7

OPERATIONS

Convenient, efficient, and user friendly passenger terminal areas will continue to be developed by BAC to accommodate forecast growth in passenger numbers to 2034, acknowledging innovation and fast travel initiatives. The terminals also need to meet high standards of safety and security.

7.1 Aviation Capacity

TERMINAL AREA DEVELOPMENT STRATEGY

Overview

The way airlines and passengers use terminal buildings and surrounds has changed significantly over the last decade. In order to account for this in master planning the terminal areas of Brisbane Airport, the development strategy must be based on flexibility and incremental expansion to cater for steps in demand.

The strategy for the terminal area development takes into account changes in the aviation sector including the growth of low cost air travel and alliances between full service airlines to improve passenger convenience and the financial viability of each airline in the respective alliances.

It will also adopt a strong commercial focus to enable the provision of high standard facilities and services for the benefit of passengers and airport users.

The future terminal area development strategy for both terminal zones will focus on expansion of existing facilities.

This approach recognises the potential for 'fast travel' initiatives to be incorporated within the modern and efficient systems that already exist at Brisbane Airport.

This strategy retains flexibility for potential expansion through shared international and domestic satellite nodes located between both the existing terminal precincts.

The strategy refines the terminal area designation to International T1 and Domestic T2 to reinforce potential future shared use.

In 2012/13 there were over 219,000 aircraft movements at Brisbane Airport

The strategy also allows for additional terminal development to the north and west of the Domestic T2 precinct either directly linked or separated to respond to future airline operational requirements.

This section of the 2014 Master Plan describes existing terminal arrangements, assesses capacity and future demand and outlines plans for future terminal development.

Planning Approach

The terminal area development strategy for the 2014 Master Plan reflects the long held BAC policy to concentrate future terminal development around the existing International T1 (incorporating the current International Terminal Building) and the existing Domestic T2 (incorporating the current Domestic Terminal Building).

The strategy recognises the substantial capital investment in these facilities and the demands and opportunities available for future expansion of the two precincts to incorporate a potential integrated domestic and international operation at either location. This approach is supported by a central transport interchange with direct links to both terminal precincts.

The strategy also considers the aviation growth forecasts and provides staged solutions that offer the flexibility to address changing industry directions while still meeting that demand and providing airport users with a level of service that meets their expectations and the high standards already established by the existing Brisbane Airport facilities.

In 2013 BAC instigated a series of vision workshops with key stakeholder groups where those groups were challenged with the concept of considering what Brisbane Airport could and should look like in 2034. Of relevance to the delivery of a visionary but robust strategy were those workshops conducted with airline, freight, ground support providers, and ground transport operators.

The key issues relevant to terminal development were:

» Flexibility to address changing markets and industry trends

» Facilitation of incremental expansion

» Minimise redundancy

» Create opportunity – swing gates / joint-use facilities

» Minimise connection times

» Enable ground transport objectives

» Address the 20-year horizon but structure for long-term development.

Many international airlines operate through Brisbane Airport

Existing Terminal Areas

General

The existing passenger facilities at Brisbane Airport include:

» International T1

» Domestic T2

» General Aviation Terminal (GAT)

» Charter Terminal (under development as at 2014)

Currently International T1 and Domestic T2 operate as separate terminals. The two terminals are 1.5 km apart with International T1 used by international carriers for international services only. Domestic T2 is used by domestic and regional airlines.

The GAT is a minor facility located adjacent to the General Avaiation (GA) apron. A Charter Terminal to service non-regular public transport (RPT) operations up to 20 tonne aircraft will be constructed in the period from 2014 – 2019 and will result in the relatively minor GAT facility being replaced.

International T1

International T1 opened in September 1995 and is a well-designed, spacious and aesthetically pleasing building. The use of natural light within the terminal, as well as the external and internal landscaping and finishes, reflect the sub-tropical image of the airport.

International T1 is operated as a common user facility under BAC administration. The terminal is a four level structure consisting of:

- Level 1 – baggage handling, delivery dock, stores and airline offices
- Level 2 – arrivals processing and airline offices
- Level 3 – departure lounges, airline lounges, airside retail and departures processing
- Level 4 – check-in and landside retail.

A total of 12 aerobridges (eight apron-drive and two fixed link plus one dual headed and one triple headed) connected to either the terminal face or three level concourses, service the apron.

International T1 Apron

The International T1 aircraft parking apron consists of high strength pavement in a linear arrangement with an in-ground fuel hydrant system connected to the Joint User Hydrant Installation (JUHI) facility located mid-way between the two terminal precincts. The apron has 12 primary aircraft contact positions capable of accommodating two Code F (e.g. Airbus A380) aircraft + ten Code E (e.g. Boeing B777; Airbus A330, A340) aircraft.

There are a further five stands in multi aircraft ramp system (MARS) configurations not currently directly linked to the terminal face or concourses. They have the capacity to serve up to eight Code C aircraft.

There are 16 aircraft parking positions in total.

Ground Service Equipment (GSE) storage areas are located adjacent to both ends of the apron.

International T1 Landside

The International T1 landside zone consists of traffic circulation, car parking and surface transport interchange zones. The terminal face road system consists of two separate elevated ramps servicing the departures and arrivals levels of the building.

The Airtrain station is located adjacent to the public car park and has an elevated link across to the terminal face connected at Level 3 between the road ramps. The public car park is a naturally ventilated five level, multi-storey facility located directly opposite the terminal face.

A coach parking area is provided at the southern end of the terminal. A taxi feeder system connected to the arrivals ramp is located in the northern corner of the car park zone.

Figure 7.1 shows the existing International T1 precinct.

International T1 Area Developments to Date

The following projects have occurred over the five-year period since the previous Master Plan (2009 – 2014):

- Apron expansion – Bays 72 and 73
- Taxiway C8A (and Bravo missing link)
- Extensive JUHI aviation fuel installations
- Staff car park expansion
- Level 2 transit passenger facilities expansion
- Transfer baggage expansion
- Level 2 retail upgrades
- Self service check-in facilities.

2


1


3


4

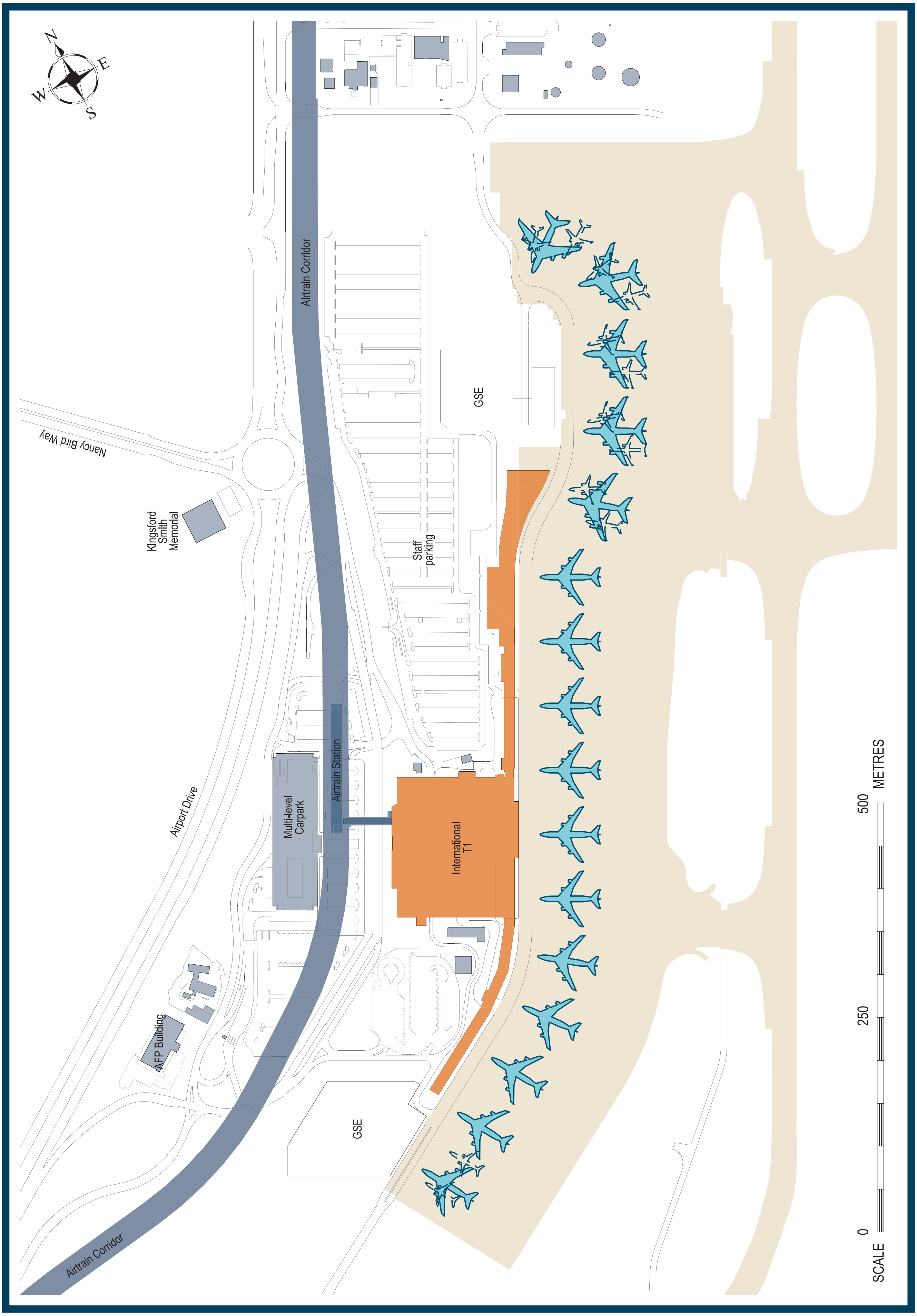

1 Passengers await aircraft at International T1.

2 Brisbane Airport's international departures board.

3 Loading aircraft at International T1.

4 Passengers arrive at International T1.

FIGURE 7.1: EXISTING INTERNATIONAL T1 PRECINCT



Domestic T2

Domestic T2 is a two level facility that opened in 1988 and consists of three distinct zones:

- The southern part is operated by Virgin Australia under a domestic terminal lease, which expires in 2018
- The central part which operates as a common user terminal under BAC management, primarily used by Jetstar and Tigerair
- The northern part is operated by Qantas under a domestic terminal lease, which expires in 2018.

Three primary terminal face aerobridge-serviced gates are located within each airline lease area. A northern and southern satellite node connected to the main terminal building by a second level concourse link provides departure lounge and retail space for an additional six, part or complete, aerobridge serviced gates. The common user section of Domestic T2 has a second level concourse link to the satellite, which provides stair access to the apron area and ground walk-on access to aircraft.

Check-in, some security processing, baggage handling and reclaim, airline offices, valet, bus and rental car facilities are located on the ground floor of the terminal. The remaining security processing areas, departure lounges, airline lounges and majority of retail outlets are located on Level 2.

There are additional departure lounges, and baggage reclaim capacity attached to the central concourse with bussing lounges recently established at ground level of the concourses to the northern and southern satellites.

Domestic T2 Apron

The Domestic T2 apron consists of high strength concrete pavement servicing all aerobridge and central satellite gates. There is an in-ground fuel hydrant system connected to the JUHI facility. Areas of tug -strength concrete pavement and medium-strength asphalt flexible pavement provide areas for regional and secondary airline operations and storage of GSE.

The apron provides a flexible parking arrangement and is marked to accommodate up to 28 domestic jet aircraft in a mix of Code E (e.g. B777, B787, A330), Code D (e.g. B767) and Code C (e.g. B737 or A320) aircraft sizes and 22 regional aircraft. A mixture of high-strength and medium-strength rigid and medium-strength flexible aircraft pavement areas suitable for domestic stand-off, freight and regional operations are to the south and north of the primary terminal connected stands.

Domestic T2 Landside

The Domestic T2 landside zone consists of traffic circulation, car parking, ground transport facilities and surface transport interchange zones. The elevated Airtrain domestic railway station, which terminates at this location, is linked by a high-capacity elevated walkway to the terminal.

This walkway, known as Skywalk, also connects the short-term car park and sits above the circulating roads delivering passengers to the terminal kerb. Escalators, stairs and lifts provide access for passengers from the kerbs to the elevated walkway.

There is a long-term multi-level car park structure also linked by an elevated covered walkway to the newer short-term car park and from there, to the terminal.

Taxi, rental car, bus and limousine areas are provided on sections of parallel terminal face roads. Taxi and bus feeder areas are located at the northern end of the public car parks.

Staff car parking currently located at International T1 is being relocated to the Central Parking Area (CPA), which is accessed from Moreton Drive. Initially staff will be transported between this car park and the terminal zones by a dedicated shuttle bus. However, planning provides an easement for a future mass transit system (MTS).

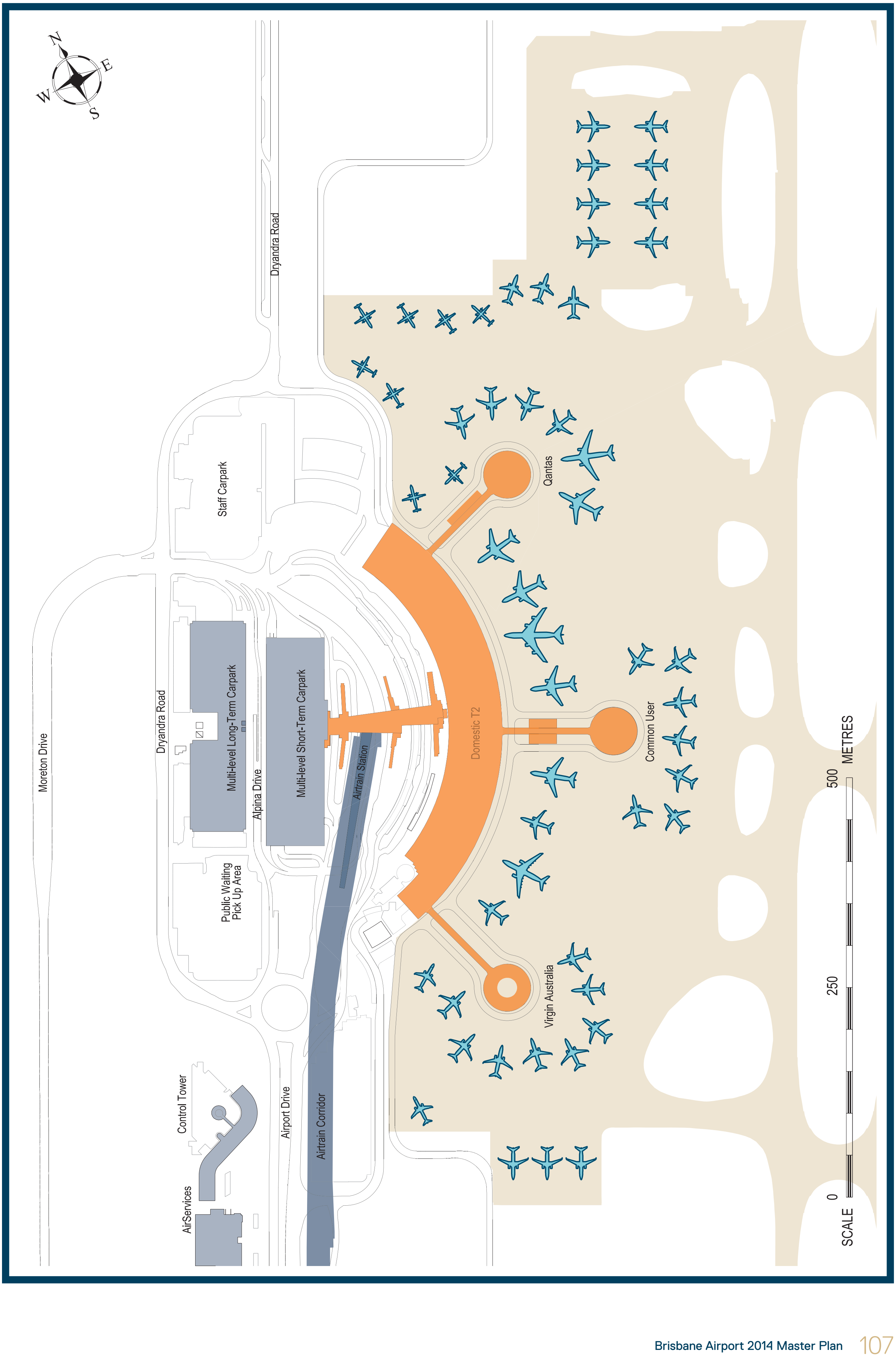
Figure 7.2 shows the existing Domestic T2 precinct.

Domestic T2 Area Developments to Date

The following projects have occurred over the five-year period since the previous Master Plan (2009 – 2014):

- Two-level Common User satellite
- Food and beverage and other retail upgrades and expansion
- Northern apron Stage 1 – 8 Code C stands
- Skywalk
- Qantas self service check-in
- Qantas baggage system expansion
- Common User Terminal baggage expansion
- QantasLink bussing lounge – northern concourse
- Common User Terminal self-service check-in and bag-drop facilities
- Short-term multi-level car park and associated road network
- Apron floodlighting upgrade
- Extensive JUHI aviation fuel installations – with further works under construction (2014)
- Virgin Australia business lounge – under construction (2014)
- Additional Virgin Australia aerobridges and MARS gates – under construction (2014)
- Southern apron expansion project – under construction (2014)
- Common User Terminal ground floor upgrade – under construction (2014).

FIGURE 7.2: EXISTING DOMESTIC T2 PRECINCT



General Aviation (GA)

GA consists of:

- Corporate flying
- Light freight operations
- Commercial flying – air taxi, patrol, survey, aerial photography, search and rescue, etc.
- Royal Flying Doctor Service
- Recreational flying
- Instructional flying
- Others – testing, experimental, etc.

GA facilities are currently located in the Airport North precinct and include a small Common User Terminal facility and a large GA apron which experiences a frequency of domestic and regional freighter operations.

Fixed Base Operation (FBO) facilities are established at both the GA apron and also adjacent to the logistics apron adjacent to the Da Vinci precinct. These two facilities handle VIP operations and closed charter operations. A new Charter Terminal to handle the increasing fly-in fly-out (FIFO) operations is to be constructed in the period 2014 to 2019 and will also be a Common User Terminal facility.

Capacity and Future Demand

Planning has been undertaken to ensure a balance of capacity between the main elements of the airport system including the runways, taxiways, aprons, terminals and landside infrastructure.

The New Parallel Runway (NPR) will provide Brisbane Airport with the capacity to sustain over 100 aircraft movements/hour during peak operating periods with up to 110 aircraft movements in a single peak hour.

Analysis and benchmarking translated this ultimate hourly runway capacity into an equivalent potential stand demand of up to 160 aircraft stands (contact and stand-off positions).

The analysis considered current and best practice gate utilisation (daily turns per gate) with average turnaround times of an hour for domestic and an hour and a half for international operations.

Benchmarking with other airports with a similar traffic mix (proportion of international and domestic aircraft and passenger aircraft movements and fleet mix) confirmed this planning criteria.

ULTIMATE CAPACITY

BAC considers that it is an appropriate planning practice to consider very long-term or ultimate capacity scenarios for elements of major airport infrastructure beyond the 2034 planning horizon of this Master Plan.

The assessment of ultimate capacity scenarios is based on current standards – aviation infrastructure, airspace management and current aircraft fleet technologies.

This Master Plan presents the implications of considering the ultimate capacity for terminal areas, ground transport, runway system and aircraft noise metrics to ensure appropriate land use reservations and stakeholders are fully informed.

Future assessments of the ultimate operating capacity of Brisbane Airport could change as a result the introduction of new and more efficient aircraft, changes to growth forecasts or changes to airspace management.

TABLE 7.1: YEAR 2034 AND ULTIMATE STAND DEMAND

The following demand numbers are based on Option 1, which has five, more stands than Option 2.

International Market					
Aircraft Code		2034		Ultimate	
		Base	Mars[1]	Base	Mars
F	Contact	-	12	-	19
	Remote	-	-	-	3
E	Contact	12	1	14	-
	Remote	5	-	8	-
C	Contact	6	-	8	-
	Remote	-	4	-	-
TOTAL		23	17	30	22

Domestic Market					
Aircraft Code		2034		Ultimate	
		Base	Mars[1]	Base	Mars
F	Contact	-	3	-	10
	Remote	-	-	-	-
E	Contact	10	3	11	-
	Remote	4	-	7	-
C	Contact	34	-	48	-
	Remote	43	-	51	-
TOTAL		91	6	117	10

1 *MARS – Multi Aircraft Ramp System: A MARS gate is a multi-headed aerobridge that can service very large aircraft through multiple entry and exit doors, which can be split such that each head of the aerobridge services a single small aircraft*

The long-term airfield layout was tested and developed to ensure the aircraft traffic that the runway could deliver to the airfield could be efficiently handled and transferred to and from the terminals along the network of dual parallel field taxiways with minimal conflict and congestion. Potential bottlenecks were identified and addressed in the long-term airfield layout.

The terminal and apron areas have been sized to accommodate the long-term aircraft demand (including consideration of aircraft fleet mix) matching the potential runway capacity.

While long-term forecasts show consistent growth in both domestic and international passengers, shorter-term forecasts in any given period can have larger or smaller rates of growth. With this in mind, two interchangable options outlining how the terminal areas could be developed have been prepared and included in this Master Plan.

International T1 and its associated aircraft parking aprons can expand both north and south. The area between International T1 and Domestic T2 has been reserved for satellite nodes for long-term expansion with potential landside and airfield connections to either of the south and north terminals.

Domestic T2 can expand to the north and south with a long-term expansion area to the west of the existing Domestic T2, facing the NPR.

Together the aircraft parking aprons servicing all these precincts can offer the long-term terminal and apron capacity to match the aircraft demand that the runway system can deliver to the airport.

The ultimate capacity of the various precincts in terms of aircraft parking is summarised in Table 7.1. The table also includes the 2034 stand demand forecast for comparison.

TABLE 7.2: INTERNATIONAL DEMAND – BUSY HOUR PASSENGER FLOW FORECAST

International Demand – Busy Hour Passenger Flow Forecast		
Flows 2014 to 2034		
Year	Arrivals	Departures
2014	2,105	1,584
2015	2,234	1,681
2016	2,363	1,778
2017	2,500	1,881
2018	2,643	1,989
2019	2,791	2,100
2024	3,514	2,644
2029	4,359	3,280
2034	5,531	4,162

TABLE 7.3: INTERNATIONAL AIRCRAFT STAND DEMAND – 2014 TO 2034

International Stand Demand – 2014 to 2034				
Number Of Stands (Contact and Remote)				
Year	Code F[1]	Code E[2]	Code C[3]	Total
Existing Provision 2014	5	11	Included in 6 Code F/E MARS, therefore up to 12 Code C	16
Forecast				
2015	5	11	-	16
2016	6	12	-	18
2017	6	12	-	18
2018	6	12	2	20
2019	6	12	4	22
2024	9	13	6	28
2029	10	16	8	34
2034	12	18	10	40

1 *Code F aircraft – Assumes A380 type and MARS configuration with 2 Code C capacity on a Code F stand*
2 *Code E aircraft – Assumes B777, B787, A330 types*
3 *Code C aircraft – Assumes B737, A320, A321 types*

Existing International T1

The original maximum design capacity of the International T1 was 1,520 departing and 1,520 arriving passengers in the peak hour.

Since its delivery, the International T1 has undergone a number of capacity enhancing projects including expansion of both the southern and northern concourses and a significant 60 m expansion to all four levels of the central terminal processing building.

Bays 72 and 73 (completed in 2012) have further added to the capacity of the International T1 to meet increased demand.

International Demand

The international share of the total passenger numbers for Brisbane Airport is approximately 20% and is forecast to grow from 4.7 million in 2014 to around 11 million by 2034.

The current 2014 peak hour international passenger departure flows are 1,584 per hour and this is forecast to increase to 4,162 per hour in 2034.

Similarly, the current 2014 arrival passenger flow of 2,105 per hour is expected to increase to 5,531 by 2034, refer Table 7.2.

International Apron Demand

Table 7.3 depicts the forecast stand demand for international aircraft operations at Brisbane Airport. It is apparent that the international stand demand will more than double over the next 20 years.

Existing Domestic T2

The original maximum design capacity of the existing Domestic T2 was estimated at 2,500 departing and 2,040 arriving passengers in a peak hour. Several upgrade projects that have occurred in the period 2009 – 2014 have added to the processing capacity of the terminal. These include:

- Expansion of the QantasLink area to the north and new bussing lounge
- Virgin Australia business lounge
- Common User area satellite
- Common User area check-in and facilities
- Qantas self service check-in facilities
- Common User and Qantas baggage system expansions
- Aerobridge and apron works (including northern apron Stage 1 and the southern apron expansion).

When combined with enhanced check-in processing, these works add significantly to overall terminal capacity.

TABLE 7.4: DOMESTIC DEMAND – BUSY HOUR PASSENGER FLOW FORECAST

Domestic Demand – Busy Hour Passenger Flow Forecast		
Flows 2014 to 2034		
Year	Arrivals	Departures
2014	4,172	4,244
2015	4,389	4,464
2016	4,583	4,661
2017	4,776	4,857
2018	4,971	5,056
2019	5,170	5,258
2024	6,221	6,328
2029	7,394	7,520
2034	8,781	8,932

Domestic Apron Demand

Table 7.5 depicts the forecast stand demand for the domestic operations at Brisbane Airport. It is apparent that domestic stand demand will almost double over the next 20 years.

TABLE 7.5: DOMESTIC AIRCRAFT STAND DEMAND – 2014 TO 2034

Domestic Stand Demand – 2014 to 2034					
Number Of Stands (Contact and Remote)					
Year	Code F[1]	Code E[1]	Code C[1,2]	Regional	Total
Existing Provision 2014	-	4	24	22	50
Forecast Demand					
2015	1	5	25	22	53
2016	1	6	26	22	55
2017	1	7	27	23	58
2018	2	7	27	24	60
2019	2	8	28	24	62
2024	3	11	34	26	74
2029	3	14	39	30	86
2034	3	17	44	33	97

1 *Code F aircraft – Assumes A380 type and MARS configurations*
Code E aircraft – Assumes B777, B787, A330 types
Code C aircraft – Assumes B737, A320, A321 types

2 *Currently Code C turbo prop stands are being converted for use by Code C jet aircraft. This will continue during the life of the Master Plan; however turboprop type aircraft will continue to use these stands.*

Further expansion within either of the International T1 or Domestic T2 precincts as outlined in this section of the Master Plan will allow the demand requirements of the forecast growth to be met.

Domestic Demand

Total passenger numbers for Brisbane Airport are forecast to more than double from 23 million annual passengers in 2014 to around 48 million by 2034. The domestic share (approximately 80%) including regional traffic, is forecast to grow from 18.3 million annual passengers in 2014 to 39 million in 2034.

The current 2014 peak hour domestic passenger departure flows are 4,244 per hour and this is forecast to increase to 8,932 per hour in 2034.

Similarly, the current 2014 arrivals passenger flow of 4,172 per hour is expected to increase to 8,781 per hour by the 2034, refer Table 7.4.

Terminal Area Strategy – Planning Approach

The terminal layouts included in this section of the Master Plan have been sized according to the following design timeframes:

- 2014 Master Plan – planning horizon – 2034
- Ultimate capacity of the current airport site (2060).

In the following sections, two options for the preferred terminal area development strategies are presented, depicting possible terminal footprints and associated apron layouts.

These drawings are included in this Master Plan to demonstrate a high-level infrastructure response to both BAC's vision for terminal facilities and current industry trends and influences.

BAC has undertaken a very comprehensive analysis of space requirements required to address the growth forecasts out to airport ultimate development, to ensure that the land-use planning and area reservation for passenger and aircraft facilitation is preserved.

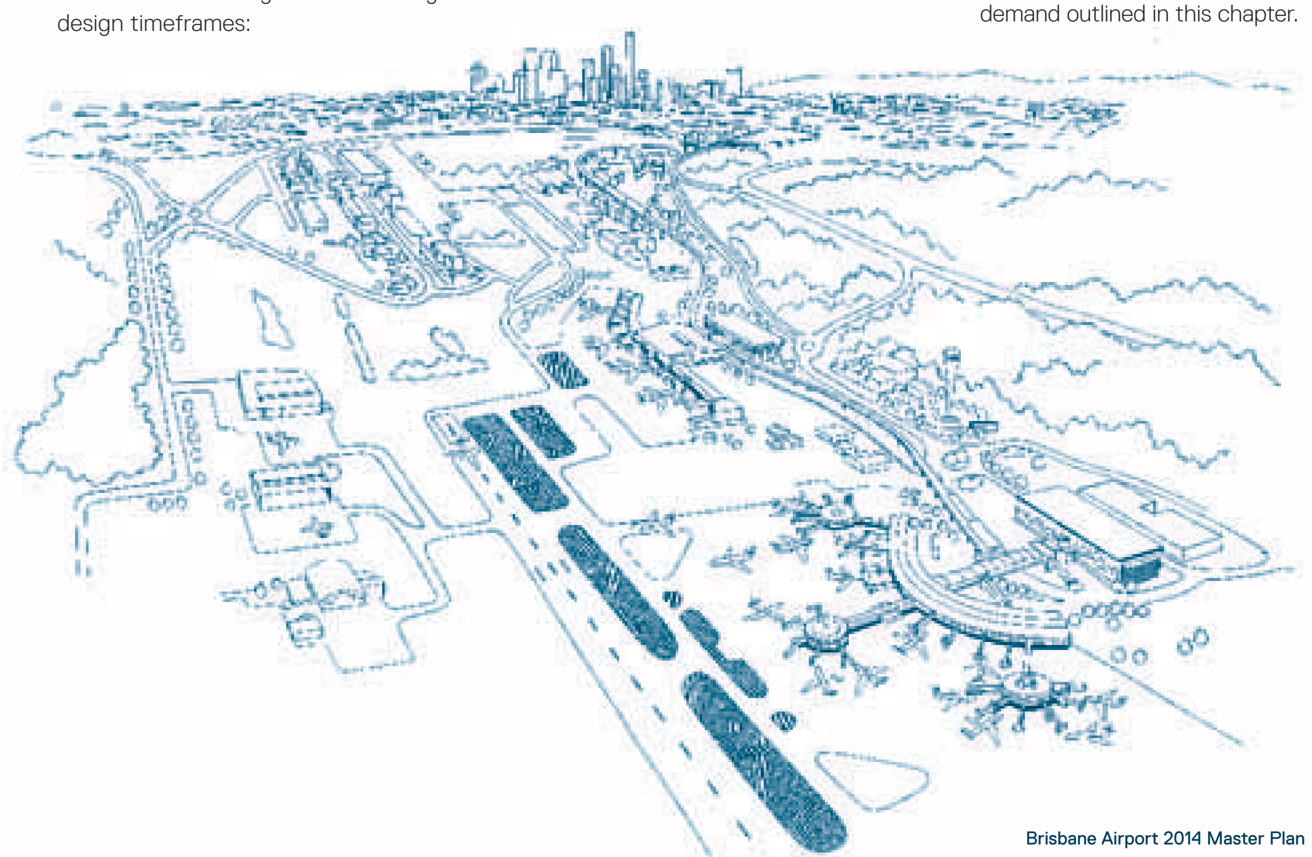
Elements of the two terminal development options presented in the Master Plan are largely interchangeable and designed to provide a flexible response to future industry trends and requirements.

From a master planning perspective, BAC defines a contiguous terminal area development zone extending from the southern end of the Airport Central precinct to the northern extent of the Domestic T2 where the terminal zone would wrap around facing the NPR to the north-west.

The location, configuration, and sizing of elements of the 2034 and ultimate capacity 2060 terminal options presented in the Master Plan are indicative only and are included to articulate the planning principles adopted and feasibilities around staged delivery.

Any staged delivery of the terminal area strategy will involve a high level of consultation with key industry partners including airlines and Airservices Australia.

Figures 7.3 and 7.4 outline possible options for how the terminal area could develop to 2034. Figures 7.5 and 7.6 highlight how continued development of the terminal area could occur beyond 2034 through to ultimate capacity. These figures show aircraft placed on apron areas and based on aircraft stand demand outlined in this chapter.



7 OPERATIONS

FIGURE 7.3: TERMINAL AREA PRECINCT LAYOUT 2034 OPTION 1

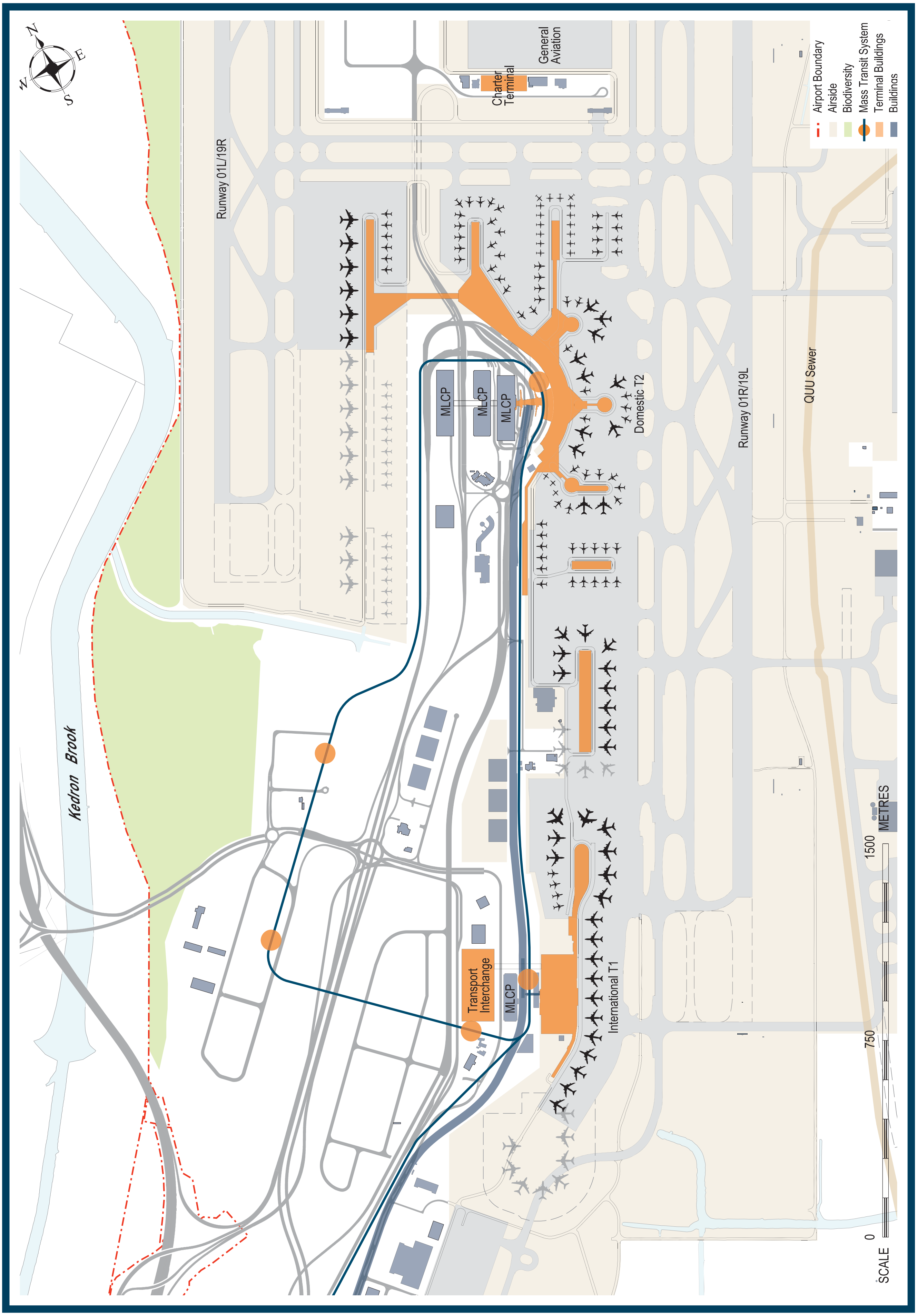


FIGURE 7.4: TERMINAL AREA PRECINCT LAYOUT 2034 OPTION 2

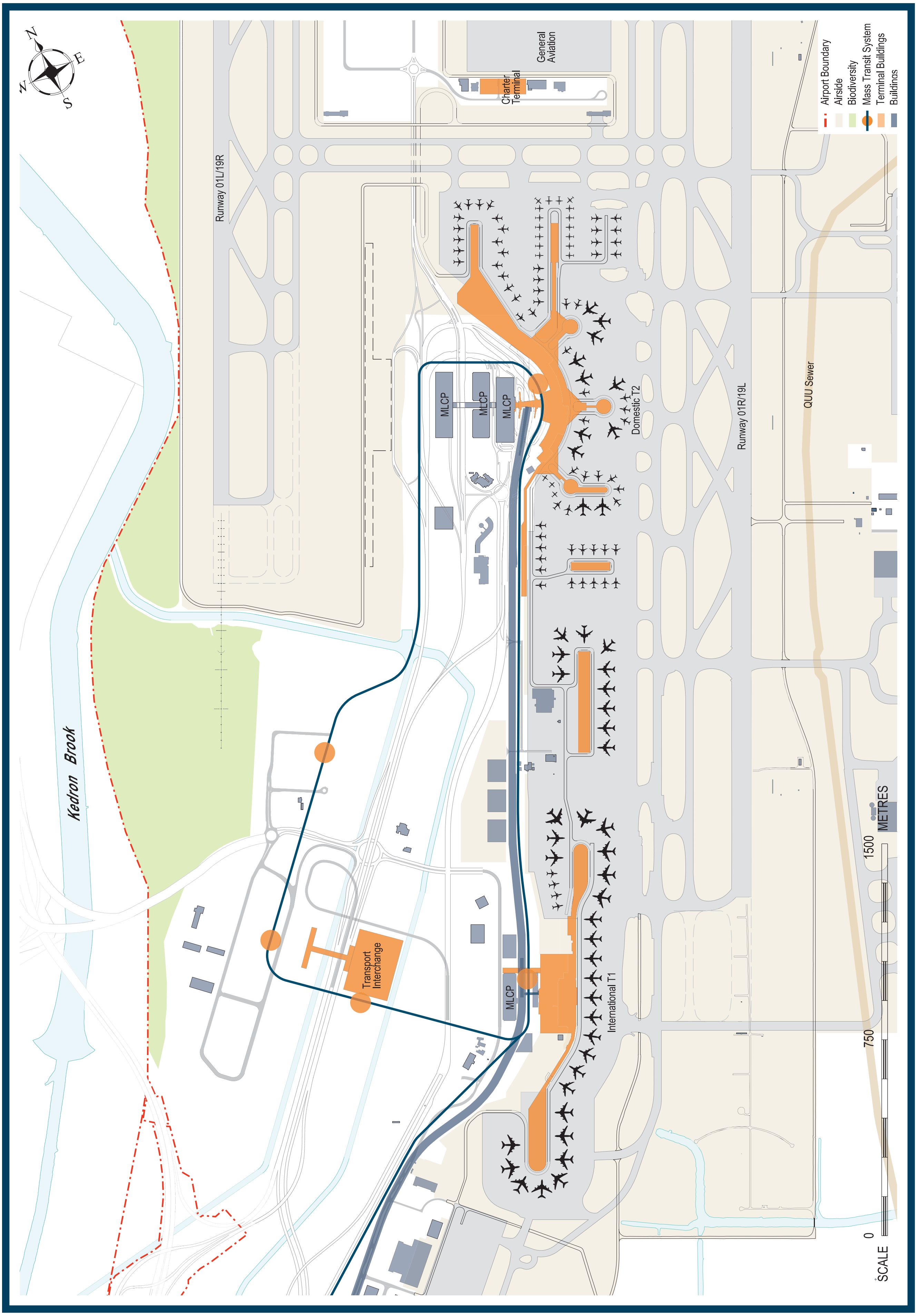


FIGURE 7.5: TERMINAL AREA PRECINCT LAYOUT ULTIMATE DEVELOPMENT OPTION 1

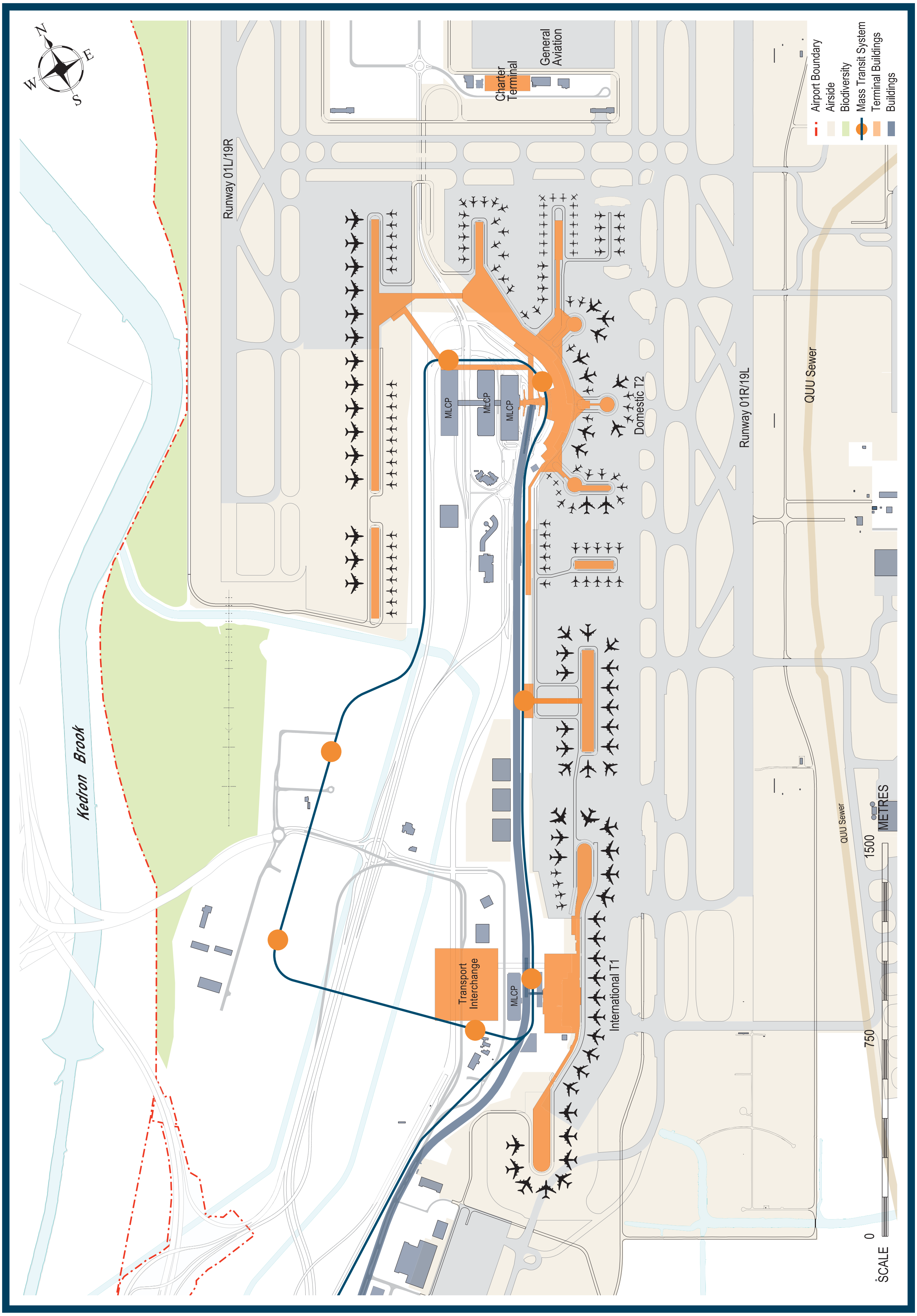
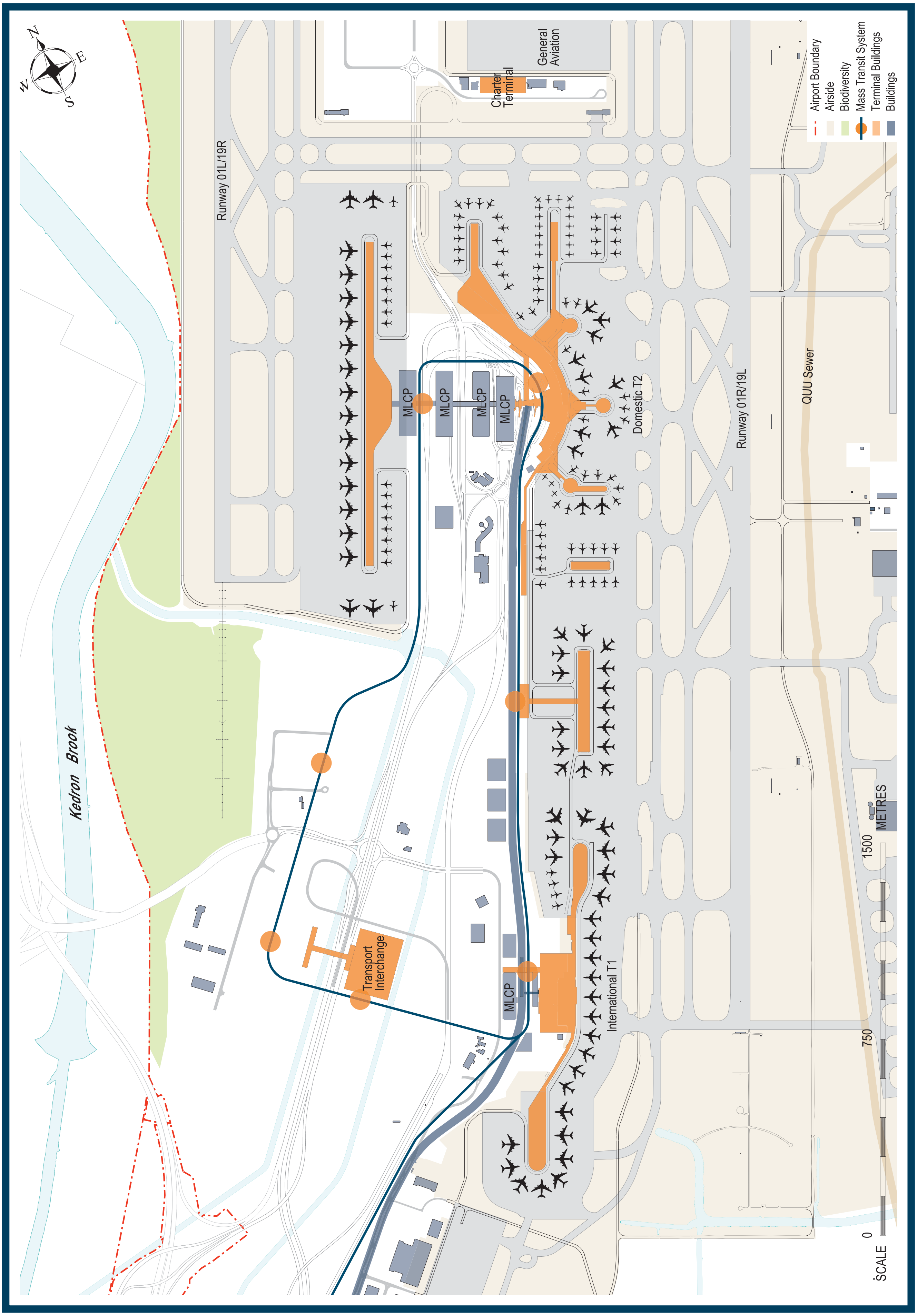


FIGURE 7.6: TERMINAL AREA PRECINCT LAYOUT ULTIMATE DEVELOPMENT OPTION 2



TERMINAL PLANNING CONSIDERATIONS

The major terminal area planning objectives applied in the strategy are:

- Recognition of existing Domestic T2 airline leases and address the impact on the terminal configuration once the leases expire in 2018
- Minimisation of passenger walking distances, and the creation of positive journey experiences
- Facilitation of logical passenger flows, processing and orientation
- Establishment of nodal retail development to maximise exposure to passengers
- Improvement of linkages between existing terminals and the integration of associated facilities
- Testing of demand forecasts to ensure adequate capacity is provided by the terminal development options
- Consideration of the feasibility of staging to ensure development can be achieved incrementally and that it is both realistic and commercially viable
- Provision of flexibility to meet unexpected changes in demand, industry trends and airline market share
- Provision of flexibility to meet new or revised security and passenger processing requirements
- Recognition of the possibilities of new technologies to improve passenger processing times, their overall journey experience and the opportunity to optimise infrastructure requirements and impact on the airport environment
- Optimisation of aircraft parking aprons for operational efficiency and flexibility
- Planning for complimentary terminal related operations such as hotels
- Development of strategic options that maximise commercial opportunities and cost effective solutions.

International T1 Area Development Strategy

International T1 was designed and developed to accommodate future incremental staged expansion, for the terminal core, concourses, apron and gates.

The northern concourse will be extended further north as demand requires, with its ultimate configuration comprising a wrap-around apron, which will allow aircraft to be parked on both sides of the concourse.

Further expansion of International T1 can be undertaken with a southerly development of terminal core, concourse, apron and gates to suit further demand, or it can be focused around a development strategy that sees this capacity met by new facilities located to the north-west of Domestic T2.

Either option, supported by the remote satellite between the terminal zones, can be adopted to suit future aviation demands.

The main features of the development common to both options for International T1 are:

- Expansion of the northern concourse to create a departure lounge with secondary retail
- Similar satellite expansion to the southern concourse
- Northern expansion of the terminal building
- Expansion of existing multi-level car park facilities.

The International T1 precinct will also be served by a ground transport interchange and an early bag storage (EBS) facility. Two transport interchange options are included in the terminal area development strategy and have been planned to cater for both International T1 and Domestic T2 passengers.

The features/key criteria underpinning this strategy are:

Terminal:

- Maintenance of the iconic identity and aesthetics of the building
- Incremental terminal expansion to provide adequate core processing facilities to meet initial demand but with the flexibility to respond to future stakeholder requirements
- Incremental concourse and gate expansion to meet demand expanding to satellite nodes, which provides increased departure capacity
- Primary or 'home-base' retail in the building core
- Secondary retail and food and beverage opportunities in future satellite nodes.

Apron:

- Simple linear aircraft parking arrangements which facilitate incremental growth
- Flexibility to accommodate industry trends by linear relocation of aerobridges
- Ability to accommodate the 20-year demand forecast
- Optimal utilisation of apron pavement areas
- Ability to accommodate new large aircraft operations with isolated areas of apron widening.

Landside:

- Proximate public car parking and the ability to develop capacity through staged delivery further multi-deck facilities
- Opportunity for complementary commercial development
- MTS to support connectivity between terminal zones and ground transport products.

The Domestic T2 apron was expanded in 2012

Domestic T2 Area Development Strategy

BAC's preferred development scenario for Domestic T2 is for a complete common user facility. A common user facility provides the opportunity to make maximum use of existing infrastructure to address peaks in demand across all domestic and regional airlines, potentially deferring capital works for expansion.

It could also potentially accommodate a mix of international and domestic services within this zone of the airport.

Development of the Domestic T2 precinct is complicated by the existing long-term airline lease agreements and the need to provide facilities for other domestic operators and potential new domestic entrants until those leases expire.

The ability of the existing terminal layout to address future demand is constrained by the terminal face road frontage and also limitations in the terminal depth and structure to accommodate baggage system developments.

Figures 7.3 to 7.6 indicate the extent of development required to meet forecast demand in 2034 and also what the ultimate development of the Domestic T2 precinct could look like.

There are also two potential options for terminal development up to 2034:

» Constrained development of International T1 at the southern end because of the high costs of taxiway works in this area. This would mean expansion of Domestic T2 to the north-west to accommodate future growth

» Unconstrained development of International T1 at the southern end therefore reducing the need to expand Domestic T2 to the north-west.

Both options propose a satellite swing pier between International T1 and Domestic T2. This pier could serve either terminal zone and be bus connected for the initial development phases and either bus or airside MTS in subsequent development.

The options also show potential approaches to the location of ground transport interchange facilities either closely integrated to the terminal zones or centralised with long-term parking and the use of an MTS to access the terminal zones with direct access to passenger security screening.

Providing increased runway capacity through the construction of the New Parallel Runway requires a significant investment of over $1.3 billion by BAC and its shareholders.

EBS areas can be linked to the terminal zones to allow bag drop to be located within transport interchange facilities and bags to be held in storage ready for call-up to make-up areas in the terminal as appropriate. Bags can be transported to the EBS and then to the terminal via high-speed conveyors or alternatively integrated with the MTS. The advantage of this system is that it can be located in a purpose built facility and does not require costly terminal development for make-up areas.

The main features of development for the Domestic T2 common to the 2034 development options:

- Expansion of the existing terminal core to the north with an extensive northern pier to accommodate up to Code F aircraft
- Addition of aerobridges to the central satellite
- Landside expansion of the terminal to the west of the existing terminal face accommodating check-in and access to security processing
- Covered walkway or concourse structure to the south to serve new aircraft stands – both contact and remote
- If the need arises, an option to establish an interim, low-cost terminal facility to the north
- Connection of Domestic T2 to an MTS providing passenger access from transport interchanges and remote parking areas. The MTS would also serve staff parking and connectivity between terminal zones.

The features/key criteria underpinning this strategy are:

Terminal:

- A processing zone for check-in that facilitates the segregation of passengers from surface transport and proposed MTS
- Segregated departures and arrivals streams with minimum level changes
- Straight-line processing
- Support for centralised retail zones with resultant economies and passenger exposure
- Minimising walking distances
- Ease of staged construction.

Apron:

- Flexibility for large aircraft facilitation
- Ability to accommodate the 20-year demand forecast
- Efficient utilisation of apron areas
- GSE storage provision
- Flexibility to accommodate changes in market share
- Facilitation of incremental capacity growth of the airside concourse and gate expansion.

Landside:

- Maintenance of rapid and simple terminal processing procedures that maintain passenger convenience
- Proximate public car parking product definition and the ability to develop capacity through staged delivery of additional facilities linked by the MTS to the terminal
- Opportunity to create a transport plaza and public space, enhancing the gateway identity
- Opportunity for complementary commercial development
- Terminal by-pass system for traffic.

Passenger processing is streamlined

Linkages Between Terminals

At present, passengers transferring between International T1 and Domestic T2 do so using the Airtrain rail link, bussing or taxis. As at 2014, the train timetable has frequencies of up to 15 minutes in the peak and 30 minutes outside of peak, depending on the time and day of the week.

Common to both options outlined in this terminal area development strategy is the inclusion of an MTS between International T1, Domestic T2 and various public and staff car parks.

Critical to the successful development of an MTS on Brisbane Airport is to reserve sufficient space in this planning phase so it can be integrated with existing terminal infrastructure in the future.

BAC has undertaken a preliminary review of available MTSs used internationally, their construction requirements and their ongoing operation and maintenance costs.

International benchmarking suggests that an MTS is a fundamental element of a large international and domestic hub airport such as Brisbane with annual passenger numbers over 35 million.

The introduction of an MTS would also improve traffic flow around International T1 and Domestic T2 by directing vehicles towards a centralised ground transport interchange between International T1 and Domestic T2.

An MTS also offers an effective and efficient connection between terminals to provide future flexibility and access from ground transport and car parking facilities.

Terminal Area Development Flexibility

The ultimate airport capacity beyond 2034 is represented in Figures 7.5 and 7.6, which highlight the following features and key criteria:

Terminal:

» Ability to maximise utilisation of the existing terminal precincts with flexibility to suit future airline needs

» Two potential options for terminal development to the west, either directly linked to Domestic T2 or stand alone as a separate terminal

» Terminal zones linked by MTS for improved connectivity between terminals and to all ground transport facilities

» Satellite swing pier linked to International T1 and Domestic T2

» Airside MTS possible to link terminal zones and satellite pier

» Incremental expansion possible to grow terminal zones to ultimate development with ease of staged construction

» Maintain short walking distances to aircraft parking gates.

Apron:

» Aircraft parking flexibility for large and small aircraft at all apron zones

» Efficient use of apron areas

» GSE storage provision and links to other aviation support activity

» Swing International/Domestic capability at any zone

» Facilitation of incremental capacity growth of airside concourses and gate expansion

» Integrated airfield movement system.

Landside:

» MTS to link ground transport facilities with terminals

» Two potential options with transport interchange at each terminal area or a central facility adjacent to the long-term parking precinct with MTS links to terminals

» Differentiation in car parking products based on proximity to terminals

» Ease of staged construction

» Maintenance of fast and simple terminal processing procedures that maintain passenger convenience

» Opportunities to create transport plazas and public space, enhancing the gateway identity

» Opportunity for complementary commercial development

» Terminal by-pass system for traffic.

Short-Term Terminal Infrastructure Development

International T1 Area:

The following terminal related infrastructure projects are envisaged for the International T1 Precinct over the period 2014 to 2019:

» Northern concourse expansion – Gates 73/74

» Northern apron expansion

» Baggage handling systems expansion

» Check-in expansion and self service kiosks and bag drop facilities

» Northern concourse bussing facilities.

MASS TRANSIT

A mass transit system capable of moving large numbers of passengers is required.

Domestic T2 Area:

In 2011, BAC in response to significant increased demand for domestic travel, particularly regional interstate services, initiated a comprehensive Domestic Terminal planning exercise engaging extensively with the major domestic carriers. The project developed a detailed expansion strategy focusing on the short to medium term, which secured the endorsement of those major carriers.

The key objectives established for the project were:

- Airline growth in an incremental fashion to meet demand requirements
- Cost effective solutions that respond to user needs and BAC commercial imperatives
- Increasing use of new technologies to minimise the need for further construction
- Meet the operational requirements of all stakeholders
- Maximise commercial opportunities particularly retail exposure
- Provide for future flexibility and expandability – solutions to allow adaptability for changing stakeholder requirements
- Meet airline functional requirements and project drivers, principles, objectives and core requirements.

The major directions taken by the design of the preferred option are:

- Major airlines, Qantas and Virgin Australia migrate into the central satellite as demand for their gates grows
- Existing low cost carrier airlines relocate to a purpose built stand-alone common user facility located to the north of the existing Domestic T2
- Qantas and Virgin Australia also expand incrementally to the north and south respectively
- The existing Domestic T2 expands toward landside for bag drop and centralised passenger security screening. It expands airside to create additional retail zones at the heads of each pier
- A shuttle bus service is established to serve a regional holding lounge located on the north apron.

View to the Domestic T2 airside precinct from the Air Traffic Control tower

Major advantages include:

» Existing Domestic T2 transforms into a flexible common user terminal with central facilities such as passenger access from ground transport, bag drop, security and retail

» Premium passenger flows for Qantas and Virgin Australia are provided

» Arriving passengers descend into a common but zoned baggage reclaim hall with central retail, a ground level pedestrian plaza and covered access to ground transport facilities

» New low cost carrier terminal (LCCT) is a common use 'built for purpose' facility that can be integrated into the Domestic T2 in the future and has good access to and from all ground transport facilities

» Ease of further incremental expansion of all infrastructure to meet demand with minimum disruption to existing operations

» All airline stakeholder requirements and design objectives can be met by the preferred option

» Minimum build within the existing Domestic T2 precinct and within an expensive facility that is difficult to expand or redevelop.

The above strategy is consistent with the 2034 and ultimate (2060) vision for terminal development at Brisbane Airport. Based on this strategy, the following projects are envisaged for the Domestic T2 Precinct over the period 2014 to 2019:

» Southern apron expansion

» Northern apron expansion

» Northern regional satellite facility

» Southern concourse regional lounge and bussing facility

» Skywalk terminal penetration

» Centralised security, bag drop and check-in

» Additional aerobridges including MARS gates

» Common user bussing lounge

» Baggage system expansions

» Southern satellite infill

» Building services upgrades including central energy plant

» Northern low cost terminal.

General Aviation

It is anticipated that certain limited GA activities will remain as an integral part of the airport, particularly as they support domestic and international passenger, freight and medical operations.

BAC will provide a dedicated Charter Terminal facility positioned against the GA apron in the Airport North precinct. It is intended that all non-RPT passenger services involving aircraft up to 20 tonnes (excluding FBO and VIP processing) will operate from this new facility due to be operational between 2015 and 2019.

The Charter Terminal is configured to facilitate future expansion (up to a potential to service 250,000 annual passengers) and both building and apron area reservations are provided in the Master Plan.

Brisbane Airport has a dedicated FBO located at the Logistics Apron in the Da Vinci precinct.

BAC has assessed the demand for this type of facility, and given the necessary focus on high-volume RPT operations, limited airside development opportunities will restrict the development of this type of facility. The FBO could be catered for in the future Charter Terminal.

1

2

3

1 Baggage collection area at Domestic T2

2 Entry to the Domestic T2 Airtrain station from Skywalk.

3 International signage is adopted across Brisbane Airport.

NEW PROJECTS

Around 12 major projects are planned for Domestic T2 between 2014 and 2019.

7.2 The Airfield System

INTRODUCTION

As outlined in Chapter 5, Aviation Growth Forecasts and Development Objectives, during the 20-year period of this Master Plan airline passenger growth is forecast to grow from 21.6 million passengers in 2012/13 to 48 million annual passengers by 2034. Over this same 20-year period, aircraft movements will grow from 219,000 annually in 2012/13 to a forecast 360,000 annual movements.

To accommodate this growth, BAC needs to increase the capacity of the airfield system at Brisbane Airport. As discussed in Chapter 6.1, Economic Significance, it is imperative that increased runway capacity be achieved to optimise the economic benefits to the national and regional economies from air travel through Brisbane Airport.

Increased runway capacity will enable:

- Growth in direct airline routes and frequencies to international, interstate and intrastate destinations, which will provide connectivity and accessibility for business and leisure travellers
- Reduced aircraft delays and improved on-time performance resulting in less social disruptions to the travelling public
- Reduced, unnecessary fuel consumption and associated emissions from improved system reliability or hold on the ground while awaiting a take-off clearance.

Providing increased runway capacity, through the construction of the NPR, will however, require a significant investment of over $1.3 billion by BAC and its shareholders.

PLANNING APPROACH

The following principles guide BAC in the planning of additional airfield system capacity at Brisbane Airport:

- All opportunities to extract additional capacity and efficiencies from the existing airfield system will be exhausted while the NPR is being delivered
- The NPR will be constructed to meet future demand
- Taxiways will be located to ensure aircraft movement efficiency
- Runways and taxiways will be configured to minimise aircraft noise impacts and environmental impacts wherever practicable
- Airfield infrastructure will comply with relevant national and international aviation standards.

EXISTING RUNWAY SYSTEM

The existing runway system Figure 7.7 at Brisbane Airport consists of a 3,600 m long main runway aligned along a 10 degrees magnetic – 190 degrees magnetic orientation (referred to as the ‘Main’ or RWY 01/19), with a shorter cross runway of 1,760 m length aligned along a 140 degrees magnetic – 320 degrees magnetic orientation (referred to as the ‘Cross’ or RWY 14/32).

(On commissioning of the NPR and decommissioning of RWY 14/32, the existing main runway will be designated as RWY 01R/19L and the NPR designated as RWY 01L/19R.)

The main runway is of sufficient length to enable operations by all types of large jet aircraft, including the Airbus A380.

The smaller cross runway, due to its shorter length and lower pavement strength, can accommodate turboprop aircraft, as well as limited operations by smaller jet aircraft including B737 and A320 size.

Currently these jet aircraft can only operate on the cross runway with a weight restriction (56 tonne and 1,200 kpa tyre pressure) due to pavement strength and runway length.

As well as the two runways, Brisbane Airport has an extensive taxiway system.

In addition to the main taxiway systems that facilitate aircraft manoeuvring to and from the International T1 and Domestic T2, taxiways are provided for access to the GA area, the aircraft maintenance facilities in Airport East and freight handling facilities in Airport Central and Airport South. BAC may construct additional taxiways and apron areas within Airport East and Airport Central to cater for any increased demand.

EXISTING RUNWAY SYSTEM – DESIGN CRITERIA

The initial planning for Brisbane Airport adopted a design aircraft with the following characteristics:

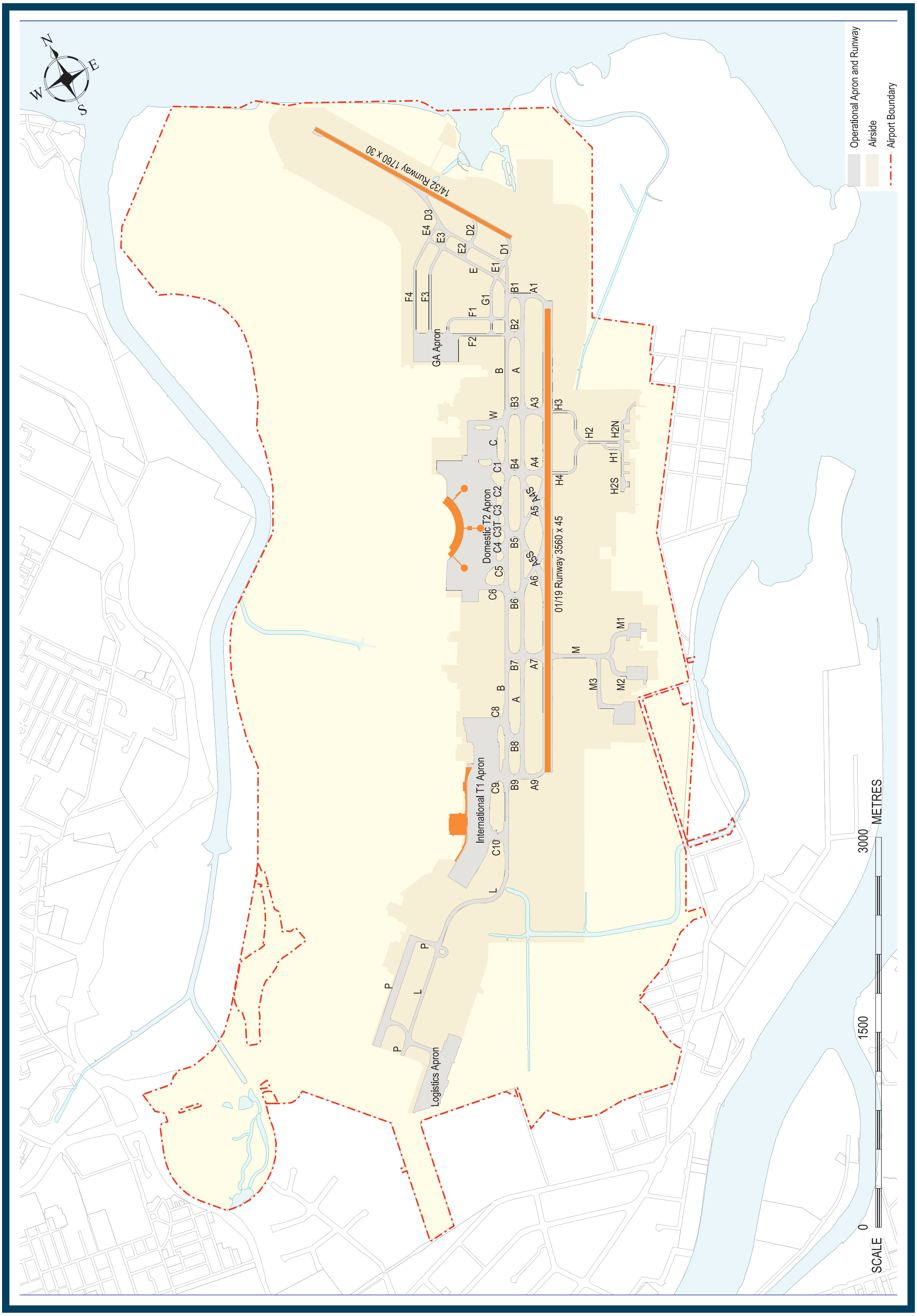
- Wing span – 95 m
- Length – 113 m
- Gross weight – 1,000 tonne.

This design aircraft fell within the now discontinued Code ‘G’ airfield design criteria and resulted in:

- Runway – inner field taxiway separation – 200 m
- Inner field taxiway – outer field taxiway separation – 122 m
- Curved runway entry taxiways – design speed – 25 knots
- Rapid exit taxiways (RETs) – design speed – 35 knots 14/32 and 50 knots 01/19.

As at 2014, the largest passenger aircraft operating internationally is the new generation Airbus A380 which falls within the Code F criteria and which has a dispensation to operate to existing runways of 45 m width, but requires a 60 m width standard for new runway developments.

FIGURE 7.7: EXISTING RUNWAY SYSTEM



Brisbane Airport has experienced itinerant A380 operations since they commenced flying to Australian destinations and from October 2013 had scheduled A380 operations.

Runway End Public Safety Areas

A Public Safety Area (PSA) is a defined area at the end of the runways where there is increased risk of an aircraft accident occurring. The probability of an accident occurring during any single aviation operation is very low. However, an analysis of aircraft accidents reported to the International Civil Aviation Organization (ICAO) since 1970 suggests most accidents that do occur, occur immediately beyond the ends of a runway; up to 1,000 m, before the runway during landing or up to 500 m beyond the runway end on take-off. During this time the aircraft is aligned with the extended runway centreline and is relatively close to the ground.

PSAs define the area in which development will be restricted in order to protect the safety of both aircraft passengers, and property and people on the ground in the event of an aircraft accident during landing or take-off.

Consistent with State Planning Policy and previous Brisbane Airport Master Plans, the PSAs form the shape of an isosceles trapezoid symmetrically positioned on Runway centreline – 1,000 m long, 350 m wide at the runway end tapering to a width of 250 m furthest from the runway.

Brisbane Airport's PSAs are in five of the six instances (three runways x two ends) contained on airport land or over Moreton Bay. The one instance where the PSA extends beyond the airport boundary (south eastern end of the cross runway) state planning provisions will apply for this unoccupied area of land. On decommissioning of the cross runway, this PSA will no longer be required.

BAC's land use strategy ensures that future land uses and development do not increase risk to public safety by avoiding:

- Significant increases in people living, working or congregating in the PSAs
- The use or storage of hazardous, explosive or flammable materials in the PSAs.

The following types of development will be restricted in the PSAs:

- Accommodation activities
- The manufacture or bulk storage of flammable, explosive or noxious materials
- Uses that attract large numbers of people (e.g. sports stadiums, shopping centres, industrial and commercial uses involving large numbers of workers or customers)
- Institutional uses (e.g. education establishments, hospitals).

AIRFIELD DEVELOPMENT FROM 2009 – 2014

Main 01/19 Runway System

BAC has completed the widening and strengthening of the runway shoulder pavements to meet safety requirements for the A380. The outer engines of this aircraft extend past the edge of the runway pavement, and to mitigate any risk of the outer engines causing loose stones and grass to be displaced onto the runway, BAC has provided a hardened shoulder.

BAC has completed the construction of the missing section of the "Bravo" outer field taxiway (known as the "missing link") resulting in a now complete dual parallel taxiway system for the main runway, improving both safety of operation and aircraft flow facilitation.

BAC has also completed a maintenance overlay of both ends of the main runway. This second partial overlay, which follows a complete runway overlay in 2003, involved an extent of approximately two-thirds of the runway length being one-third in each direction from runway end. The overlay for the central section of the runway has been able to be deferred for several years due to favourable pavement performance.

Secondary 14/32 Cross Runway

Operations on RWY 14/32 were suspended for the period October 2012 to March 2013 to allow for early enabling civil works for the NPR. These works involved:

- The installation of major drainage culverts and a dredge enveloper pipe approximately mid-runway length
- The removal of approximately half the parallel taxiway system in areas requiring surcharge consolidation for the NPR
- The consequential construction of a runway end turning node to allow aircraft to backtrack down the runway if arriving on RWY 32 or departing on RWY 14.

With the configuration of the taxiway infrastructure associated with RWY 14/32 reworked, it is no longer possible for aircraft to exit the runway at the full length after landing on RWY 32. Aircraft must make a 180 degree turn at the runway end and then taxi back towards the south to exit at a taxiway approximately half way down the runway.

This adds about one and a half to two minutes to the time the landing aircraft spends on the runway, during which the runway is not available for any other landings or take-offs.

Similarly a departing aircraft wishing to use RWY 14 cannot access the runway at its northern threshold, but must enter midway down the runway, taxi north west to the threshold, make a 180 degree turn and only then commence its take-off. This departure manoeuvre takes approximately the same time as the landing on RWY 32 mentioned previously. These constraints severely limit the number of flights able to operate on RWY 14 or 32 in a mixed arrival and departure mode.

Information regarding the NPR can be found in the section about the New Parallel Runway System (page 131).

Existing Runway Capacity

The capacity of the existing runway system is dependent on:

» Aircraft demand and mix during peak periods

» The proportion of arrival and departure movements

» The operating mode and the capacity of that mode

» Meteorological conditions (cloud base, visibility, wind direction and speed, etc.)

» Duration of the peak periods.

For the purpose of determining when additional airfield infrastructure such as a new runway, additional taxiways and apron stands for aircraft are needed, the growth in aircraft movements is the more relevant planning parameter than passenger movements.

Air travel is not uniform over a year and the number of daily flights will fluctuate on a monthly basis to account for when passengers have a strong propensity to travel, e.g. during school holidays, Easter and Christmas periods.

Brisbane Airport predominantly handles domestic air travel, with 75% of air travellers and 80% of flights being on domestic routes. The balance is international and GA traffic. The daily profile of aircraft movements during a 2014 typical busy day at Brisbane Airport is shown in Figure 8.4 and Figure 8.5 (page 174).

This shows that Brisbane Airport has two distinct busy periods, between 7am and 10am in the morning and 5pm and 8pm in the evening. These two periods coincide with the busy domestic travel times. It is estimated that business travel accounts for between 60% and 65% of domestic travel and that between 35% and 40% of domestic passengers travel to and from Brisbane and return on the same day.

As part of the extensive Environmental Impact Statement and Major Development Plan (EIS/MDP) that BAC prepared in 2005 – 2007 for the NPR project, BAC undertook airfield modelling to determine the capacity of the existing runway system and to identify when the NPR would be needed.

This modelling showed that the capacity of the existing main and cross runway system was in the order of 59 to 63 hourly movements. This range in peak hour capacity was dependent on the number of turbo prop arrivals on the cross runway.

Proportionally, at that time, the cross runway handled between 15% and 18% of all aircraft movements, with the main runway handling the bulk of the movements, particularly for jet aircraft.

If considering only the main runway, which during the peak period would need to handle all jet aircraft, then the peak hour capacity on the main runway was considered to be between 50 and 54 movements depending on the mix of jet aircraft.

Larger jet aircraft such as the B747 and A380 require longer separation distances and time between arriving aircraft due to wake turbulence generation. If more of these larger aircraft arrive during the peak hour, then the capacity of the main runway will be closer to 50 movements per hour.

Taking into account the daily forecasts prepared for the NPR EIS/MDP, it was expected that the peak hour capacity of the existing runway system would be reached around 2015.

FLIGHT ORIGINS

Around 80% of flights through Brisbane Airport are domestic.

The annual capacity of the current runway system for Brisbane Airport was estimated at approximately 255,000 aircraft movements before noticeable delays would regularly occur. Based on the Tourism Futures International forecasts, this was expected to occur around 2020. Hence, additional runway capacity was required between 2015 (when the busy hour capacity is expected to be exceeded) and 2020 when demand is expected to equal the airport's annual capacity.

14/32 Runway Operational Constraints

When Brisbane Airport was being designed in the 1970s it was planned to initially construct it as a single runway airport, being RWY 01/19. Aviation planning experts at that time considered this configuration the optimum needed to fit within the available land holding and to best manage the existing traffic and potential growth until the need for a parallel runway became evident.

However, during the planning process several groups representing GA companies operating into the old Brisbane Airport successfully lobbied the Federal Government (then owner and builder of airports) to include a small cross runway in the design of the new airport to cater for the limited crosswind capability of the then operating GA aircraft types. At that time the GA operation at Brisbane Airport was considerable, but limited mainly to single and twin piston engined aircraft with crosswind limitations of 15 – 20 knots. This smaller crosswind runway RWY 14/32 was then included as part of the new Brisbane Airport – Stage 1 works, and to cater for mainly GA operations, RWY 14/32 was built to a length of 1,760 m and a width of 30 m.

Over the years since it has been built, the use of RWY 14/32 has significantly changed. Initially it provided a runway capability for GA aircraft with limited crosswind capability when the wind direction and speed made operations on the main RWY 01/19 marginal for some aircraft types.

However, as progressively GA operations moved away from Brisbane Airport and single and twin engine piston engined aircraft were replaced with twin engined turbo-prop aircraft such as the Dash 8 and Beech 200 types with improved crosswind capability, the use of RWY 14/32 changed.

No longer was its principal use one of providing an into-wind option for crosswind limited aircraft but it became one of providing extra capacity to the airport in peak periods, when demand regularly exceeded the available capacity of the main RWY 01/19.

In this mode, RWY 14/32 was very successfully utilised when Airservices Australia (Airservices) introduced a runway mode known as Converging Runway Operations (CROPS) which allowed for the independent use of both RWYs 01/19 and 14/32 simultaneously with a commensurate increase in capacity.

Due to a significant safety incident in 2010 and the subsequent inquiry and safety analysis process, all but a limited daytime use of CROPS on one runway configuration only is permitted. For safety reasons, a re-introduction of CROPS using RWYs 19 and 14 simultaneously as landing runways will not occur.

Some limited use can be made of the RWY 32 direction for independent departures, when the wind is the right direction and speed. As at early 2014, the limited use of RWY 14 as an arrival runway with aircraft landing on both RWY 14 and RWY 19 being subject to Air Traffic Control (ATC) separation is in the early stages of evaluation by Airservices under the Airport Capacity Enhancement (ACE) initiative. RWY 14 and RWY 01 can be used simultaneously for landings during daylight hours only, but this mode constrains departure capacity.

Consequently, the previous 15% to 18% capacity contribution of RWY 14/32 to overall system capacity has reduced to around 5%.

RWY 14/32 – Future Closure Strategy

In 2013, BAC revisited the strategy to decommission RWY 14/32 once the NPR was operational. The assessment considered:

- » Safety of operations
- » Environmental impacts of operations
- » System capacity.

1. Safety of Operations

An evaluation of the safety of operations following the introduction of the NPR was considered in four distinct situations.

The first is the operation of the airport itself in respect of landings and take-offs during peak demand periods.

The second is the safety of an individual flight being able to complete its flight at destination within the operational constraints of the aircraft.

The third is the ability of a flight suffering some form of operational degradation being able to undertake a safe landing and the fourth is the closure of one or other of the parallel runways due to a disabled aircraft or infrastructure failure.

Airports with a well designed set of parallel runways with similar lengths, similarly located thresholds, spaced widely enough apart to meet the ICAO separation standards for independent operation, with no crossing or converging runway in use, move significantly more aircraft with improved levels of safety than airports limited to or impacted by a crossing or converging runway configuration.

Airports with crossing/converging runways require multiple sets of airspace configurations to be developed and used.

ATC and pilots need to maintain currency in these modes to maintain the safety of the operation. There is an added level of complexity with each mode of operation that is utilised and the additional complexity layers reduce the safety margin.

One set of parallel runways requires normally just one operating mode, which is directly transferable to either end of the runway, and significantly increases the safety margin.

ATC runway nomination rules in Australia allow a runway to be nominated for use:

- » In dry conditions with a crosswind of 20 kts and a downwind of 5 kts
- » In wet conditions with a crosswind of 20 kts and no downwind.

This is principally applicable at airports that have a crossing runway configuration where the runways are physically capable of handling all aircraft type. (e.g. Sydney, Melbourne, Perth).

Brisbane ATC is not constrained by these nomination criteria because of the aircraft weight limitation on RWY 14/32. However, when RWYs 19 or 01 are nominated at Brisbane within these crosswind/downwind criteria, there is no record of any aircraft having elected to divert to an alternate airport due to crosswind limitations.

Therefore, it can be accepted that the normal operating types at the airport are comfortable operating up to a crosswind of 20 kts.

The Bureau of Meteorology (BoM) has provided half hourly wind direction and speed data for the last 10 years at Brisbane Airport. From this data crosswind on RWY 01/19 was calculated at 5 kt increments starting at 10 kts and ending at 35 kts. The analysis showed that there were no recorded instances where the crosswind exceeded 35 kts during the 10 year period. The results of this crosswind analysis are included in Table 7.6.

The analysis does not include the effect of short-term crosswind conditions (microbursts) associated with thunderstorm activity. While the crosswind may exceed the limits of the BoM survey data for short periods, inbound flights to Brisbane are required to carry sufficient holding fuel to allow the aircraft to hold to a landing time beyond the extent of the microburst activity when thunderstorm activity is forecast.

This analysis of BoM data demonstrates that an aircraft with a 25 kt crosswind capability can operate on the parallel RWYs 01L/R, 19L/R for all but the smallest period of time. For the vast majority of the time the crosswind is comfortably below 20 kts.

After the de-commissioning of RWY 14/32, commensurate with the opening of the NPR, any aircraft with its destination as Brisbane Airport will be required to make fuel provision for an alternate airport in those very small time periods that the crosswind is forecast to be above the capability of the aircraft. This is no different from the requirement for aircraft with destinations such as Launceston or Cairns where there is only one runway suitable for jet and turboprop operations, or in fact for those aircraft restricted by size and weight to operations on the main runway at Brisbane Airport.

An assessment was undertaken for the instance where the actual crosswind on the parallel runways is beyond an aircraft's crosswind capability, or an aircraft with a destination within the Brisbane Basin (e.g. Archerfield) that suffers an operational degradation (e.g. engine shutdown, undercarriage malfunction) and opts to land at an airport with better emergency services.

If the crosswind is within the aircraft's capabilities then a landing on one of the parallel runways at Brisbane can be made. In the event that the crosswind is beyond the aircraft's capabilities there are alternative runway options in South East Queensland (SEQ) available for use.

In this scenario, with available into wind runways located approximately 80 km north, west and south of Brisbane, with emergency services available, a landing can be made about 15 minutes earlier than if the aircraft continued past these airports to land at Brisbane.

Table 7.7 compares Brisbane's RWY 14/32 with the available runways within the Brisbane Basin, noting direction, length and width, pavement strength and availability of emergency services.

The NPR will be built to a width of 60 m, considerably wider than the existing RWY 01/19 at 45 m and RWY 14/32 at 30 m. The extra 15 m provides a safety margin in crosswind operations.

TABLE: 7.6: CROSSWIND ANALYSIS FOR RWY 14/32 CLOSURE

Runway 01/19 Crosswind						
Month	**10 Knots**	**15 Knots**	**20 Knots**	**25 Knots**	**30 Knots**	**35 Knots**
January	86.07%	97.88%	99.98%	100.00%	100.00%	100.00%
February	89.07%	98.40%	100.00%	100.00%	100.00%	100.00%
March	88.33%	98.18%	99.97%	100.00%	100.00%	100.00%
April	92.97%	98.96%	99.99%	100.00%	100.00%	100.00%
May	95.41%	99.37%	100.00%	100.00%	100.00%	100.00%
June	94.09%	99.08%	99.96%	100.00%	100.00%	100.00%
July	93.17%	98.76%	99.88%	99.99%	100.00%	100.00%
August	93.55%	98.94%	99.95%	100.00%	100.00%	100.00%
September	92.47%	98.24%	99.70%	99.97%	100.00%	100.00%
October	90.19%	98.01%	99.65%	99.93%	99.99%	100.00%
November	91.76%	98.68%	99.88%	99.99%	100.00%	100.00%
December	89.83%	98.51%	99.97%	100.00%	100.00%	100.00%

These percentages relate to the amount of time the wind speed was below the stated speed. For example, for 10 knots in January, the wind was below 10 knots 86% of the time.

TABLE: 7.7: ALTERNATE RUNWAY AVAILABILITY IN SEQ

Airport[1]	Runway Direction	Length/Width	Pavement Strength	Emergency Services
Brisbane	14/32	1,760/30 M	145 psi	Yes
Gold Coast	14/32	2,492/45 M	Better than BNE 14/32	Yes
Sunshine Coast	18/36	1,797/30 M	Better than BNE 14/32	Yes
Amberley	15/33	3,047/45 M	Better than BNE 14/32	Yes
Amberley	04/22	1,523/45 M	Better than BNE 14/32	Yes

1 All have instrumental approach capability and ATC services available

Historically, it has been consistently demonstrated that a pilot in command of an aircraft suffering an operational degradation will request the larger runway at Brisbane Airport.

If one of the parallel runways is forced to close for any reason, the other remains open for use. Airborne aircraft are landed on a priority basis and the Airservices National Operations Centre (NOC) will utilise its Air Traffic Flow Management (ATFM) systems to hold all flights on the ground destined for Brisbane that are not yet airborne, and departures from Brisbane will be held on the ground by Brisbane Tower ATC to facilitate a maximum arrival rate (if required) on the remaining operational runway.

2. Environmental Impact of Operations

The concept of operations for parallel runways indicates that three possible modes will be used for noise relief over the metropolitan area by directing all operations when those three modes are operating, over Moreton Bay. These modes are known as Simultaneous Opposite Direction Runway Operations (SODPROPS), and two variations of Dependent Opposite Direction Runway Operations (DODPROPS). These over-water modes will be the preferred operating modes applied to the maximum extent possible, particularly in the noise sensitive periods when conditions for their use are available more often.

The preferred mode of operation for noise relief once the NPR is commissioned will be SODPROPS, where RWY 01R is used for departures and RWY 19R is used for arrivals. This operation confines jet operations to over the bay, and as the name implies both take-offs from RWY 01R and landings onto RWY 19R can happen simultaneously.

It is expected that this mode will have a capacity of at least 55 movements per hour, and as such will be available, weather permitting, most nights and for extended daytime periods on weekends when demand is lower.

An extended and widened RWY 14/32 may allow the introduction of a mode using RWY 01R for departures and RWY14 for arrivals. However as a night time mode, the runways would become dependent and as such would have a capacity nowhere near the SODPROPS capacity of 55 per hour. The capacity of this mode would be closer to the 20 movements per hour predicted for the two DODPROPS modes articulated in the Draft EIS/MDP Volume D Draft Parallel Runway Operating Plan.

An extended and widened RWY 14/32 does not provide a new mode that provides any increase in night time noise relief capacity. Any such mode would go nowhere near matching the expected capacity of SODPROPS.

Due to its limitation in length and width RWY 14/32 has no part to play in providing noise relief from large aircraft.

3. System Capacity

The advantage of operating a set of widely spaced parallel runways is that the hourly capacity rate is able to be delivered consistently in either runway direction. Given its projected traffic mix, it is anticipated that Brisbane Airport with parallel runways should be able to sustain an hourly rate of 100 + movements per hour over the morning and evening three to four hour peak demand periods.

The Current and Future Flight Path and Noise Information booklet identifies the runways as being used in mixed mode (i.e. departures and arrivals operating from each of the runways), and given the destination/origin mix of the projected traffic, this will effectively see each runway of the parallel group operate almost as an independent airport. There will be some interaction of flights paths and hence some small loss of capacity when any long haul departing flight requires to use the existing runway (RWY 01R/19L) because of an operational length requirement.

Should the smooth operation of parallel runways be interrupted by operations on a crossing or converging runway, then there is an immediate loss of capacity created by the safety separation standard protection required at the point where either the runways intersect or the flight paths intersect.

In Brisbane's case, any operation on RWY 14/32 should it remain in use will rob each of the parallel runways of capacity. The exact reduction is difficult to quantify precisely, as it will depend on aircraft types involved, whether the parallel direction in use is 19 or 01, the prevailing wind and cloud conditions and the procedures put in place by ATC to manage what would be a very complex operation.

MANAGING DEMAND PRIOR TO THE NPR BEING OPERATIONAL (YEAR 2020)

BAC expects aircraft movement demand to continue to increase between 2014 and 2020, placing pressure on the capacity of the existing runway system.

BAC will work closely with Industry to manage that demand and contain schedule delays to the extent possible, through continued implementation and refinement of programs including:

- **The Runway Demand Management Scheme**
- **Airport Capacity Enhancement**
- **Air Traffic Flow Management**
- **Collaboration with airlines to identify and assess all improvement opportunities.**

It is realistic to expect that as a minimum for each operation on RWY 14/32, four movements will be lost on the parallel runways. This represents a minimum 4.5% reduction in capacity per 14/32 movement – an inefficient and ineffective outcome.

Future Use of the 14/32 Runway Strip

BAC will retain the runway strip area of the 14/32 Runway free from encroachment of permanent structures. It will be retained in a condition that the current runway pavement and grassed strip areas could be utilised in an extreme situation by propeller and turbo-prop aircraft undertaking an emergency landing manoeuvre when the parallel runways are unavailable.

Demand and Operational Delay Trends

All major Australian airports are experiencing significant growth in aircraft movement numbers, to the extent that, by 2030, national air passenger numbers are expected to be double the 2013 numbers.

At Brisbane Airport, flights noticeably increased over 2012/13 such that they regularly exceed 700 aircraft movements on a weekday. This increase in movements was largely driven by unprecedented activity in regional flights, domestic airlines increasing the number of flights available, and strong population growth with a propensity for both leisure and business travel.

Other factors also contribute to delays at Brisbane, including:

- **Cumulative delays across a national system** – delays can build up through the day across the national airport network. For example, where an aircraft departs late in the morning, a knock-on effect can occur with that aircraft and its connections, affecting many later flights across multiple airports, resulting in airline schedule delays
- **Weather conditions –** delays also occur due to weather conditions, either around Brisbane or at other airports
- **Requests for urgent landings or take-offs for emergency services** – medical flights have priority over all traffic and this can result in standard services being delayed. For example, the Royal Flying Doctor Service regularly operates more than 20 flights per day at Brisbane Airport, which may need to operate on the main runway
- **Diversions of flights from other airports to Brisbane –** such as services to regional airports being directed to Brisbane in bad weather.

Prior to the implementation of the Runway Demand Management Scheme (RDMS) and the Airservices "Metron" ground delay and flow-control program discussed below, the significant growth and uncontrolled demand in peak operating periods was resulting in significant delays, particularly in the evening arrival-dominated periods. This delay resulted in arrival aircraft placed into circling stacks to the north, west and south of Brisbane Airport awaiting sequencing into runway availability at Brisbane Airport. The situation was exacerbated by the loss of the marginal contribution that RWY 14/32 contributed to overall system throughput with it being taken out of service for a 20 week period from October 2012 for early civil works associated with the NPR delivery.

The Airport Capacity Enhancement (ACE) Project

Airport Capacity Enhancement (ACE) is a national program that was commissioned by Airservices in collaboration with airports and industry stakeholders to address the growing demand at Australia's major airports. The goal of the ACE program is to identify opportunities to improve efficiency and to increase the utilisation of existing airfield, airspace and infrastructure in order to increase runway capacity.

ACE is based on the principal of broad collaboration with the airport community to address the common challenge of airport congestion and delay.

The ACE programme is closely based upon a proven European programme, which the Air Navigation Service Provider NATS has effectively managed at its busiest airports. NATS provides air traffic management services to the UK Gatwick Airport, considered the busiest single-runway airport in the world.

NATS undertook on-site benchmarking of the performance of Brisbane Airport determining its current operational efficiency and identifying opportunities to further enhance the capacity and performance of the airfield system. That analysis indicated that the capacity of the airfield for single-runway mixed-mode operations was 744 movements per day. Based on a recommended suite of changes to airspace and airfield management, that capacity could be increased to around 820 movements per day.

Led by Airservices, the airport community collaboration on ACE has matured and been accorded a high priority by all participants with around 25 capacity enhancement initiatives identified, prioritised, and undergoing progressive implementation. The ACE program in conjunction with the NATS recommendations may provide initiatives within 18 – 36 months, which may add two to three movements per hour to the existing runway rate.

The Runway Demand Management Scheme (RDMS)

In response to consistent increasing demand trends, BAC introduced a RDMS which commenced operation on 28 October 2012. BAC introduced the RDMS through its Aviation Services and Charges Agreement for the runway system, meaning airlines/operators are contractually bound to comply with its terms.

Administration of the RDMS was assigned to a recognised slot coordination provider – Airport Coordination Australia. The implementation of the RDMS followed a comprehensive consultation approach and was generally supported by operators.

The RDMS is largely principled on International Air Transport Association (IATA) Worldwide Slot Guidelines, for which there is wide application and acceptance internationally. The RDMS also sets "Local Rules" regarding historical precedence rights to slots on successive scheduling seasons, and "Coordination Parameters" which set target capacity criteria for the airfield system.

All operations to Brisbane Airport are required to apply for and be allocated a runway slot prior to operation. The RDMS has the limitation in mitigating delays at Brisbane Airport in being a strategic planning tool that generally establishes a compliant, workable schedule on a seasonal basis based on good visual operating conditions.

Under the RDMS, BAC conducts a Local Coordination Committee each scheduling season to review the performance of the previous season, preview the upcoming season and discuss potential enhancements to the RDMS.

Metron – Ground Delay and Flow Control Program

In response to the significant growth and increasing operation delay experience, Airservices implemented the replacement of the Central Traffic Management System tool, which serviced Sydney, Perth and Brisbane, with an advanced Air Traffic Flow Management application capable of simultaneously managing traffic flows at multiple airports. This new application is called Metron Traffic Flow.

From a traffic management perspective, where demand exceeds capacity, Metron Traffic Flow will regulate traffic into a designated airport through the allocation of ground delay. Metron Traffic Flow will issue ground delays through the allocation of Calculated Off Block Times.

Metron Traffic Flow accepts real-time updates to schedule data, either via flight plan submission, airline day of operations changes to scheduled departure times, or ATC live data. As a consequence of accepting real-time updates, Metron Traffic Flow is able to display the most up-to-date demand/capacity information for any monitored airport, which in turn provides both airlines, airports and ATC with an enhanced capability to predict traffic management issues.

All airlines intending to operate into a Ground Delay Program airport are required to submit operating details into the Metron Traffic Flow system. Airlines will upload a schedule directly into a web based interface, and smaller operators can contact the Airservices National Operations Centre who can enter their details into the system.

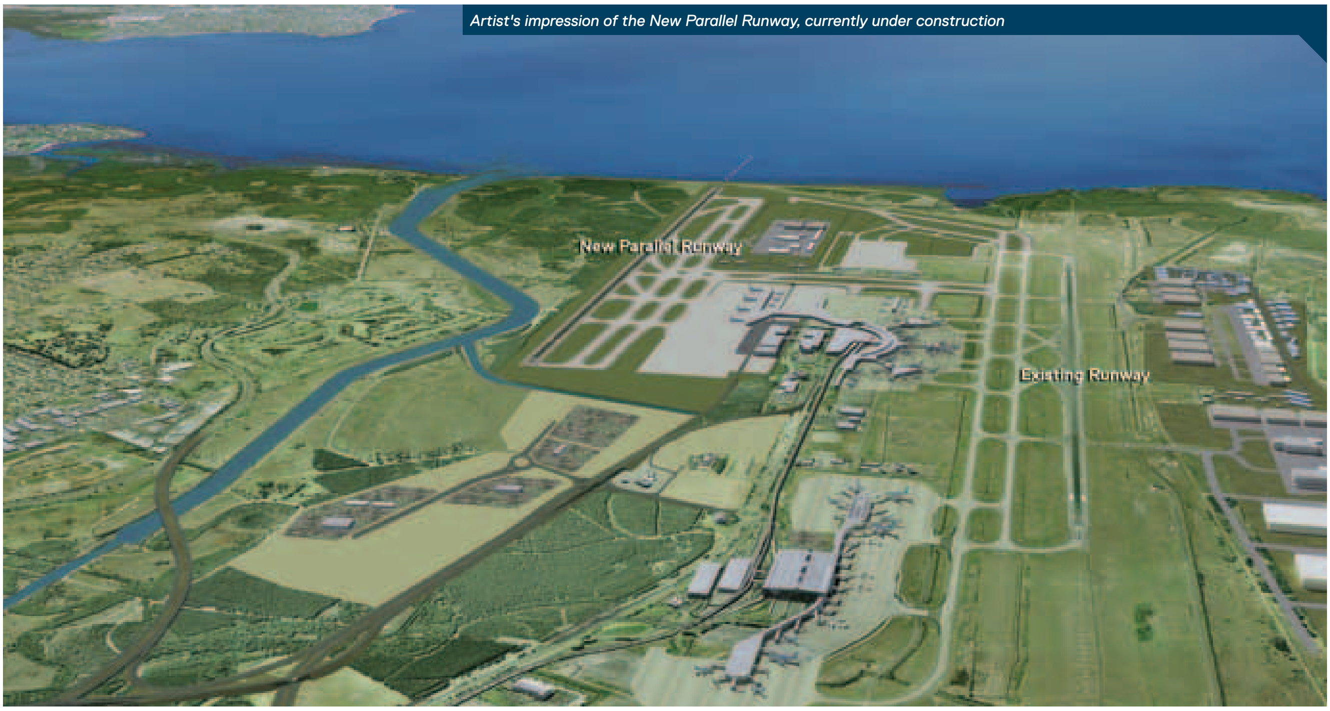
Updated System Capacity Assessment

Brisbane Airport operates the RDMS with a declared rate of 50 movements per hour, with one hour of 52. This allocation of slots compares favourably with similar international single runway airports.

In the peak hours actual runway movements measured by Airservices regularly exceed 50/hour, and this again compares favourably with similar international airports and fits within the International ICAO capacity estimates for single runway operations. The existing agreed arrival rate of 25 landings per hour in good meteorological conditions underscores the RDMS hourly rate of 50 movements per hour. However, Airport Capacity Assessment prepared by adopting certain capacity enhancement initiatives over the next 18 to 36 months as part of the ACE program, this arrival rate may be able to be increased to 27-28/hour.

Following the significant safety event (refer Section RWY 14/32 – Future Closure Strategy, page 126), the procedure whereby RWY 14/32 could be used in conjunction with RWY 01/19 to add tactical arrival or departure capacity in certain weather conditions, has been severely curtailed via both the outcomes of Airservices Australia risk assessment policies and a Civil Aviation Safety Authority (CASA)

Artist's impression of the New Parallel Runway, currently under construction



directive. BAC and Airservices have undertaken a process via the ACE program to establish under what safety rules more use could be made of RWY14/32 to add to the airports, tactical capacity.

As at 2014, this work is in the preliminary stage. However due to the inability to predict the use of RWY 14/32 as either an arrival or departure runway beyond the 30 hour airport weather forecasting cycle any additional capacity will only be available on a tactical basis and will not add to the declared airport capacity for seasonal planning purposes.

NEW PARALLEL RUNWAY (NPR) SYSTEM

History of the NPR Project

Over the last 30 years, the NPR project has been identified in forward planning documents for Brisbane Airport.

The initial planning for the current Brisbane Airport site was undertaken in the 1970s by both the Australian and Queensland Governments. The site chosen enabled the ultimate development of an airport that would be able to handle in excess of 40 million annual passengers.

From a runway capacity perspective, this early planning and site selection to achieve an annual throughput of 40 million+ passengers was based on Brisbane Airport having parallel main runways aligned along a north – south axis (RWYs 01/19) and a smaller cross runway (RWY 14/32).

Initially, when the new airport was constructed in the 1980s, a 3,600 m long single eastern main runway and the smaller 1,760 m long cross runway were provided as it was expected that this initial runway system would provide sufficient capacity for at least 20 years.

The new western parallel runway of 3,600 m length has been identified in all Brisbane Airport Master Plans since 1983. Since acquiring the long-term lease of Brisbane Airport in 1997, BAC has maintained its intention to construct a new western parallel runway in its Master Plans of 1998, 2003, and 2009.

In November 2006, BAC released for public comment its draft EIS/MDP for the NPR. Following the public submission period, BAC analysed the 198 submissions received and presented its Supplementary EIS/MDP to the Australian Government. In September 2007, the Australian Government granted BAC planning approval for the construction of the NPR.

NPR System – Design Criteria

In 2011, BAC convened an Industry Working Group to review location, layout and design standards for the NPR and its associated field and link taxiways. The findings from the comprehensive analysis by that group resulted in the following criteria being adopted for the initial build of the NPR:

- 3,300 m length x 60 m width (retention of the long-term/ultimate development option to extend to 3,600 m)
- 2,000 m separation to the existing main runway
- 240 m Runway End Safety Areas (RESAs)
- A dual parallel taxiway system near mid-field linking the existing main runway

- A dual parallel taxiway system servicing the NPR, the extent or staging of which to undergo further evaluation through airfield modelling
- A number of connecting runway delivery taxiways and Rapid Exit Taxiways (RETs) to facilitate efficient operations – the quantity and positioning of which will also be subject to further modelling and analysis.

It should be noted that the construction methodology adopted to prepare the large parcel of airport land associated with the NPR System – basically a 3,700 m x 500 m or 185 hectare rectangular block – facilitates future flexibility in constructing additional taxiway elements as needed. This approach contrasts to the construction of the existing main runway system in the mid-1980's where intended pavement areas only were surcharged during the site reclamation processes, making the constructability of additional taxiway elements problematic and new pavements potentially subject to differential settlement challenges.

BAC has adopted Code "F" standards for the NPR and its dual parallel taxiways, however has increased taxiway separations slightly for the parallel taxiway system linking the two major runways system to a Code "F+" criteria (Refer Figure 7.8). This will provide long-term flexibility in having separation standards that allow:

- Very large aircraft exceeding current Code 'F' access to the existing main runway
- Future potential variants of current Code 'F' (such as new wing technologies up to 85m wing-span) access to the existing main runway and across to western terminal facilities on the link taxiways
- Full Code 'F' (current Airbus A380 and known variants) aircraft facilitation on the NPR.

NPR Project Overview

The NPR will be constructed west and parallel to the existing main runway (01/19) and staggered in a northerly direction towards Moreton Bay. The location of the NPR is generally consistent with that identified in the 2009 BAC Master Plan.

Key features of the NPR project are:

- A new 3,300 m x 60 m (3,600 m in ultimate form) runway 2 km west and parallel to the existing RWY 01/19, including taxiways, navigational aids and associated infrastructure such as drainage, services, perimeter road, new airside security fence and roads
- The site for the NPR is low lying and the existing ground soils are of very poor quality and strength. Accordingly, the site will need to be filled and surcharged before runway pavement can be constructed. Some 360 hectares of airport land will be filled by dredging up to 15 million m^3 of sand from Middle Banks in Moreton Bay and pumping to the NPR site from a pump-out facility to be established at the mouth of the Brisbane River near Luggage Point
- A new drainage system for the new airfield established by the NPR. This has resulted in the construction of a new drain to the south of the NPR discharging into the Kedron Brook Floodway, as well as a new drain under the cross runway and discharging into airport land near Serpentine Inlet
- New navigational aids and lighting, as well as a possible new fire station to service the NPR. Navigational lighting may include the construction of approach lighting into Moreton Bay from the northern end of the NPR
- Changes to current airspace procedures to accommodate new arrival and departure procedures.

Construction Program

Construction of the NPR is being undertaken in stages. This is mainly due to the need to stabilise the existing poor in situ soils before a runway pavement can be constructed.

The six main construction elements of the NPR are as follows:

- Enabling civil works – drainage, services relocation, modifications to the 14/32 runway system (completed in mid 2013)
- Site clearing and preparation (commenced in 2013 and completed in 2014)
- Dredging and sand fill placement (commenced in October 2013 and due for completion in June 2015)
- Site settlement and monitoring
- Runway, taxiway and supporting facilities construction
- Operational commissioning.

The current planned delivery program for the NPR envisages operations commencing in 2020.

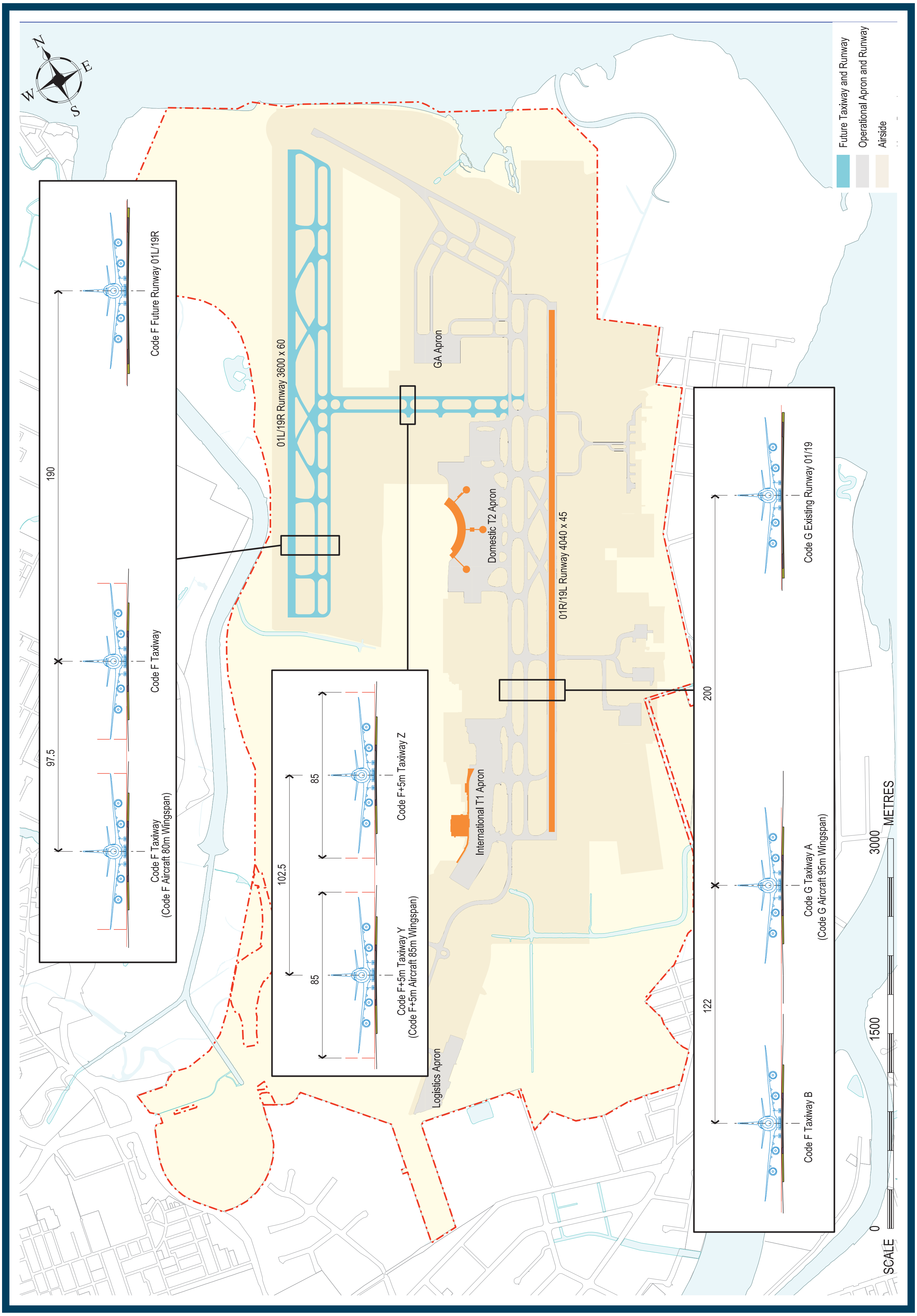
Changes to Airspace Routes

As stated previously, the construction of the NPR responds to the forecast increased aviation activity at Brisbane Airport. The NPR will necessitate changes to flight paths and how aircraft are safely managed by ATC. BAC's EIS/MDP identified in great detail the changes to existing departure and arrival routes, and associated noise changes for suburban Brisbane.

The design of the airspace procedures takes account of a number of factors including:

- Existing air routes to and from Brisbane Airport
- Optimisation of the airport runway capacity
- Current preferred runway rules and Noise Abatement Procedures
- Options for varying wind conditions

FIGURE 7.8: FUTURE RUNWAY SYSTEM



- Simplicity of airspace design and flight paths to maximise safety and efficiency
- Options to minimise flights over residential areas
- Optimisation of flights over Moreton Bay, particularly in the more noise sensitive times (10pm – 6am).

BAC has compiled the Current and Future Flight Path and Noise Information booklet for Brisbane Airport describing its existing and parallel runway configuration and associated aircraft noise metrics.

Parallel Runway System – Ultimate System Capacity

The construction of the NPR will make Brisbane the most efficient operational airport in Australia. Unconstrained by artificial caps, with optimum mid-field terminal locations, balanced runway lengths and strength capacities, and positioning against Moreton Bay providing positive noise mitigation opportunities, Brisbane's runway, taxiway and terminal placement will be comparable to the world's best parallel runway airports.

1

2

The advantage of operating a set of widely spaced parallel runways is that the hourly capacity rate can be delivered consistently in either runway direction. Given its projected traffic mix, it is anticipated that Brisbane Airport with parallel runways will be able to sustain an hourly rate of 100 + movements per hour over the morning and evening three to four hour peak demand periods.

The Current and Future Flight Path and Noise Information booklet identifies the runways as being used in mixed mode (i.e. departures and arrivals operating from each of the runways), and given the destination/origin mix of the projected traffic, this will effectively see each runway operate almost as an independent airport. There will be some interaction of flights paths and hence some small loss of capacity when any long haul departing flight requires to use the existing runway because of an operational length requirement.

BAC has undertaken a very comprehensive assessment of future demand and airline fleet trends in constructing a revised Australian Noise Exposure Forecast (ANEF) (Section 8.8) and has concluded that in also considering current airspace management practices and standards, Brisbane Airport with the parallel runway system, has capacity to meet expected demands until 2060.

1 Airspace around Brisbane Airport is strictly managed by Airservices Australia.

2 BAC works with Brisbane City Council to protect valuable airspace around Brisbane Airport.

AIRSPACE

Airspace planning is integral to the airport's Master Plan.

7.3 Airspace Protection

Facilitating the safe and efficient movement of aircraft to and from Brisbane Airport is a fundamental development objective and principle in the master planning process.

Adequate protection from infringements to the airspace surrounding Brisbane Airport is as important to the safe and efficient use of the airport as the safe design and operation of on-ground infrastructure such as runways, taxiways, terminals and navigational aids.

Appropriate airspace protection also ensures that the safety, efficiency and regularity of existing and future operations are sustained.

For these reasons the Brisbane Airport airspace must be regarded as an integral part of the airport. Land use planning, development assessment and approval procedures need to take account of these airspace requirements, and this applies equally to the airport land as well as the land around the airport.

Certain developments and structures in the vicinity of Brisbane Airport, whether they are natural features or man-made, may limit the scope of the airport's existing and future operations. While it is widely appreciated that tall


Night time operations at the Air Traffic Control tower

structures and aircraft operations are basically incompatible, it is true not only on immediate approaches and take-off paths close to the airport, but also further afield.

High terrain, high-rise buildings, stack efflux, antenna and the like – remote from the airport – may be the critical obstructions in the design of instrument flight procedures and may impose limits on the range of weather conditions in which aircraft operations can take place.

Under the Airports Act 1996 (Airports Act), some of these structures will be "controlled activities", and will require an approval from the Department of Infrastructure and Regional Development before the facility can be constructed/operated. As described in this section, this could be because of the height of the structure, but also may relate to its lighting configuration or in the case of a stack or chimney – its efflux characteristics.

The impacts of any one obstacle may be relatively minor, but together a number of obstacles may seriously limit runway utilisation, increase environmental impacts, cause airspace congestion and reduce the effective handling capacity of the airport.

It can also result in aircraft having to depart or arrive with weight restrictions such as taking on less fuel, passengers or freight.

In the case of international flights, this could impact on the viability of the route and lead to fewer direct international services to and from Brisbane Airport. This would have significant economic consequences to the Brisbane and regional economies.

AIRSPACE PROTECTION – REGULATORY ENVIRONMENT

This section includes a brief summary of the requirements of various regulatory controls and "best practice" processes and guidelines that address airspace protection for Brisbane Airport.

The Airports Act and the Airports (Protection of Airspace) Regulations 1996 (Regulations) are the primary control mechanisms for airspace protection and consider issues such as the Obstacle Limitation Surfaces (OLS), the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces, navigational and radar systems, Radar Terrain Clearance criteria, and other off-airport land use planning issues arising from the airport's location, configuration, and existing and future operations.

The Regulations establish a system for the protection of airspace at, and around those privatised airports regulated under the Airports Act, in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of airports.

Under the Regulations, the 'prescribed airspace' for Brisbane Airport is made up of:

- » The OLS and PANS-OPS surfaces, and the airspace above those surfaces, for existing and future air transport operations into and out of Brisbane Airport
- » Any additional airspace that has been declared under the Regulations by the Secretary of the Department of Infrastructure and Regional Development. In making that declaration under the Regulations, the Secretary must have regard to:

- The OLS and PANS-OPS surfaces for the ultimate runway system for the airport proposed in the approved Master Plan
- Any advice from the CASA
- Any other matters the Secretary considers relevant.

This declaration process has allowed Brisbane Airport to protect airspace around the NPR runway system and extensions to the existing main runway.

It also takes account of new aircraft navigational procedures that are introduced as a result of technological advances. The "prescribed airspace" for Brisbane Airport was declared on 19 April 2013, superseding the previous declaration of 5 July 2001.

QUEENSLAND STATE GOVERNMENT PLANNING POLICY

In 2013, the Queensland State Government consolidated its various State Planning policies into a single State Planning Policy (SPP).

The former SPP 1/02 – "Development in the Vicinity of Certain Airports and Aviation facilities" has been incorporated into that single State Planning Policy, recognising that strategic airports and aviation facilities (including communication, navigation and surveillance facilities) play a key economic, social and defence role in Queensland.

The SPP and its guidelines inform local government and applicants in addressing state interest in local planning instruments and where required through development assessment.

In relation to the making or amending of a local planning instrument the policies that are required to be reflected in the local planning instrument are:

1. Protecting operational airspace by ensuring development and associated activities do not adversely impact on the operational safety and viability of strategic airports by creating incompatible intrusions into the operational airspace
2. Mitigating impacts of aircraft noise by ensuring development is compatible with forecast levels of aircraft noise within the 20 ANEF contour or greater of strategic airports
3. Protecting public safety areas by ensuring development avoids increasing risk to public safety in defined public safety areas
4. Protecting aviation facilities by ensuring development and associated activities do not adversely affect the functioning of aviation facilities
5. Integrating land use and development with airports by promoting use of land surrounding strategic airports for development that is compatible with, depends upon or gains significant economic advantage from being in proximity to a strategic airport, or supports the role of the strategic airport as a critical freight and logistics hub
6. Protecting key transport corridors linking strategic airports to the broader transport network

Aircraft departs from Brisbane Airport

7. Including mapping in relation to provisions (1) to (6), as obtained from the relevant airport manager.

NATIONAL AIRPORTS SAFEGUARDING FRAMEWORK

The purpose of the National Airports Safeguarding Framework (the Safeguarding Framework) is to enhance the current and future safety, viability and growth of aviation operations at Australian airports, by supporting and enabling:

» The implementation of best practice in relation to land use assessment and decision making in the vicinity of airports

» Assurance of community safety and amenity near airports

» Better understanding and recognition of aviation safety requirements and aircraft noise impacts in land use and related planning decisions

» The provision of greater certainty and clarity for developers and land owners

» Improvements to regulatory certainty and efficiency

» The publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

The Safeguarding Framework provides the opportunity to drive improvements in planning outcomes consistently across all jurisdictions, and to improve the safety and viability of operations at all Australian airports.

The Safeguarding Framework includes information to guide state, territory and local governments in regulating and managing:

» Measures for managing intrusion by aircraft noise

Brisbane Airport's airside navigation system

» The risk of building-generated windshear and turbulence at airports

» The risk of wildlife strikes in the vicinity of airports

» The risk of wind turbine farms as physical obstacles to air navigation

» The risk of distractions to pilots from lighting in the vicinity of airports

» The risk of intrusions into the protected operational airspace of airports.

It is anticipated that guidelines for PSAs, and the protection of communications, navigation and surveillance infrastructure will also be considered.

The Safeguarding Framework Implementation Plan will identify the processes through which jurisdictions will seek to implement the guidelines taking into account:

» Existing Commonwealth, state and territory legislation and regulatory processes

» Responsibilities of each level of government

» Local conditions and circumstances

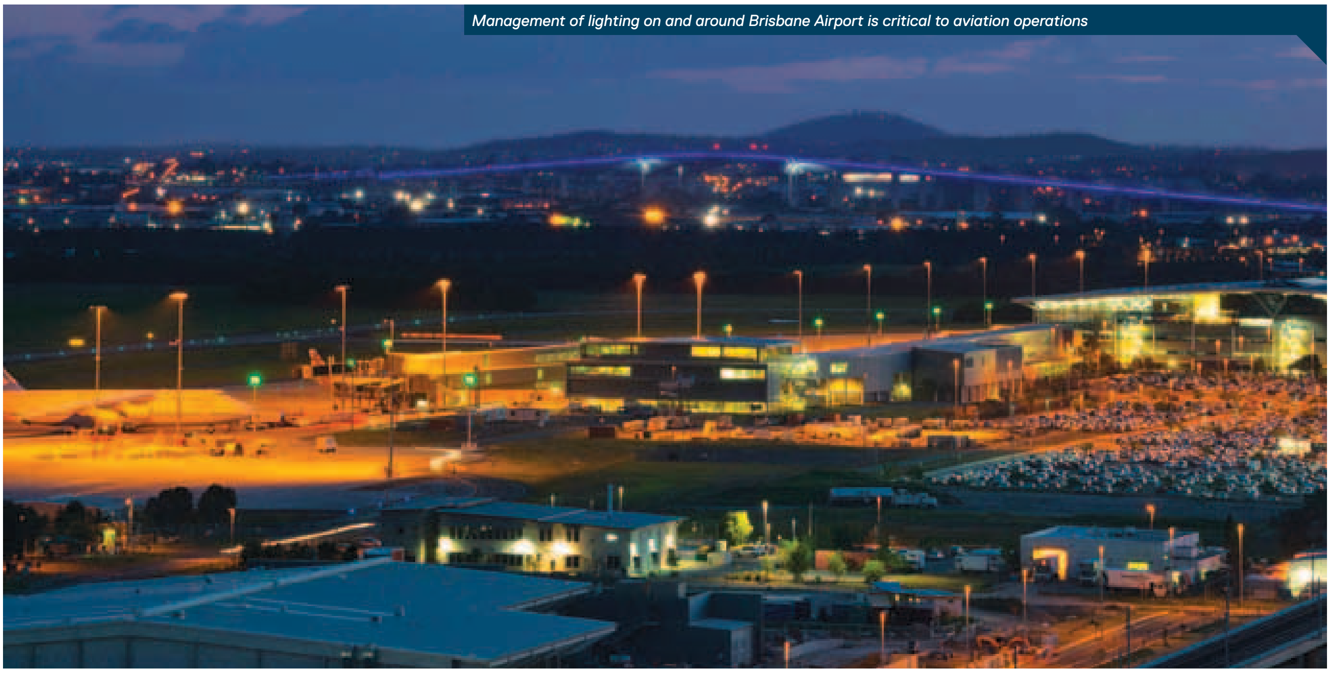
» The need for efficiency, effectiveness and appropriate risk management

» Provision for evaluation and review of regulatory arrangements over time to accommodate changing circumstances and technologies.

Brisbane Airport advocates the full incorporation of the current Safeguarding Framework guidelines in Queensland planning policy and encourages the continued development of such guidelines as a best practice approach to ensuring sustainable airport operations.

AIRSPACE PROTECTION

BAC strives to limit incompatible development around the airport.


Management of lighting on and around Brisbane Airport is critical to aviation operations

OBSTACLE LIMITATION SURFACES (OLS)

An OLS for an airport is a surface that is determined in accordance with the ICAO International Standards and Recommended Practices for Aerodromes (Annex 14) document.

OLS requirements are also detailed in the Civil Aviation Safety Regulations, Manual of Standards (MoS), Part 139 – Aerodromes.

The OLS surfaces define protection requirements for the initial and final stages of a flight – take-off, preparation to land, and the landing itself. During these manoeuvres visibility must be good enough for the pilot to see and maintain visual reference to the airport, and take responsibility for obstacle avoidance and separation from other aircraft.

The objective of the OLS is to define a volume of airspace in proximity to the airport which should be kept free of obstacles that may endanger aircraft in visual operations, or during the visual stages of an instrument flight.

Even so, the intention is not to restrict or prohibit all obstacles, but to ensure that either existing or potential obstacles are examined for their impact on aircraft operations and that their presence is properly taken into account.

Since they are relevant only to visual operations, it may sometimes be sufficient to ensure that the obstacle is conspicuous to pilots, and this may require that it be marked and/or provided with night lighting. Of course each new obstacle may in some way inhibit the freedom of aircraft operations and inevitably contribute to air traffic congestion and delays.

If an obstacle is located in the approach and take-off areas, pilots may need to make adjustments to their aircraft's optimum take-off and landing manoeuvre to ensure the necessary obstacle clearance. This may require using less than the full runway length available and may result in significant operational penalties such as fewer passengers, or less freight and fuel.

It is essential that off-airport land use planning takes full account of OLS implications and avoids planning decisions which may adversely affect the safety, efficiency and regularity of existing and future operations.

The OLS for Brisbane Airport – Ultimate Development, is depicted in Figure 7.9. It comprises a number of reference surfaces in airspace which determine when an object may become an obstacle to aircraft manoeuvring in the vicinity of the

LIGHTING

Bright lights, other than navigational aids, are avoided close to the airport.

airport, or during landing or take-off. The OLS – Ultimate Development depicted in Figure 7.9 is similar to that contained in the current declared "prescribed airspace" and all previous Master Plans prepared by BAC.

The main change is that the NPR is now planned to be constructed with a 240 m RESA in lieu of the originally proposed 90 m RESA.

ICAO has recommended a 240 m RESA to member countries, which includes Australia.

PROCEDURES FOR AIR NAVIGATION SERVICES AIRCRAFT OPERATIONS (PANS-OPS)

In conditions of poor visibility, pilots must rely on instrument procedures once they are airborne or when approaching an airport. Although a landing will always be completed visually at Brisbane Airport, pilots must initially be guaranteed they will have obstacle clearance until such time as they make the transition to the final visual phase of the flight.

The instrument procedures are designed using a second set of assessment surfaces to provide the necessary obstacle clearance requirements.

Obstacle assessment or accountability requirements for instrument flight are prescribed by ICAO in Document 8168-OPSA/611: Procedures for Air Navigation Services, Aircraft Operations – hence the term PANS-OPS surfaces.

In contrast to the OLS surfaces which define when objects are to be considered as obstacles and assessed for their impact on aircraft operations, PANS-OPS surfaces cannot be infringed on a permanent basis in any circumstances. In fact the height of the tallest structure or natural feature underneath a PANS-OPS surface determines its altitude or elevation.

This is because instrument procedure designers have to be able to guarantee that an aircraft will have the specified minimum clearance above any accountable obstacle in situations where the pilot is relying entirely on the information derived from cockpit instruments and may have no external visual reference, to the ground, to obstacles or to other aircraft.

The minimum obstacle clearance requirement is simply added to the height of the tallest object under the PANS-OPS surface to determine the minimum or lowest safe altitude to which a pilot may descend in attempting to establish visual reference to the airport.

The landing cannot be made unless the pilot is "visual" at or before reaching this minimum descent altitude.

If the minimum for an instrument procedure has to be raised to account for new buildings, or other structures around the airport, there may be direct impacts on airport usability. The higher this altitude needs to be, the less likely it becomes that a pilot will be able to land during low visibility conditions. Figure 7.10 depicts the PANS-OPS surfaces for Brisbane Airport – Ultimate Development. These surfaces in this figure are based on the existing navigational systems at the airport and the evolving satellite-based navigational systems being introduced at Brisbane Airport, with similar instrument procedures and systems projected for the approved NPR system.

As with the OLS definition, Figure 7.10 has been modified from the current declared "prescribed airspace" definition to reflect the small locational change of the NPR to accommodate a 240 m RESA.

OTHER EXTERNAL LAND USE PLANNING ISSUES

The final approach, take-off and climb phases of flight are the most demanding in terms of pilot workload.

Checklists, instruments, radio communications, aircraft configuration and speed changes, weather conditions, other traffic, manipulation of controls, approach monitoring, etc. require intense pilot attention and concentration.

Distractions under the approach and take-off paths may impact on aircraft safety. Issues concerning lighting, navigational aids, visibility and other considerations affect land use planning beyond the airport boundary.

RESTRICTED LIGHT ZONES

The use of lighting around Brisbane Airport is mainly a concern in close proximity to the airport, where there are two main problems that can arise:

» If bright lights, such as floodlights, emit too much light above the horizontal plane, then there is the possibility that a pilot could be dazzled, and momentarily unable to read cockpit instruments. Those lights could also have an effect on air traffic controllers' ability to clearly see aircraft approaching the airport

» In addition, lights might create a pattern that looks similar in appearance to approach or runway lighting and this may cause confusion for a pilot. Street lighting, security lighting and illuminated sports fields are examples that require special consideration. The problem will often be able to be corrected by suitable screening or shielding of the light source.

CASA has powers to deal with lights that can be considered hazardous in either of these ways (Regulation 94, Civil Aviation Regulations 1988).

FIGURE 7.9: ULTIMATE DEVELOPMENT OBSTACLE LIMITATION SURFACES (OLS)

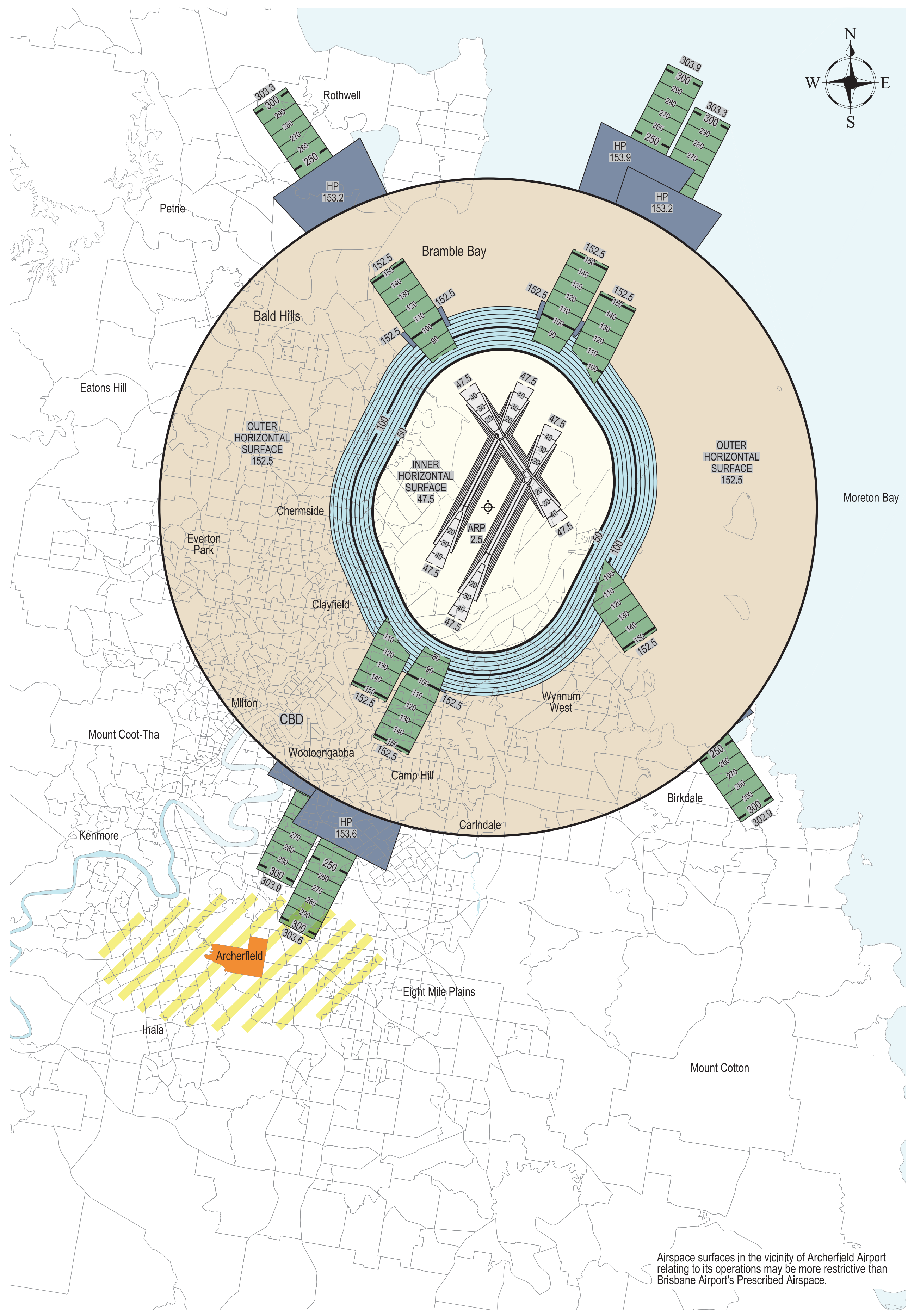


FIGURE 7.10: ULTIMATE DEVELOPMENT PROCEDURES FOR AIR NAVIGATION SERVICES AIRCRAFT OPERATIONS (PANS-OPS) AND RADAR TERRAIN CLEARANCE SURFACES

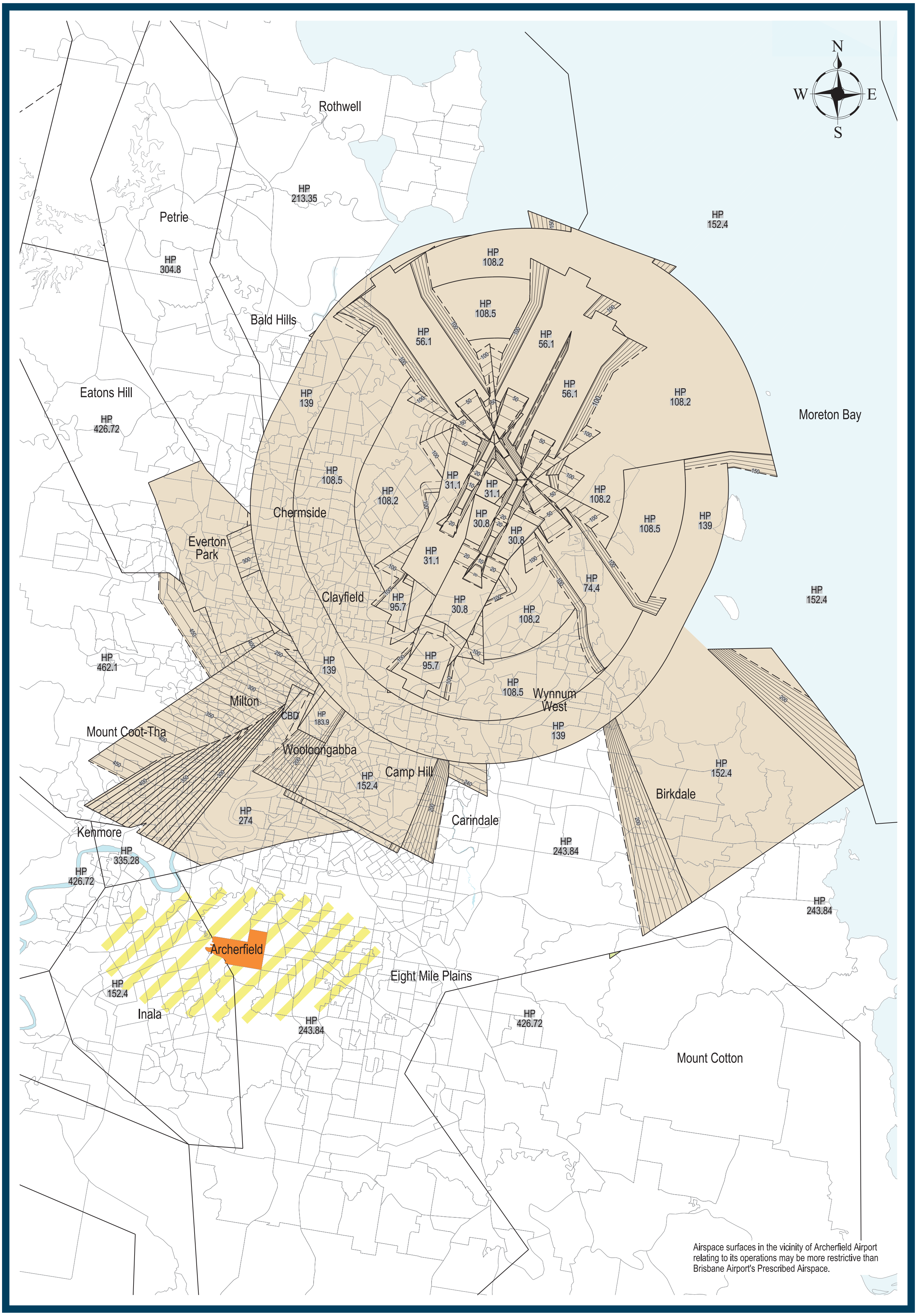
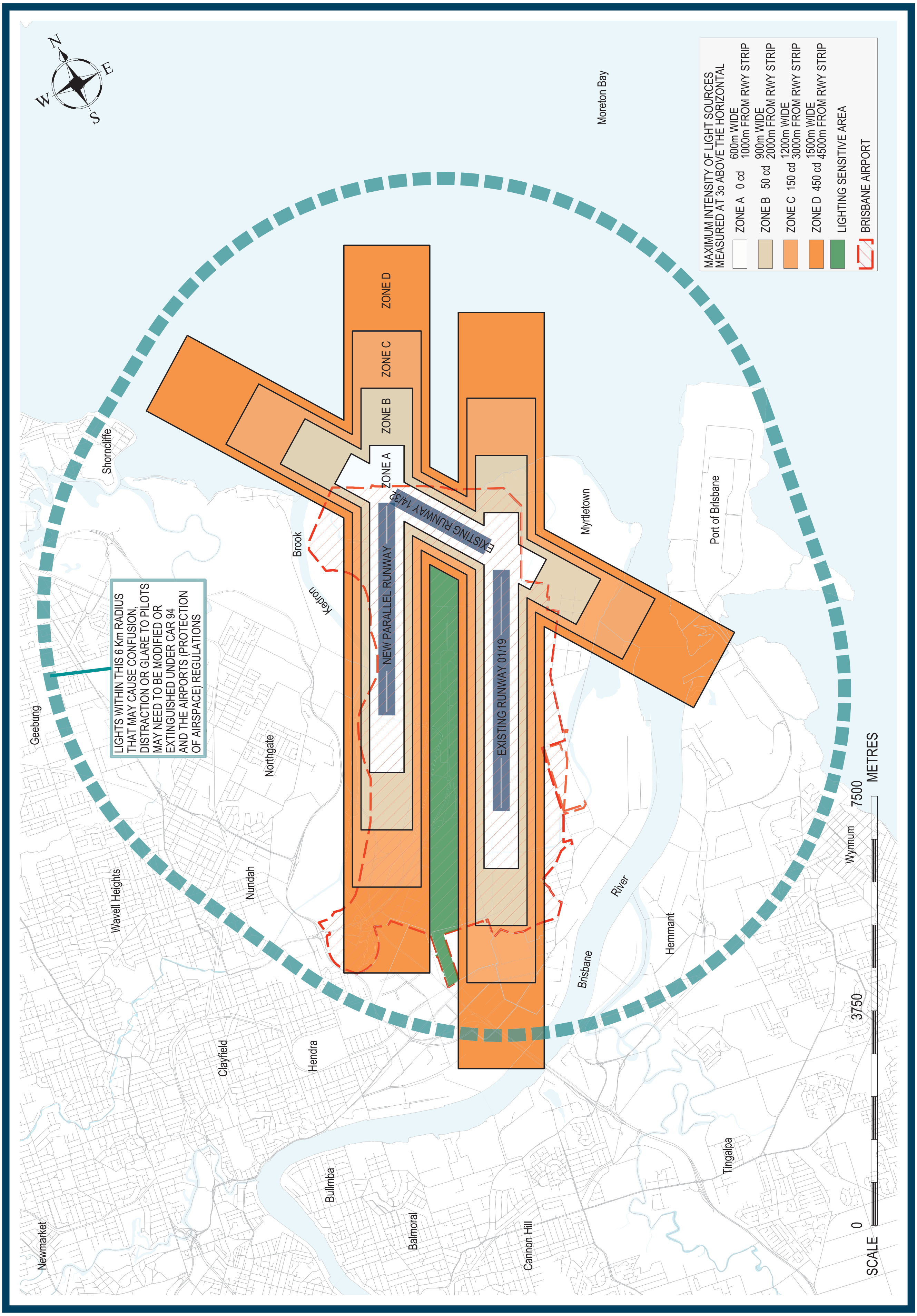


FIGURE 7.11: ULTIMATE DEVELOPMENT RESTRICTED LIGHT ZONES



It is preferable if the light design can take account of these possibilities in advance rather then look at modification after installation is complete. Chapter 9.21 of the CASA MoS Part 139 – Aerodromes, entitled 'Lighting in the Vicinity of Aerodromes', will assist in meeting these requirements. Figure 7.11 depicts the zones of restricted lighting at Brisbane Airport in accordance with these standards.

INTERFERENCE WITH AIR NAVIGATION AIDS

Aids to aircraft navigation, and to approach and landing manoeuvres, are an essential element of the air transport system. They have to be sited relative to the airport, airspace and aircraft flight paths they serve. Power lines, large buildings, moving vehicles, and the like, can affect the efficiency and reliability of their operation. Therefore their possible impacts on navigational aids need to be considered.

Facilities in the vicinity of airport navigational systems that have high electromagnetic or radio wave emissions may have the potential to impact on those systems, as well as on aircraft on-board electronic systems.

In addition, BAC is committed to ensuring developments at the airport will not compromise the efficacy of the existing navigational aids. BAC will continue to work closely with Airservices Australia to ensure relevant equipment and navigational aids remain operational during on-airport construction activities.

In most cases Brisbane Airport navigational facilities are installed and maintained by Airservices Australia which is a referral organisation on issues of protection requirements.

BAC has a direct interest in ensuring the protection of any aids located on or in the vicinity of the airport and works collaboratively with Airservices Australia on the impact assessment of on-airport development proposals, and those off-airport proposals referred to BAC.

STACK/VENT EFFLUX AND VISIBILITY HAZARDS

Although it is becoming increasingly unlikely with the implementation of strict emission controls, there may still be instances in which industry located in proximity to an airport may create a smoke hazard, which could reduce visibility for visual flight operations.

A similar situation may arise in relation to land uses or construction works which generate a severe dust problem.

Of more concern is the potential impact of either high velocity, high volume, high temperature or oxygen depleted discharge from stacks located in aircraft manoeuvring areas. Development proposals that incorporate these structures require careful assessment on their potential impact on the safety of aircraft operations.

A facility located within the "prescribed airspace" footprint, regardless of its physical height, with an efflux rate of greater than 4.3 metres/second measured at the discharge point will trigger further assessment to determine whether the facility will require approval as a "controlled activity" under the Regulations.

OTHER CONSIDERATIONS

Other planning considerations include:

- Brisbane Airport's location on the Boggy Creek and Serpentine Creek wetlands and abutting Moreton Bay, with its associated bird activity increases the potential for aircraft bird strike incidents – a potentially serious safety issue
- Land use, developments, and their design and landscaping in the vicinity of Brisbane Airport should not compound this problem by providing an attraction to bird life (e.g. because of a type of flora which is planted or because new water receptacles are created)
- Land use planning in the vicinity of Brisbane Airport needs to take account of the risks, however slight, associated with aircraft operations in the siting of:
  - fuel or hazardous material storage facilities
  - facilities that involve large concentrations of people
  - major public utility infrastructure
  - any other activity in the air that may impact on aircraft operations
  - large structures and the building material utilised in those structures close to the Brisbane Airport runway systems final approach and take-off areas.
- Wind shear conditions can influence aircraft Ground Proximity Warning Systems or cause glare off large reflective surfaces at a critical stage of pilot concentration and aircraft manoeuvre could impact on the safety of aircraft operations
- Reflectivity can also be an issue for air traffic controllers because of the potential for interference with radar and other navigational aids, and because glare can affect air traffic controllers as well as pilots.

BAC'S AIRSPACE DECLARATION PROCESS

Under the Airports Act requirements for airport master plans, BAC must specify any change to the OLS or PANS-OPS surfaces "that is likely to result if development proceeds in accordance with the master plan".

The prescribed airspace drawings contained in this 2014 Master Plan present the critical airspace surfaces for Brisbane Airport at ultimate development:

- OLS – Figure 7.9
- PANS-OPS – Figure 7.10
- Radar Terrain Clearance Surfaces – Figure 7.10

View from Brisbane Airport's Air Traffic Control tower

BAC first secured a Declaration of Airspace on 5 July 2001 following on from the 1998 Airport Master Plan process.

The 1998 Brisbane Airport Master Plan presented a parallel runway concept that positioned that runway at a consistent 2,000 m separation, but further south.

Given that the origin of OLS and PANS-OPS for that runway was further south, resulting in a marginal lower protection outcome in potential development areas, BAC delayed seeking a revised definition of airspace until the parallel runway configuration was fully confirmed.

This confirmation resulted from the approval of the MDP/EIS for the parallel runway in 2007, the Brisbane Airport 2009 Master Plan process, and a final endorsement of the detailed configuration by an Aviation Industry Working Group in 2010.

BAC initiated the process to update the airspace definition for Brisbane Airport convening an industry, agency and airspace specialist workshop in August 2009 to agree an approach and scope of the update.

BAC then worked closely with an airspace design specialist to develop surfaces for all existing and proposed future procedures.

The process of redefinition took some time due to the need to address emerging procedure technologies associated with satellite based navigation.

In considering and developing revised airspace surfaces, at Airservices Australia's recommendation, it was agreed to include additional protection criteria in the airspace definition:

- Surfaces to protect established air navigation infrastructure
- Surfaces to protect established radar installations
- Radar Lowest Sector Altitude Surfaces.

A second industry and agency workshop was convened in late 2011 to discuss the developed surfaces at which BCC reiterated its desire for increased Central Business District (CBD) building height allowances. This request was thoroughly considered and could not be supported given the obligation on BAC to determine the airspace definition in accordance with international standards.

BAC completed the process, consulting with both CASA and Airservices Australia for their endorsement of the comprehensive suite of airspace surfaces and supporting report.

In accordance with the Regulations, BAC formally submitted the documentation to the Secretary of the then Department of Infrastructure and Transport receiving an Instrument of Declaration on 19 April 2013.

The figures included in this section of the Master Plan are, within the constraints of presenting at a small scale, indicative of the extent of the airspace surfaces associated with the ultimate runway system development as articulated throughout this Master Plan.

The detailed definition drawings of the OLS and PANS-OPS surfaces required for the development assessment process will be provided to all appropriate agencies.

There is no change to the declared airspace due to the strategies contained in this Master Plan.

CONTROLLED ACTIVITY / DEVELOPMENT ASSESSMENT

An activity that involves infringement of an airport's "prescribed airspace" (either because of its height, or because of the efflux generated by it), is termed a "controlled activity", and the Regulations detail the notification and approval procedures to be followed in that event.

The "prescribed airspace" definition details the most critical or restrictive surface of the combined OLS and PANS-OPS surfaces.

Proposals are assessed as follows:

- The existing runway system and published procedures are used in assessments of short-term or temporary "controlled activities" such as construction cranes. BAC has a delegation from the Department of Infrastructure and Regional Development (DoIRD) for assessment of some of these temporary activities. In assessing a temporary controlled activity BAC consults with CASA and Airservices
- The ultimate runway system and intended procedures are used in the assessment of permanent or long-term development and structures. These "controlled activities" must be approved by the DoIRD.

For these proposals BAC makes its own assessment and also coordinates consultation with CASA, Airservices Australia and BCC, before providing this information to the DoIRD for a decision.

The DoIRD may approve the proposal, not approve or approve with conditions.

In addition to the Airports Act regime, CASA regulates aircraft safety standards through provision of the Civil Aviation Regulations (CAR's) – Civil Aviation (Building Control) Regulations 1988, Civil Aviation Orders (CAO's) and Civil Aviation Safety Regulations (CASR's).

In developing and amending these documents CASA recognises ICAO standards, seeking consistency with international requirements.

CASR 139.365 specifies that any development proposal constituting a structure that exceeds 110 m above ground level must be referred to CASA for assessment and possible conditions of approval.

CASA may also make a determination that a structure, or an efflux is a hazard to aircraft operations.

However, in making this determination, and modifying procedures, CASA's prime focus is on maintaining aircraft safety, not airport efficiency.

An activity that involves infringement of an airport's airspace is subject to notification, assessment and an approval procedures.

Aircraft departing from Brisbane Airport

7.4 Aviation Services and Facilities

The provision of appropriate facilities and support services to facilitate the ongoing operation and growth of aviation, business and industry utilising Brisbane Airport is necessary to provide safe and secure operations. These include:

- Security and emergency services, e.g. aviation fire and rescue
- Passenger facilitation and processing
- Aviation GSE storage and maintenance
- The supply and storage of aviation fuel
- Airport and aircraft maintenance
- Freight and logistics facilities
- Flight catering
- ATC.

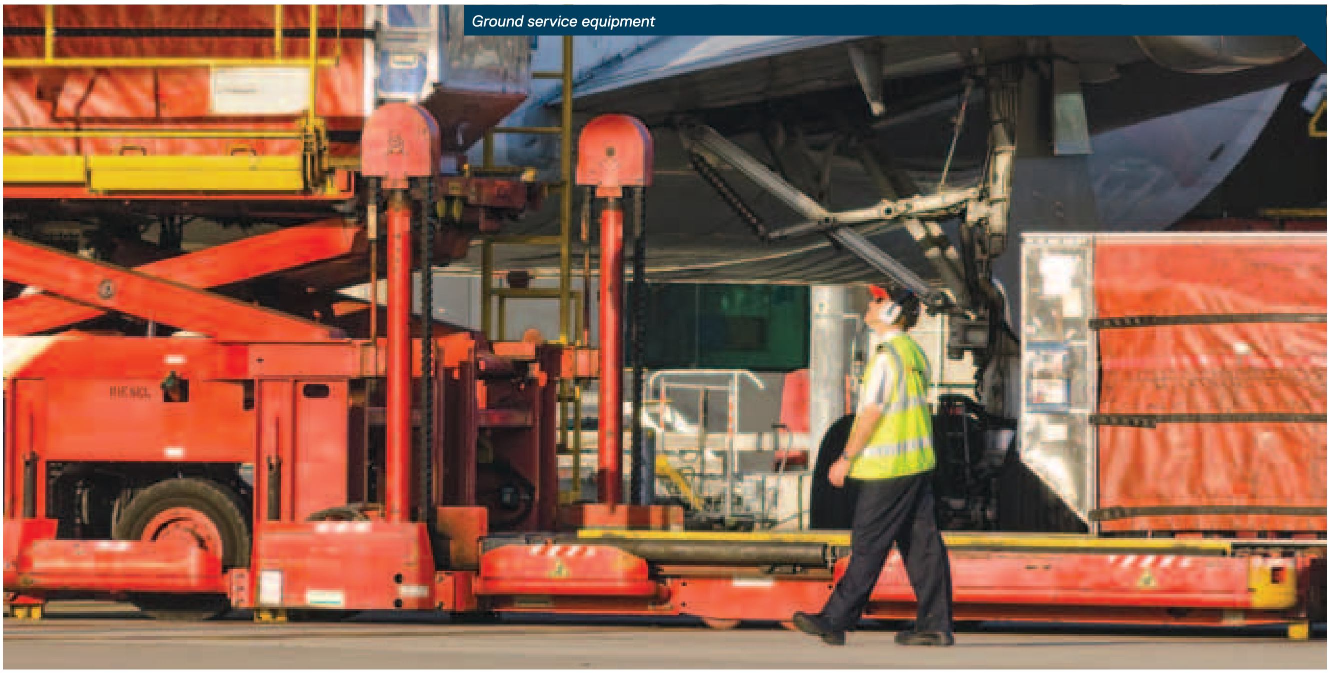
The key development objectives for BAC are to ensure the airport continues operating by facilitating the safe and secure movement of people, freight and aircraft. In order to achieve this, the relationship with different government agencies and industry bodies is key in allowing BAC to achieve an operating environment that embraces innovation, efficiency and continuity of services.

This section outlines the key planning issues that need to be considered for both existing and expected aviation operations in the future. It also details how provision has been made for the further growth of air freight and other airport facilities such as GSE, aircraft maintenance and other operational infrastructure requirements.

PREVIOUS FIVE YEARS

The passenger and aircraft growth experienced at Brisbane Airport since the 2009 Master Plan has resulted in expansion of areas and facilities dedicated to aviation support. The expansion of facilities and services has taken several forms including the introduction of new technology, emerging market trends or the simple demand for additional space. Specifically, aviation support facilities and processes which have expanded since 2009 include:

- A new Qantas Catering facility
- New freight and logistics facilities for Australian Air Express and DHL
- A new administration building for the Australian Federal Police
- Extension of the JUHI fuel distribution system
- Relocation of the BAC Airside Operations Centre
- Common user self-service check in at the International T1 and Domestic T2
- Installation of new x-ray screening equipment for the International T1 and Domestic T2
- A dedicated airside vehicle inspection facility
- A radar and instrument landing system upgrade.



Ground service equipment

PLANNING CONSIDERATIONS

The nature of aviation support varies – from equipment used to facilitate the operation of aircraft, to passenger screening within the terminal buildings, to aircraft fuelling activities. In order to plan for future aviation support needs, the underlying planning principles are to locate GSE in areas that are operationally accessible and in planning for support activities within the terminal buildings, the interior space should be flexible to allow for changes to screening or processing.

In preparing the 2014 Master Plan, BAC instigated a series of Vision Workshops with key stakeholder groups including airlines, freight and ground support providers. The purpose of these workshops was to consider how aviation support activities would change over the next 20 years. This information was useful in challenging current practice and informing the planning needs to be included in this Master Plan.

The key issues discussed in these workshops included:

- Additional storage areas in close proximity to aircraft stands
- The location of refuelling facilities to cater for the extended Domestic T2
- Minimise connection times for transfer baggage
- Preferred freight road corridors
- Flexibility within terminal buildings for passenger screening.

AVIATION SUPPORT

This Master Plan outlines future services and facilities.

PLANNING FOR SAFETY AND SECURITY

Brisbane Airport is committed to maintaining the safety and security of passengers, airlines and the airport community. Aviation security has been progressively enhanced in line with the *Aviation Transport Security Act 2004* and Aviation Transport Security Regulations 2005. A range of mandated security measures have been introduced to airport operations under that legislation and it is anticipated that additional measures will be introduced as legislation is amended to reflect international harmonisation, industry and technology drivers.

BAC has developed and implemented a Transport Security Program as well as adopting the principles of 'security by design', the basis of which is to identify potential vulnerabilities and risks to identify mitigation options for inclusion in the design of new infrastructure.

In recent years, Australian Government regulations for airport security screening have led to enhanced screening of passengers and their possessions, accompanying visitors and airport staff.

Security of airside areas, although subject to strict security controls with dedicated enhanced inspection areas, is being further enhanced to introduce additional processes and technologies aimed at increasing the level of mitigation of the risk to aircraft. The recent opening of the relocated main landside entrance into the Enhanced Inspection Area (Gate 23) has provided additional facilities such as vehicle bays, staff facilities and processing areas.

The adoption of new technologies and processes assists in achieving continuous improvement in safety and security on-airport. This is supported by ongoing innovation through research and development with airlines, universities, other airports and government agencies.

To control and operate its security and emergency services more effectively, BAC is also planning for an improved Operations Control Centre once the NPR becomes operational.

PLANNING FOR AIR FREIGHT

Planning for air freight is an important aspect of airport activities as air freight provides the most effective means to transport time-critical or high-value freight both domestically and internationally. Once freight has arrived at the airport, there has already been, comparatively, a considerable length of time needed to transport the goods from where they originated. Therefore, the time freight is stored at an airport is minimal in the overall supply chain. When planning for air freight facilities on Brisbane Airport, key considerations are given to:

- The proximity of freight forwarding facilities to aircraft gates
- The travel route of vehicles between the freight forwarding facility and airside
- The transport corridors from freight forwarding facilities to arterial connections across SEQ.

Brisbane Airport already facilitates a number of freight forwarding companies primarily within the Airport Central precinct. Total international freight is forecast to increase from 92,000 tonnes per annum (2012/13) to approximately 200,000 tonnes per annum in 2033/34.

As noted in the 2009 Master Plan, BAC expects that the majority of air freight will continue to be transported as cargo in passenger aircraft in the immediate future. The presence of one or more full freighter services to and from Brisbane Airport could be anticipated in the longer timeframe of this Master Plan.

Given the volume of freight transported by passenger aircraft, planning for freight will continue with the approach to locate facilities in the vicinity of the passenger aprons wherever possible. In the longer term and once the NPR is operational, future expansion of freight facilities will be directed to the Airport North precinct.

Figure 7.12 shows the existing and future freight areas required to support the continued growth in freight at Brisbane Airport. Direct airside access from the Airport North precinct to the Domestic T2 precinct will be facilitated by an expanded airside road system with dedicated access in the tunnel structure under the NPR-linking taxiways.

The current freight facilities located between the International T1 and Domestic T2 precincts will be relocated in the longer term to either the Airport North or Central precincts.

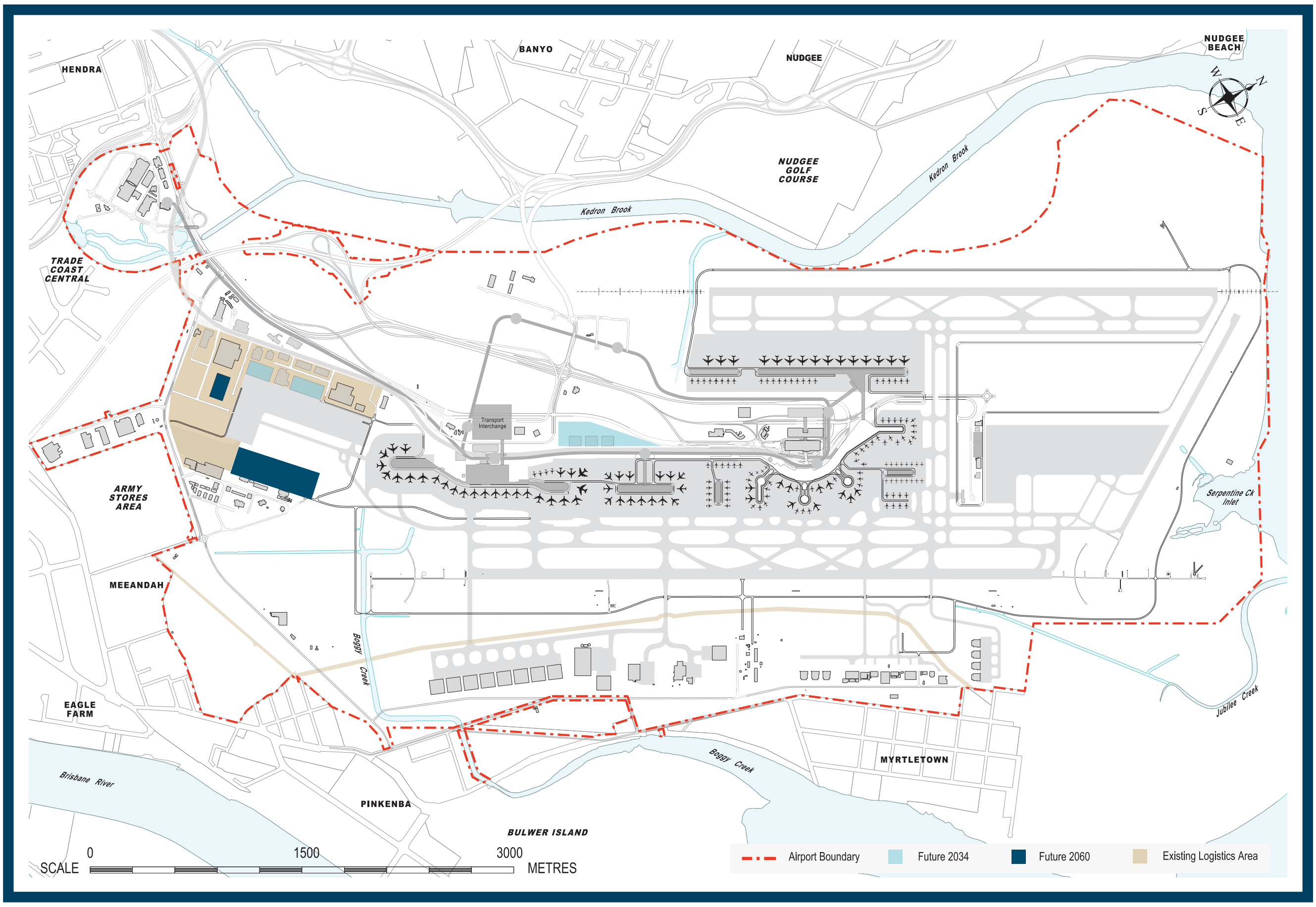
The relocation of facilities including the existing Qantas Flight Catering, Alpha Flight Services, Australian Air Express, Toll and Smiths Aerospace buildings will allow for the expansion of aviation facilities including the satellite terminal, southern extension of the Domestic T2, additional apron area and a southern remote pier of the Domestic T2. The leasing structures in place for these facilities will facilitate that relocation strategy.

PLANNING FOR GROUND SERVICE EQUIPMENT

GSE is used to service aircraft once positioned at the terminal or other parking position and consists of a variety of equipment to provide for a range of aircraft needs. Broadly, there are three categories of GSE used:

- Equipment used by ground handlers for loading/unloading baggage and cargo, aircraft cleaning, lavatory service and potable water supply to aircraft
- Equipment used by ramp engineers for aircraft line maintenance, ground power, preconditioned air and aircraft push-back
- Aircraft containers and unit load devices.

FIGURE 7.12: PLANNING FOR FREIGHT



When reserving areas for the use, storage and subsequent maintenance of GSE, a variety of factors should be considered such as some GSE is limited to low speeds or other types of GSE can be bulky with the need for significant clearances around buildings. In planning for the future demands of GSE, the key principles for consideration are:

» The proximity to aircraft stands

» The proximity to maintenance facilities for GSE that is bulky and/or slower moving

» Accessibility and subsequent use of the airside perimeter roads for all types of GSE and airside traffic.

Brisbane Airport currently has around 38,000 m^2 of dedicated GSE parking and storage areas across the International T1 and Domestic T2 areas.

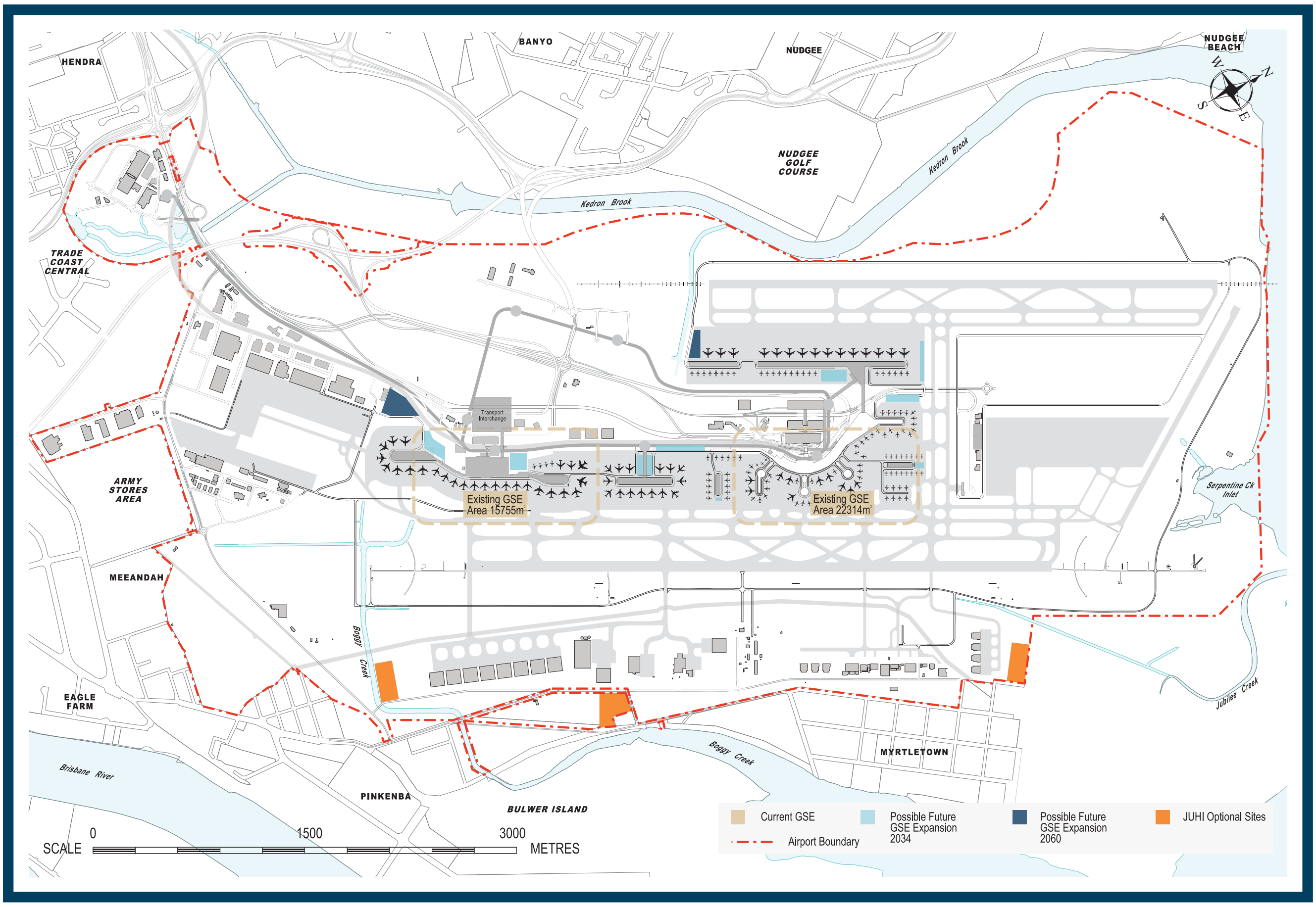
BAC recognises the continued importance of GSE to facilitate the efficient turnaround of aircraft and has considered this in developing the conceptual layouts for future expansion of the terminal areas.

By 2034 it is anticipated that areas dedicated for GSE will be in the vicinity of 55,000 m^2 and 92,000 m^2 of dedicated area by 2060.

The maintenance of GSE is currently provided on-airport for minor maintenance needs, with these facilities distributed between the international and domestic apron areas. This is likely to continue with an opportunity to have a dedicated GSE servicing area within the central airside zone created when Airport Drive is realigned.

BAC will continue to preserve and expand the capacity of the airside and terminal-face road system to ensure facilitation of GSE and freight transfer. Additional passing lanes to assist in overcoming constraints imposed by slow moving equipment will be provided between key supply and destination nodes. Figure 7.13 highlights the current GSE zones within the terminal areas and options to incrementally expand through to 2060.

FIGURE 7.13: PLANNING FOR FUELLING REQUIREMENTS AND GSE



PLANNING FOR AVIATION FUELLING FACILITIES

Efficient and reliable aviation fuelling facilities are a fundamental component of airport operations. Aircraft fuelling facilities and operations at Brisbane Airport are provided by the JUHI operators. The two major jet-A1 fuel installations servicing Brisbane Airport are located at Hakea Street between the International T1 and Domestic T2 aprons (the primary storage facility) and at Lomandra Drive at the corner of Viola Place (a secondary storage facility set to cease operations in 2014). Both installations are fed from either a fuel terminal or direct refinery feed.

Additional storage capacity will be installed at the Hakea Street facility to maintain an operating reserve when the Lomandra facility is decommissioned.

International benchmarking of other airports indicates that the typical reserve for fuel storage can be up to seven days of supply. As at 2014, there is approximately three days reserve held on site. This reserve supplies the following activities:

- The International T1 apron is serviced by a system of in-ground fuel hydrants supplied by a high capacity 600 mm fuel pipeline from the Hakea Street depot
- The Domestic T2 apron primary gates are also serviced by a system of in-ground fuel hydrants supplied by a medium capacity 450 mm fuel pipeline from the Hakea Street Depot
- Regional aircraft and remote stands on the domestic apron are serviced by tanker fuelling, as is the GA apron, and those aircraft requiring refuelling in the Airport East precinct

Fire fighting equipment on stand-by at Brisbane Airport

- The Logistics Apron has an installed fuel hydrant system, which is currently inactive and which is connected to the Lomandra Drive JUHI Depot. The Logistics Apron is currently serviced by tanker fuelling methods
- GSE and airside vehicle refuelling requirements are currently addressed by several secondary facilities located within airline leased and licensed areas.

In planning for the future expansion of the JUHI depot and storage facility, two key factors have been considered – the amount of storage reserve on site and, the distribution system to the aircraft.

While newer aircraft are more fuel efficient, demand for fuel at both the International T1 and Domestic T2 aprons is expected to increase over the period of this Master Plan in line with to the growth in aircraft movements.

This is coupled with planning for additional storage to reflect international benchmarking for fuel reserve criteria. Table 7.8 outlines the estimated fuel storage requirements for Brisbane Airport.

During the timeframe of the 2014 Master Plan, both short- to medium-term fuelling facilities and long-term fuelling requirements need to be carefully planned and aligned with the projected future fuel demand and layout of the airport. For the short- to medium-term, modifications are expected to include:

- The abandonment and remediation of the Lomandra Drive Depot
- The installation of additional fuel storage at the Hakea Street Depot
- The possible longer-term installation of a replacement higher capacity feed line from the Shell Pinkenba Facility to Hakea Street Depot in a long-term secure alignment airside, in part parallel to the Boggy Creek Drain and the balance parallel with Taxiway B
- The possible reinstatement of hydrant fuelling to the Logistics Apron with a hydrant supply feeder established from the International T1 apron fuel hydrant system. The alternate option to this would be additional high-capacity tanker equipment to meet the demands of freight operations at the Logistics Apron

» A possible additional primary apron hydrant feeder route to the apron expansion areas to the north of the domestic apron

» For ground fuels the establishment of suitable common user GSE and airside vehicle fuelling facilities within a functional operating distance of the major apron areas. These facilities would preferably have a landside interface to minimise the requirements for airside supply access by tankers.

In the long-term, BAC anticipates that:

» In order to retain connectivity of apron between the international, domestic and future satellite terminals, the existing JUHI depot at Hakea Street would require relocation. This relocation would be expected after 2032

» The allocation of a long-term land reservation within the Airport East precinct of sufficient size for the relocation of the existing Hakea Street Depot. The 2014 Master Plan provides for three alternate sites for a JUHI facility. One option may be to operate a primary and secondary 'booster'. This booster site may be located in the Airport North or Airport Central precincts. Figure 7.13 shows the alternate land reservations for the long-term relocation of the Hakea Street Depot.

BAC will continue to liaise with key stakeholders regarding industry trends and alternate fuels for aviation purposes.

PLANNING CONSIDERATION FOR AIRCRAFT MAINTENANCE FACILITIES

Currently, Brisbane Airport has two types of aircraft maintenance activities being carried out on-airport including line and heavy maintenance. Line maintenance is carried out at both the aircraft gate and within dedicated hangar facilities, while heavy maintenance requires a hangar that conforms to relevant aviation standards.

As maintenance activity increases, it results in a critical mass of activity requiring ancillary services such as aircraft paint shops, upholstery repair, instrumentation as well as component supply and maintenance. The Airport East precinct is configured to provide both front line – direct airside connected sites – and second line sites for these types of facilities. In 2014, the types of operators using these hangar facilities include Qantas Airways, Virgin Australia, Five Star Aviation, Alliance Airlines and Australian Aerospace.

Future provision of space for the expansion of maintenance hangars has been made, be that for new airlines requiring a maintenance facility at Brisbane Airport or for existing airlines relocating maintenance programs to Brisbane. For example, in 2013 Qantas announced the relocation of Boeing 737 heavy maintenance to its hangars located in the Airport East precinct. This extends the Brisbane Airport based fleet maintenance of Qantas aircraft to include Airbus 330, Boeing 767 and Boeing 737 aircraft.

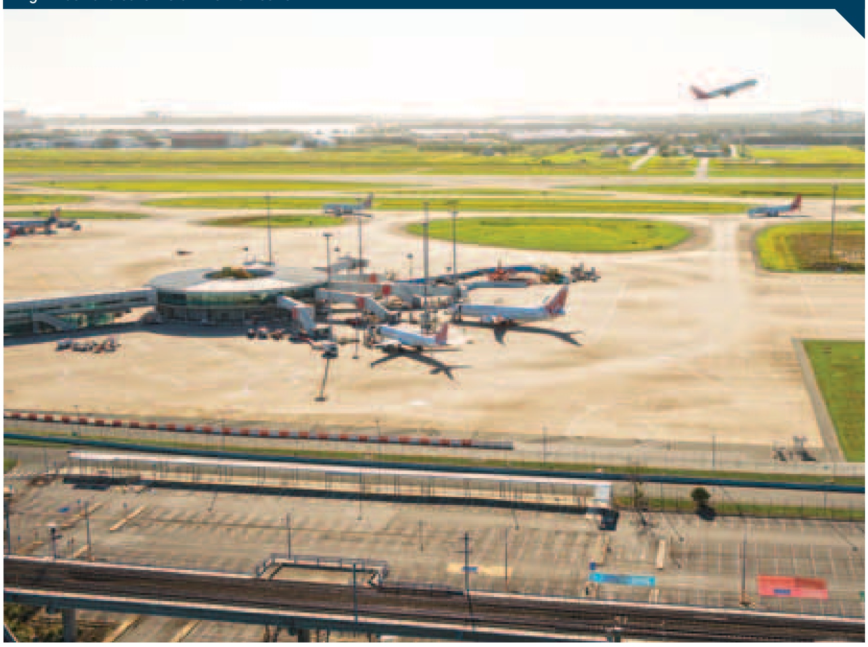
TABLE 7.8 FUEL STORAGE FORECASTS TO 2060

	Fuel Reserve Capacity	Forecast Aircraft Movements	Forecast Passengers
2014	9ML	220,000	22,500,000
2034	36ML[1]	358,000	48,200,000
2060	48ML[1]	495,000	70,000,000

1 *This increase includes additional capacity commensurate with international benchmarking of seven days supply.*

Source: Airbiz 2013

Virgin Australia satellite at the Domestic T2



The Airport East precinct contains some existing constraints that must be accounted for in the planning and design of infrastructure and facilities in some locations within the precinct. Namely, a sewer easement is located along the majority of the length of the precinct. The planning implications translate into weight limitations for aircraft crossing the easement at taxiways H and M.

Maintaining access to these taxiways is critical to facilitate the continued growth in aircraft maintenance activity in this precinct. In the long term, an additional high strength taxiway has been planned to facilitate additional heavy maintenance facilities to cater for widebody aircraft in the southern area of this precinct.

Another planning constraint existing in the Airport East precinct relates to the current alignment of Main Myrtletown Road. This public road currently which truncates the airport lease-holding is planned to be relocated into a 30 m corridor reserve along the far eastern boundary of the Airport East precinct, removing two sharp corners in the road and significantly improving aircraft maintenance facilitation and better public ground transport facilitation to downstream Myrtletown industrial zones.

FLIGHT CATERING

Airline operations rely on efficient flight catering services.

Airport East precinct commonly has poor in situ ground conditions which require considerable geotechnical improvement in order for provide suitable foundations for buildings and aircraft aprons. In recognition of this, coupled with the significant periods of time required to improve soils in situ, BAC placed aeronautical grade sand across approximately 30 hectares of the southern sections of the precinct in preparation for future development in this precinct.

Currently, a small number of FIFO passengers are processed within the Airport East precinct. The development of the Charter Terminal in the GA area will provide a custom built facility for this activity. Once the Charter Terminal is operational it is BAC's preference for the current passenger processing in the Airport East precinct to move to this facility. Relocation of this activity to the GA area will also translate into fewer runway crossings for those aircraft. This will translate into improved runway efficiency of the existing system especially prior to the NPR becoming operational.

In addition to aircraft maintenance facilities, Brisbane Airport endeavours to provide support facilities including engine testing facilities. Planning for this airside facility includes future development of a remote apron that will be used for engine testing after maintenance or manufacture. This facility is planned for development within the time horizon of this Master Plan and will be located in the Airport North precinct to maximise separation from residential areas. Figure 7.14 highlights the current and planned locations for aircraft maintenance activities and engine test locations.

PLANNING FOR FLIGHT CATERING

Flight catering facilities are recognised by BAC as an important support facility for airline operations.
Flight catering facilities have several functions including:

- The preparation of passenger meals
- Storage and replenishment of cabin service supplies used in aircraft including in flight magazines, toiletries and towels etc.
- Management of aircraft food wastes generated in flight
- Storage of aircraft cabin equipment including catering trolleys, crockery and glassware etc.
- Storage of pre-packed meals prepared at an alternate location and transported to the airport for loading onto aircraft.

One of the key differences between premium service airlines and low cost carriers is the in-flight catering products offered. Premium service airlines have higher demand for catering facilities and storage areas than low cost carriers. A mix of premium and low cost carriers operate at Brisbane Airport and consequently catering facilities suitable to both types of airlines are needed.

As at 2014, the on-airport flight catering facilities are located in the Airport Central precinct. The ongoing need for flight catering facilities is being addressed by BAC through the future development of a proposed airside zone within the Airport Central precinct between the International T1 and Domestic T2 zones. This area would be available for the development once the realignment of Airport Drive has occurred.

PLANNING FOR AIRSERVICES AUSTRALIA FACILITIES

Airservices owns and operates a number of facilities across Brisbane Airport and is responsible for the provision of the following services:

» Air traffic control

» Radio navigation aids

» Aeronautical information

» Aviation rescue and fire fighting

» Aircraft noise monitoring at various locations in Brisbane.

The present control tower and related facilities are well suited to handling air traffic at Brisbane Airport. The control tower is suitable for the current 01R/19L and 14/32 runway operations and is of sufficient height to provide observation of the current runway ends and taxiway systems. The NPR will basically operate as an independent runway system and will require the installation of a separate console system for which the control tower cabin was originally sized.

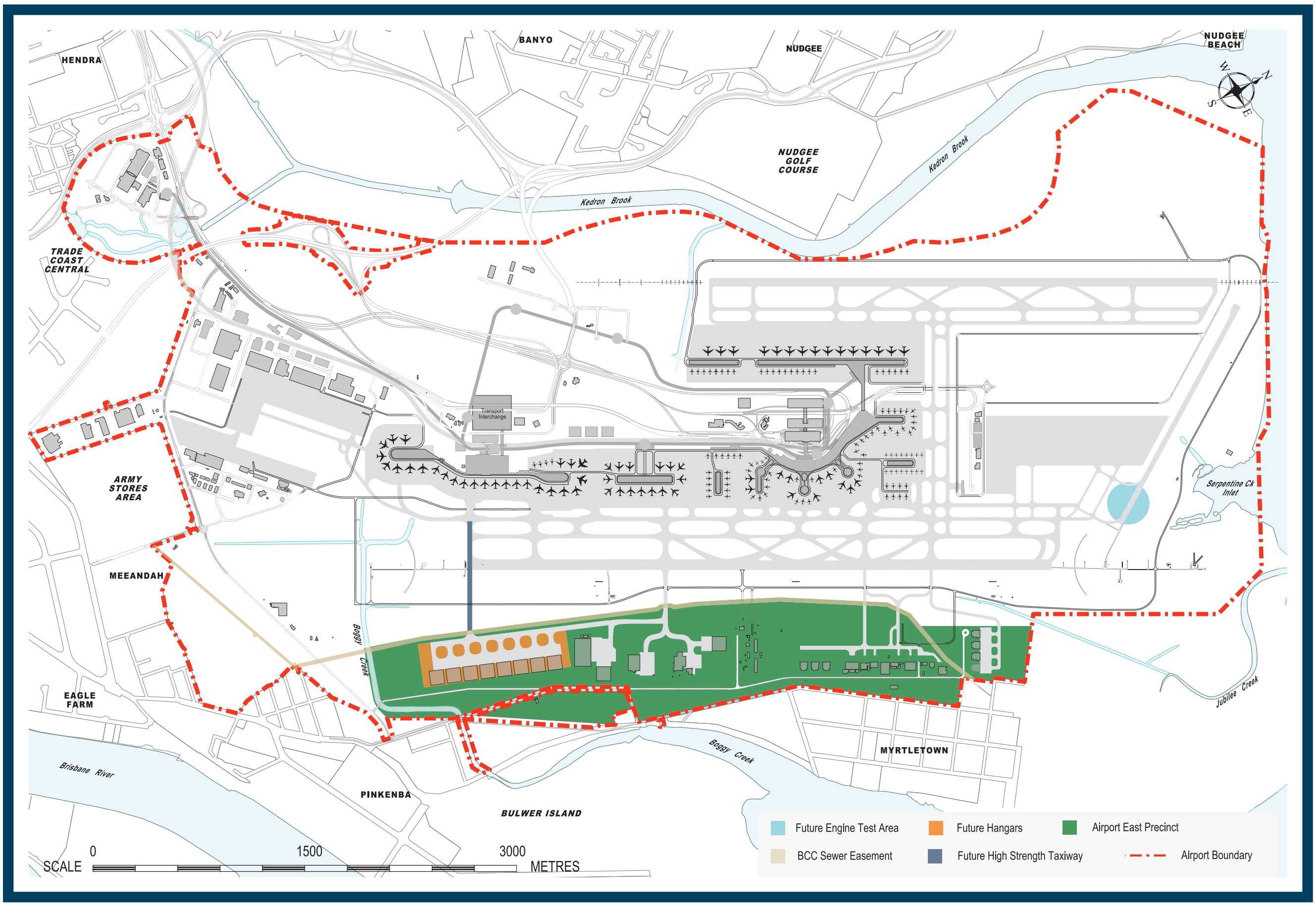
Assessments completed by Airservices in relation to the control tower visual response time for the NPR show that while the optimum four second period will not be met, visual detection of aircraft will still be achievable for the NPR.

This may result in a slight decrease in the operational efficiency of the runway necessitating slightly longer time spacing between aircraft movements on the NPR. The control tower response time for the Moreton Bay end of the approved NPR (threshold 19R) is between five and six seconds; the response time for the other runway end (threshold 01L) is within the four second optimal period. It should be noted that no siting opportunity exists within the airport for single a control tower that would provide the four second response time to all runways ends.

Supplementary aids using radar, closed circuit television, transponders or GPS based tools are available and will be further considered as part of the planning for the NPR.

Construction of the current control tower was completed in 1988 and Airservices has recently completed a structural assessment of the tower's façade. Airservices have indicated that this, coupled with a capital program to extend a range of internal components of the tower, means that the operating life of the existing control tower will be at least 25 years beyond the planning horizon of this Master Plan.

FIGURE 7.14: PLANNING FOR AIRCRAFT MAINTENANCE



It is planned that when replacement of the control tower is required in the long term, it will be closely positioned to the current site, potentially with a higher cabin level and with the operational implications of its delivery determined at a significantly later date.

Aeronautical Equipment

The equipment on site such as radio navigational aids is sufficient for handling the traffic on the existing runway systems.

The approved NPR may require lighting and navigational structures (high intensity approach lighting – HIAL) in Moreton Bay, outside the extent of the current Brisbane Airport boundary. The need to locate such facilities on the tidal flats seaward of the airport, and an assessment of any associated impacts, was addressed in the EIS/MDP for the NPR.

If BAC decides, in consultation with CASA, Airservices and the airlines, that such off-airport navigational lights and aids are required for the NPR, then the construction of such facilities will require approvals under State Laws.

Rescue and Fire Fighting Facilities

Currently, Airservices is approved by CASA to provide aerodrome rescue and fire fighting services for Brisbane Airport. In order to conduct these services, Brisbane Airport has one main fire and rescue station located east of the main runway and one satellite station south of the cross runway.

Airservices Australia provides a Category 10 level of service for approximately 18 hours a day and Category 9 level of service for the remaining period of the day. The extent of fire fighting and rescue facilities is determined by the protection level that is recommended by ICAO for an airport of the size of Brisbane Airport and for the size of aircraft operation at the airport, rather than by traffic level.

The fundamental planning parameter for sighting the existing two fire stations is to provide appropriate response times to the existing main and cross runways. The main station contains facilities for aircraft fire fighting and rescue, as well as for building fire fighting.

In the short term and in preparation for the NPR becoming operational, a new fire station will be constructed and commissioned most likely in the Airport North precinct.

Aligned with Airservices approach, a new facility will be constructed for the NPR and the existing main fire station will continue to operate to ensure response times can be achieved. Once Airservices are committed to a site for NPR operations, the site not used will be available for development in line with the intended uses for that precinct described in Chapter 6.

In the planning horizon of this Master Plan, Airservices will review the Memorandum of Understanding with relevant Queensland emergency response agencies which provide assistance in responding to incidents on-airport. Airservices will also seek planning information from Brisbane Airport for future developments in the vicinity of the new station or new structures which may impact on the new station to ensure the station remains compliant with CASA regulations.

Radar Facilities

An En-Route Surveillance Radar facility is established on the airport. This facility, maintained by Airservices, is situated in a location that is clear of the construction works for the NPR. The radar underwent a major upgrade in 2013 and is now designated as the secondary radar facility for Brisbane Airport. The previous En-Route Radar, now Terminal Area Radar, located at Mt. Hardgrave on North Stradbroke Island, was upgraded in 2013.

Airservices has also established an Advanced Surface Movement Guidance and Control System at Brisbane Airport. The system involves an surface movement radar (SMR) installation in the Airport East precinct supplemented with a system of distributed remote units (RUs) that have the capability to, as a minimum, triangulate all areas of the movement area. An additional SMR and a number of RUs will be required for coverage of the NPR. This transponder based system provides a comprehensive real time surveillance screen image of the airport's airfield, operational area and terminal area airspace. It will assist ATC in managing flight operations at Brisbane Airport and further reducing the risk of runway incursions.

Navigational Aids and Systems

Navigational aids form a fundamental component of aeronautical operations. Significant advances have been achieved via the adoption of new technology in navigational aids. Adopting these technological advances translates into safer, more precise and more efficient aircraft navigation for both in flight and on ground operations.

The key navigational aid at Brisbane Airport is an Instrument Landing System (ILS) consistent with the Category 1 standard set by ICAO. Between 2014 and 2019, additional instrumentation in the form of transmissometers may be added to the ILS to improve the safety and efficiency of operations in low visibility conditions.

In preparing for the commencement of operations on the NPR, a key planning objective for future navigational aid requirements is to achieve a balanced runway system. This means that the technology and equipment for operations installed for each independent runway, should in principle, be the same. To achieve industry consensus on the navigational technology to be adopted for a balanced runway system, an industry working group has been established by Airservices and BAC with industry representation from airlines and CASA. Some of the key elements to be examined by the working group include:

» The suitability of the ILS to facilitate independent approaches on each runway

» The adoption of emerging technology including Ground Based Augmentation System as a future satellite based substitute for ILS.

The precise navigational aid requirements will be determined as part of the detailed planning and design of NPR infrastructure.

OTHER PLANNING CONSIDERATIONS

Engine Test Area

Aircraft engine tests are currently undertaken within the Airport East precinct where aircraft maintenance is undertaken and is conducted in accordance with BAC's guidelines to minimise any noise impact on surrounding areas. A future option is to relocate this area to the Airport North precinct in the vicinity of the existing 14/32 runway, after it is decommissioned when the NPR becomes operational.

Airport Maintenance Facilities

Airport maintenance undertaken by BAC involves maintenance of pavements, airport lighting, drainage channels, buildings, mechanical/electrical/electronic installations, water supply, sewerage, other utilities and landscaping. This maintenance must be undertaken to ensure the safety and reliability of airport assets and operations and provides staff and visitors with enhanced amenity.

BAC's maintenance facilities base is located east of the existing main runway within the Airport East precinct. This complex consists of a number of buildings such as stores and workshops. Wherever practical, expanded or future facilities can be located in the Airport North precinct, which would facilitate efficient access and response to the airfield surrounding the NPR.

Royal Flying Doctor Service (RFDS)

RFDS plays a critical role throughout Queensland's regional and remote communities. In recognition of this, Brisbane Airport facilitates RFDS operations to enable medical emergency support and patient transport throughout Queensland. RFDS flights are considered non-RPT flights and priority is given to them in medical emergencies.

In the situation that an RFDS flight is to transport patients on a non-urgent basis, these flights are scheduled in non-peak periods to avoid potential delays as a result of RPT flights during peak periods.

The RFDS has a dedicated hangar and administration facility in the Airport North precinct, which is close to landside vehicle access for emergency vehicles, as well as the helipad for Brisbane Airport. In the short to medium term of this Master Plan, it is anticipated that the location of these facilities will be sufficient to continue facilitating RFDS operations.

Airfield Lighting Equipment Rooms

There are currently three airfield lighting equipment rooms for the existing runway system. These buildings contain the airport's back-up electricity generators to support runway lighting and are relatively small in size.

Two additional airfield lighting equipment rooms will be required to house constant current regulators, switch boards and circuit selectors, high/low tension switch gear, transformers and an automatic generator with control for the airfield lighting systems of the NPR.

1 The Brisbane CBD is approximately 8 km from Brisbane Airport.

2 Security at Brisbane Airport.

3, 4 Operations on Brisbane Airport's aprons and runway.