8

ENVIRONMENT

A cornerstone in developing Brisbane Airport is to proactively manage the surrounding environment to ensure the impacts of growth are managed.

8.1 Introduction

An informed response to climate change, reduced use of natural resources, protection of the airport's biodiversity values and management of the airport's landscape and open space are vital elements to achieve that goal.

Three key environmental priorities underpin the development objectives of the 2014 Master Plan, which are:

- Achieve a balance between the on-airport built environment and biodiversity values
- To be recognised as a leader in the management of energy, water, waste, noise and biodiversity
- Achieve environmentally sustainable development across the airport.

To achieve these objectives, BAC is committed to reducing its carbon footprint through improving energy and water efficiencies, waste management protocols and maintaining biodiversity values.

A focus on continuous review and improvement will allow BAC to respond to ongoing changes in the regulatory framework and to act on new environmental research findings and stakeholder feedback.

Partnerships with government, community and customers will continue to be an important conduit to BAC's success in achieving environmental sustainability.

This Master Plan highlights that Brisbane Airport will experience continued growth over the next 20 years. Critical to the successful achievement of balancing the built and natural environments, BAC will continue to implement an environmental management framework across all activities.

BAC's commitment to the environment goes beyond risk and compliance. In the past five years, BAC has engaged in ongoing research and innovation to achieve major gains with natural resource efficiencies, a more sustainable urban and built environment and ongoing protection of Brisbane Airport's biodiversity values.

The basis of BAC's environmental management framework is the 2014 Airport Environment Strategy (AES) and associated adoption of management protocols consistent with ISO 14001. This framework will facilitate the growth forecasts outlined in this master plan to be realised while balancing environmental outcomes and reducing impacts.

BAC has a designated role to manage overarching environmental impacts associated with Brisbane Airport. Tenants and contractors, as operators of undertakings on-airport, are responsible for environmental management of their operations.

In responding to legislative requirements and corporate environmental goals, the 2014 AES sets the direction for environmental initiatives across Brisbane Airport for the next five years.

To ensure that environmental management is considered from a 'whole of site' perspective, this strategy also provides guidelines for environmental management by other airport users to ensure that their operations and activities align with the Airports Act and BAC's sustainability objectives.

Stakeholder input, approval and endorsement of the AES, alongside the Master Plan, provides a process for parties who are interested, involved in or affected by on-airport activities to contribute to this strategy.

All commitments and responsibilities under the AES for operational and site management are captured and implemented within the airport's Environmental Management System (EMS).

In this Master Plan, BAC's recent environmental achievements are presented together with those initiatives that are planned to be implemented over the next five years.

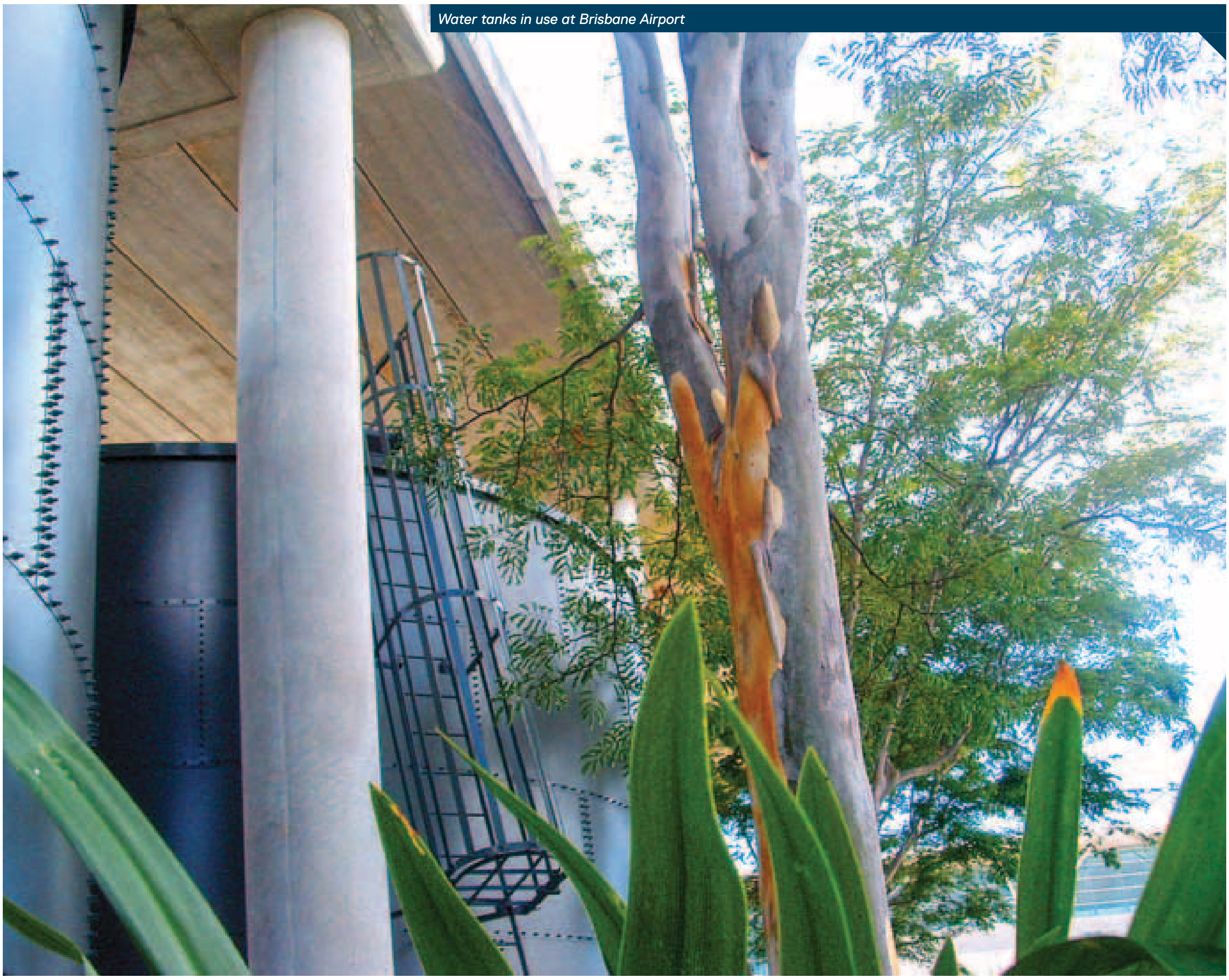
8.2 Achievements Over the Past Five Years

BAC is committed to achieving a high level of environmental compliance and environmental sustainability performance for its operations. Brisbane Airport's environmental compliance program is well established. It is demonstrated through a rigorous environmental review, monitoring and inspection program for all high risk activities. Details of these programs can be found in the 2014 AES with a summary of key issues following.

Water

BAC has achieved significant water savings throughout the last decade via the implementation of a Water Management Strategy. This provided a framework for BAC to reduce potable water usage across all aspects of operations.

This strategy also guided the installation of water efficient fixtures and fittings in new and existing buildings, the roll out of smart metering to detect abnormal water consumption and the installation of a series of water tanks to capture rainwater for use in irrigation.


Water tanks in use at Brisbane Airport

BAC manages several water sources across the airport including stormwater captured in freshwater lakes; rainwater harvested from roof spaces and stored in tanks; Class 'A' recycled water supplied by Queensland Urban Utilities (QUU); and potable water.

Energy and Carbon

BAC developed an Energy Management Strategy in 2011 outlining the preferred approach for balancing Brisbane Airport's energy demand and carbon emissions. Guidance from the National Australian Built Environment Rating System (NABERS) has been integrated into BAC's energy efficiency efforts. Supplementing this has been a series of energy efficiency audits across major buildings and car parks and the installation of solar arrays on selected buildings. Collectively, these audits and renewable energies have provided savings of approximately 4.8 gigawatt hours of energy since 2011.

Upgrades to the airport electrical metering system were undertaken to enable more accurate system monitoring and data verification. BAC also established an ongoing partnership with Amsterdam Airport Schiphol and research alliances such as the Guided Innovation Alliance (Ergon Energy, Queensland University of Technology and Smart Grid Partners) regarding the long-term sustainability of electricity delivery on airport.

The majority of BAC's greenhouse gas emissions are generated from the consumption of electricity. Therefore a key initiative in BAC's response to climate change will be to continue to reduce carbon emissions through improved efficiencies and the generation of onsite renewable energy. Reductions in BAC's carbon footprint over time will be demonstrated through its continued efforts to reduce demand and substitution of renewable energy.

Fill Materials and Land Contamination

BAC has long recognised the benefits of responsible soil management and uses comprehensive planning, monitoring and management tools to avoid soil degradation, contamination or loss.

There are two key issues that relate to soil management on Brisbane Airport – potential or actual acid sulfate soils (PASS/AASS) and contaminated site management.

For projects requiring significant earthworks, the adopted approach during the 2009 Master Plan was to identify and remedy the disturbance of PASS before and subsequently during BAC's approval phase for construction projects.

The analysis of PASS in the early stages of airport developments has also delivered improved environmental outcomes by way of achieving appropriate erosion and sediment control both during and post construction.

BAC manages contaminated sites using a risk-based approach. A Contaminated Site Register (CSR) has been prepared which forms the basis of a management framework. BAC will continue to monitor and remediate contaminated sites in accordance with the CSR and any advances in industry standards such as the National Environmental Protection Measures (NEPM).

Waste

BAC has developed Waste Management Strategy for operations under BAC's control. This stratgey allowed the implementation of innovative ways to reduce waste generation through initiating changes in logistical operations at the Domestic T2; including recycling targets in contract clauses; facilitating a food rescue collection service with key tenants; and the introduction of public space recycling at the International T1, common user area of the Domestic T2 and in the Skygate precinct.

Ground Based Noise

While most receptors of ground-based noise on airport are commercial entities, noise can also impact on nearby operations associated with hotels, childcare centres, medical centres, educational facilities and residential communities.

BAC has continued to record aircraft engine test events and acted on any complaints received. In implementing this Master Plan, a range of ground noise attenuation strategies will be applied in designing and constructing new facilities.

Biodiversity Values

Protection of biodiversity values has continued over the period 2009 to 2014 with the implementation of the Biodiversity Management Strategy. One of the key achievements during this timeframe was the development of a comprehensive ecosystem health monitoring program for all Environmentally Significant Areas (ESAs) on Brisbane Airport.

This program monitors and detects changes in ecosystem health to ensure the appropriate management of biodiversity values continues. Furthermore, a Wildlife Hazard Management Plan has been prepared as a means to manage and inform planning controls to reduce the operational risks associated with aircraft wildlife strike in the immediate vicinity of the airport.

ENVIRONMENT

BAC has many individual environmental management plans in place.

Cultural Heritage

In recent years, Brisbane Airport has maintained an interest in understanding on-airport sites or structures of cultural significance. While the area of Brisbane Airport has been highly modified during the history of European settlement, two Indigenous heritage sites occurring on airport land are listed on the Queensland Cultural Heritage Register and Database.

Three non-Indigenous sites are currently identified on airport land. These include two sites associated with the former Cribb Island community and the Kingsford Smith Memorial.

BAC will continue to require Construction Environmental Management Plans to address methods for managing heritage items should any item be discovered during construction related activities on site.

8.3 Planning Considerations

Looking ahead, the environmental strategies of highest priority for BAC are those that address the stated development objectives to balance the built environment and biodiversity values; be a recognised leader in the management of energy, water, waste, noise, biodiversity and to achieve sustainable development across Brisbane Airport.

To this end, key considerations for BAC to integrate into future plans include resultant impacts of climate change, environmental management of development across the planning, design and construction phases, the consumption of energy, water and waste management, particularly in the operational life of a development in addition to managing the biodiversity zone and environmentally significant areas.

8.4 Planning for Climate Change

The key to sustainable development of Brisbane Airport is to understand and adapt BAC's long-term plans to be cognisant of the impacts climate change will bring.

The projected impacts of climate change are numerous and varied. BAC recognises that it has a role to play in adapting to the long-term impact of climate change. In doing so, a number of key climate change risks have been identified for Brisbane Airport, including:

- Increased sea levels
- Increased storm and rainfall intensity
- Changes to cyclone behaviour
- Increased occurrence and length of heatwaves
- Elevated groundwater levels.

Over the period 2009 to 2014, BAC has continued to consider long-term implications of climate change through a careful assessment of development levels in order to account for future sea level rise and storm surge events.

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1 Use of recycled water at Brisbane Airport.

2 Sediment and erosion controls protect native species from construction activity.

3 Brisbane Airport is located adjacent to Kedron Brook floodway.

Furthermore, as the manager of a major transport infrastructure and a sizeable land bank in South East Queensland, BAC's immediate aims are to manage and reduce carbon emissions of facilities and activities for which it is directly responsible.

Energy efficiency auditing to identify benchmarks and targets and a multi-layered water management strategy are examples of how BAC will continue to develop Brisbane Airport while actively minimising the long-term environmental impacts continued growth could bring.

It is vital that airports, airlines, aircraft manufacturers and air traffic providers continue to work together to establish shared responses to impacts climate change will bring. Where practical, BAC will encourage a reduction in overall emissions on-airport through ongoing collaboration and partnerships.

BAC already has a range of measures in place to address long-term climate change affects. It is likely that there will be future measures that could be implemented, although the nature of these measures is tied to future estimates of climate change impacts by international organisations.

8.5 Framework for Environmental Management to 2019

BAC has formulated a range of strategies detailed in the 2014 AES designed to reduce the environmental impacts of on-airport development and activities. Adverse impacts of operational and construction activities embrace two broad areas of impact. These are:

- Impacts associated with construction of infrastructure, buildings and other facilities and services
- Impacts associated with the operation of new and existing facilities.

In the context of the 2014 AES, BAC implements programs across a number of environment disciplines to ensure that these impacts are prevented or mitigated where appropriate. These include requirements placed on operators responsible for construction activities, tenants operating on Brisbane Airport and BAC's own staff who are involved in planning, developing and managing the airport.

The EMS is the key management tool used to record activities conducted on-airport, to assess and manage related environmental risks and to audit performance in order to achieve continuous improvements.

BAC conducts risk-based reviews of its own operations which include airfield and terminal maintenance, airfield safety and security, contractor management and administration. In this way, audits conducted in the context of the EMS ensure that the high standards of environmental performance are maintained in day to day operations.

While tenants and contractors are responsible for the environmental management of their own activities, the EMS also aims to ensure that these management plans respond to the level of risk posed by these activities. Each contractor and tenant is required to develop an Environmental Management Plan (EMP) that clearly addresses the risks and impacts associated with activities that they undertake at Brisbane Airport. BAC also conducts annual environmental inspections of tenant operations of a higher risk nature.


Clearing is managed under an Environmental Management Plan

Where new construction is occurring on-airport, the EMS requires that all developments undergo an environmental assessment. All new developments must show consideration of environmentally sustainable design elements and meet BAC's ongoing environmental management requirements.

Certain development projects may trigger a Major Development Plan (MDP) requirement under the Airports Act. As well as being triggered by a cost threshold or a type or size of development, a MDP may also be required due to a potential environmental or ecological impact.

The EMS framework allows for a structured approach for managing the key sustainability initiatives of energy and water efficiency, waste management and maintaining biodiversity features across Brisbane Airport.

BAC's immediate aims are to manage and reduce the carbon emissions for which it is directly responsible.

Energy Management

Implementation of the energy strategy over the period 2014 to 2019 will lead to further efficiencies to support greenhouse gas reductions across Brisbane Airport. Current investigations of solar panels and the feasibility of increasing the use of gas as an energy source will also inform the future energy mix employed on-airport. In the future, BAC expects to increase its research into alternative energies and their potential success in the airport environment.

Integrated Water Management

BAC's Water Management Strategy which has underpinned the efficiency gains over the last decade will continue to form the basis of management across the site.

Key features include water sensitive urban design, minimising potable water consumption, use of nano-filtration and recycled water alongside continued implementation of a water quality monitoring program.

These strategies depend on responsible integration of water supply and storm water networks (potable and non-potable) across Brisbane Airport.

Given the proximity of the airport to the Brisbane River and Moreton Bay, forward thinking and integrated approaches to water management are vital to minimise any potential adverse impacts of airport operations and development.

An influential factor in the airport's water quality management is its location between the Boggy Creek/ Brisbane River and Kedron Brook sub-catchments which discharge into Moreton Bay. Because these waterways are part of the Lower Brisbane River Catchment, the potential for pollutants resulting from upstream activities to enter airport drainage channels through tidal processes is high.

Waste Management

In the long term, waste management (volume generated, storage, recycling and disposal) at airports will require more innovative solutions. During the implementation of the 2014 Master Plan, BAC will continue to explore ways to increase recycling and responsible disposal.

More innovative approaches for the intermediate storage and disposal of waste on-airport may well emerge as a result of a program of partnered research. Additional insights to best practice in waste management processes and systems adopted at other international airports will also help to shape future strategies.

Balancing Built Environment and Biodiversity Values

A high priority for BAC is to protect and manage the airport's natural resources. The 2014 AES outlines key priorities of continued management of Brisbane Airport's unique Biodiversity Zone, adoption of drought-resistant landscaping, as well as ongoing operational assessment of wildlife strike risks.

The BAC Biodiversity Management Strategy provides the foundation to guide the management of Brisbane Airport's biodiversity values. Key elements to be maintained, enhanced or recreated in line with this strategy are:

- Mangrove communities and their associated species
- Tall, unmanaged grasslands and their associated species
- Intertidal sand flats that provide feeding grounds for wader birds including migratory birds listed in international agreements and endangered birds
- Habitats for high risk species such as Lewin's Rail.

The strategy provides guidelines for the management of the Brisbane Airport Biodiversity Zone that occupies around 10% of the airport's total area.

8.6 Landscape, Open Space and Public Realm

The location of Brisbane Airport in itself offers varied landscapes and open space areas. Central to balancing the built environment with biodiversity values is the ability to provide open space and landscaped linkages across the airport precincts. The landscaped environment, open space and built environments come together to form the public realm of Brisbane Airport.

The quality of the public realm is vital to creating an environment where people want to visit and work – public realm is a catalyst in connecting people and building opportunities. To facilitate the creation of high quality public space across Brisbane Airport, the core elements BAC has adopted for its landscaped and open space networks include:

- Scenic amenity that is enhanced through landscape design and the use of a variety of colours, textures and materials in areas with high public use
- Water sensitive urban design to align with the Queensland sub-tropical landscape and the use of drought tolerant native plants to minimise high maintenance grass areas and reduce water consumption for irrigation
- Planned and integrated pedestrian and cycle paths to access community places
- Artwork and height variation to accentuate the entrances or precinct themes.

Connections between precincts are strengthened through the relationship of built to natural environment especially with the surrounding waterways, large environmental and landscaped areas. As the airport develops, the landscape will change accordingly, hence the opportunities to protect and enhance landscape and public realm character will appear through future developments.

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1 Landscaping enhances open space at Brisbane Airport.

2 Drought tolerant species are used across the airport.

3 Colourful landscaping in the Airtrain corridor.

Some examples of landscaping and public realm integration over the past five years include:

- Domestic T2 Skywalk and terminal face roads connecting pedestrian movements seamlessly with parking, ground transport and public areas whilst transitioning areas of hardstand to soft landscaping themes
- Creating a kinetic design artwork blanket across the front of the new Domestic T2 car park softening the hard structural design lines
- Integrated design solution with the new commercial office building adjacent to International T1, drawing on inspiration from the sub-tropical surrounding landscape with sleek architectural design and vibrant building façade treatments.

The outcomes of high quality public realm across Brisbane Airport include opportunities to improve legibility, way-finding and social interaction.

The provision of pedestrian-friendly streets, outdoor recreation opportunities and community focal points where people can meet and interact, each contribute and enrich people's interaction with Brisbane Airport.

Some initiatives which will be investigated from 2014 to 2019 include:

- The relationship of new site development with the environment such as natural vegetation and water courses
- Water management practices expressed as a feature rather than just a function
- Extension of existing landscaping themes in areas such as Da Vinci and Skygate building on well-established public space design
- Newly established pedestrian spines creating a journey space at human scale.

Brisbane Airport's Landscape Master Plan identifies many more landscape and open space initiatives to continue the achievements of the previous Master Plan period.

The purpose of the Landscape Master Plan is to direct BAC in its design of landscape and open space and to create a distinctive sense of place at Brisbane Airport.

Within the landscape, there are a range of values that provide environmental and social opportunities as well as constraints for airport precinct planning.

Developing the airport's landscape values and open space network supports the priorities of the Airport Environment Strategy and Biodiversity Management Plan.

Guidance for considering aspects of public realm for individual projects is outlined in BAC's Development Control Document, available on BAC's website www.bne.com.au

8.7 Sustainable Development

Sustainable design provides the opportunity for BAC to continue to deliver on the growth anticipated over the next 20 years while enabling a focussed and balanced approach to managing the surrounding natural environment.

A method to consider sustainable design in the planning, design and development phase of a project has been developed by the Green Building Council of Australia (GBCA).

The foundation behind the method is in the GBCA Green Star Communities Certification. This certification, on the same basis as other Green Building Certification, is a voluntary rating tool that provides best practice benchmarks and third-party verification of the sustainability of community and precinct-wide developments.

BAC plans to become the first Australian airport to attain a Green Star rating. The GBCA Green Star Communities Certification requires criteria in five key areas be met: Governance, Liveability, Environment, Economic and Innovation.

Through supporting the development of the GBCA's Green Star Community Pilot Project and applying those concepts to commercial developments, BAC can ensure that key sustainability practices are included in all stages of a development.

Aspects such as stakeholder engagement, materials usage and climate change adaption are factors that will be considered and where appropriate, integrated in all future developments at Brisbane Airport. In attaining certification, the development process will provide for a greater focus on sustainable design and community engagement, a continued emphasis on review of environmental impacts development may bring ranging from contaminated site management to eco-efficiency and promote increased use of recycled materials in the built form.

LANDSCAPE

Brisbane Airport has varied landscapes and open spaces.

Sub-tropical landscaping at International T1

8.8 Australian Noise Exposure Forecast (ANEF)

LIMITATIONS OF THE ANEF

While the ANEF is a requirement of the Airports Act, it is essentially a land use planning tool of most relevance and importance to local and state governments who are making planning decisions for future decades.

This is because an ANEF is an aggregate calculation of noise modelling, combining current and future aviation operations. Brisbane Airport's ANEF is an aggregation of noise modelling around current flight paths and future flight paths (with the NPR operational) out to 2060.

Because of its aggregate nature, an ANEF provides little assistance to individuals in the community seeking to understand specific noise impacts on a day-to-day basis.

DESCRIBING AIRCRAFT NOISE FOR THE COMMUNITY

For the purposes of informing the community about noise impacts and the effect of aircraft operations on a day-to-day basis, BAC has prepared the Current and Future Flight Paths and Noise Information booklet as an appendix to this Master Plan. This document presents noise impacts in the form of N70 drawings, which illustrate the spread and number of aviation-related events expected to exceed 70 decibels for a range of years, days and seasons.

INTRODUCTION

The management of aircraft noise has a central place in the day-to-day operation of major airports such as Brisbane Airport. In line with its development objective to minimise negative environmental impacts, BAC works in close cooperation with its aviation partners to minimise aircraft noise over residential areas and to maintain a dialogue with those communities affected by aircraft noise.

Although BAC is not responsible for the operational standards of airlines or how airspace is managed, a proactive approach to monitoring and mitigating noise is consistent with BAC's sustainability goals. As a result, BAC liaises and collaborates with the airlines, the Civil Aviation Safety Authority (CASA) who administer the safety of aircraft operations, and with Airservices Australia (Airservices), who control and manage airspace in a joint effort to address the issue.

A mandatory requirement of the Airport Master Plan process is the development of an Australian Noise Exposure Forecast (ANEF) to assist Brisbane City Council (BCC) and state planning agencies to ensure that land use planning decisions and future land uses, such as new residential developments or schools, take into account those areas that may be subject to intrusive or nuisance noise levels from current or forecast aircraft operations.

BACKGROUND

As required for the Brisbane Airport 2014 Master Plan, an updated Ultimate Capacity ANEF has been prepared. The Brisbane Airport Ultimate Capacity ANEF that it will replace was endorsed for technical accuracy by Airservices in 2009 and adopted in relevant State Planning Schemes. For convenience this revised draft ANEF is referred to as the draft 2014 ANEF and that which it will replace is called the 2009 ANEF.

The following sections set out the base parameters and assumptions used to prepare the Ultimate Capacity ANEF contours in accordance with the requirements of the "Manner of Endorsement" for ANEFs approved by the Minister for Infrastructure, Transport, Regional Development and Local Government (the Minister) on 2 May 2008.

For Brisbane Airport 'Ultimate Capacity' is nominally expected to be reached in 2060. 2060 was calculated through modelling and is regarded as a conservative estimate. The ultimate capacity year may change in future Master Plans depending on variables such as demand, changes in aircraft technology and air traffic management proceedures.

THE INTEGRATED NOISE MODEL (INM)

Aircraft noise exposure forecast contours are derived by computer simulation using the Federal Aviation Administration (FAA) Integrated Noise Model (INM) Software Version 7.0d (including the service update circulated 9/13 making a correction to the standard departure profiles for the newly added Boeing 777-300ER aircraft).

The INM database includes a representative listing of standard aircraft types which can be called up for use in an INM study. Where possible these standard INM aircraft are used to model operations at the study airport. This INM database contains common aircraft such as the B737-800 and A320.

The INM database also contains a number of approved substitutions, which allow these standard INM aircraft to be used to model another aircraft with similar performance and noise characteristics e.g. the

A319 which substitutes for the Embraer 190 regional jet.

Each INM aircraft has a number of standard approach, departure and/or circuit training profiles which define thrust setting, airspeed and altitude related to the distance from the start of take-off or from the runway threshold.

These profiles may need to be adjusted, or user defined, to reflect airspace or operational restrictions in place at the study airport.

Each INM aircraft has an associated set of noise-power-distance (NPD) curves for approach and departure at different thrust settings, and defined by 10 noise levels at standard distances from an observer.

The INM calculates aircraft noise impacts by applying standard or user defined aircraft flight profiles, performance data and NPD curves to the runway configuration and flight tracks specific to the study airport.

The time of day is also factored into the noise computation to allow for people being more sensitive to aircraft operations at night. In the ANEF system, aircraft movements between 7pm and 7am are weighted x four – i.e. 50 additional movements between 7pm and 11pm at night would be the equivalent of 200 additional day-time movements.

The extent and shape of noise contours are influenced by many factors such as airport elevation, runway geometry, aircraft types, movement numbers, runway utilisation, flight track geometry, origins/destinations and subsequent assignment of aircraft to individual flight tracks, and the day/night split in aircraft movements.

PREVIOUS STUDIES

BAC completed a comprehensive Environmental Impact Statement and Major Development Plan for the New Parallel Runway at Brisbane Airport (the NPR EIS/MDP) in 2005/06. This included extensive noise modelling and a 2035 ANEC as required by the Australian Government's Terms of Reference for the NPR MDP/EIS. The NPR MDP/EIS was approved on 13 September 2007 by the Environment Minister under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act), and from the Transport Minister on 18 September 2007 under the Airports Act.

In updating the 2009 ANEF, the extensive modelling and noise studies undertaken as part of the EIS/MDP were used as a base. Updated procedures or data since completion of the EIS/MDP and the 2009 ANEF are detailed below.

The 2009 ANEF was a composite of four Australian Noise Exposure Concepts (ANEC) and used the INM version 7.0 (INM 7a). It used FAA recommended substitutes for the A380 and B787 aircraft, which at the time were in development but not yet operational. The latest version of INM used in this ANEF update now includes profiles for these aircraft.

The other significant change is the updated assumption of the parallel runways at capacity having a NPR length of 3,600 m compared to the 2009 assumption of 3,000 m. In both this update and the 2009 ANEF it is assumed that all aircraft can operationally use either the existing runway or the NPR. Runway allocation, outlined in the Current and Future Flight Path and Noise Information booklet, has always assumed for maximum efficiency and capacity in peak periods that arrivals and departure runways/tracks are allocated by compass mode.

The 2009 ANEF included the Parallel Runway Ultimate Capacity ANEC at 1,400 movements for a "busy day" profile for a Summer Weekday and Winter Weekday scaled back by a factor of 0.88 to represent for an ANEF average day of 1,233 daily movements translating to 450,000 annual movements. Separate daily profiles were prepared in 2009 for Weekend and Weekday for Summer/ Winter (0.88 is an industry standard for representative days).

The Boeing 787 Dreamliner represents a new generation of aircraft

This update has used the same busy hour runway capacities and similar mode usage rules. However, the Ultimate Capacity Parallel Runway ANECs now have around 500,000 movements per annum. This increase is based on detailed analysis of current yearly profiles of daily movements relative to the busiest days.

The draft 2014 ANEF builds on the assumptions in the ANEF prepared and endorsed in 2009. It includes updated forecasts, and confirmation and adjustment, as appropriate, of various other operational assumptions.

This updated ANEF also uses a composite of four ANECs to combine the effects of individual Summer and Winter scenarios for both Existing Runway System and Parallel Runway scenarios. The 2009 ANEF used a composite of Existing and Parallel Runway ANECs. However, it is understood that each of these two ANECs was made up of an average of the Summer and Winter scenarios and not a true composite.

This Ultimate Capacity ANEF is a composite of the following four ANECs:

» ANEC 1: Current runway system at capacity (2020) *Summer*

» ANEC 2: Current runway system at capacity (2020) *Winter*

» ANEC 3: Future parallel runway system at capacity (nominally 2060) *Summer*

» ANEC 4: Future parallel runway system at capacity (nominally 2060) *Winter*

Because different wind patterns between Summer and Winter months will bias operations in different directions, separate Winter and Summer ANECs for each runway layout were prepared to best reflect changes in runway and flight path usage. It also allows the ANEC to account for the difference in the hourly aircraft movement profiles between Summer and Winter, due to daylight saving in south-eastern states impacting on interstate flight schedules, particularly the early morning operations.

Reviewing both the months when wind patterns start to change, and the dates when domestic schedules change with daylight saving in the southern states, the Summer ANECs reflect airport operations in the six month period October to March and the Winter ANECs are for the six months from April to September.

Figure 8.1 shows diagrammatically the key assumptions feeding into the various functional models and the subsequent outputs.

The key assumptions were:

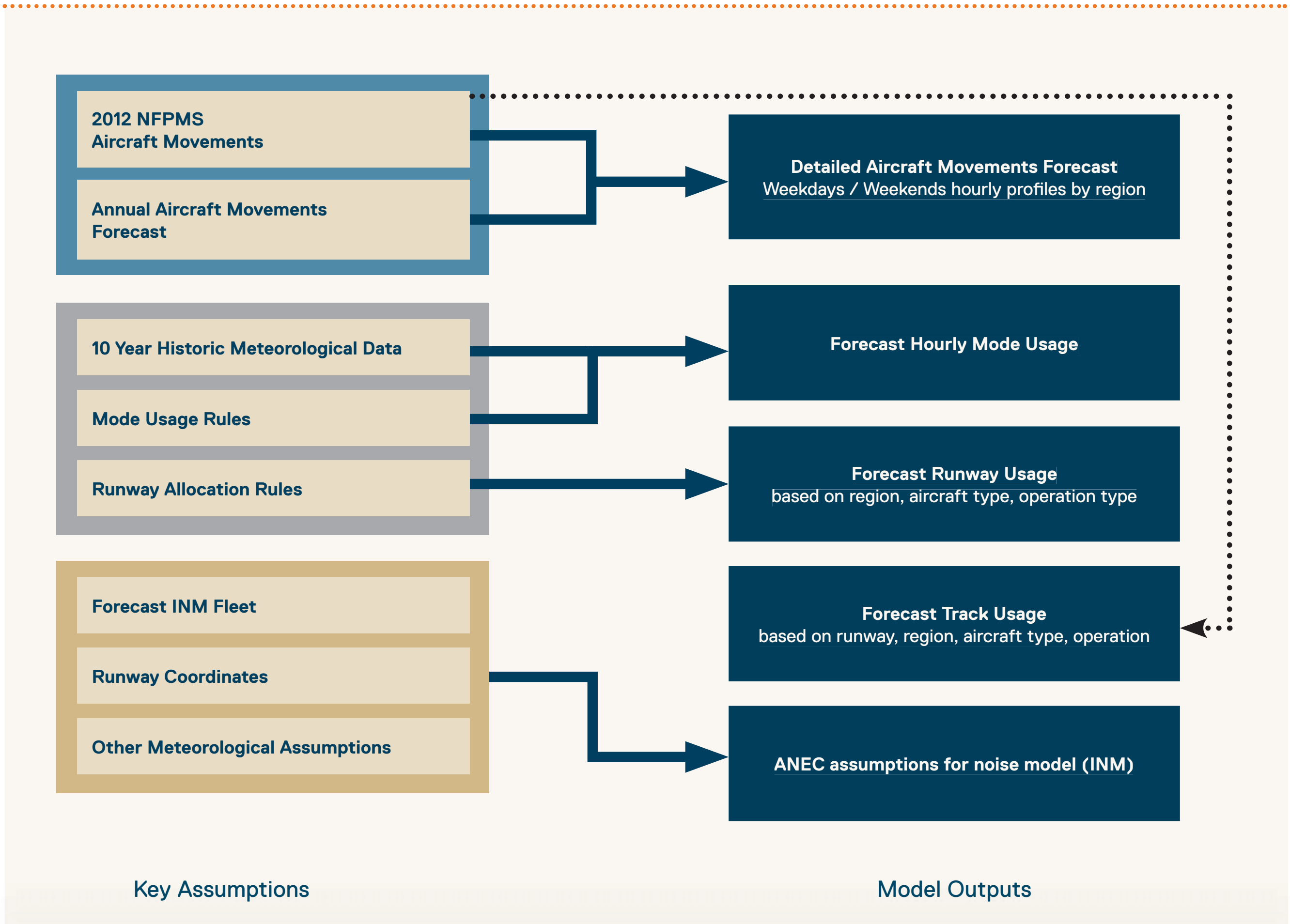
1. 2012 Noise Flight Path Monitoring Station (NFPMS) data from Airservices including 12 months of aircraft movement forecasts and quarterly samples of flight track data
2. Extended range detailed annual aircraft movement forecasts prepared by Tourism Futures International (TFI)
3. 10 years of historic wind speed and direction and precipitation data from the Bureau of Meteorology (BoM), as well as average temperature and average air pressure
4. Mode usage and runway allocation rules for the existing runway system and the concept of operations for the future parallel runway system as defined in the NRP EIS/ MDP and consultations with BAC and Airservices
5. The forecast fleet mix based on generic aircraft types in the detailed TFI aircraft movement forecast, matched against appropriate INM aircraft types to reflect near-term and long-term aircraft fleet
6. Assumptions for use of intersection departures agreed with Airservices Air Traffic Control (ATC).

These assumptions provided input to a range of bespoke models to:

1. Create annual daily aircraft movement profiles for current and future years
2. Create detailed daily aircraft movement profile by clock hour for representative busy weekdays and weekends for Summer and Winter for the various ANECs, with detailed tables of projected future year arrival and departure movements in each clock hour including aircraft type and origin/destination
3. Using "runway mode emulator" models to create tables of mode and runway mode usage by clock hour based on mode selection rules, hourly traffic (arrivals and departures) and weather (wind speed/direction and precipitation) for each ANEC
4. Using a "runway allocator model" assigning a runway for each movement based on runway allocation rules (e.g. compass mode origin/destination for parallel runways)
5. Allocate individual movements to arrival and departure tracks associated with each runway movement based on rules provided by ATC
6. Distribute arrivals and departures across backbone and spread tracks for each arrival and departure track based on assumptions provided by ATC for each ANEC (track spread based on current NFPMS or assumptions related to Required Navigational Performance (RNP) take-up and spread).

Finally, the detailed flight files for all runway movements for each ANEC for a typical busy weekday and weekend day, were then scaled across a whole year to create an "average day" profile (forecast annual detailed aircraft movements "at capacity" divided by 365) to be run in the INM to create the noise contours.

FIGURE 8.1: BRISBANE AIRPORT 2014 ULTIMATE CAPACITY COMPOSITE ANEF – OVERALL METHDOLOGY



Key ANEF Input Parameters

Airfield Configuration

The airfield layout at Brisbane Airport will change from its current converging non-intersecting cross runway system to an independent parallel runway system:

1. Existing Runway System

   The current runway system consists of the 01/19 main runway, which is 3,600 m long and 45 m wide, and a secondary, non-intersecting 14/32 cross runway which is 1,760 m long and 30 m wide.

2. Future Parallel Runway System

   BAC has commenced construction and is committed to commissioning the NPR by 2020.

The future runway system assumed in the Ultimate Capacity ANEF has parallel runways 01/19 (left and right) with the NPR at 3,600 m long (it assumes an extension of 300 m from the initial build of 3,300 m) and 60 m wide. The existing runway is assumed to be extended to around 4,000 m and retain the current width of 45 m. It is assumed that after commissioning the 01L/19R NPR, the 14/32 cross runway will be decommissioned. Refer Section 7.2.

Aircraft Noise Profiles

All four ANECs have been modelled using standard profiles and assumptions as laid out in the INM 7.0d model except for the representation of next generation narrowbody jet aircraft in the two parallel runway ANECs.

The Boeing 737MAX and Airbus A320/A321NEO jet aircraft are scheduled to progressively enter the market from 2015 onwards. These aircraft will supersede completely the existing narrowbody fleet by the time horizon of the two ultimate capacity ANEC parallel runway contours (circa 2060).

Airservices have advised that the assumptions made by BAC in the definition of the noise profiles of these new generation aircraft as shown in Table 8.1 are reasonable.

TABLE 8.1: USER-DEFINED AIRCRAFT NOISE PROFILES

User-Defined Aircraft Type	Inm Baseline Model	Departure Adjustment	Arrival Adjustment
A320NEO	A320-211	-4 dB	-3 dB
A321NEO	A321-232	-4 dB	-3 dB
B737MAX8	737-800	-4 dB	-3 dB

Aircraft Types and Substitutions

Annual aircraft movement forecasts were prepared by TFI and were broken down into the generic aircraft categories listed in Table 8.2. These were then assigned to specific representative aircraft types for the various ANECs. The forecast proportions for the existing runway at capacity (2020) and the parallels at Ultimate Capacity (2060) are compared with those in the 2012 NFPMS data, refer Table 8.3. Freighters were split between three sizes of narrowbody and widebody jets. As there are relatively few helicopter movements, only one category was used.

TABLE 8.2: AIRCRAFT CATEGORIES

Aircraft Class	Description
VLWB	Very Large Widebody
LWB	Large Widebody
MWB	Medium Widebody
SWB	Small Widebody
LNB	Large Narrowbody
SNB	Small Narrowbody
LTP	Large Turboprop
MTP	Medium Turboprop
STP	Small Turboprop

THE ANEF

It is a long-term land planning tool of most use to government.

International T1 at Brisbane Airport

TABLE 8.3: FORECAST PROPORTIONS OF AIRCRAFT CATAGORIES COMPARED WITH 2012

Class	Inm Type	2012	2020	2060	Comments
VLWB	A380-841	0%	57%	67%	747s are phased out and replaced by A380s. The A380-841 (Rolls-Royce engines) will represent majority of the A380 fleet. Based on the current split of airlines flying A380 aircraft into Australia being Qantas, Singapore Airlines and Emirates.
	A380-861	0%	29%	33%	
	747400	100%	14%	0%	
LWB	7773ER	100%	100%	100%	7773ER is considered the most representative INM type for LWB in 2020 and 2060.
MWB	A330-301	94%	58%	0%	The A330-301 is a short term back-bone aircraft for international carriers and will represent upgauges from 767s. In the future this will be replaced by 787s and A350s with the 7878R the INM type used to represent these aircraft.
	7878R	6%	42%	100%	
SWB	767300	100%	0%	0%	767s are to be phased out and upgauged to A332/B788.
LNB	A321-232	1%	3%	5%	A321-232 represents upgauged options for A320 international and domestic operators. Majority of the domestic market will be represented by the large narrowbody 737800s and A320s. When the parallels are close to capacity it is expected that the fleet will be totally renewed with A320NEO/737Max type aircraft (on order at present but not yet in operation) or newer. User defined noise profiles have been used for the 2060 ANECs.
	A320-232	21%	19%	16%	
	737800	77%	79%	79%	
SNB	717200	51%	35%	0%	EMB190 is the representative INM type for the SNB aircraft class.
	EMB190	49%	65%	100%	
LTP	DHC830	100%	100%	100%	Also includes the European manufactured short-haul regional aircraft, ATR.
MTP	DHC830	100%	100%	100%	
STP	DHC6	100%	100%	100%	
GA_1	CNA441	67%	67%	67%	
GA_2	LEAR 35	33%	33%	33%	
FRT_1	BAE300	100%	60%	0%	It is expected the F10065 will represent the noise profile for smaller types of freighter aircraft.
	F10065	0%	40%	0%	
FRT_2	737700	49%	50%	100%	It is expected 737-300 will be largely replaced by 737-700 in the long term.
	737300	51%	50%	0%	
FRT_3	7478	0%	0%	100%	It is anticipated in the future that 7478 will represent the larger freighters
HELO_1	EC130	100%	100%	100%	Use of the largest INM standard helicopter type to represent helicopters at Brisbane Airport. Currently approximately 700 movements and assumed to grow at average annual rate for all aircraft.

Origins and Destinations

Annual aircraft movement forecasts from TFI were broken down by regions based on markets, distance and direction for International, Interstate and Intrastate origins and destinations. This breakdown was then applied on the daily and hourly level, to individual aircraft movements, which are in turn used to define stage length (for departure profile) and direction (for runway and track allocation). Refer Figure 8.2.

FIGURE 8.2: ORIGINS AND DESTINATION REGIONS – DIRECTION, DISTANCE AND TYPICAL AIRCRAFT

INTERNATIONAL

AIRCRAFT TYPE	EXAMPLE
VLWB	A380, B744
LWB	B773, A340
MWB	A332, A333
SWB	B763
LNB	A321, B738

INTERSTATE (DOMESTIC)

AIRCRAFT TYPE	EXAMPLE
MWB	A332, A333
SWB	B763
LNB	A321, B738
SNB	F100, E170
LTP	DH4, ATR72
MTP	DH3, F50
STP	DH8A, BEH

INTRASTATE (REGIONAL)

AIRCRAFT TYPE	EXAMPLE
MWB	A332, A333
LNB	A321, B738
SNB	F100, E170
LTP	DH4, ATR72
MTP	DH3, F50
STP	DH8A, BEH

Source: Airbiz, 2013

Circuits

There are currently no circuit operations at Brisbane Airport, nor are they anticipated in the future and are therefore not included in the construction of the ANECs.

Fixed Wing Flight Track Allocation and Spread

Flight tracks for the existing airfield system were developed based on the Brisbane Airport NFPMS actual track data. Flight paths for the parallel runways system were developed based on the assumptions contained in the NPR EIS/MDP (Chapter D3) and presented in the Current and Future Flight Path and Noise Information booklet.

As part of the preparation of the draft ANEF 2014, flight paths were reviewed and supported by the Airservices Brisbane Airport ATC.

In general terms the existing airfield flight tracks are based on the most recent 2012 NFPMS actual data. RNP tracks at 2020 are assumed to apply to 80% of jet arrivals and for Ultimate Capacity (2060 nominal) assumed to be 100% of jet arrivals, with no RNP departures in either case. Non-jets are assumed to not use RNP tracks.

Track spread for non-RNP tracks is as per 2012 NFPMS data using a back-bone and two or four sub-tracks (total of three or five tracks) depending on the extent of spread in the NFPMS data with RNP tracks assumed to be distributed across three tracks dispersed by 0.3 nautical miles (nm).

Helicopters

Growth in helicopter operations were not specifically forecast for Ultimate Capacity, but is conservatively assumed by BAC to grow at the same rate as the overall average annual growth rates of fixed wing aircraft movements.

The tracks used and proportional allocation to those tracks were based on the 2012 NFPMS data and no change to helicopter tracks is anticipated in any of the ANECs.

Based on a review of current traffic, for the purposes of noise modelling a single medium sized single-engine helicopter, the EC130, was selected as the representative type. The standard INM profile for that helicopter is adopted.

Currently noise from helicopter arrivals and departures makes a negligible contribution to the overall noise footprint outside the airport boundary as it does to the various ANECs.

Runway Concept of Operations – Parallel Runways

The concept of operations for parallel runway operations assumed in the development of the ANECs (Summer and Winter), was based on the principles in the approved NPR EIS/MDP (Volume D Section 5.2). The modes considered are detailed in the Current and Future Flight Path and Noise Information booklet, and were reviewed by BAC and Airservices as part of the 2014 Master Plan for continued relevance.

Runway allocation for the Parallel Runway System

As the two parallel runways are of equal performance capability, there is no intrinsic difference in their operational capability or capacity with runway allocation based on “compass mode” for both arrivals and departures (that is the direction (north, east, south or west) to the destination port or from the last origin port as shown in Figure 8.2). This eliminates the need for crossing flightpaths on arrival or departure.

If during particular busy hours there is a bias of traffic to one runway or the other, some balancing would be assumed to be done by ATC. The outputs from running traffic at capacity (nominally 2060) did not show major bias, even on busy day traffic.

Basically north and west operations are allocated to the NPR and south and east operations to the existing main runway.

Runway Capacity and Aircraft Forecasts

The Brisbane Airport Ultimate Capacity ANEF is a composite made up of ANECs at 2020 for the existing runway system just before the commissioning of the NPR and the parallel runway system at ultimate practical capacity (2060).

Runway capacity for an existing or planned airfield can be estimated based on analysis of existing runway movement data, empirical methods and/or analytical or simulation models.

Aircraft Movement and Type Forecasts

Long-term aircraft movement forecasts were prepared by TFI extending the 20-year passenger and aircraft movement forecasts (Section 5.1) used in the Master Plan.

The long-term aircraft movement forecasts prepared by TFI are based on econometric modelling for unconstrained growth by various components of traffic – international, interstate (domestic) and intrastate (regional).

These forecasts include details at the regional market level (e.g. for the international sector the major markets include Asia, the Middle-East, the Pacific, the Americas and Africa). Passenger demand to/from Europe is assumed to be via Asian or Middle-Eastern hubs. Annual passenger movement projections were converted to aircraft movements based on aggregate fleet mix and load factor assumptions.

The fleet mix was based on consultations with airlines on short to medium-term trends and plans, which were then extrapolated out for the long-term forecast. Based on this and the matching of equipment (range and capacity) to routes, the long-term aircraft movement forecast provided for use in the preparation of the ANEF included annual projections by region and split by generic aircraft type (e.g. very large widebody, large widebody, medium widebody etc.).

Typical busy day hourly aircraft movement profiles were then created scaling up and modifying existing schedules. These included details of aircraft type and region based on the annual aircraft forecasts, and were used downstream for runway allocation (compass mode) and mode utilisation models.

The TFI annual aircraft movement projections for the existing airport runway system (before opening of the NPR scheduled for 2020) and the parallel runway system at ultimate capacity (nominally 2060) are shown in Table 8.4. The TFI forecasts included General Aviation (GA) (non-scheduled) and freight. BAC provided the separate helicopter movement forecast.

Arrival runway capacity calculations were done for the existing runway system and for the parallel runways, based on hourly overall, arrival and departure capacities for typical busy days. The nominal long-term forecast year corresponding annual aircraft movement numbers was then used to check the detailed breakdown of the forecast by aircraft fleet and regions. The nominal year when 500,000 annual movements is reached is around 2060. The detailed annual breakdown from the 2060 forecast by airline sector (international, interstate and intrastate), region and generic aircraft category was used for the ANEF. These annual disaggregations were extended to daily and hourly profiles (by airline sector, region and generic aircraft category) for use in mode and runway usage and track allocations required to generate the ANECs and the ANEF.

The various splits between aircraft types for the three points in time are shown in Table 8.5 for:

» The 2020 current runway system just before commissioning of the NPR

» The nominal 2060 parallel runway system at capacity.

TABLE 8.4: ANNUAL AIRCRAFT MOVEMENTS FORECAST 2020 AND 2060

Annual Aircraft Movements [1][2]	2020	2060
International	34,000	76,000
Interstate	100,000	189,000
Intrastate	100,000	200,000
GA Itinerant	18,000	20,000
Freight	6,000	10,000
Helicopters [3]	800	1,700
TOTAL	258,800	496,700

1 *Source is TFI*
2 *Numbers do not match exactly with other tables and breakdowns because of rounding*
3 *Helicopter projection by BAC assuming similar annual growth as fixed wing*

TABLE 8.5: ANNUAL RPT AIRCRAFT MOVEMENTS BY AIRCRAFT TYPE – 2012 BASE, 2020 AND 2060

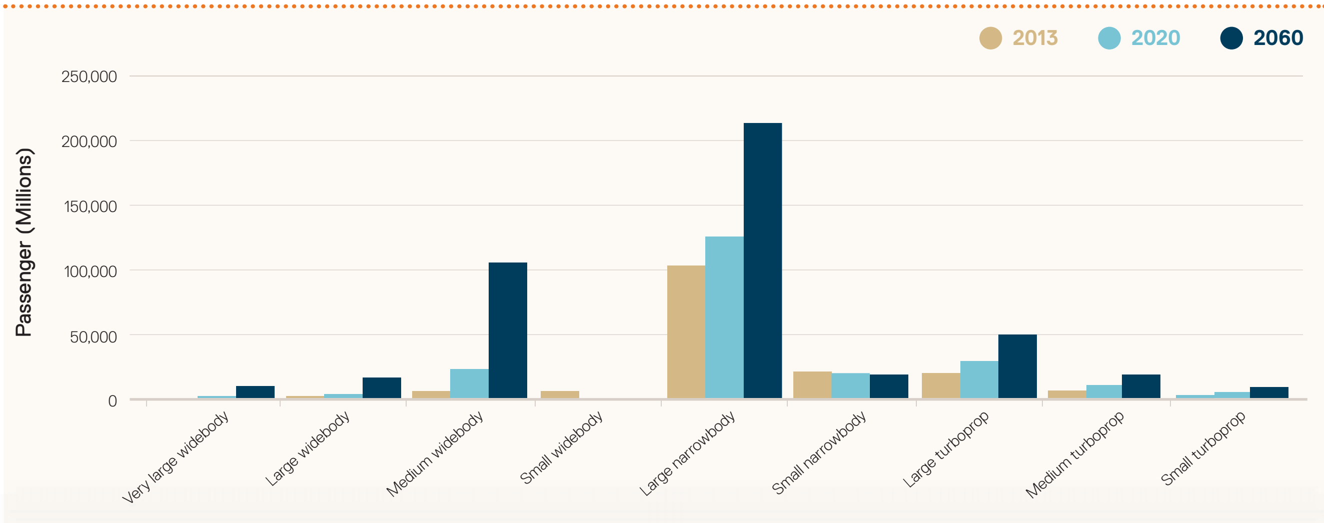
Annual Aircraft Movements [1,2,3,4]	2012	2020	2060	2012	2020	2060
Widebody Jet	22,700	33,100	140,500	12%	14%	30%
Narrowbody Jet	127,800	151,500	240,200	68%	64%	52%
Turboprop (non-jet)	37,700	51,400	85,200	20%	22%	18%
TOTAL	188,200	236,000	465,900	100%	100%	100%

1 *Numbers will not necessarily match exactly because of rounding*
2 *2012 base, 2020 and 2060 forecast is by TFI (financial years)*
3 *RPT aircraft movements excludes freight and GA*
4 *Helicopters are not included*

While there is growth in all aircraft categories, widebody jets are growing fastest and there is also upgauging from turboprop to narrowbody jets over time, as average seats per aircraft increase in line with long term historic trends.

The annual forecasts were further broken down into generic aircraft categories as shown in Figure 8.3 and Table 8.6 from which detailed INM aircraft types were finally derived.

FIGURE 8.3: ANNUAL FORECASTS BY GENERIC AIRCRAFT CATEGORIES



Source: Airbiz, 2013

TABLE 8.6: ANNUAL RPT AIRCRAFT MOVEMENTS BY AIRCRAFT TYPE AND BY SEASON – 2012 BASE, 2020 AND 2060

Aircraft Movements (RPT)[1,2,3,4]	2020 Summer	2020 Winter	2060 Summer	2020 Winter
VLWB – very large widebody	2,338	2,338	12,216	12,216
LWB – large widebody	5,058	5,058	19,079	19,079
LWB – medium widebody	25,597	25,597	109,030	109,030
LNB – large narrowbody	132,512	132,543	225,797	225,694
SNB – small narrowbody	30,571	30,508	28,645	28,607
LTP – large turboprop	44,570	44,570	73,354	73,354
MTP – medium turboprop	6,605	6,605	11,731	11,731
STP – small turboprop	12,036	12,068	14,143	14,181
TOTAL	**259,287**	**259,287**	**493,995**	**493,892**

1 *Includes freight and GA but not helicopters*
2 *Totals are shown for ANEF average daily x 365, although summer and winter seasons are assumed to be six months each*
3 *Minor differences in Summer and Winter due to differences in base from which profiles are grown*
4 *Numbers will not necessarily match exactly with other tables and breakdowns because of rounding*

Existing Runway System Capacity

The existing runway system at Brisbane Airport is already capacity constrained at certain times of the day and in response to increased delays and disruption, BAC implemented a Runway Demand Management Scheme (RDMS).

The RDMS has been operating at Brisbane Airport since the start of the Northern Winter 2012 Scheduling Season (October 2012). The coordination parameters apply to Runway 01/19. The use of the cross runway 14/32, in combination with the main runway, is weather dependant and limited to smaller aircraft types and has not been taken into account in allocating RDMS slots. When available, the 14/32 reduces delays and improves efficiency but the additional capacity from the modes of operation with the 14/32 is not used for scheduling purposes.

Table 8.7 shows average hourly capacities, based on the RDMS maximum slot allocation principles. The slot scheme has more detailed parameters related to 15 minute limits, short term peak and "firebreak" periods.

TABLE 8.7: AVERAGE HOURLY CAPACITIES BASED ON RDMS MAXIMUM SLOT ALLOCATION PRINCIPLES

	Hourly Slots
Total Movements	50
Arrivals (maximum)	27
Departures (maximum)	30

The separate total, arrival and departure slots have been used as the single runway capacities for the existing main runway, and for preparation of the ANEC, these hourly capacities were converted to daily and annual aircraft movement capacities for the runway system.

The analysis of 2012 NFPMS data showed that despite schedules for international, interstate (domestic) and intrastate (regional) airlines not varying greatly across the year, the actual daily movements vary for a variety of operational reasons (demand fluctuations, weather, network disruptions etc). In practice daily movements at Brisbane Airport in 2012 ranged from around 700 on the busiest day to 400 on the quietest day.

BAC plans to have the NPR operational by 2020. As the ANEF is a composite of Summer and Winter ANECs (nominally six months of summer and six months of winter), each ANEC used only six months of traffic and weather data for the defined season.

The daily profile (average movements each hour for 13 busiest days) was also split into international/interstate/intrastate sectors and each was grown at the annual growth rate to 2020 for each individual traffic sector – different growth rates were applied to international, interstate and intrastate, and each traffic sector had a different distribution across the hours of a day, so the shape of the daily profile could change with growth.

Because RDMS has been implemented, there is effectively a cap on hourly movements and growth between 2013 and 2020 (as per the unconstrained aircraft movement forecast) will only be accommodated by peak spreading until the NPR is commissioned.

This is illustrated for the representative busy day (average of arrivals and departure movements for each clock hour for the top 13 days). For the annual capacity calculation, it conservatively assumes that the distribution of daily aircraft across a year remains similar (no peak spreading between days).

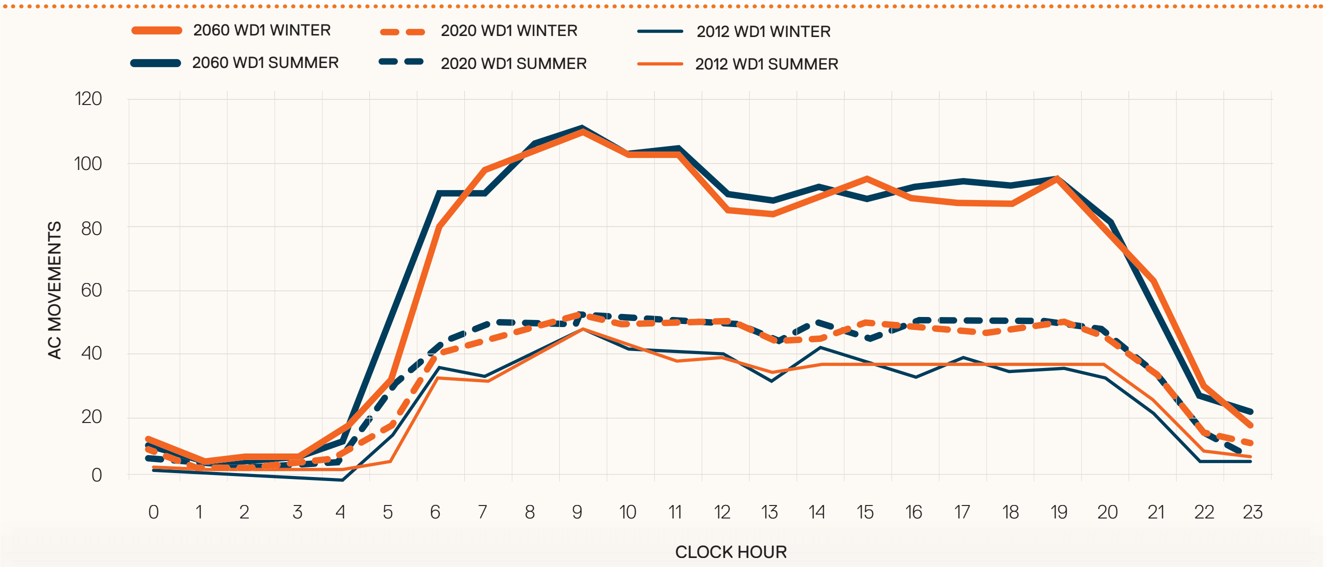
The hourly profiles (split between arrivals and departures) derived from the average of the top 13 days also include details of origin/destination and aircraft type. As the average for each hour disaggregated at this level may not be "whole" numbers, rounding was done to have discrete numbers in the detailed hourly movements, which are also used in mode usage calculations and also consider weather (wind speed/direction; wet/dry runway).

The main difference in the number of weekend versus weekday movements (as found in the original 2012 NFPMS data) (refer Figures 8.4 and 8.5) was the significant reduction in intrastate traffic on weekends.

The movement profiles which include breakdowns into Arrivals/ Departures; Region (for stage length and direction); Aircraft Class are used with the runway mode allocation rules to assign runway and then aggregated to day (7am to 7pm) and night (7pm to 7am) totals according to the ANEF definition.

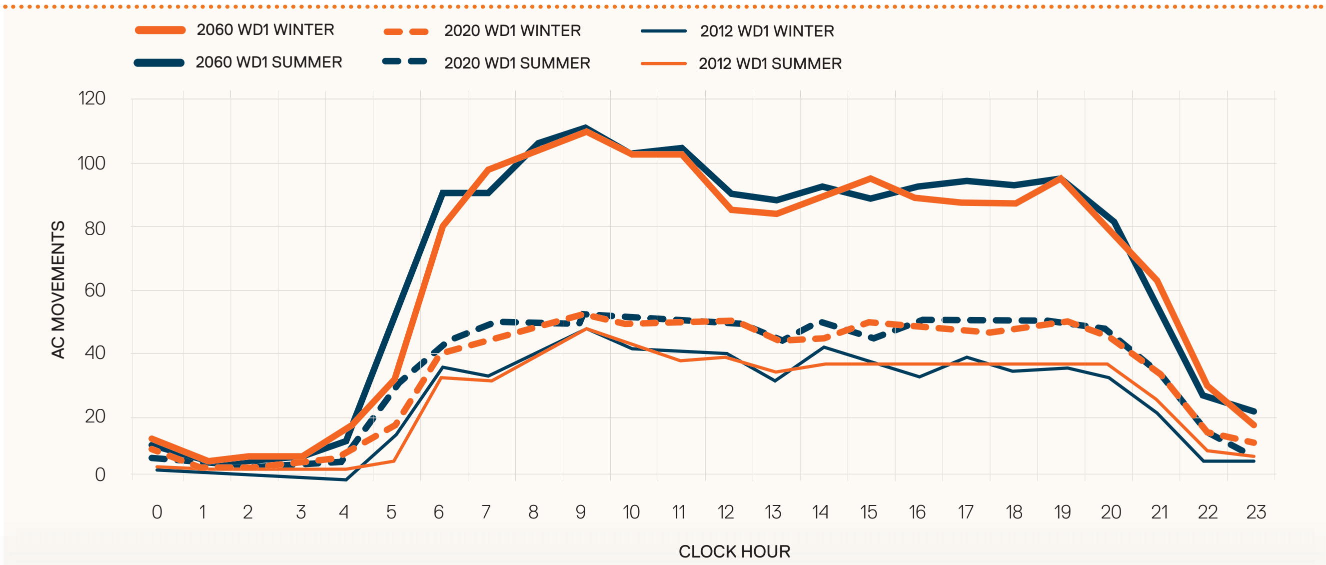
Freight, GA and helicopters aircraft movements were later added into profiles.

FIGURE 8.4: REPRESENTATIVE BUSY DAY (WEEKDAYS) TOTAL MOVEMENTS BY CLOCK HOUR 2012; 2020; 2060



Source: Airbiz, 2013

FIGURE 8.5: REPRESENTATIVE BUSY DAY (WEEKENDS) TOTAL MOVEMENTS BY CLOCK HOUR 2012; 2020; 2060



Source: Airbiz, 2013

FLIGHT PATHS

Information on the current and future locations of flight paths for Brisbane Airport can be found in the supplementary booklet to this Master Plan the Current and Future Flight Path and Noise Information Booklet.

1

2

3

1, 2, 3 Aircraft operating from Brisbane Airport.

TABLE 8.8: NOTIONAL SUSTAINABLE PEAK HOURLY CAPACITY

	Sustainable Hourly Movements	Peak Hourly Movements
Total movements	100+	100+
Total arrivals	54+	54+
Total departures	60+	60+

As the profiles were developed, they confirmed that for the busiest periods of the busiest weekdays demand approached nominal runway capacity (either overall, departure or arrival capacity). As discussed previously for the existing runway system, RDMS has been introduced because current demand is already regularly close to capacity for certain periods of the day/week and peak spreading was assumed in scaling up current weekday profiles to meet forecast unconstrained annual demand up to 2020 prior to commissioning of the NPR.

Parallel Runway System Capacity

The parallel runway system has been designed for independent operations, so that the sustainable peak capacity is logically assumed to be twice the single runway capacity.

The notional sustainable peak hourly capacity adopted to derive the ultimate capacity for parallel runways is shown in Table 8.8. As noted in the NPR EIS/MDP peak capacities for short periods could be greater than this and up to 108 total movements per hour.

The following steps are used to determine when the system approaches capacity.

1. The day movements were averaged for each hour to show the daily profile of total aircraft, arrivals and departures for notionally the top busiest 10% of days. This is a measure of runway demand versus capacity for planning purposes (traditional analysis is done for 90th percentile or 30th busiest day or other metrics representing typical busiest days).
2. The daily profile (average movements each hour for 26 busiest days) was then grown pro-rata until the busiest hours in the busiest day started to encroach on the parallel runway capacity (twice the single runway RDMS total, arrival or departure limits). The daily profile was also split into international/interstate/intrastate sectors and each was grown at the annual growth rate for each individual traffic sector – different growth rates were applied to international, interstate and intrastate, and each traffic sector had a difference distribution across the hours of a day, so the shape of the daily profile could change with growth.

At nominal parallel runway capacity, the busiest 26 days have on average around 1,500 total aircraft movements. Based on the annual demand distribution the busy day peak of 1,500 movements translates to almost 500,000 annual aircraft movements.

Based on the estimated capacity of almost 500,000 annual movements relative to average value of the maximum throughput capacity available per hour gives a "capacity coefficient" of 0.57 (500,000 annual /(100 max hourly x24 hours x 365 days).

The above figures have been benchmarked and are within the range of "a high range of between 0.55 to 0.60 for airports with moderate daily and seasonal peaking, intensive utilization during all but a few night-time hours of the day, and a high tolerance for delays", quoted on page 455, de Neufville and Odoni, Airport Systems – Planning, Design and Management, McGraw Hill (2003).

Aerobridges at Brisbane Airport

The capacity thresholds used for parallel runways are consistent with the results quoted in the 2009 ANEF report and the NPR EIS/MDP based on Airservices Total Airspace and Airport Modeller (TAAM) computer simulation modelling to determine the peak hour capacity of parallel runways. The results of the TAAM modelling can be found in Chapter 2, Volume A of the NPR EIS/MDP. In summary, the TAAM modelling determined for parallel runway operations (01R/19L and 01L/19R) a maximum movement rate of 108/hour in the peak. In discussions with Airservices air traffic controllers during the TAAM modelling, it was stressed to BAC that the above maximum movement capacities could be sustained for one peak hour only, and that the shoulder periods would only sustain lower movement rates. This is also reflected in the current RDMS rules based on single runway operations.

Detailed simulation modelling of the existing runway system is less relevant since the RDMS system has been put in place, which effectively caps busy-hour demand – overall, arrivals and departures peaks.

Draft 2014 ANEF

Figure 8.6 presents the Draft ANEF contours for Brisbane Airport. This ANEF and the extensive inputs summarised in the preceding sections of this chapter of the 2014 Master Plan have been endorsed for "technical accuracy" by Airservices in accordance with the "Manner of Endorsement" for ANEFs approved by the Minister for Infrastructure, Transport, Regional Development and Local Government (the Minister) on 2 May 2008.

The process in developing those inputs included regular engagement with planning agencies at the three levels of government, as well as the Aircraft Noise Ombudsman (ANO), and the major airlines operating at Brisbane Airport.

As stated previously, the Draft 2014 ANEF is a series (20, 25, 30, 35 ANEF) of worst-case footprint contours of four ANECs.

Figure 8.7 demonstrates changes in the 20 ANEF contour footprint between the Draft 2014 ANEF and the previous 2009 Brisbane Airport Ultimate Capacity ANEF.

Figure 8.8 demonstrates the potential change in the 20 ANEF contour for the existing main runway 01R/19L, when the NPR 01L/19R becomes operational – currently planned to occur in Year 2020, and also to the 20 ANEF contour in the previous 2009 Brisbane Airport Ultimate Capacity ANEF. (It is highlighted that prior to 2020, BAC will be required to undertake another Master Plan process which will again include the development of an ANEF – that process, likely to occur in 2018 – 19 will have the benefit and outcomes of updates to all ANEF input assumptions.)

Changes to ANEF Contours

ANEF contours are an output of the INM. BAC has a responsibility to develop an appropriate suite of input metrics that are developed in consultation with agency stakeholders and subjected to close scrutiny through a structured endorsement process.

A number of factors have contributed to changes in the extents of the ANEF contours:

» An increase in ultimate capacity total annual aircraft movements from an updated capacity calculation involving a more robust methodology in converting mode capacities to annuals

» Updated fleet mix assumptions and INM data now available for A380 and B787 aircraft (which have both now extended service)

» Updated annual forecasts (movement numbers, proportional split with aircraft types and differential growth trends of regions)

» A shift in the dominant runway from 01R / 19L to 01L / 19R due to growth trending in intrastate and north and westbound operations

» Increasing jet aircraft operations (including wide body jets) in the INM weighted (x 4) period of 7pm to 7am

» Increasing stage length operations by long wide body jet aircraft due to increased Middle East hubbing

» High demand and peak operating period extended duration of the existing runway system prior to NPR in 2020.

Aircraft Fleet Updates

The INM aircraft database includes a representative listing of standard aircraft types and approved substitutions, which are applied to the forecasts in the development of the ANEF. With the exception of the deliberate substitution by BAC of a reduced noise characteristic for LNB jet aircraft in the ultimate capacity ANECs, due to the imminent introduction of A320 NEO and B737MAX aircraft, the ANEF process is limited in the ability to apply expected long-term airline technology improvements.

It is probable that the aircraft industry will undergo at least two iterations of major fleet improvements over the next 50 years to around Year 2060. By way of demonstration of the real effects of aircraft technological improvements, BAC has included a comparison of the 1983 ANEF, versus the Draft 2014 ANEF and the post 2020 Summer / Winter ANEC 20 contour.

The 1983 ANEF was the result of 400,000 annual movements (Draft 2014 ANEF = 495,000) and fleet including B707, B727, DC9, etc. now phased out of operation.

Figure 8.9 shows the comparison of the 1983 ANEF and the ANEF included in this 2014 Master Plan.

The ANEF and State and Local Government Planning Agencies

The Queensland Government has developed an overarching State Planning Policy (SPP), which sets out the state's interest concerning development in the vicinity of those airports and aviation facilities considered essential for the state's transport infrastructure. The SPP applies to land use changes and development occurring off airport that could:

i. Adversely affect the safety and operational efficiency of operational airspace or the functioning of aviation facilities

ii. Increase the number of people that could, amongst other things, work or live within a noise contour of 20 – 25 ANEF

iii. Increase the number of people or the use/storage of hazardous material within public safety areas.

Under the *Sustainable Planning Act 2007* (SPA), the SPP has effect when development applications are assessed, when planning schemes are made or amended, and when land is designated for community infrastructure.

AIRCRAFT

Two major fleet improvements are likely across the airline industry in the next 50 years.

The SPP applies in the vicinity of airports, but does not apply to those airports or aviation facilities themselves.

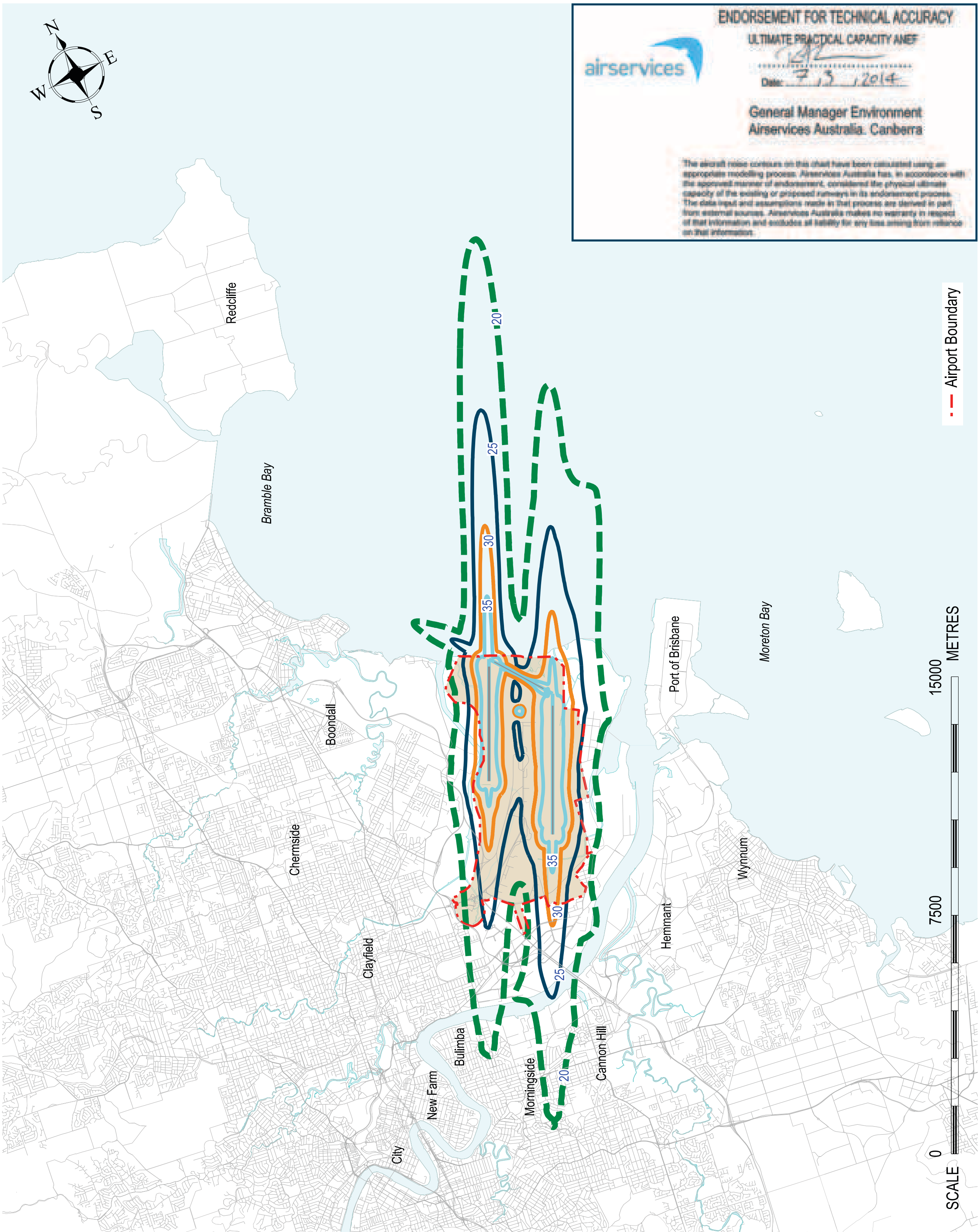
The specific areas to which the SPP applies vary with the issue being addressed; for noise purposes it is within areas defined by the ANEF 20 contour at and around each airport.

BAC has prepared the ultimate capacity ANEF for Brisbane Airport. The ANEF defines those contour areas to which SPP applies.

Brisbane Airport has the largest buffer zone of any major capital city airport in Australia and is the outcome of several decades of determined planning by all levels of government. This buffer is comprised of physical distance, augmented by additional areas of appropriate conservation/ green space and industrial land uses. BAC will continue to work closely with BCC and the State Government to maintain the substantial buffer zone around Brisbane Airport.

8 ENVIRONMENT

FIGURE 8.6: ULTIMATE CAPACITY AUSTRALIAN NOISE EXPOSURE FORECAST (ANEF)



This Ultimate Capacity ANEF is a land use planning tool of relevance to state and local planning authorities. For community members seeking information about aircraft noise impacts on a day to day basis, please refer to the Current and Future Flight Path and Noise Information booklet.

Refer to Table 8.10 for contour definitions.

TABLE 8.9: ANEF EXPLANATORY TABLES
ANEC – EXISTING RUNWAY SYSTEM SUMMER 2020

		Arrivals			Departures			All
Runway	Aircraft	Day	Night	Total	Day	Night	Total	Total
01	A380-841	0.638	0.305	0.943	1.667	0.008	1.675	2.618
01	A380-861	0.319	0.152	0.472	0.833	0.004	0.837	1.309
01	747400	0.157	0.075	0.233	0.411	0.002	0.413	0.645
01	7773ER	3.772	0.600	4.372	2.872	3.268	6.140	10.512
01	7878R	7.431	3.412	10.843	8.297	4.560	12.857	23.700
01	A330-301	10.115	4.644	14.759	11.294	6.207	17.501	32.260
01	A321-232	2.717	0.921	3.637	3.204	0.933	4.138	7.775
01	A320-232	18.255	6.187	24.442	21.530	6.272	27.803	52.245
01	737800	76.803	26.031	102.834	90.583	26.389	116.972	219.806
01	737700	0.282	0.655	0.937	0.080	2.208	2.289	3.226
01	737300	0.282	0.655	0.937	0.080	2.208	2.289	3.226
01	717200	4.574	1.802	6.376	3.552	1.847	5.399	11.775
01	F10065	0.071	0.839	0.910	0.117	1.034	1.151	2.060
01	EMB190	8.548	3.367	11.915	6.637	3.451	10.088	22.003
01	BAE300	0.106	1.258	1.364	0.175	1.551	1.726	3.090
01	LEAR35	1.137	3.004	4.140	2.770	0.547	3.317	7.457
01	DHC830	22.139	12.305	34.444	20.810	5.016	25.827	60.271
01	DHC6	2.751	2.110	4.861	3.854	2.143	5.997	10.858
01	CNA441	3.704	6.340	10.044	4.422	1.196	5.617	15.661
	TOTAL	**163.800**	**74.663**	**238.463**	**183.188**	**68.844**	**252.033**	**490.496**
19	A380-841	0.357	0.534	0.891	0.158	0.001	0.159	1.050
19	A380-861	0.178	0.267	0.445	0.079	0.000	0.080	0.525
19	747400	0.088	0.132	0.220	0.039	0.000	0.039	0.259
19	7773ER	1.093	1.464	2.558	0.482	0.307	0.789	3.347
19	7878R	1.520	2.487	4.007	1.446	0.547	1.993	6.000
19	A330-301	2.070	3.385	5.455	1.968	0.745	2.713	8.168
19	A321-232	0.470	0.264	0.734	0.506	0.264	0.769	1.504
19	A320-232	3.161	1.773	4.934	3.397	1.773	5.170	10.104
19	737800	13.298	7.458	20.756	14.294	7.460	21.753	42.510
19	737700	0.020	1.502	1.522	0.038	0.132	0.170	1.692
19	737300	0.020	1.502	1.522	0.038	0.132	0.170	1.692
19	717200	0.903	0.362	1.265	1.011	0.532	1.543	2.807
19	F10065	0.053	0.216	0.269	0.007	0.021	0.029	0.298
19	EMB190	1.687	0.676	2.363	1.888	0.994	2.883	5.246
19	BAE300	0.080	0.324	0.404	0.011	0.032	0.043	0.447
19	LEAR35	0.705	1.631	2.337	1.098	1.172	2.270	4.607
19	DHC830	4.042	2.322	6.364	5.549	3.211	8.760	15.123
19	DHC6	0.391	1.681	2.072	0.841	0.042	0.883	2.956
19	CNA441	0.933	0.793	1.726	1.541	2.016	3.557	5.283
	TOTAL	**31.070**	**28.773**	**59.843**	**34.392**	**19.381**	**53.773**	**113.616**
14	A321-232	0.447	0.025	0.472	0.000	0.000	0.000	0.472
14	A320-232	3.001	0.169	3.169	0.000	0.000	0.000	3.169
14	737800	12.624	0.710	13.335	0.000	0.000	0.000	13.335
14	717200	2.573	0.125	2.699	0.024	0.029	0.053	2.752
14	EMB190	4.809	0.234	5.043	0.046	0.054	0.100	5.142
14	LEAR35	1.679	0.000	1.679	0.000	0.111	0.111	1.790
14	DHC830	16.531	1.201	17.732	0.142	0.269	0.411	18.143
14	DHC6	1.507	0.360	1.867	0.007	0.001	0.008	1.875
14	CNA441	3.018	1.120	4.138	0.024	0.221	0.245	4.383
	TOTAL	**46.189**	**3.944**	**50.133**	**0.243**	**0.685**	**0.928**	**51.061**
32	A321-232	0.052	0.011	0.064	0.000	0.000	0.000	0.064
32	A320-232	0.353	0.075	0.428	0.000	0.000	0.000	0.428
32	737800	1.483	0.317	1.800	0.000	0.000	0.000	1.800
32	717200	0.319	0.054	0.373	3.197	0.521	3.718	4.091
32	EMB190	0.597	0.101	0.697	5.974	0.973	6.947	7.644
32	LEAR35	0.045	0.000	0.045	0.795	1.707	2.503	2.547
32	DHC830	2.080	0.435	2.515	21.679	4.379	26.058	28.574
32	DHC6	0.172	0.075	0.248	2.058	0.103	2.160	2.408
32	CNA441	0.259	0.320	0.579	3.505	3.563	7.068	7.647
	TOTAL	**5.360**	**1.389**	**6.748**	**37.208**	**11.246**	**48.454**	**55.203**
	ALL	**246.419**	**108.769**	**355.188**	**255.032**	**100.156**	**355.188**	**710.376**

TABLE 8.9: ANEF EXPLANATORY TABLES (CONTINUED)
ANEC – EXISTING RUNWAY SYSTEM WINTER 2020

Runway	Aircraft	Arrivals			Departures			All
		Day	Night	Total	Day	Night	Total	Total
01	A380-841	0.105	0.380	0.485	1.104	0.007	1.111	1.596
01	A380-861	0.052	0.190	0.243	0.552	0.004	0.556	0.798
01	747400	0.026	0.094	0.120	0.272	0.002	0.274	0.393
01	7773ER	1.920	1.813	3.733	2.725	2.390	5.115	8.849
01	7878R	4.830	3.480	8.310	5.787	3.720	9.506	17.816
01	A330-301	6.574	4.738	11.312	7.877	5.063	12.940	24.251
01	A321-232	2.112	0.881	2.993	2.222	0.904	3.126	6.118
01	A320-232	14.192	5.917	20.109	14.928	6.076	21.004	41.112
01	737800	59.707	24.894	84.601	62.806	25.561	88.368	172.969
01	737700	0.132	0.542	0.674	0.033	2.149	2.182	2.856
01	737300	0.132	0.542	0.674	0.033	2.149	2.182	2.856
01	717200	3.345	1.740	5.084	2.065	0.926	2.992	8.076
01	F10065	0.044	0.757	0.802	0.097	1.022	1.120	1.921
01	EMB190	6.250	3.251	9.501	3.859	1.731	5.590	15.091
01	BAE300	0.067	1.136	1.203	0.146	1.534	1.679	2.882
01	LEAR35	1.982	2.339	4.321	2.205	0.439	2.644	6.965
01	DHC830	20.547	10.166	30.713	11.130	3.686	14.817	45.529
01	DHC6	1.787	1.857	3.645	0.939	3.419	4.358	8.002
01	CNA441	3.626	5.711	9.338	2.462	3.874	6.336	15.673
	TOTAL	127.431	70.428	197.859	121.242	64.654	185.897	383.755
19	A380-841	0.194	1.155	1.349	0.721	0.002	0.723	2.071
19	A380-861	0.097	0.578	0.674	0.360	0.001	0.361	1.036
19	747400	0.048	0.285	0.332	0.178	0.000	0.178	0.511
19	7773ER	1.393	1.803	3.196	1.060	0.754	1.814	5.010
19	7878R	3.675	2.865	6.540	4.166	1.178	5.344	11.884
19	A330-301	5.002	3.900	8.902	5.671	1.604	7.274	16.176
19	A321-232	1.229	0.286	1.515	1.345	0.436	1.781	3.296
19	A320-232	8.257	1.924	10.181	9.041	2.929	11.969	22.150
19	737800	34.738	8.095	42.832	38.036	12.321	50.357	93.190
19	737700	0.044	1.762	1.806	0.051	0.247	0.298	2.104
19	737300	0.044	1.762	1.806	0.051	0.247	0.298	2.104
19	717200	2.210	0.994	3.205	2.700	1.009	3.709	6.914
19	F10065	0.073	0.288	0.360	0.020	0.023	0.043	0.403
19	EMB190	4.130	1.858	5.988	5.046	1.885	6.931	12.920
19	BAE300	0.109	0.432	0.541	0.030	0.034	0.064	0.605
19	LEAR35	1.224	1.778	3.002	1.956	1.372	3.328	6.330
19	DHC830	12.383	2.522	14.905	16.250	4.023	20.272	35.178
19	DHC6	0.595	3.435	4.030	1.951	0.775	2.726	6.756
19	CNA441	1.665	1.261	2.926	2.769	1.219	3.988	6.914
	TOTAL	77.108	36.983	114.090	91.401	30.059	121.460	235.551
14	A321-232	0.309	0.023	0.332	0.000	0.000	0.000	0.332
14	A320-232	2.078	0.152	2.230	0.000	0.000	0.000	2.230
14	737800	8.742	0.641	9.383	0.000	0.000	0.000	9.383
14	717200	1.787	0.237	2.024	0.065	0.058	0.124	2.148
14	EMB190	3.339	0.444	3.783	0.122	0.109	0.231	4.014
14	LEAR35	0.546	0.058	0.604	0.021	0.152	0.174	0.778
14	DHC830	11.885	0.816	12.701	0.365	0.323	0.688	13.389
14	DHC6	0.959	0.160	1.120	0.030	0.015	0.045	1.165
14	CNA441	2.273	1.162	3.435	0.101	0.120	0.221	3.655
	TOTAL	31.918	3.694	35.612	0.704	0.777	1.482	37.094
32	A321-232	0.052	0.016	0.068	0.000	0.000	0.000	0.068
32	A320-232	0.348	0.106	0.454	0.000	0.000	0.000	0.454
32	737800	1.463	0.446	1.909	0.000	0.000	0.000	1.909
32	717200	0.304	0.095	0.399	3.159	0.729	3.888	4.287
32	EMB190	0.568	0.177	0.746	5.904	1.361	7.265	8.011
32	LEAR35	0.157	0.071	0.228	0.957	1.053	2.010	2.239
32	DHC830	2.098	0.637	2.736	21.852	3.427	25.278	28.014
32	DHC6	0.168	0.086	0.254	1.822	0.098	1.919	2.173
32	CNA441	0.371	0.462	0.833	4.937	1.051	5.988	6.821
	TOTAL	5.530	2.096	7.626	38.631	7.718	46.349	53.975
	ALL	241.987	113.200	355.188	251.979	103.209	355.188	710.376

ANEC – PARALLEL RUNWAYS SUMMER ULTIMATE CAPACITY

Runway	Aircraft	Arrivals			Departures			All
		Day	Night	Total	Day	Night	Total	Total
01L	A380-841	1.414	0.485	1.899	4.171	0.727	4.898	6.797
01L	A380-861	0.707	0.242	0.949	2.086	0.364	2.449	3.399
01L	7478	0.454	0.004	0.458	0.000	0.089	0.089	0.547
01L	7773ER	2.253	1.348	3.600	4.719	3.178	7.897	11.498
01L	7878R	13.923	2.424	16.347	14.533	3.883	18.415	34.762
01L	A321NEO	2.456	0.566	3.022	2.355	0.528	2.882	5.904
01L	A320NEO	8.342	1.922	10.264	7.999	1.792	9.791	20.055
01L	737MAX8	40.684	9.374	50.058	39.009	8.740	47.749	97.807
01L	737700	0.109	2.484	2.593	0.040	0.736	0.776	3.369
01L	EMB190	9.968	2.806	12.774	10.361	2.010	12.371	25.145
01L	LEAR35	0.447	0.840	1.287	0.104	0.936	1.039	2.327
01L	DHC830	34.160	7.564	41.725	35.160	5.084	40.243	81.968
01L	DHC6	5.671	0.168	5.838	4.399	0.405	4.804	10.642
01L	CNA441	1.610	0.479	2.090	0.061	1.450	1.512	3.601
	TOTAL	122.197	30.707	152.904	124.995	29.922	154.917	307.820
01R	A380-841	0.000	0.478	0.478	0.000	0.579	0.579	1.057
01R	A380-861	0.000	0.239	0.239	0.000	0.290	0.290	0.529
01R	7478	0.000	0.600	0.600	0.000	1.758	1.758	2.357
01R	7773ER	2.109	1.417	3.526	2.599	2.578	5.177	8.703
01R	7878R	28.411	13.397	41.808	31.831	17.078	48.909	90.717
01R	A321NEO	2.343	0.781	3.124	2.392	0.930	3.322	6.446
01R	A320NEO	7.958	2.654	10.612	8.124	3.158	11.283	21.895
01R	737MAX8	38.809	12.945	51.754	39.623	15.404	55.026	106.780
01R	737700	0.068	0.575	0.644	0.320	7.025	7.344	7.988
01R	EMB190	0.000	0.425	0.425	0.000	1.136	1.136	1.560
01R	LEAR35	1.338	1.030	2.367	1.126	2.306	3.432	5.800
01R	DHC830	2.752	1.030	3.783	2.551	2.662	5.213	8.995
01R	DHC6	1.265	0.494	1.759	1.681	0.066	1.747	3.506
01R	CNA441	4.931	1.275	6.206	5.167	2.978	8.144	14.350
	TOTAL	89.982	37.341	127.323	95.414	57.946	153.360	280.683
01L	A380-841	0.000	0.000	0.000	0.000	0.152	0.152	0.152
01L	A380-861	0.000	0.000	0.000	0.000	0.076	0.076	0.076
01L	7478	0.000	0.291	0.291	0.000	1.170	1.170	1.461
01L	7773ER	3.818	0.726	4.544	4.261	0.925	5.186	9.730
01L	7878R	35.763	17.405	53.167	42.442	16.188	58.630	111.797
01L	A321NEO	2.996	1.098	4.094	3.016	1.166	4.182	8.276
01L	A320NEO	10.176	3.730	13.906	10.246	3.961	14.207	28.113
01L	737MAX8	49.629	18.192	67.821	49.969	19.316	69.286	137.106
01L	737700	0.502	0.293	0.795	0.251	1.233	1.484	2.280
01L	EMB190	0.000	0.000	0.000	0.000	0.012	0.012	0.012
01L	LEAR35	1.176	1.633	2.809	1.207	1.995	3.202	6.011
01L	DHC830	3.597	0.537	4.134	2.963	1.379	4.343	8.476
01L	DHC6	1.596	0.608	2.205	2.209	0.664	2.873	5.078
01L	CNA441	5.526	2.608	8.134	6.629	1.995	8.624	16.758
	TOTAL	114.779	47.122	161.900	123.193	50.233	173.426	335.327
01R	A380-841	4.054	4.725	8.779	4.824	0.703	5.527	14.306
01R	A380-861	2.027	2.363	4.390	2.412	0.351	2.763	7.153
01R	7478	0.343	2.074	2.417	0.000	0.749	0.749	3.166
01R	7773ER	6.525	7.940	14.465	5.573	2.302	7.875	22.340
01R	7878R	20.223	17.811	38.034	18.366	5.035	23.401	61.435
01R	A321NEO	2.810	1.226	4.036	2.934	0.956	3.889	7.926
01R	A320NEO	9.545	4.166	13.710	9.966	3.246	13.212	26.922
01R	737MAX8	46.548	20.315	66.864	48.603	15.831	64.434	131.298
01R	737700	0.081	5.934	6.015	0.150	0.293	0.443	6.458
01R	EMB190	11.432	4.973	16.405	12.087	3.998	16.085	32.490
01R	LEAR35	0.477	2.695	3.172	0.443	1.520	1.963	5.135
01R	DHC830	37.890	12.955	50.844	41.023	9.664	50.687	101.531
01R	DHC6	5.351	0.918	6.269	5.137	1.509	6.646	12.915
01R	CNA441	1.538	1.406	2.944	0.085	1.008	1.093	4.037
	TOTAL	148.844	89.500	238.344	151.604	47.165	198.769	437.112
	ALL	475.801	204.670	680.471	495.206	185.266	680.472	1360.943

TABLE 8.9: ANEF EXPLANATORY TABLES (CONTINUED)
ANEC – PARALLEL RUNWAYS WINTER ULTIMATE CAPACITY

		Arrivals			Departures			All
Runway	Aircraft	Day	Night	Total	Day	Night	Total	Total
01L	A380-841	0.291	0.223	0.514	1.821	0.240	2.061	2.575
01L	A380-861	0.146	0.111	0.257	0.911	0.120	1.030	1.287
01L	7478	0.268	0.000	0.268	0.000	0.024	0.024	0.291
01L	7773ER	0.547	0.620	1.167	2.223	1.082	3.305	4.472
01L	7878R	6.234	0.902	7.136	7.160	1.412	8.572	15.708
01L	A321NEO	1.321	0.213	1.534	1.172	0.167	1.340	2.874
01L	A320NEO	4.489	0.723	5.212	3.983	0.568	4.550	9.762
01L	737MAX8	21.891	3.528	25.419	19.424	2.768	22.192	47.611
01L	737700	0.000	0.984	0.984	0.000	0.081	0.081	1.066
01L	EMB190	5.826	0.972	6.798	5.802	0.492	6.294	13.091
01L	LEAR35	0.206	0.379	0.585	0.015	0.074	0.089	0.674
01L	DHC830	18.736	2.889	21.625	18.371	1.521	19.891	41.517
01L	DHC6	3.272	0.068	3.340	2.251	0.174	2.424	5.764
01L	CNA441	0.775	0.190	0.965	0.029	0.085	0.115	1.080
	TOTAL	64.003	11.802	75.804	63.162	8.806	71.968	147.772
01R	A380-841	0.000	0.061	0.061	0.000	0.394	0.394	0.455
01R	A380-861	0.000	0.031	0.031	0.000	0.197	0.197	0.227
01R	7478	0.000	0.189	0.189	0.002	1.416	1.418	1.607
01R	7773ER	1.065	0.165	1.230	0.869	2.500	3.369	4.598
01R	7878R	14.144	4.534	18.678	14.872	11.898	26.770	45.448
01R	A321NEO	1.173	0.319	1.491	1.209	0.650	1.859	3.350
01R	A320NEO	3.983	1.083	5.066	4.107	2.208	6.315	11.381
01R	737MAX8	19.424	5.282	24.706	20.029	10.770	30.799	55.505
01R	737700	0.017	0.156	0.173	0.219	7.210	7.429	7.601
01R	EMB190	0.000	0.000	0.000	0.000	1.790	1.790	1.790
01R	LEAR35	0.812	0.426	1.239	0.761	1.755	2.516	3.755
01R	DHC830	0.708	0.470	1.178	1.326	3.302	4.628	5.807
01R	DHC6	0.992	0.000	0.992	0.937	0.000	0.937	1.929
01R	CNA441	2.690	0.503	3.193	2.553	2.669	5.221	8.414
	TOTAL	45.007	13.218	58.225	46.882	46.761	93.643	151.869
01L	A380-841	0.000	0.000	0.000	0.000	0.200	0.200	0.200
01L	A380-861	0.000	0.000	0.000	0.000	0.100	0.100	0.100
01L	7478	0.005	0.503	0.508	0.003	1.698	1.701	2.209
01L	7773ER	5.795	0.000	5.795	5.145	1.846	6.992	12.786
01L	7878R	49.875	20.243	70.118	58.899	22.544	81.443	151.561
01L	A321NEO	4.016	1.398	5.414	4.121	1.706	5.827	11.241
01L	A320NEO	13.643	4.749	18.391	13.998	5.796	19.794	38.186
01L	737MAX8	66.535	23.158	89.694	68.268	28.269	96.537	186.230
01L	737700	0.544	0.419	0.963	0.342	2.054	2.396	3.359
01L	EMB190	0.000	0.000	0.000	0.000	0.799	0.799	0.799
01L	LEAR35	1.721	2.181	3.902	2.635	2.880	5.515	9.418
01L	DHC830	3.663	1.592	5.255	4.975	2.821	7.796	13.051
01L	DHC6	3.629	0.000	3.629	3.683	0.000	3.683	7.311
01L	CNA441	7.922	3.369	11.292	9.440	3.359	12.799	24.090
	TOTAL	157.348	57.611	214.959	171.509	74.074	245.583	460.542
01R	A380-841	4.073	6.509	10.582	7.522	0.979	8.501	19.083
01R	A380-861	2.037	3.254	5.291	3.761	0.490	4.251	9.541
01R	7478	0.520	2.423	2.942	0.000	0.764	0.764	3.706
01R	7773ER	7.979	9.964	17.944	8.596	3.874	12.470	30.414
01R	7878R	28.413	25.011	53.424	25.564	7.007	32.571	85.995
01R	A321NEO	4.105	1.731	5.836	4.037	1.212	5.250	11.085
01R	A320NEO	13.944	5.880	19.823	13.714	4.118	17.832	37.656
01R	737MAX8	68.003	28.675	96.677	66.883	20.085	86.968	183.645
01R	737700	0.000	7.787	7.787	0.000	0.000	0.000	7.787
01R	EMB190	17.859	4.947	22.806	16.750	3.970	20.720	43.526
01R	LEAR35	0.613	3.245	3.858	0.392	1.071	1.463	5.321
01R	DHC830	55.613	16.814	72.427	57.044	11.126	68.170	140.597
01R	DHC6	7.726	0.384	8.110	7.343	1.683	9.026	17.136
01R	CNA441	2.143	1.833	3.976	0.103	1.189	1.291	5.267
	TOTAL	213.027	118.456	331.482	211.709	57.569	269.278	600.760
	ALL	479.384	201.087	680.471	493.261	187.210	680.471	1360.943

HELICOPTER MOVEMENTS

Ultimate Capacity Winter

HELO_ID	OP_TYPE	PROF_ID1	PROF_ID2	PAD_ID	TRK-ID1	OPS_DAY	OPS_NIGHT	TOTAL
EC130	A	STANDARD	1	HE01	HE01HA01	0.7661	0.0515	
EC130	A	STANDARD	1	HE01	HE01HA02	0.7023	0.0473	
EC130	A	STANDARD	1	HE01	HE01HA03	0.7023	0.0473	2.3166
EC130	D	STANDARD	1	HE01	HEO1HD01	0.1861	0.0125	
EC130	D	STANDARD	1	HE01	HE01HD02	0.6822	0.0459	
EC130	D	STANDARD	1	HE01	HE01HD03	0.6822	0.0459	
EC130	D	STANDARD	1	HE01	HE01HD04	0.6202	0.0417	2.3166
					TOTAL	**4.3412**	**0.2921**	

Annual (365 days) 1691.147

Ultimate Capacity Summer

HELO_ID	OP_TYPE	PROF_ID1	PROF_ID2	PAD_ID	TRK-ID1	OPS_DAY	OPS_NIGHT	TOTAL
EC130	A	STANDARD	1	HE01	HE01HA01	0.7661	0.0515	
EC130	A	STANDARD	1	HE01	HE01HA02	0.7023	0.0473	
EC130	A	STANDARD	1	HE01	HE01HA03	0.7023	0.0473	2.3166
EC130	D	STANDARD	1	HE01	HEO1HD01	0.1861	0.0125	
EC130	D	STANDARD	1	HE01	HE01HD02	0.6822	0.0459	
EC130	D	STANDARD	1	HE01	HE01HD03	0.6822	0.0459	
EC130	D	STANDARD	1	HE01	HE01HD04	0.6202	0.0417	2.3166
					TOTAL	**4.3412**	**0.2921**	

Annual (365 days) 1691.147

Existing System Winter 2020

HELO_ID	OP_TYPE	PROF_ID1	PROF_ID2	PAD_ID	TRK-ID1	OPS_DAY	OPS_NIGHT	TOTAL
EC130	A	STANDARD	1	HE01	HE01HA01	0.3665	0.0247	
EC130	A	STANDARD	1	HE01	HE01HA02	0.3359	0.0226	
EC130	A	STANDARD	1	HE01	HE01HA03	0.3359	0.0226	1.1081
EC130	D	STANDARD	1	HE01	HEO1HD01	0.0890	0.0060	
EC130	D	STANDARD	1	HE01	HE01HD02	0.3263	0.0220	
EC130	D	STANDARD	1	HE01	HE01HD03	0.3263	0.0220	
EC130	D	STANDARD	1	HE01	HE01HD04	0.2967	0.0200	1.1081
					TOTAL	**2.0765**	**0.1397**	

Annual (365 days) 808.924

Existing System Summer 2020

HELO_ID	OP_TYPE	PROF_ID1	PROF_ID2	PAD_ID	TRK-ID1	OPS_DAY	OPS_NIGHT	TOTAL
EC130	A	STANDARD	1	HE01	HE01HA01	0.3665	0.0247	
EC130	A	STANDARD	1	HE01	HE01HA02	0.3359	0.0226	
EC130	A	STANDARD	1	HE01	HE01HA03	0.3359	0.0226	1.1081
EC130	D	STANDARD	1	HE01	HEO1HD01	0.0890	0.0060	
EC130	D	STANDARD	1	HE01	HE01HD02	0.3263	0.0220	
EC130	D	STANDARD	1	HE01	HE01HD03	0.3263	0.0220	
EC130	D	STANDARD	1	HE01	HE01HD04	0.2967	0.0200	1.1081
					TOTAL	**2.0766**	**0.1399**	

Annual (365 days) 808.924

FIGURE 8.7: ANEC20 CONTOUR COMPARISON BETWEEN 2009 – 2014

This comparison of the Ultimate Capacity ANEF from 2009-2014 is a land use planning tool of relevance to state and local planning authorities. For community members seeking information about aircraft noise impacts on a day to day basis, please refer to the Current and Future Flight Path and Noise Information booklet.

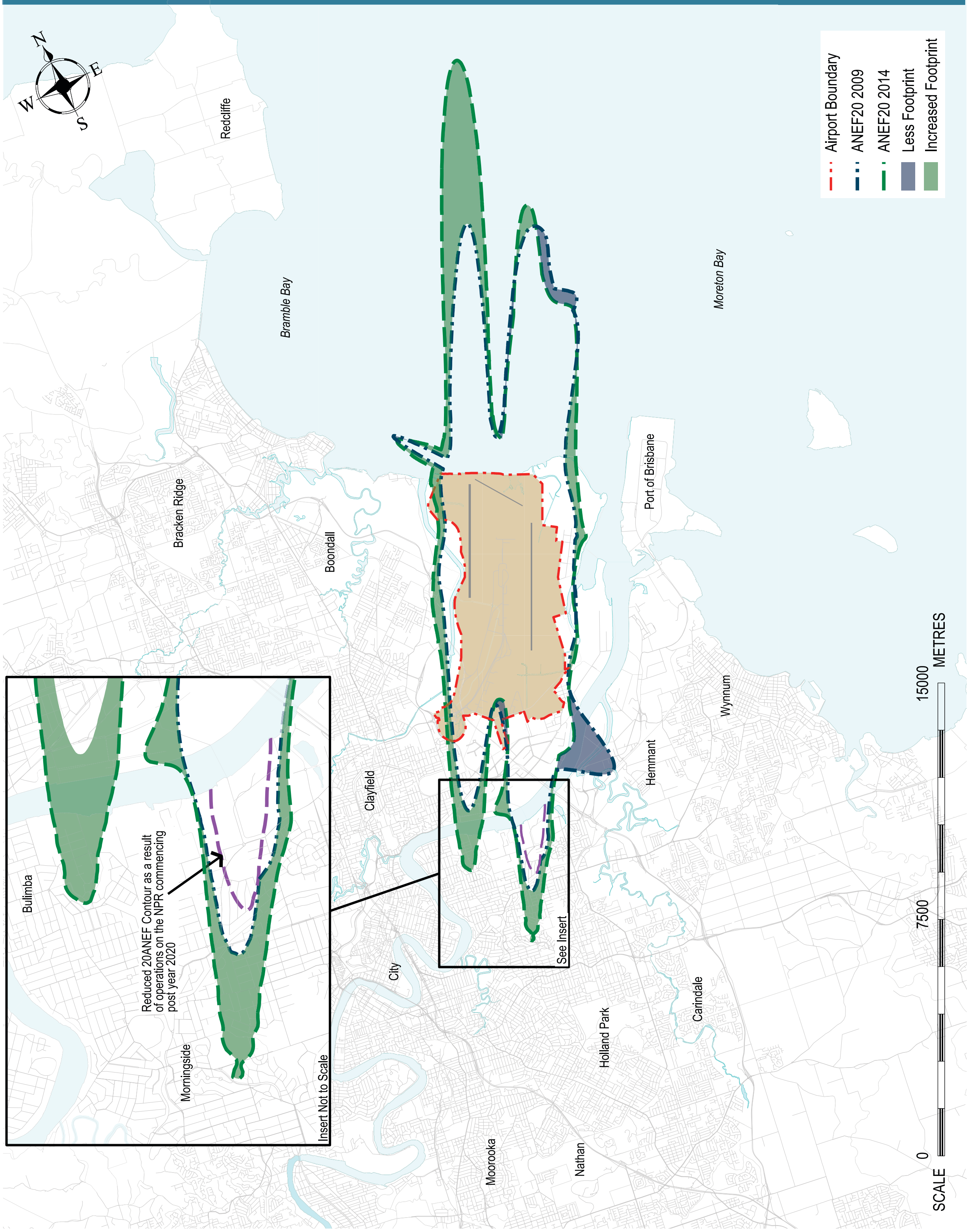


FIGURE 8.8: ANEC20 CONTOUR COMPARISON BEWEEN 2014 AND ULTIMATE CAPACITY

This comparison of the Ultimate Capacity ANEF from 2009-2014 is a land use planning tool of relevance to state and local planning authorities. For community members seeking information about aircraft noise impacts on a day to day basis, please refer to the Current and Future Flight Path and Noise Information booklet.

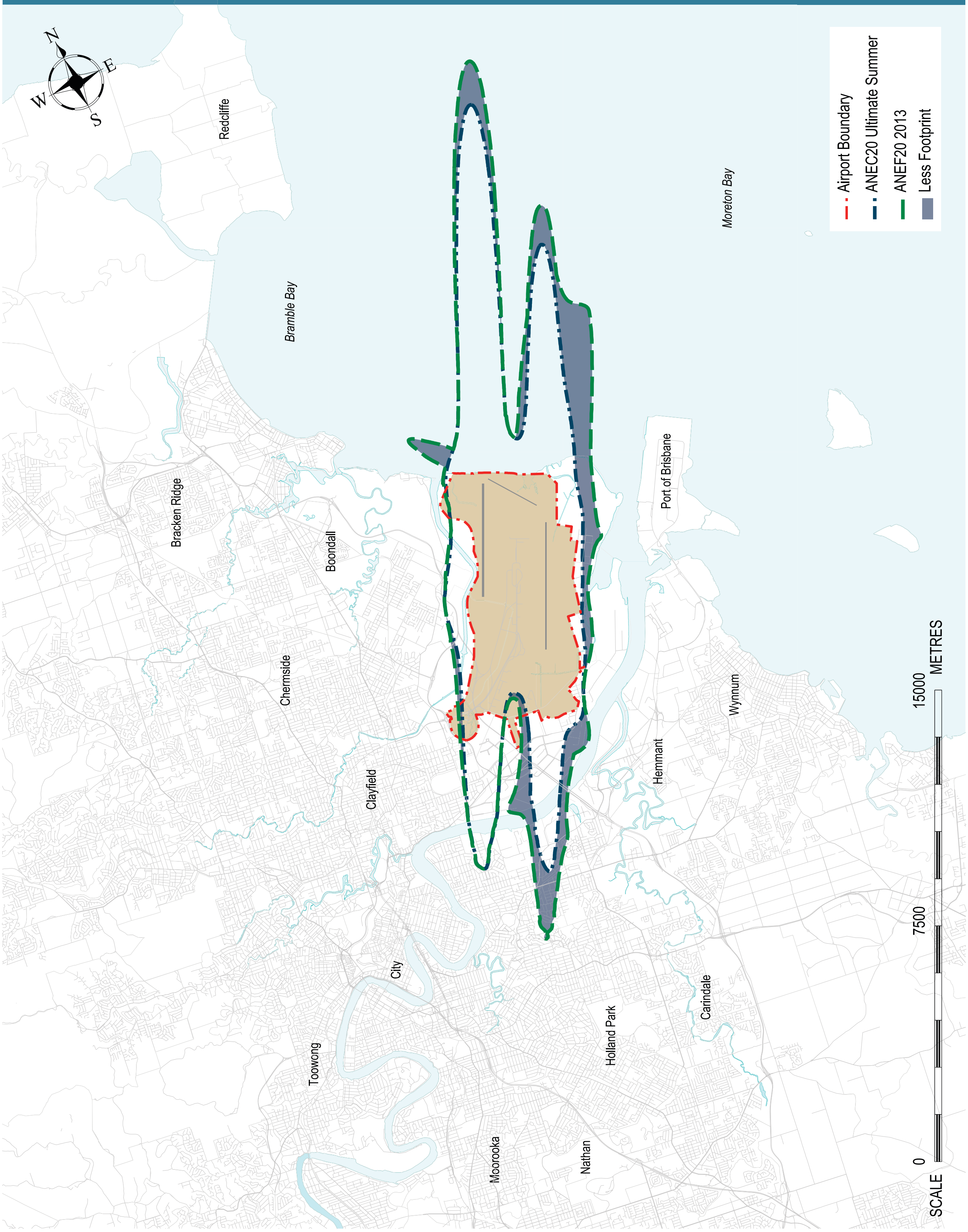
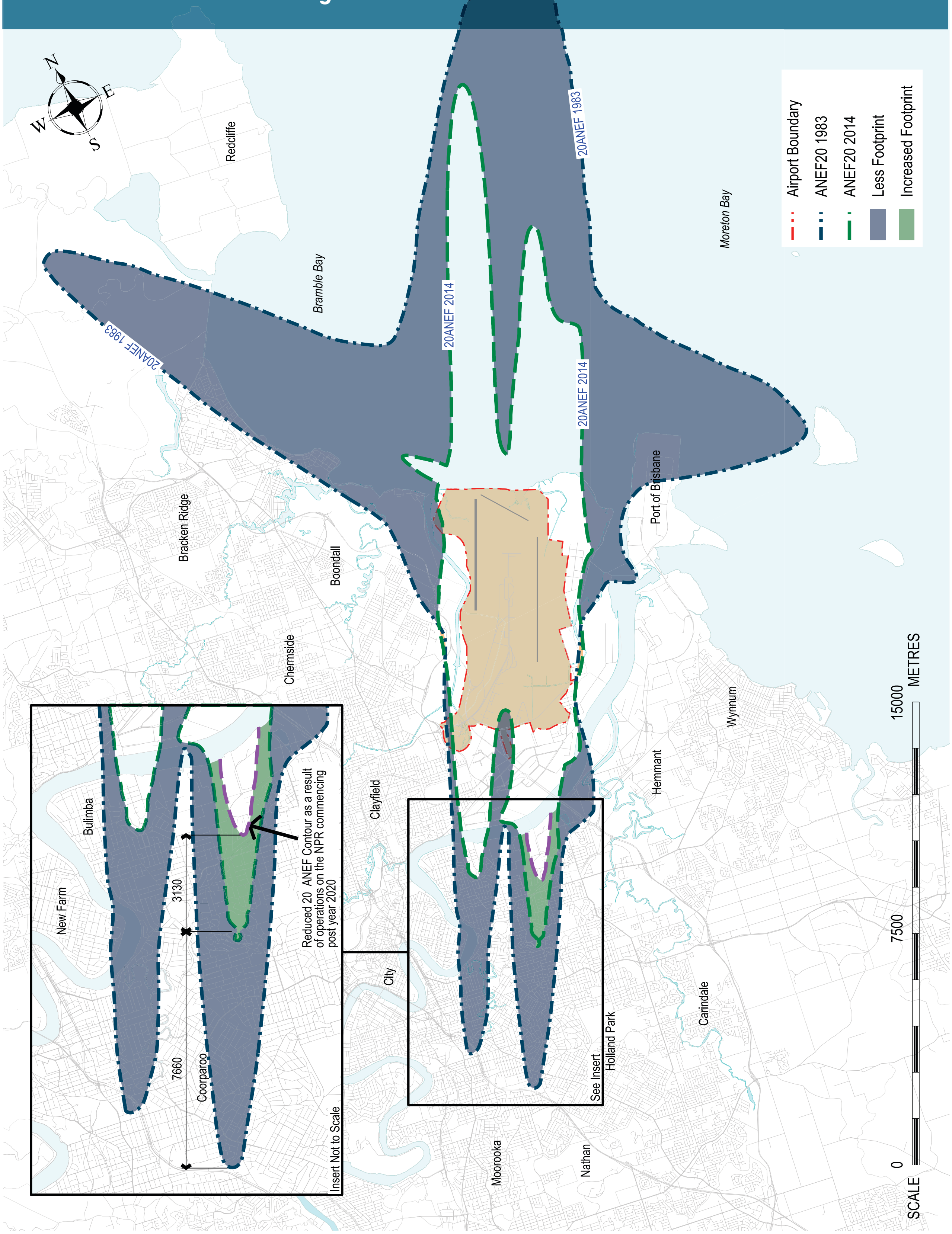


FIGURE 8.9: ANEC20 CONTOUR COMPARISON BETWEEN 1983 AND 2014

This ANEF comparison between 1983-2013 highlights the impacts of aircraft design, technology, air traffic management and fleet mix has had on planning and development around Brisbane Airport. For community members seeking information about aircraft noise impacts on a day to day basis, please refer to the Current and Future Flight Path and Noise Information booklet.



Managing Noise by Off-airport Land Use Planning Authorities

The primary function of an ANEF is as a tool in land use planning; BCC and state planning agencies use the ANEF charts to determine the compatibility of different land uses within the ANEF contours – the higher the ANEF contour, the greater the noise exposure. Table 8.9 details the types of buildings (as established by AS2021-2000) considered acceptable to be located within different ANEF zones.

BAC strongly supports the consideration of aircraft noise effects as a relevant factor to consider land use planning and residential development assessments, as (future) aircraft noise from increased movements can have a potential impact on residents.

Additionally, BAC believes that high-rise residential development in the vicinity of Brisbane Airport should be considered carefully. Residents in upper levels of such developments may find aircraft noise more intrusive as there is less other background or ambient noise experienced at higher levels.

Furthermore BAC recommends forms of covenants on title for residents at new developments in the 20 ANEF contours, to ensure awareness and acceptance of the potential amenity impacts that aircraft over flight may result in.

BAC is required to provide, as part of its Master Plan, a strategy to manage the intrusion of inappropriate land uses in areas forecast to have aircraft noise above the "significant" ANEF levels.

The Airports Act identifies the 30 ANEF contour as being the "significant" noise level. The presented ANEF indicates that the 30 ANEF contour is generally contained on Brisbane Airport land or over water in Moreton Bay. There is minor extension beyond the airport boundary to the south of the existing main runway – 01L/19R – refer Figure 8.6, which is over land use zoning consistent with its existing general industry use and therefore consistent with the land-use compatibility standards of AS 2021.

BCC's ongoing planning intent within the 30 contour is to maintain industrial land use zoning.

The 30 ANEF contour southern extents associated with the NPR is contained well within the airport boundary.

Finally, BAC reiterates its belief that the ANEF system, while being the adopted system for land-use zoning around Australian airports, has proved to not adequately address individual's reaction to aircraft noise and aircraft over-flight. BAC is committed to working with all levels of government and the Industry to continue to explore metrics to improve aircraft noise information and planning mechanisms.

High-rise residential development near Brisbane Airport needs to be considered carefully as residents in upper levels may find aircraft noise more intrusive.

TABLE 8.10: BUILDING LAND USE COMPATIBILITY ADVICE FOR AREAS IN THE VICINITY OF AIRPORTS

Building Type	ANEF Zone of Site		
	Acceptable	Conditional	Unacceptable
House, home, unit, flat, caravan park	Less than 20[1]	20 to 25[2]	Greater than 25
Hotel, motel, hostel	Less than 25	25 to 30	Greater than 30
School, university	Less than 20[1]	20 to 25[2]	Greater than 25
Hospital, nursing home	Less than 20[1]	20 to 25	Greater than 25
Public building	Less than 20[1]	20 to 30	Greater than 30
Commercial building	Less than 25	25 to 35	Greater than 35
Light Industrial	Less than 30	30 to 40	Greater than 40
Other Industrial	Acceptable in all ANEF zones		

1 *The actual location of the 20 ANEF is difficult to define accurately, mainly because of variations in aircraft flight paths. Because of this, the procedures in Clause 2.3.2 of the Standard may be followed for building sites outside but near the 20 ANEF contour.*

2 *Within the 20 to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate.*