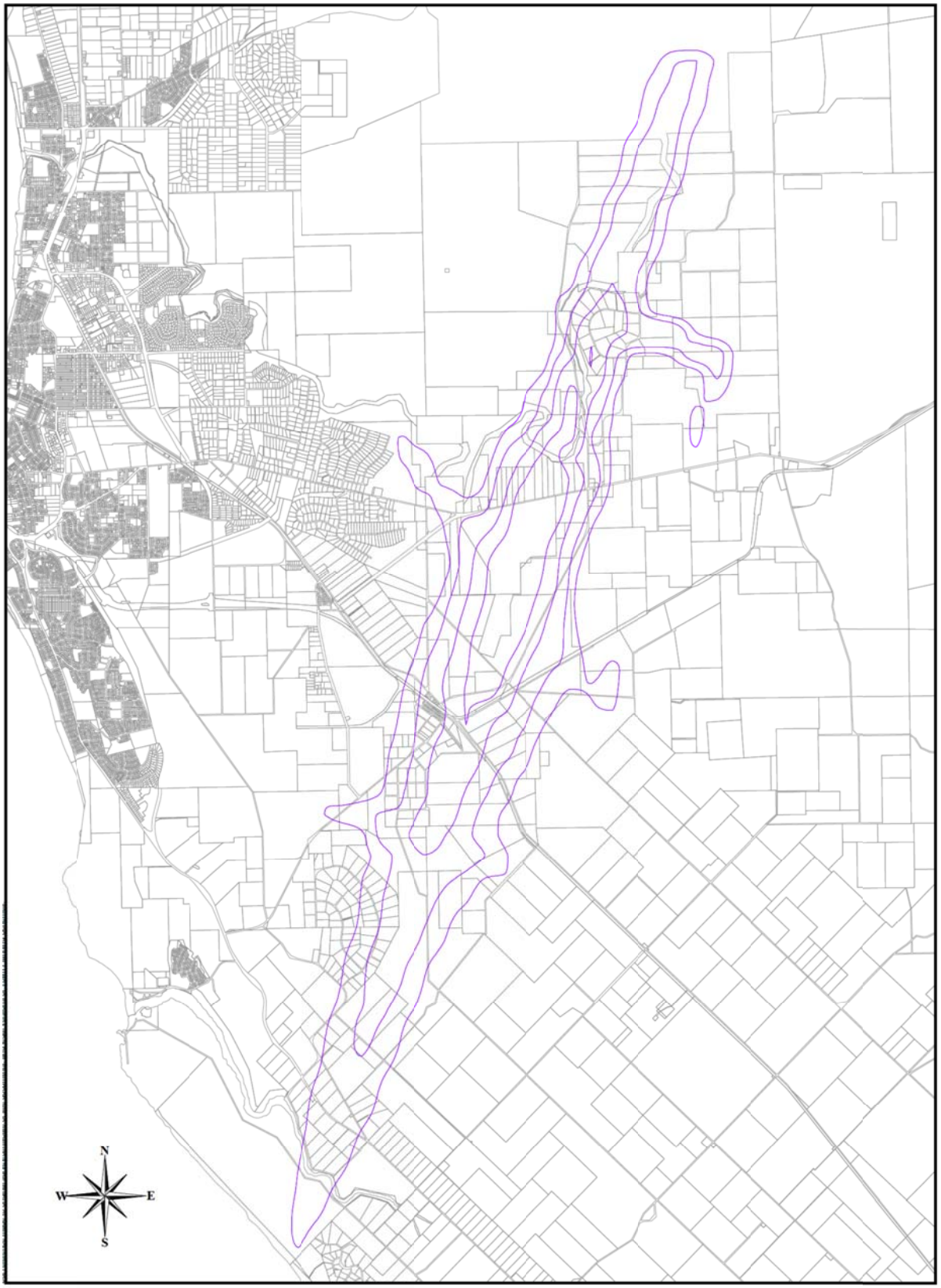
- incorporate the Government-endorsed ANEF & AS2021 system into planning schemes for planning control purposes; and
- also include the N70 contours as a planning policy area.

Under this recommended practise, the ANEF / AS2021 planning control would apply to situations where a landowner currently has a right to establish a house or other noise-sensitive use on an existing lot. For land in the N70 policy area (which includes land outside the 20 ANEF) the associated local planning policy would indicate that Council would not support any rezoning or subdivision that would increase the potential for noise sensitive land uses to be established on the land beyond what is currently allowed by the existing zoning.

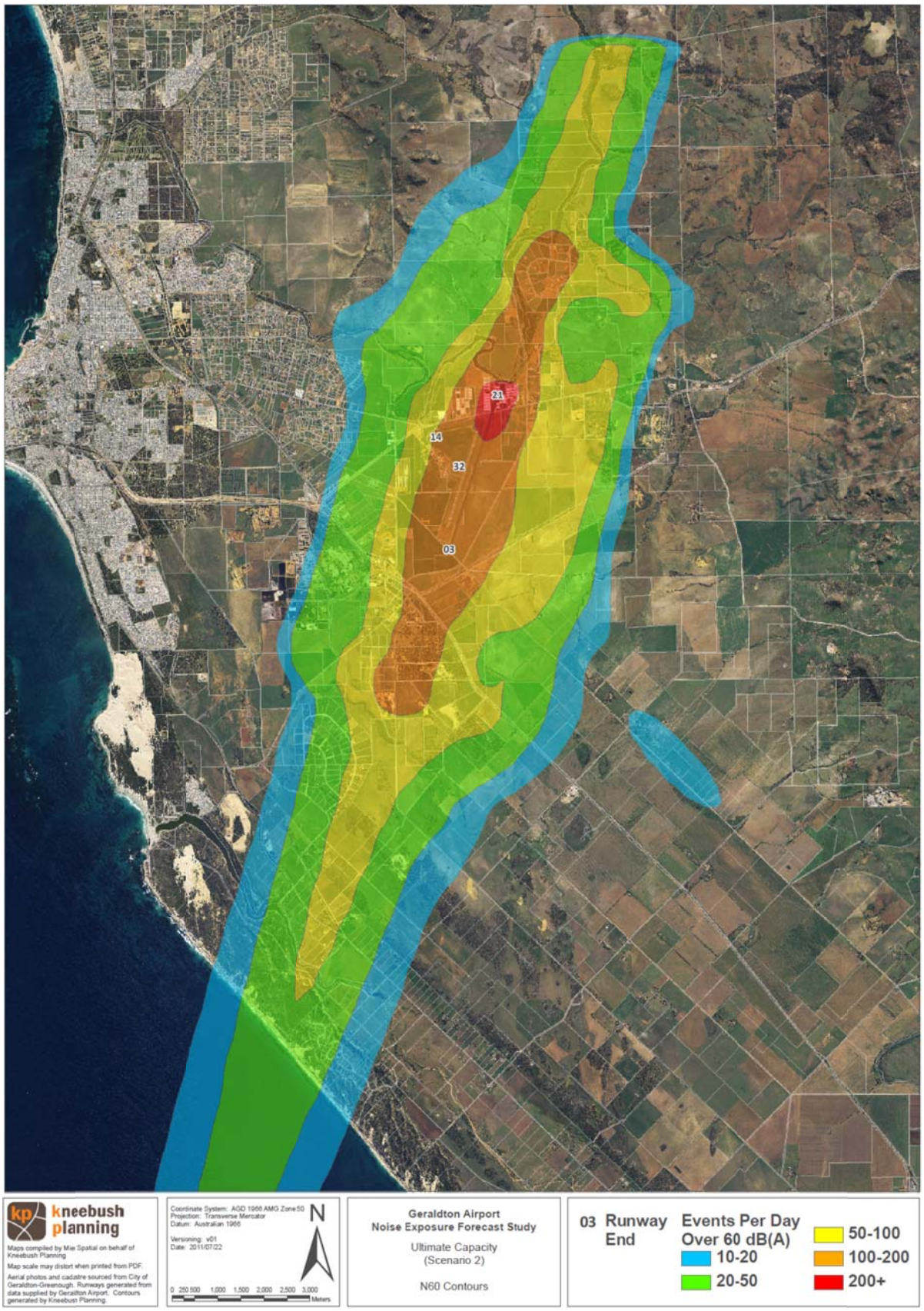
The ANEF and N70 contours for the ultimate future development of new runway 03/21 to 3500M should be adopted for the purposes of future-proofing the airport as essential regional infrastructure



N70 Contours – Geraldton Airport Ultimate Development (Aerial Overlay)

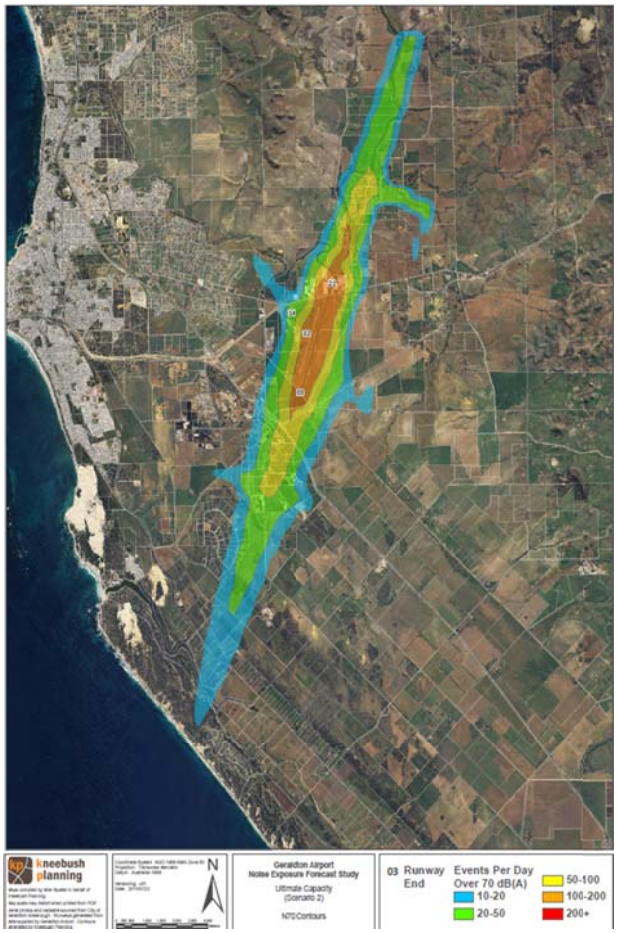


N70 Contours – Geraldton Airport Ultimate Development (Map Overlay)

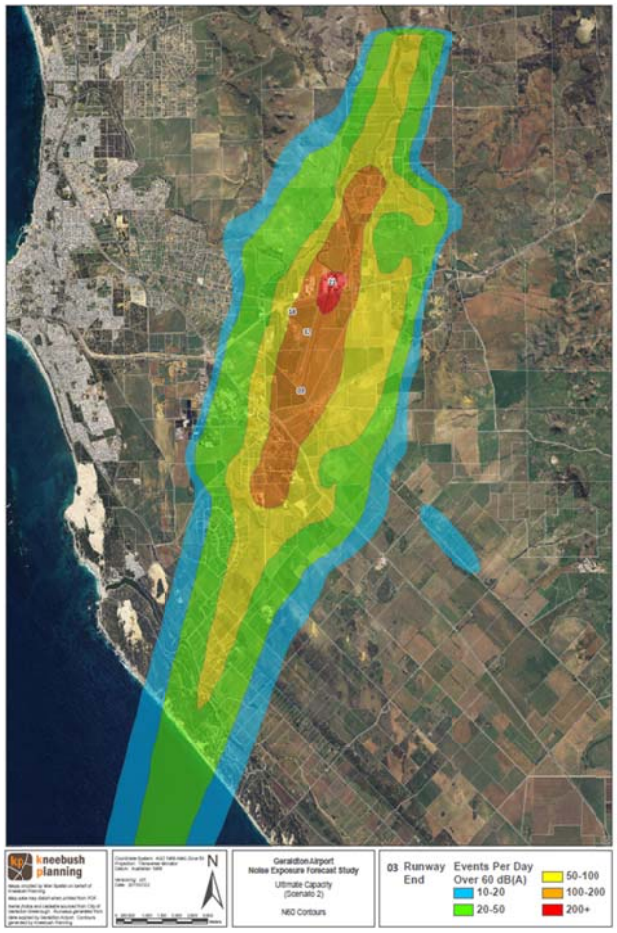


N60 Contours – Geraldton Airport Ultimate Development

Comparison of N70 & N60 Noise Contours



3500M: N70



3500M: N60

National Airports Safeguarding Advisory Group

A key initiative of the Commonwealth Government's Aviation White Paper (released December 2009) is to safeguard airports and the communities in their vicinity and to develop, with State, Territory and Local governments, a national land use planning regime to apply near airports and under flight paths.

The National Airports Safeguarding Advisory Group (NASAG), comprising high-level Commonwealth, State and Territory transport and planning officials, was formed to develop a national land use planning regime to apply near airports and under flight paths. NASAG released a set of Guidelines for public consultation, with the consultation period ending on 15 March 2012. Following consideration of submissions, a final set of proposed Guidelines will be submitted consideration by Governments. In particular, the following are immediately relevant to Geraldton Airport:

- **Guideline A: Measures for Managing Impacts of Aircraft Noise**. Attachment 1 to the proposed guideline addressed Alternative Aircraft Noise Metrics. The proposed guideline advocates continued use of ANEF, but with use of 20xN70, 50xN65 and 100xN60 noise event frequency metrics to supplement the ANEF.

- **Guideline F: Managing Risks of Intrusion Into Protected Airspace of Airports**. In essence, this proposed guideline addresses use of OLS as the land use planning and control mechanism. OLS has been utilised at Geraldton for some years, is already reflected in buffer zones included in the Greater Geraldton Structure Plan released by the WAPC in 2011, and this master planning process reflects City intention to continue use of OLS for land use planning and control in the vicinity of Geraldton Airport.

The proposed NASAG Guidelines will require adoption by Federal and State Governments before they have any authority. How the authority then manifests, whether in State legislation, or in subordinate legislation or formal policies with backing of law – such as State Planning Policies, Structure Plans and so on – will determine if and how the City will formally integrate them into Planning Schemes or Local Planning Policies.

Review of the airport master plan, and associated matters in planning schemes and/or local planning policies, will be necessary once the Commonwealth and States conclude with NASAG findings and the Commonwealth and WA State Government respectively provide responses to any NASAG recommendations. Given NASAG recommendations to review AS2021, this may be some time away - hence planning controls adopted by the City should proceed on the best information available.

Adoption of ANEF and N70 noise contours as the basis for Planning Scheme amendments and/or Local Planning Policies to establish development control buffers and land use controls is strongly recommended in the interim. The City's Local Planning Policy – Airport Buffer has been amended in 2016 to reflect the ultimate runway runway development noise exposure contours.

LANDSIDE PLANNING

Terminal Reserve

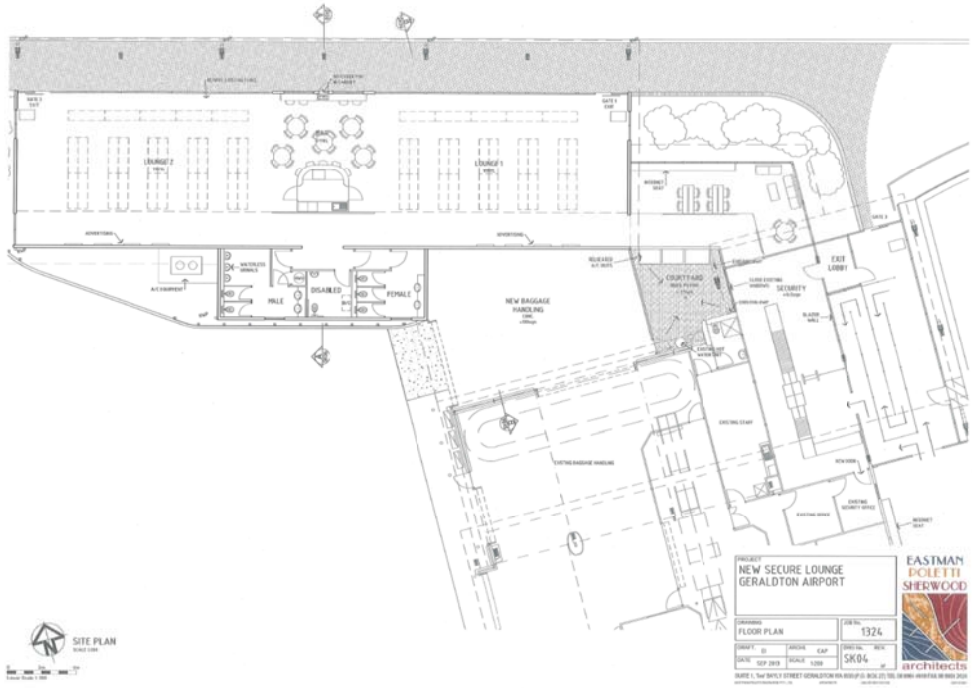
The terminal reserve is an area that not only allows for construction of RPT and charter passenger terminals but allows the full integration of vehicle access for drop off and car parking.

The terminal reserve depth varies upward from 100 metres at its southern end to 300 metres at the northern end. This master planned configuration takes into account existing and immediate planned expansion of the car park areas.

Linear development is master planned to extend 250 metres south of existing Taxiway 'A' centreline and 130 metres north of its centreline creating a terminal reserve length of 380 metres with direct access to the apron reserve.

Greenough RPT Passenger Terminal

The Greenough terminal building had design capacity to security-screen and accommodate up to 186 persons in the sterile departures lounge, completed for introduction of mandatory baggage and passenger security screening from 1st July 2012. The departures lounge design met the requirements of departure for a single aircraft type B737-800 or A320-200 of around 165 seat capacity. In practise it could not comfortably meet requirements for multiple coinciding aircraft departures of, say, an F100 and a Q400. As well, the absence of toilets and sterile departures lounge and re-enter through the security screening process, causing congestion and inconvenience. As a consequence, in 2013 the City commissioned design of an extension to the terminal building and construction was completed in April 2015. The new multi-gate sterile departures lounge design includes refreshment areas and direct access to secure toilets.



Capacity of checked-baggage security scanning equipment is adequate to deal with efficient processing under high-growth passenger forecasts.

Should international services be considered in future on a Restricted International Airport basis then Greenough terminal modification and expansion will be necessary for sterile departure and sterile arrival lounges. Anticipating future need for a second sterile departures lounge for domestic services, inevitably requiring its own security scanning equipment and sterile entry area, then logically the planning and design of facilities necessary for restricted international airport operations – and international alternate airport operations – should be undertaken in conjunction with planning for terminal building modification/extension for a second domestic departures facility.

Development logic would see modifications and extension to the southern end of the Greenough terminal, to accommodate a second secure departures lounge with screening facilities, and a sterile international arrivals facility, including Federal Gateway Agency requirements.

Car Parking

Parking areas are located in the precinct area west of the terminal reserve. Beyond this master plan timeframe (2030) it may be necessary consider additional car park capacity, met by either multi-story building or remote parking with courtesy bus collection. The latter method is being effectively employed by Perth Airport as it has the separate land available to provide broad acre car parking.

Car bays for short and long term parking will inevitably have growth demand. It is well recognised that incremental build of terminals typically generates apron expansion and incremental expansion of car parks.

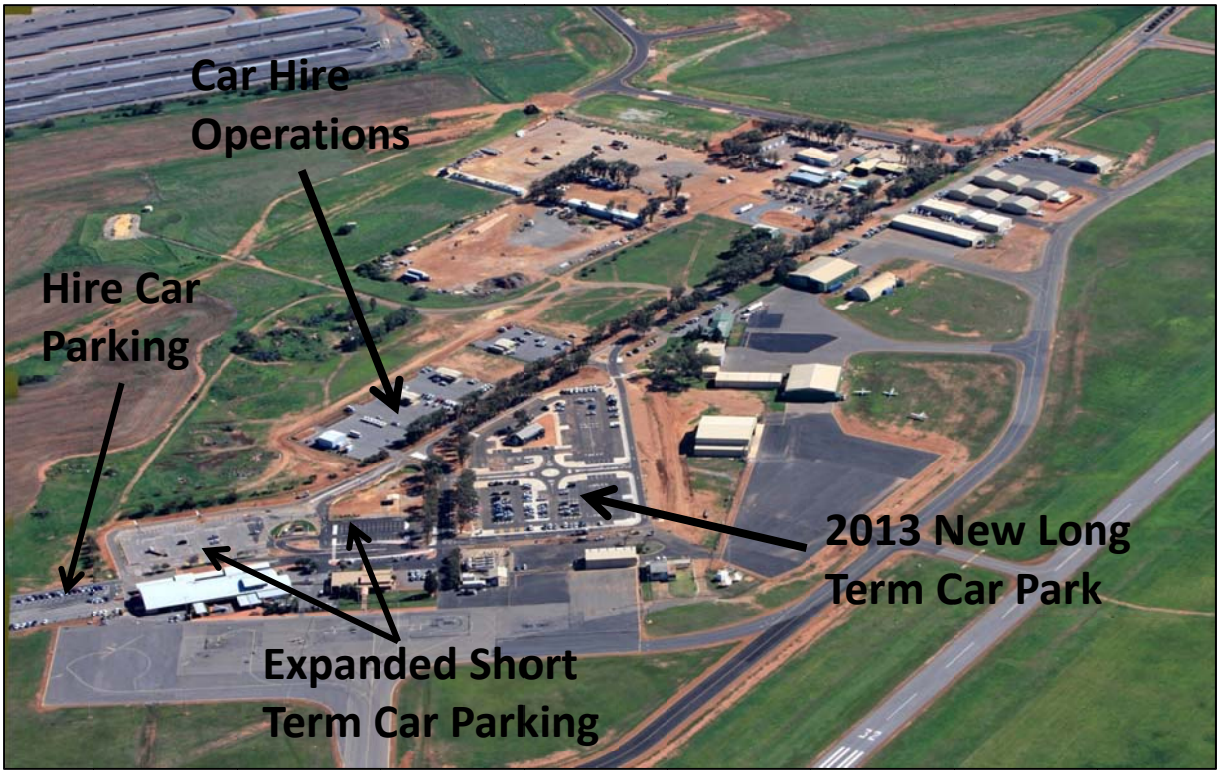
The Bureau of Meteorology (BoM) was relocated to new premises to the south-west of the Greenough terminal, and planning for the technology park to the west of the terminal has been restricted, not encroaching south into land within a 500m radius of the new BoM building and weather radar tower. This land area will continue to have restrictions in terms of height of any structures, and type of permitted activities (including banning of electric arc welding).

These restrictions create a significant area of level land, within the 500m radius area, and within reasonable distance of the terminal, portions of which may be utilised in future for development of additional car parks, within the development constraints necessary to preserve BoM instrument viability.

Car Parking Expansion Completed 2013-14:

Short term car parking spaces increased from 232 to over 320 spaces, and Long term car parking pavement spaces increased from 72 to 330 spaces.

Pay-Parking was introduced on commissioning of the new car parks.



Hire Car Operations

Hire Car operators previously utilised an area immediately adjacent to the Brearley Terminal car park for fuel, wash down, servicing and parking, and they also used areas adjacent to the existing long term car park for parking. Operations areas for Car Hire firms were relocated in 2013, to new leased areas west of Gordon Garrat drive to accommodate extension of both the short term and long term terminal patron car parking. A new parking area for collection and return of hire vehicles has been established immediately south of the Greenough Terminal arrivals area. This parking area would be relocated in future, should the terminal building be extended to the south.

Ground Support Equipment

Sufficient space should be provided in close proximity to the RPT passenger terminal and apron area for parking and management of airside ground support equipment and baggage make up areas.

Outbound baggage handling activity is currently located under the Greenough terminal roof, in an enclosed secured area behind the departures check-in area, which accommodates baggage security screening equipment and provides space for loading baggage onto baggage train trolleys for towing out to aircraft on the apron. Inside the main terminal hall, space is provided for up to four check-in booths, with capacity demonstrated as adequate for baggage check-in for current RPT service providers – QantasLink, Virgin and Skippers.

In the future, outbound baggage handling may need to be managed via conveyor to another built enclosure because either the terminal building area may have a higher value use (for example, for extension or duplication of the sterile departures lounge area), or the larger area required for baggage processing, as demanded by growing traffic volumes, cannot be readily made available in that area.

Aviation Fuel Reserve

The current aviation fuel storage facility is located immediately north of the Brearley terminal, with airside apron frontage. Airport refuelling vehicles (suitable up to B737-800 size aircraft) are typically not public road registered and for expedience need direct apron access

To the south of the terminal building reserve, provision has been made for a future new aviation fuel storage and dispensing site, with apron frontage.

The central position to the ultimate apron reserve has been adopted because wide bodied jet aircraft require hydrant refuelling, and the distance-to-run from storage desirably should be kept to a minimum.

It is envisaged that the southern portion of the terminal reserve apron – planned for development to handle Code 4E (and potentially Code F) aircraft, would be hydrant serviced. Being a new apron build, it should be designed to strength for the wide bodied aircraft types.

Separation of fuel stored would be enhanced by road access and buffer to ARFFS facilities planned in future for the site immediately south.

Jet A1 fuel storage commensurate with demand would be provided by additional 110,000 litre bulk storage units.

Avgas is used only by piston engine aircraft. The primary Terminal apron area will in future be confined to use by RPT aircraft. The overwhelming majority RPT aircraft operating through Geraldton are turboprop and jet aircraft. Any RPT aircraft requiring Avgas will continue to be serviced by fuel truck operated by the Mobil agent. Resident commercial GA operators such as Shine Aviation have their own fuel storage and dispensing facilities, located adjacent to their operational apron areas. Bulk storage of Avgas is currently provided in the existing fuel storage facility north of the Brearley terminal.

Hangar Reserve

Provision for additional future maintenance hangars has been made. While there is a global trend to centralisation to fewer major aircraft maintenance and servicing centres (as evidenced by recent Qantas initiatives impacting their engineering service presence in Australia, with preference for offshore centres for servicing newer aircraft types), some maintenance activity may gravitate to Western Australia as fleet sizes grow in Western Australia supporting growth in FIFO operations.

With congestion levels at Perth and Jandakot, it may become attractive for maintenance operators to consider relocation of some maintenance and servicing operations to a regional airport such as Geraldton within a one hour flight distance from Perth. The potential should be preserved for further aircraft maintenance and overhaul work being established at Geraldton Airport.

Aerodrome Rescue & Fire Fighting Services Reserve

CASR 1998 Part 139 Subpart H sets out the requirements for Aerodrome Rescue and Fire Fighting Services (ARFFS) and according to these regulations ARFFS must be provided at an aerodrome *from or to which an international passenger air service operates,* and any other aerodrome through which more than 350,000 passengers passed on air transport flights during the previous financial year.

Regulations currently prescribe that no entity other than Air Services Australia may provide services associated with rescue and firefighting on an airport, without prior CASA approval.

In December 2015 the Federal Department of infrastructure and Regional development issued a consultation paper, foreshadowing the following:

- Continuation of the Australian policy of not providing ARFFS at designated alternative landing airports for international carriers (as a lodged exception to the ICAO charter – along with a number of other member nations), unless other threshold requirements exist;

- Cessation of current policy of automatically providing ARFFS at all airports to which an international passenger service operates, regardless of frequency of services or number of passengers;

- Increase of the ARFFS threshold from 350,000 to 500,000 annual passenger movements;

- Adding a requirement, in lieu of the binary test of whether or not an international passenger service operates, of conduct of a comprehensive risk assessment to determine whether or not ARFFS is justified;

- Amendment of Regulations to remove the requirement for CASA approval of provision of services associated with rescue and firefighting by anybody other than Airservices – potentially including State fire and emergency service entities - enabling airports to negotiate with such entities, and with international airlines, to put in place alternative ARFF arrangements that will satisfy international airline requirements.

Whether under the existing arrangements and regulations, or applying the foreshadowed threshold, on the basis of projected RPT demand forecast the requirement for provision of ARFFS by Airservices is not likely to transpire for Geraldton within this master planning period before 2030.

In that context, the proposed changes to Regulations would benefit Geraldton Airport. Should international flights be undertaken in the years prior to the establishment at Geraldton of Airservices ARFFS facilities and personnel, then *interim arrangements for services associated with ARFFS would need to be made, to meet a level of AFFR capacity negotiated with the Airline – on a direct user-pays basis*. This would typically be achieved by engaging the services of the local Fire and Emergency Services Authority (FESA) professional fire brigades.

For minimisation of both capital and operational outlays (and consequent optimisation of cost recovery charges on the aviation industry for availability of ARFFS capability) the City sees benefits for all stakeholders in consideration of compromise arrangements, per the foreshadowed changes to regulations.

In 2015, the City reactivated an emergency services facility located on the northern boundary of the airport estate, adjacent to the airport entrance. The facility provides office space and personnel amenities, with designed space suitable for an emergency response control room, plus large shed for parking for multiple fire appliances.

The City's bushfire control officer and a FESA officer posted with the City have relocated into the building, and volunteer bushfire brigade appliances are now parked in the adjacent shed. The appliances have foam spray capacity, and hold appropriate foam-type stores for aircraft fires.

These are not purpose-designed ARFFS appliances and volunteer brigades currently have limited training in ARFFS. Additional training will be required.

From the current FESA brigade station in the CBD, response time for appliance callout to the airport is about 8 minutes. Planned relocation of the professional brigade, to a new FESA Fire Station under construction on North West Coastal Highway, with ease of access via Edward Rd or the Southern Transport Corridor to the Airport, will reduce that response time.

The proposed location for a longer-term future on-airport ARFFS facility is depicted on the ultimate movement area plan, adjoining the southern end of the Terminal Reserve. This ARFFS reserve location is chosen on the basis that it is relatively central to the ultimate aerodrome layout with direct access to constructed pavements.

Air Traffic Control

The aerodrome is currently located within non-controlled **Class G airspace** and no air traffic control services are provided.

Air Traffic Control (ATC) would typically be considered necessary with around 1,500 aircraft movements a month but would be subject to an aeronautical risk assessment by CASA/Office of Air Space of aircraft activity mix and RPT passenger movements. Outcomes and recommendations from their most recent assessment, published in early 2012, are included earlier in this document.

International operations may trigger a requirement for traffic management and to some extent may depend upon the extent of services, the aircraft operator and type of international operations.

Airservices Australia is trialling ‘remote tower technology’, allowing air traffic controllers to be based elsewhere in Australia working with images and data transmitted by broadband or fibre optic cable.

Geraldton is designated as one of the first regional centres for broadband connection under the Federal NBN project, and the airport precinct has the particular advantage of achieving early broadband fibre connection via special arrangements for access to nearby fibre installed for the ASKAP project. Accordingly, Geraldton Airport is well positioned should remote tower technology become appropriate to meet its future ATC needs.

Alice Springs airport is the base for the trial of a Swedish designed system under an agreement between Saab Systems and Air Services Australia.

The technology allows object tracking and alerting, infrared vision and image enhancement and predictive software danger of collision.

Aircraft beyond normal view are able to be displayed as a labelled radar track enabling controllers to gain an earlier awareness of aircraft in the vicinity of the aerodrome than is possible by optical means alone.

In essence, an onsite controller looking through a window would see an aircraft with the aid of binoculars, but a controller viewing the same scene remotely could see the image magnified on the screen with the aircraft's type, registration, altitude and airspeed displayed and could be alerted by predictive software if it was in danger of collision with other aircraft.

Whether this capability might replace the need for site specific ATC at regional airports is yet to be determined.

For future planning the optimum physical site for ATC infrastructure is in the location of the existing VOR navigation site. ATC requires all round vision and the stringent siting criteria limits the sites available.

The Airservices Australia demand criteria on aircraft movements and passenger numbers suggest the requirement for ATC could be at least another 10-15 years before facilities are required. At such time the VOR renewal may also be required. Airservices Australia should be advised of the future alternative navigation site.

In this context the NDB may also have a siting conflict due to the proposed apron expansion and fuel services expansion site in the master plan.

However, the operational future of NDB's is such it is unlikely that an alternative site would need to be found when demand for airport expansion arises. Also there is no immediate need for a new fuel storage depot or hydrant refuelling to warrant urgency of a shift to the master planned site. The alternative site for the VOR could also substitute as the site for the NDB for the interim period leading to VOR relocation. It is also quite feasible that all ground based navigation equipment could be co-located in the north east quadrant of the airport.

Should Geraldton Airport move to acquire ILS, consultation with CASA and Airservices will be necessary to determine location, installation and operational issues, taking into account likely timeframes for development of the new 03/21 runway, conversion of old runway 03/21 to a parallel runway, and location and operation of ILS in the intervening period. Questions such as class of ILS equipment desired, runway alignment versus obstacles alignment, and use of see-to-land protocols, require deliberation.

AIRPORT HOTEL DEVELOPMENT

Hotel developments have successfully been built on airports with high business throughput. The demand and commercial viability are not matters for consideration in this aviation infrastructure master plan but the provision of a suitable area is relevant.

The optimum hotel site is within walking distance from the RPT terminal. In the case of Melbourne's Tullamarine Airport the hotel has been integrated into a new multi-level car park development with walkway for over surface access to terminal. Development of hotel facilities within the terminal reserve is the optimum approach and, with future redevelopment of open plan car park areas, this approach would be achievable.

For Geraldton, with limited availability of good quality four star or better tourism and business accommodation in the urban area, and with the airport within a 10 minute drive of the CBD, a higher quality development should be considered, incorporating restaurant and business meeting facilities, with light commercial retail development on its ground floor, consistent with airport retail patterns elsewhere.

Retail development in the envisaged hotel accommodation complex may have a focus beyond airport terminal passenger and visitor traffic. The airport precinct will include the resident GA operators, Durack Institute trades training campus, potentially a Flying College, the City Depot, and a range of tenant businesses in the Technology Park bringing a captive customer base for particular retail streams and food outlets.

What should be avoided is development of lower cost hotel/motel accommodation that by default would attract advanced bulk booking by FIFO workforce management companies, defeating the purpose of providing high quality visitor accommodation for tourists and the corporate sector. The Geraldton airport terminal reserve is *not the appropriate site* for a de facto FIFO worker accommodation facility.

The City owns Geraldton airport land in freehold, and has to date had a strong policy preference for retaining freehold ownership of land in the airport precinct over which continuing direct City control is seen to be in the best interests of future-proofing airport operations. For hotel accommodation developments, and particularly so in the post-GFC environment of globally constrained finance for accommodation and tourism developments, offering long term leasehold tenure rather than freehold ownership for a hotel site was assessed as a deterrent to financiers of companies otherwise interested in undertaking this development, and the City considered freehold sale of the hotel site accordingly.

The City has identified a large site, to the immediate west of the Greenough terminal car park, for potential hotel and associated commercial development. This is a prime commercial site in very close proximity to the Greenough terminal. Alternative sites within the non-aviation development land holdings, for example adjacent to the Durack Institute site, can be considered by the City for a freehold sale, and could also be suitable to a hotel developer. Development will be required to comply with the Geraldton Airport Technology Park Design Guidelines.

The City initiated an EOI process, inviting companies to submit expressions of interest in development of hotel accommodation on the reserved site. Submissions closed in March 2012. The City has appointed the Melbourne-based Saraceno Group – which developed the Tullamarine Mantra Hotel – as preferred developer.

AIRPORT BUSINESS/TECHNOLOGY PARK DEVELOPMENT

Aviation industry requirements for aircraft hangars, terminals, car parks, hire cars and the like also extend to aviation support services. These businesses aligned to aircraft servicing, avionics and other electronics, and telecommunications would desirably locate on airport, to be close to their principal customers.

Flying training is essential for the future of the aviation industry. The City has a preferred model for any major pilot training operation to be based at Geraldton Airport, with basing of aircraft and a formal residential and study campus, and associated briefing facilities at the airport, with instrument and other advanced training undertaken at and about the airport using larger training aircraft types including jets, but with ab initio pilot circuit training work utilising smaller single piston engine aircraft types (with high urban noise impacts) to be undertaken at rural satellite airstrips located outside the Geraldton CTAF.

From the early stages of development of the technology park concept, the City reserved a large land area on the western side of the airport precinct for establishment, by the Durack Institute of Technology, of a trades trading campus. Provision of around 7 hectares will accommodate the new mining trades training facility, but in future may become the primary Trades Training campus for Durack, with other trades to be migrated over time from the current Fitzgerald Street campus. Approval of Government funding of $9M over 3 years was included in the 2012-13 State Budget. This campus commenced construction in 2014, making Durack a major foundation tenant of the Technology Park.

The Mid West economic development context influences the range of business tenants likely to be attracted to the Technology Park. As a mining province the Mid West has major gold, uranium, nickel, vanadium, platinum, rare earths, mineral sands, coal, natural gas – not just iron ore.

Professional employment for the full range of professions engaged in mineral resources exploration, development, extraction and processing is growing, with potential for permanent establishment/re-location of their offices to Geraldton. A professional services hub supporting this growth can develop at the Technology Park, along with specialist firms providing technical support to their activities.

There is strong emergence of technology driven businesses in Geraldton, not necessarily aligned to aviation but attracted to the secure working environment offered by airport precincts. Alternative energy generation – with wind farms already developed and more planned, a solar farm under construction and another planned – is growing rapidly. NBN fibre connection to Perth has been completed, with access readily available from the Technology Park.

Any business requiring broadband telecommunications, or a safe environment for hosting facilities such as Data Centres, can consider the Technology Park. Potential land uses in the Park that may be considered include aviation support, ICT, logistics, transport and distribution, office, professional services, non-bulk warehousing, light industrial trades, mining support and administration, light equipment sales servicing and hire.

Heavy or noxious industry will ***not*** be permitted in the park. Lots may be made available for commercial development (such as food supply, light retail) to support the workforce resident in the technology park.

A Technology Park landside development concept has been prepared by the City that establishes a broad land use plan for the areas outside of the primary aviation land use requirements.

Aerodrome Reference Codes

Aerodrome Reference Codes (ARC) categorise groups of aircraft types, for guidance in aerodrome design.

Aerodrome Reference Code (ARC)				
Code element 1		**Code element 2**		
Code number	**Aeroplane reference field length**	**Code letter**	**Wing span**	**Outer main gear wheel span**
1	Less than 800 m	A	Up to but <15 m	Up to but < 4.5 m
2	800 m < 1200 m	B	15 m < 24 m	4.5 m < 6 m
3	1200 m < 1800 m	C	24 m < 36 m	6.0 m < 9 m
4	1800 m and over	D	36 m < 52 m	9.0 m < 14 m
		E	52 m < 65 m	9.0 m < 14 m
		F	65 m < 80 m	14.0 m < 16 m

ARC 1A-1B includes general aviation aircraft below 5,700 Kg such as Cessna 172 and Beechcraft 200 (King Air).
ARC 2A-2B includes general aviation aircraft above 5,700 Kg such as Beechcraft 1900
ARC 3C includes 50 to 100 seat RPT aircraft type E170, F100, F50 and BAe146-300
ARC 4C includes 100-165 seat RPT aircraft type E190, B737-800 and A320-200
ARC 4E includes 250 seat RPT wide body aircraft type A330-200, B787, and larger B747
Code F aircraft : Airbus A380

AERODROME MOVEMENT AREA SPECIFICATIONS	C172 B200	Beech 1900	F50 F100	A320-200 B737-800	A330-200 B787-800
Aerodrome Reference Code (ARC)	1A-1B	2A-2B	3C	4C	4E
Runway Length (metres) *	1000	1200	1800	2300	2600
Runway Width (metres)	18	23	30	45	45
Runway Shoulders (metres)	optional	optional	3.0	3.0	7.5
Runway strip width requirement (metres)	90	90	150	300 [Graded 150]	300 [Graded 150]
Approach Inner Edge: Instrument Non-Precision	90	90	150	300	300
Take-off Inner Edge width (metres)	60	80	180	180	180
Minimum separation (m) Runway centreline to Taxiway centreline	52.5	57	93	168	182.5
Taxiway width requirement (metres)	7.5	10.5	15	18	23
Taxiway Shoulders (metres)	optional	optional	3.5	3.5	10.5

***** Approximate and subject to aircraft performance and operating conditions

Abbreviations

ACN	Aircraft Classification Number
ADS-B	Automatic dependent Surveillance - Broadcast
ANEF	Australian Noise Exposure Forecast
ARC	Aerodrome Reference Code
ARFFS	Aerodrome Rescue & Fire Fighting Services
ARFL	Aeroplane Reference Field Length
ASIC	Aviation Security Identification Card
ATC	Air Traffic Control
CASA	Civil Aviation Safety Authority (Commonwealth)
CGG	City of Greater Geraldton (WA)
CTR	**C**on**tr**ol Zone
DME	Distance Measuring Equipment
DoT	Department of Transport (WA State Government)
DRDL	Department of Regional Development & Lands (WA Government)
ERSA	Enroute Supplement Australia
GA	General Aviation
GAAP	General Aviation Aerodrome Procedures
GPS	Global Positioning System
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INPA	Instrument Non Precision Approach
MWDC	Mid West Development Commission (WA)
MWIP	Mid West Investment Plan
MOS139	CASA Manual of Standards Part 139
NDB	Non Directional radio Beacon
OLS	Obstacle Limitation Surfaces
OTS	Office of Transport Security (Commonwealth)

PAL	Pilot Activated Lights
PAN-OPS	Procedures for Air Navigation Services – Aircraft Operations
PAPI	Precision Approach Path Indicator
PBN	Performance-Based Navigation
PCN	Pavement Classification Number
RAAF	Royal Australian Air Force
RADS	Regional Airports Development Scheme (WA DoT)
RESA	Runway End Safety Area
RNP	Required Navigation Performance
RPT	Regular Public Transport
R4R	Royalties for Regions (WA Government)
SGS	Satellite Ground Station
VHF	Very High Frequency
VOR	VHF Omni-directional Radio Range
WAPC	Western Australian Planning Commission