BRISBANE AIRPORT AUSTRALIA

BRISBANE'S NEW RUNWAY

CLIMATE CHANGE ADAPTATION MEASURES

OVERVIEW

- Impacts/Risks Addressed
- Information & Knowledge Gaps
- Response Strategy
- Implementation Phases

PROJECT UPDATE
JANUARY 2018

In order to accommodate future growth, planning for a new runway at Brisbane Airport has been underway for over 20 years. Major infrastructure projects such as this require extensive site surveys and design studies; are subject to numerous legislated planning conditions and approvals; involve detailed stakeholder engagement; and pose a range of construction and operational challenges.

In 2007 the New Parallel Runway Project was approved by the Australian Government following the completion and acceptance of a comprehensive Environmental Impact Statement (EIS) and Major Development Plan (MDP).

The project involves construction of a new runway and associated infrastructure on a low lying coastal area, parallel to Brisbane Airport's existing runway. The project site is subject to inundation during high tide, flood events and at risk to future climate change impacts such as sea level rise. As such, climate change impacts were considered in the planning and design for the ongoing continuity and long term viability of operation of the new runway.

IMPACTS/RISKS ADDRESSED

Given the sub-tropical location of the site, and its proximity to the coast, the key climate change related risks were identified as sea level rise, storm surge from increased cyclones and other low pressure events, local/regional flood events and an increase in average temperatures. Specifically, there were a number of key design and planning decisions for the project where consideration of climate change and other related stakeholder issues featured.

Specifically, these were:

- **Project go / no go decision:**
  As part of the design process for the project, alternatives to building a new runway were considered. After evaluation of the options available to address the airport's current operating constraints and future growth projections, construction of a new runway was found to be the most appropriate option.
- **Runway placement and layout:**
  Six options were considered. Each option presented a range of issues for assessment, including cost, operating and safety standards, noise restrictions, environmental impacts, and climate change resilience.
- **Runway height:**
  The height above sea level of the runway became the major climate change related design issue. The final design had to take account of historic and projected severity and frequency of sea level rise, storm surge and local/regional flood events. Based on the available evidence a design decision was then made to take account of the level and likelihood of the risk (e.g. sea level rise) and the cost of mitigation (e.g. raising the height of the runway).

About Brisbane Airport: Brisbane Airport is the third busiest airport in Australia and operates 24 hours a day, seven days a week. It is Australia's largest capital city airport (by land size) and has two major terminals providing services to 31 airlines flying to 82 international and domestic destinations. In FY17 Brisbane Airport welcomed nearly 22.9 million passengers through its facilities.

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INFORMATION & KNOWLEDGE GAPS

In considering the impacts of climate change on the new runway the project drew upon information and expertise from across a range of scientific and engineering sources. Initial considerations for flood and storm tide surge modelling were derived from the findings of a multi-agency investigation which assessed the magnitude of the present and future ocean threats from tropical cyclones in Queensland and the vulnerability of coastal communities to extreme winds (Queensland Government 2004).

RESPONSE STRATEGY

The project team were cognisant of the need to consider future climate change impacts in the design, construction and operation of this major asset and the role that engagement with key stakeholders would play in the design and approval process.

Climate Change Impacts

Given the vital importance of the infrastructure and its long term operating life, the design response to potential climate change impacts was as follows:

- Sea level rise and increased frequency of cyclonic events was addressed by incorporating a 400mm allowance plus 500mm additional wave set up freeboard in the hydrological modelling in accordance with research available at the time for the Queensland coast.
- Consideration of temperature increases in future decades was accounted for in the ultimate length planning for both the existing main runway and for the new runway, each of which has significant additional lengths available to be added in the future.

In the preliminary design developed in 2005 the minimum design level for the new runway based on a 1% Average Exceedence Probability (AEP) design storm tide level was determined to be 2.4m AHD or 3.53m Airport Datum (AD).

This consisted of:

- Existing storm surge level of 1.5m AHD;
- Climate change increase of 400mm (including 300mm sea level rise and increased cyclone frequency); and
- Wave set up freeboard of 500mm.

Additional design considerations

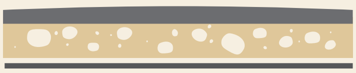
In addition to the storm tide, climate change and freeboard allowance, a further design consideration influenced the final design elevation for the project. BAC decided that it would be preferable to select a minimum design to be the same as the existing runway (5.2m AD) so as not to have an undesirable incline (gradient) along the linking taxiways and links into adjoining aprons. This design feature minimises aircraft fuel burn during taxiing between the new runway, the existing runway system and existing aircraft terminals. In addition to decreased fuel burn a runway elevation higher than 3.53m AD provides further enhancement of protection against future climate impacts.

In addition to the height of the new runway, other climate change impact related measures include construction of tidal channels and the installation of a new sea wall along the northern boundary of the airport, and allowance for a future runway extension to 3600m if it is determined that additional runway length is required for aircraft operations due to temperature increase.

Approximately

380,000t

of **aircraft grade concrete** (prepared on site from local products)



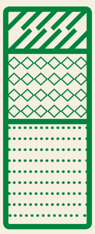
Approximately

100,000t

of **aircraft grade asphalt** (prepared on site from local products)

Overall thickness of runway

3.2m deep



125mm asphalt layer placed on top

600mm fine crushed rock

2475mm of compacted sand

Up to

300ha

of **landscaping, turf and seeds** to be sourced locally

90%

of **project materials** will come from SEQ (excavators, compactors and trucks)

Updated Research

To further substantiate the proposed runway height to account for newer research, in 2009, BAC engaged the Antarctic Climate and Ecosystems Collaborative Research Centre (ACE CRC) based in Tasmania, Australia, to evaluate the runway height specifications using the latest climate and sea level data available. Using a customised sea-level calculator the ACE CRC provided updated assurance of the runway design level (5.2m AD) describing it as 'strongly precautionary'.

Stakeholder Engagement

Given the profile and complexity of Brisbane's new runway project, a key factor in progressing the design and approval of the project was engagement with a broad range of stakeholders. A 22 month stakeholder engagement process was undertaken culminating in late 2006 when BAC released for public comment the New Parallel Runway Project Environmental Impact Statement and Major Development Plan (EIS/MDP).

At the conclusion of the consultation period BAC had received 196 public submissions. Of the submissions received, three specifically questioned whether the proposed runway design adequately took account of the long term impacts of climate change and sea level rise. In responding to the climate change issues raised in the engagement process BAC drew upon research and design data applied in the modelling and the final design specifications for the runway height and other supporting measures.

IMPLEMENTATION PHASES

The project has progressed through the usual climate change adaptation phases: Assessment & Research / Engagement / Decision Making / Planning / Construction. The ground preparation works (including the early civil works and dredging and reclamation works) were completed in 2015 and the site was consolidated under the placement of nearly 11 million cubic metres of sand and an extensive array of vertical wick drains. The desired performance of the ground strength and elevation improvements were achieved, enabling pavement and airfield construction to commence in 2017 with the runway targeted to be operational in 2020.

HOW DOES IT CONTRIBUTE TO REDUCING THE ENVIRONMENTAL FOOTPRINT OF THE SECTOR?

The new parallel runway system will be operated to maximise operations over Moreton Bay in order to minimise noise impacts to local communities. Parallel runways provide the best opportunity to maximise the number of aircraft that can fly into and out of an airport. Upon opening the dual parallel runways will be used in a number of ways, commonly referred to as 'modes of operation'. Each mode of operation is allotted a hierarchy of 'preference'. With two parallel runways in operation the preference will be to use Over Bay operations, in the first instance (see diagram below), particularly in the noise sensitive night hours, then 19 parallel, and then 01 parallel operations respectively.

360 hectare Site

Approximately **260,000**m^3 of **topsoil to be generated from on site**, supplemented with approximately 15,000m^3 imported from local sources

11 million cubic metres of dredge sand

Approximately **750,000**t of **quarry products** (sourced and transported locally)

Up to **1,250** million litres of **recycled water**

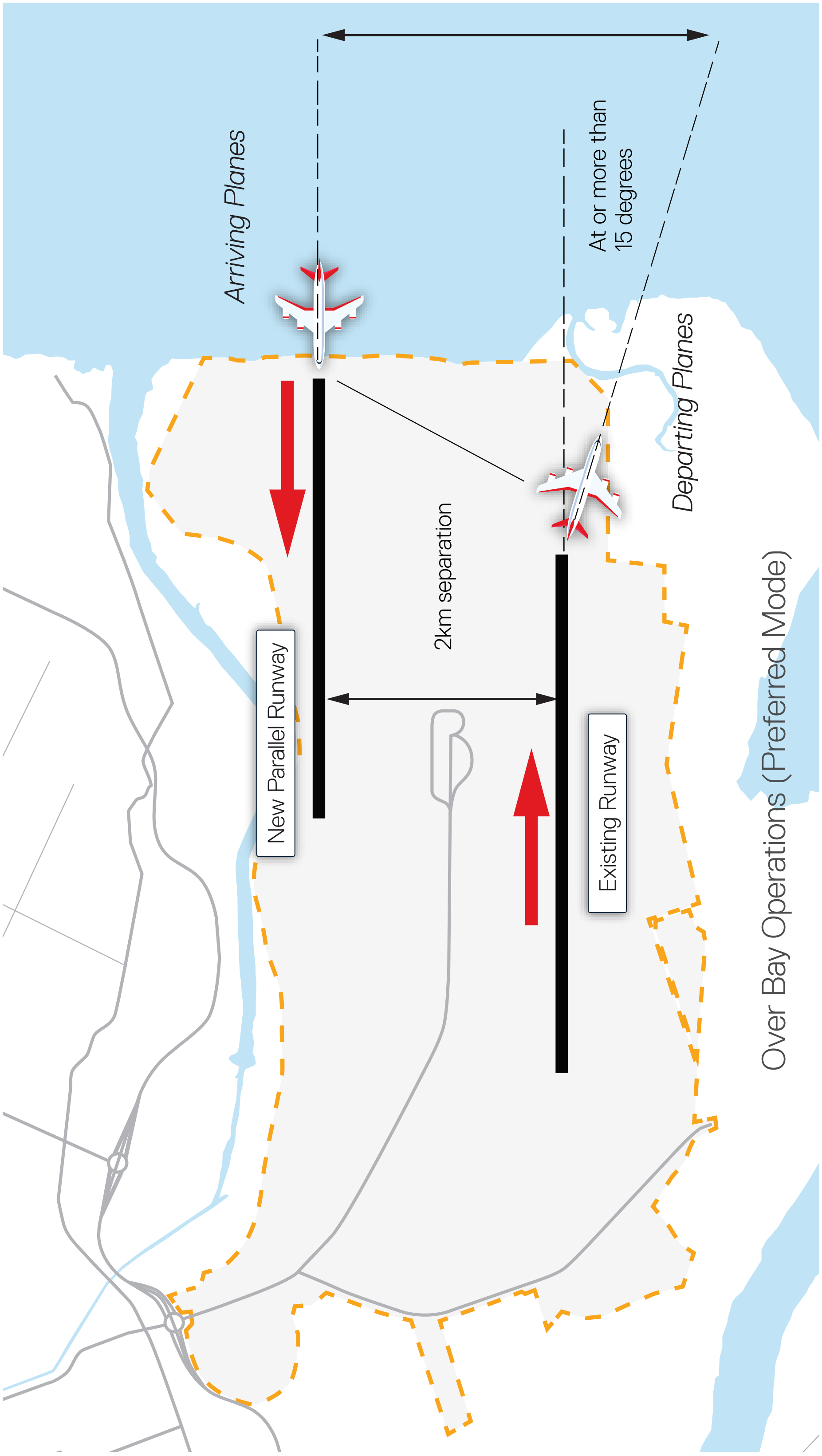
THE WAY FORWARD

Construction of the airfield commenced in 2017 starting with the Dryandra Road underpass and the removal of excess sand, as suitable ground settlement performance had been achieved. The final steps in construction involve pavement laying, installation of all other necessary airfield infrastructure and capping off with 300 hectares of airfield landscaping.

Brisbane's new runway will be commissioned and operational in 2020.

1ST PREFERENCE (PREFERRED MODE) – OVER BAY OPERATIONS

This means that given the right weather conditions, aircrafts could arrive over Moreton Bay and take off over Moreton Bay.



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