

RUNWAY EXTENSION FEASIBILITY STUDY

SUMMARY REPORT

Lord Howe Island Board | 22 February 2019

Lord Howe Island Runway Extension Feasibility Study Summary Report

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1.0 Introduction

1.1 Background

Lord Howe Island is located approximately 590 km from the closest town on the Australian mainland and 790 km from Sydney, it is one of the most remote communities in NSW and among the most remote of any Australian territory (Figure 1). It is known nationally and internationally for its natural beauty and biodiversity, as recognised in the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Listing.

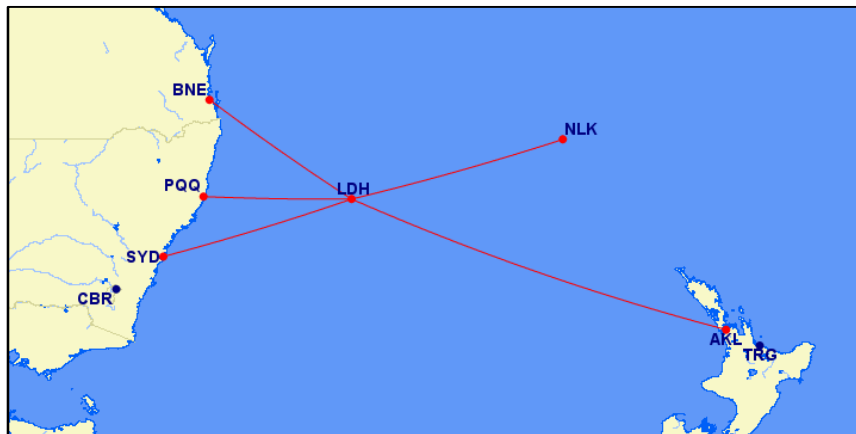


Figure 1 Location of Lord Howe Island

There are currently regular airline services operating from Sydney and Brisbane to the island, although the current route agreement is scheduled to end in March 2022 and Qantas have indicated they will no longer be operating the DHC8-200 aircraft servicing the island beyond this date. The existing runway is 888m (Figure 2) which presents limitations on the range of aircraft able to operate.



Figure 2 Existing Runway

In November 2017, AECOM were engaged by the Lord Howe Island Board (LHIB) to undertake a Runway Extension Feasibility Study to investigate the viability of a runway extension in order to continue the operation of 30+ seater regular passenger transport (RPT) services to the island beyond 2022. This study was completed in February 2019 with the final report issued XX February 2019.

1.2 Purpose

This report summarises the work completed by AECOM between November 2018 and January 2019 as part of LHIB Runway Extension Feasibility Study.

1.3 Scope of work

The scope of work is detailed in the following documents:

- a. Document - Request for Quote - LHI Airport Runway Extension Feasibility Study - Contract LHIB 2017-25 (August 2017)
- b. AECOM Proposal for LHI Airport Runway Extension Feasibility Study - Contract LHIB 2017-25 (11th September 2017)

The scope generally comprises the following:

- Milestone 1 – Detailed Assessment of Extended Runway Requirements and Suitable Aircraft
- Milestone 2 – Geotechnical Interpretive Report
- Milestone 3 – Concept Design
- Milestone 4 – Preliminary Environmental Assessment
- Milestone 5 – Preliminary Business Case
- Community Consultation

2.0 Milestone 1 – Detailed Assessment of Extended Runway Requirements and Suitable Aircraft

2.1 Summary

Information contained in this summary is taken from AECOM's report titled (April 2018, Rev B) *Detailed Assessment of Extended Runway Requirements and Suitable Aircraft*, this contains further detailed information on the work completed as part of Milestone 1.

The existing runway is 888m (Figure 2) which presents limitations on the range of aircraft able to operate. Milestone 1 provided a detailed review of the runway requirements for operation of the existing DHC8-200 regular passenger transport (RPT) aircraft at Lord Howe Island Airport (LDH), and the requirements for alternative currently in operation aircraft types such as the DHC8-300/400, ATR42/72 and Fokker 50.



Figure 3 Existing Runway

In addition future aircraft design trends were investigated, including electric aircraft. It was concluded that electric aircraft of comparable size will be developed within the next 15-20 years but at this point no conclusions can be drawn on their runway requirements except that they are expected to be similar to current aircraft.

The predominant in production turbo-prop aircraft in the 30-70 seat class are the ATR42, ATR72 and the Bombardier DHC-400. These aircraft form the fleet of the “mainline” airlines such as Qantas and Virgin Australia who expressed interest in operating the route. Older types no longer in production such as the DHC8-200/300, the Saab 340 and Fokker 50, while capable of operating on an extended runway, are confined to the small regional airlines such as Rex and Skytrans who did not express an interest in operating the route.

The operating requirements for each aircraft type assessed against potential runway arrangements under a range of operational configurations (take-off weight, landing weight etc.)

In addition to consideration of aircraft types, the following runway options were investigated during Milestone 1:

- Option 1: Do Nothing;
- Option 2: 450m runway extension;
- Option 3: 570m runway extension;
- Alternative Option 1: Runway realignment; and
- Alternative Option 2: Retaining the existing runway and leasing or purchasing of aircraft.

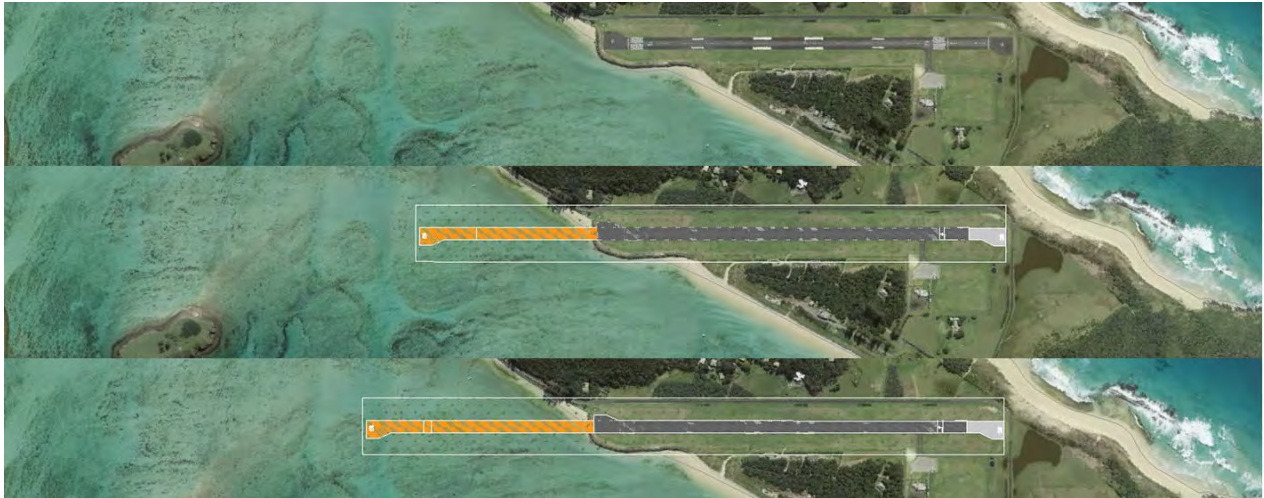


Figure 4 Aerial view of Option 1, 2 and 3

2.2 Conclusion

Key conclusions were:

- a. The current runway orientation should be retained due to the likely considerable cost associated with a full realignment and was not recommended for further study.
- b. A 'Do' Nothing' approach could leave the island with no 30+ seater RPT service from March 2022 onwards once the current agreement with Qantas expires as alternative 30+ seater aircraft would not be able to operate from the existing runway; this was not considered a final solution at this early stage of the project.
- c. Although a 450m extension option could provide for the future operation of some candidate aircraft, it did not provide sufficient "future proofing" for efficient operation of the ATR72 and DHC8-400 and therefore the recommendation was to further investigate a 570m extension option.
- d. Further investigation of leasing or purchasing an aircraft to use the existing runway was to be completed during Milestone 5 – Preliminary Business Case
- e. Further investigation of aircraft not meeting the 30+ seat requirement was to be completed during Milestone 5 – Preliminary Business Case, including the current non RPT air services from Port Macquarie

3.0 Milestone 2 – Geotechnical Interpretive Report

3.1 Summary

Information contained in this summary is taken from AECOM's report titled (August 2018, Rev 1) *Geotechnical Interpretive Report*, this contains further detailed information on the work completed as part of Milestone 2.

The report presented a preliminary interpretation of the geotechnical conditions along the proposed expansion alignment this included

- Desktop study based on existing information to assess likely ground conditions
- Geophysical survey and report undertaken as part of this study
- Geological cross sections of the expected geological conditions along the alignment
- Preliminary geotechnical design parameters to inform feasibility design

3.1.1 Geotechnical considerations

Seismic refraction surveys successfully mapped subsurface conditions up to 45m below the seabed; this information was correlated with historic geotechnical boreholes to develop a preliminary geological model. Geotechnical considerations of the expected profile are discussed below.

Coral Sands – These are represented by the blue to green layers in Figure 5. The sands are low strength, compressible, and may be susceptible to liquefaction under seismic loading. The depth of soil increases into the lagoon, with material extending to 25m below the seabed. Placing fill to on these soils will result in settlement, increasing the volume of material required. For a piled option the contribution of the overlying soils to the pile capacity will be very small and would be ignored.

Calcarenite (Limestone) – This is represented by the grey to red layers in Figure 5. The inferred top of calcarenite can vary in level by up to 5m over short distances. Pile embedment requirements within this layer would need to be proved by detailed drilling; in addition the strength and stiffness of the calcarenite would also need to be determined if this material was to be considered as the bearing strata for a piled deck option.

Volcanic Bedrock – This is represented by the white layer in Figure 5. The bedrock also seems to be irregular in profile with an increase in depth towards the lagoon side, it was generally found at least 20m below the seabed. This layer may comprise of high strength basalt which could be difficult to drill.

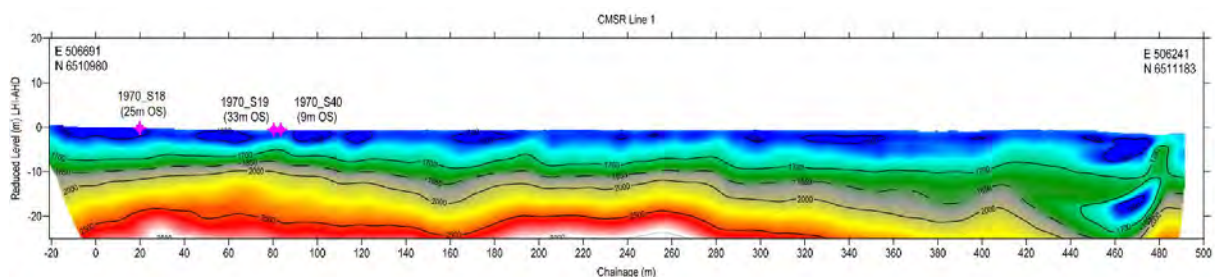


Figure 5 Interpreted Seismic Refraction along proposed runway centreline from the existing shoreline (0m)

3.2 Conclusion

The desktop study was based on a limited number of historic boreholes from within and surrounding the site, these preliminary geotechnical design parameters were used to inform Milestone 3 – Concept Design. Intrusive drilling would be required to inform future design stages. The investigation programme should cover the extension footprint and include the following:

- Collect samples of the overlying soils for laboratory characterisation testing (PSD, Atterberg limits, and
- Core the calcarenite (with acceptable core recovery) to carry out rock strength testing (UCS and Point Load Testing)
- Prove the depth to top of the volcanic rock

4.0 Milestone 3 – Concept Design

4.1 Summary

Information contained in this summary is taken from AECOM's report titled (November 2018, Rev C) *Concept Design Report*, this contains further detailed information on the work completed as part of Milestone 3.

The report provided an assessment of two runway extension options based on the recommended 570m extension length on the lagoon side, a land reclamation design and deck on pile structural design. Layout of the runway extension and associated turning head were developed in accordance with the requirements of CASA MOS 139.

In addition to the physical runway extension, civil work required around the airfield to accommodate the operation of the largest candidate Code C aircraft, a DHC8-400, was assessed against the requirements stated within CASA MOS 139. The following additional construction work required was identified;

- Expansion of the Eastern turning head
- Widening of the taxiway
- New RPT apron
- Realigned Island road
- Revised general aviation (GA) grass apron
- A new 2.4m high airfield security fence line
- Terminal building expansion

The Milestone 4 - Preliminary Environmental Assessment was undertaken in parallel with this design to inform the option development. Environmental and construction constraints associated with a remote World Heritage island were taken into consideration throughout the concept design process. In addition AECOM assessed outputs from the geophysical survey, historical geotechnical information and coastal design conditions to inform the final design solutions.

4.1.1 Land Reclamation Design

To prevent damage from overtopping and inundation of the runway during extreme storm events (1,000 year ARI in accordance with AS4997-2005), the western extent of the existing runway and surrounding earthwork levels would need to be raised by 500mm. This would have significant construction cost and duration implications in addition to the reclamation and due to the significant level increases required it may not be possible to keep the airfield operational during construction work.

Therefore a wave trip structure (shown as red in Figure 6) was designed along the western and southern edges of the extension, to absorb wave energy and reduce wave crest impacting the runway extension. The rock armour (shown as light grey in Figure 6) was designed as a conventional double layer rubble structure with a slope of 1 in 2.

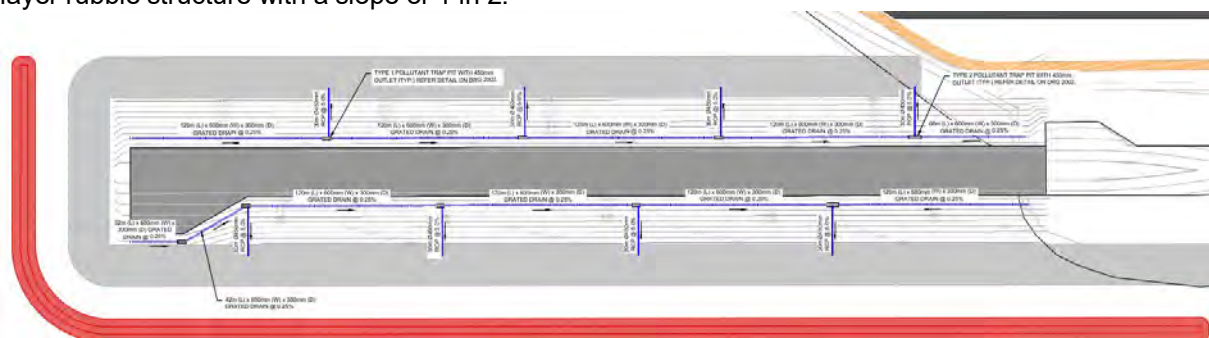


Figure 6 Land Reclamation Layout

Due to environmental constraints it is not possible to claim fill material from Lord Howe Island or the adjacent waters. As such the estimated 360,000m³ of fill would need to be imported from somewhere within the region such as mainland Australia, New Zealand, New Caledonia etc.

4.1.2 Deck on Pile Structural Design

The deck system comprises of precast concrete deck panels supported on precast reinforced concrete beams, this would be supported by a pile system generally set out on a 6m x 8m grid. This solution maximised the scope for prefabrication and minimised the on-site construction time.

The deck was designed to absorb wave impacts, therefore removing the requirement of a wave trip structure.

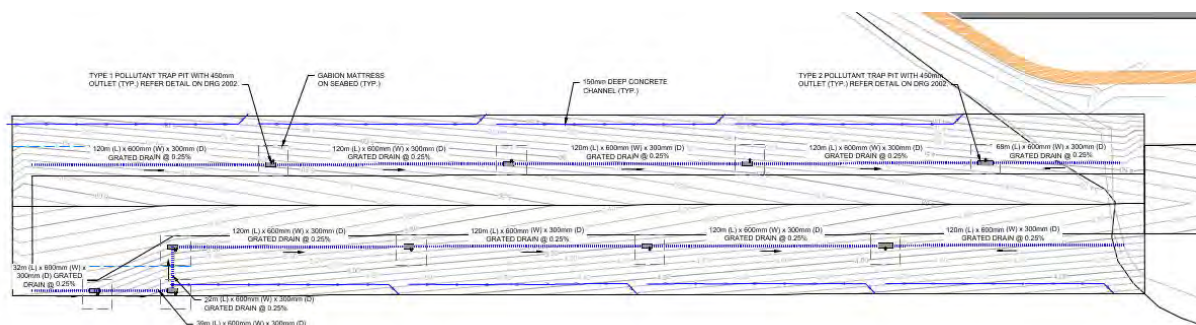


Figure 7 Deck on Pile Layout

4.2 Conclusion

Although the land reclamation and deck on pile structural design options proposed were both considered to be viable from an engineering perspective; it was AECOM's recommendation that the deck on pile option provided the preferable solution for the extended runway. A number of key differentiators were identified as part of Milestone 3 which can be seen in Table 1 below.

Table 1 Key differentiators for design options

Item	Land Reclamation	Deck on Piles	Differentiator
Coastal Processes	Significant impacts	Minor wave attenuation	Significantly lower impact
Preliminary Environmental Assessment (Section 5.0)	Higher construction and operation impact	Lower construction and operation impact	Lower potential impact
+30% Construction Cost Estimate	\$305,100,000	\$191,100,000	40% reduction in estimated construction costs
Project Delivery Program	51-69 months	45-63 months	10% reduction in program duration

5.0 Milestone 4 - Preliminary Environmental Assessment

5.1 Summary

Information contained in this summary is taken from AECOM's report titled (October 2018, Rev 1) *Preliminary Environmental Assessment*, this contains further detailed information on the work completed as part of Milestone 4.

The preliminary environmental assessment was undertaken based on a desktop review of the potential impacts of a runway extension at the Lord Howe Island Airport. The proposed runway extension would protrude into parts of the Lord Howe Island Lagoon Sanctuary Zone. The desktop assessment carried out determined potential environmental risks and approval risks associated with the environmental aspects of the marine and land based components of any proposed extension works.

The environmental issues associated with the potential construction and operation of a runway extension which were identified to have a medium to high risk were assessed in the preliminary environmental assessment (PEA). Environmental impacts which were predicted to be of a high significance as a result of the project include:

- World Heritage;
- surface water (quality and hydrology);
- coastal processes;
- contamination;
- climate change and flooding;
- biodiversity and biosecurity;
- noise and vibration; and
- landscape and visual amenity.

The assessment of significance for the potential impacts identified that the deck on pile option would have an overall lower level impact to the environment compared to the land reclamation option for construction and operational impacts. The primary differences between the two options are the potential impacts associated with coastal processes, surface water, traffic and transport and air quality.

A review of the legislative framework which would be applicable to the project was carried out, and informed a relevant approvals pathway for a proposed future runway extension project. In summary, such a project would require multiple approvals at the State and Commonwealth levels, the certainty of which is not assured due to the potential approvals risks and environmental impacts associated with the project. This process could potentially take up to 36 months to complete.

5.2 Conclusion

As the PEA was limited to a desktop assessment if the project was to progress to subsequent design stages, the environmental issues identified would need to be assessed in further detail including fieldwork based technical assessments. If it is decided that the runway extension would progress further, the next steps would be to begin with a formal planning application for the development, involving the preparation of a State significant scoping report to the Department of Planning and Environment (DP&E) and the preparation of an Environmental Impact Statement (EIS).

6.0 Milestone 5 – Preliminary Business Case

6.1 Summary

Information contained in this summary is taken from AECOM's report titled (December 2018, Rev B) *Preliminary Business Case*, this contains further detailed information on the work completed as part of Milestone 5.

The Preliminary Business Case (PBC) was developed to be consistent with NSW Treasury Guidelines for Capital Business Cases (2008) and outlines the need to maintain a Regular Passenger Transport (RPT) service to Lord Howe Island (LHI) that is of a sufficient scale (i.e. 30+ seater or similar) to satisfy demand beyond 2022, this included consideration of alternate options to the runway extension.

Securing an RPT service is essential to support tourism (capped at 400 visitors at any time), the economic viability of the Island and the well-being of its residents. Some of the benefits of maintaining an RPT include;

- Supporting local businesses and jobs
- Retaining residents' access to services, education and social and business connections on the mainland
- Ease and choice of frequency of travel for tourists
- Revenue to support environmental programs through collection of visitor fees and charges

The significance of maintaining an RPT air service is noted as a priority in a number of NSW State Government Plans and Strategies. Retaining such a service also aligns with the NSW State Priorities of creating jobs and building infrastructure. The proposal to extend the runway on Lord Howe Island is fully aligned with the LHIB Corporate Plan 2016-2019, which is, in turn, aligned with the Lord Howe Island Act 1953, the Lord Howe Island Community Strategy 2010-2015 and the NSW State Priorities.

Actions undertaken by LHIB to date were also detailed to articulate the work done to date relating to air service to the Island. Notably, given the current license expiration in March 2022, time is of the essence to secure a similar or comparable service offering that will continue to support the economy and provide visitor access. Options considered for the period post-2022 are contained in Table 2.

Table 2 Options considered beyond 2022

Option	Description	BCR
1	Cease 30+ seater RPT services to Sydney and Brisbane, and rely solely on current levels of 8 seater charter (non RPT) flights from Port Macquarie	N/A
2	Introduce an RPT service from Port Macquarie and/or another secondary city using smaller aircraft.	N/A
3 (a & b)	Buy or lease the DHC-8-200 aircraft to be operated by a suitable operator to continue RPT services from Sydney and Brisbane. Once the estimated 10 year service life of the aircraft is finished, one of the following sub-options would occur; a) The Island would revert back to relying solely on current levels of charter flight b) Upgrade to a different aircraft which could use the runway without extension, at present there is no viable aircraft available to do this.	3.16(a) 2.58(b)
4	Extend the runway using the deck on piles design option to enable operation of Code 3 aircraft (such as the ATR72 and DHC8-400) and continue 30+ seat RPT air services to Sydney and Brisbane.	0.39

While no stakeholder engagement was undertaken as part of this PBC, AECOM undertook community consultation and discussions with key stakeholders as part of the overall Feasibility Study. Discussions with key agencies assisted to understand their needs and requirements, and where relevant potential interest and feasibility of various operational arrangements which informed the development of options.

The benefit cost ratio (BCR) for the runway extension is 0.39 (i.e. 39 cents are returned for every dollar spent) under the standard analysis using a 7 percent discount rate. The indicators shows that

since the runway extension has a BCR below 1, it is not considered an economically viable project, and that the solution to this problem may better be served through one of the service change options (if possible).

6.2 Conclusion

The PBC concluded the following options should be investigated further by the Board, prior to undertaking a Full Business Case;

- Option 2: Commercialisation of chartered flights, such as the introduction of an RPT service from Port Macquarie and another secondary city using smaller aircraft
- Option 3: Continue an RPT commercial air service with Code 2 aircraft, which may require that the DHC-8-200 be bought or leased and operated by a suitable operator to continue RPT services from Sydney and Brisbane. Post 2028 when the DHC8-200 will likely be beyond its serviceable life, there are two sub-options:
 - Option 3a: Cease RPT service, reverting to the base case (Option 1).
 - Option 3b: Replace DHC-8-200s with newer or upgraded Code 2 aircraft if operational at the time.

There are a number of matters that the Board should assess further to determine a preferred option and potentially develop a full business case. All options will require consultation with key stakeholders to refine the feasibility of each option. A full business case should be pursued if it is deemed that the preferred option will require government funding to maintain an RPT service past 2022.

7.0 Community Consultation

7.1 Summary

Information contained in this summary is taken from AECOM's report titled (December 2018, Rev B) *Community Consultation Report*, this contains further detailed information on the work completed as part of AECOM's Community Consultation.

Throughout the Feasibility Study, community and stakeholder engagement was carried out to inform, and where relevant, consult the community and stakeholders about key milestones.

The objectives of community and stakeholder consultation included:

- informing the community, tourists and key stakeholders about the Feasibility Study through timely and understandable communications, and accessible consultation tools and techniques;
- early and regular engagement so that the community is informed and could provide comment, where relevant, on the Feasibility Study;
- promoting the Feasibility Study's purpose and necessity;
- understanding community, tourist and stakeholder values and opinions on environmental impacts, access to amenities and services, and the social impacts of extending or not extending the runway;
- identifying objections to extending the runway and potential community impacts and concerns, especially environmental issues;
- helping the community, tourists and stakeholders understand that a runway extension is not a certain conclusion and that the Feasibility Study would help determine this; and
- strengthening existing relationships and building positive new relationships between the Board and the community and stakeholders.

Consultation activities were carried out with key community members and stakeholders including:

- the local community – residents and businesses on the Island;
- visitors – tourists visiting the Island;
- tourism industry operators on the Island; and
- aviation industry stakeholders – airlines, Air Services Australia (ASA), Civil Aviation Safety Authority (CASA), Royal Flying Doctors Service and the Royal Australian Airforce.

A variety of consultation tools and techniques, befitting the Island's community and stakeholders, were used to inform and seek feedback about the different milestones reached in the Feasibility Study.

7.2 Conclusion

Feedback from key community members and stakeholders was sought throughout the feasibility study and were used to inform relevant stages of the project. The following key issues associated with extending the runway were raised by the local community during consultation;

- impact to World Heritage values;
- impact on coastal processes;
- climate change, particularly the rise of sea levels;
- biodiversity and biosecurity;
- traffic and transport during construction, particularly access along Lagoon Road next to the airstrip;
- marine access to the Lagoon during construction and operation;
- impacts to residents nearby such as noise, vibration and visual amenity; and
- socio-economic impacts, particularly the impact of additional tourists on the Island's existing infrastructure and systems (e.g. waste and water).

8.0 Final Summary

The study has found that an extension of the existing runway on Lord Howe Island would allow for operation of 30+ seater RPT services to the island beyond 2022 (using aircraft other than the current DHC8-200). This is solely based on the technical performance of aircraft on an extended runway; further liaison with airlines would be required to confirm their intentions for continued operation of the route with new aircraft. The runway extension is considered feasible from an engineering perspective, further consideration of the environmental impacts including the impact on World Heritage status would need to be considered.

Commissioning the design and construction of the extension would involve a significant financial undertaking and the preliminary business case has determined that it is not considered an economically viable project. Given the importance of air services to the island, the next steps and decisions may need to be made outside pure economic and financial parameters. Alternate solutions to maintaining RPT services beyond 2022 have been recommended for further investigation, these alternatives in addition to the runway extension will be presented by LHIB to an all Government working group, consisting of Transport for NSW, Destinations NSW, NSW Treasury, other agencies of NSW Government, Federal Government and LHIB. It is understood that the significant costs associated with further investigation of the alternative solutions would be cost prohibitive for LHIB to commission. In addition, provision of air services involves both market and regulatory factors. Therefore LHIB will pursue the next stages in collaboration with the all Government working group.

Further detailed information on the work completed as part of the Runway Extension Feasibility Study can be found in the following AECOM reports;

- *Lord Howe Island Board Runway Extension Feasibility Study - Detailed Assessment of Extended Runway Requirements and Suitable Aircraft* (April 2018, Rev B)
- *Lord Howe Island Board Runway Extension Feasibility Study - Geotechnical Interpretive Report* (August 2018, Rev 1)
- *Lord Howe Island Board Runway Extension Feasibility Study - Concept Design Report* (November 2018, Rev C)
- *Lord Howe Island Board Runway Extension Feasibility Study - Preliminary Environmental Assessment* (October 2018, Rev 1)
- *Lord Howe Island Board Runway Extension Feasibility Study - Preliminary Business Case* (December 2018, Rev B)
- *Lord Howe Island Board Runway Extension Feasibility Study - Community Consultation Report* (December 2018, Rev B)

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