

Great Keppel Island Resort project

Coordinator-General's report on the environmental impact statement

March 2013

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Synopsis

This report provides an evaluation of the potential impacts of the Great Keppel Island Resort project (the project). It has been prepared pursuant to section 35 of the *State Development Public Works Organisation Act 1971* (Qld) (SDPWO Act).

The proponent, GKI Resort Pty Ltd (GKIR), proposes to construct a \$592 million eco-tourism development on Great Keppel Island, 12 kilometres off the coast of Yeppoon in Central Queensland. It is located within the southern part of the Great Barrier Reef World Heritage Area and is situated within the Rockhampton Regional Council (RRC) local government area.

The project includes a 575-hectare (ha) Environmental Protection Precinct (approximately 43 per cent of the island) to be rehabilitated and protected in perpetuity. The proposed development consists of a 4- or 5-star hotel, apartment and villa accommodation, staff accommodation, a 250-berth marina, an 18-hole championship golf course and an air strip, plus associated leisure, restaurant, café, bar and retail facilities.

The development is proposed to be constructed in stages and includes demolition of the existing resort that was closed in 2008. Once completed, full occupancy would be in the order of 3500 visitors and staff. The proponent advises that these figures are approximately three times the number of visitors the island attracted when the former resort was at its peak operation levels.

In undertaking my evaluation of the environmental impact statement (EIS), I have considered the EIS, issues raised in submissions, the supplementary EIS (SEIS), additional information provided by the proponent and advice I have received from State agencies and RRC.

The following provides an overview of the main issues arising from my evaluation.

Land use

Great Keppel Island's location and history as a tourist resort make the site unique within the World Heritage Area.

The proposed development comprises four precincts including:

- (a) Marine Services Precinct (31.5 ha)
- (b) Clam Bay Precinct (225 ha)
- (c) Fishermans Beach Precinct (141 ha)
- (d) an Environmental Protection Precinct (575 ha).

The proponent currently has a major part of the island under lease. The largest parcel is a recreation lease on Lot 21/SP192569 (Lot 21), which would incorporate the Clam Bay and Environmental Protection precincts. The proponent is seeking additional leases for 58.69 ha on the island for the new airstrip, road closures and the marina.

The proponent has undertaken a substantial amount of planning and has incorporated a range of sustainability features. These include the extensive use of solar power with a goal of the development being 'carbon positive' in terms of electricity usage.

A draft Plan of Development was presented in the EIS. Once finalised and approved, it would become the primary planning instrument for the development to guide the design and construction of the resort. It includes measures that will reduce the visual impact of the buildings and infrastructure. Building heights would be limited to two and three storeys and the built form and materials would be controlled. The overall aim is to have buildings and other infrastructure blend into the landforms and the vegetation cover as much as possible.

The proponent intends to demolish and remove the closed resort in stage one of the project's development and then rebuild over the same site.

The location of the proposed development on the island has the potential to increase risks associated with natural hazards such as bushfire and tropical cyclones. The proponent has committed to implementing hazard reduction initiatives. These include bushfire management, flooding and emergency management procedures. The resort will be required to provide a cyclone shelter for visitors and staff who are on the island during such an event. Facilities for police and emergency services operations would be provided.

The project would significantly enhance public access to the island, and Lot 21 in particular, through the development of internal roads and walking tracks. At present, access through the island is limited due to the poor condition of roads. No residential accommodation is proposed.

Infrastructure impacts

The development would require a range of infrastructure to be established, including the marina, a new airstrip, roads, water supply, wastewater treatment plant, stormwater collection, power and telecommunications. The proponent has committed to provide and fund all necessary infrastructure for the development, at no cost to local or state governments.

The proponent proposes to source water from an aquifer (Long Beach aquifer) during initial construction and prior to establishing a submarine water pipeline to the mainland. Power and communication cables for the resort would also be installed.

The proponent has committed to using water recycled to an A+ standard¹ from the wastewater treatment plant to irrigate the golf course. The system is to be designed such that there will not be a wastewater outfall into the Great Barrier Reef Marine Park.

The EIS has assessed transport impacts on local roads including the marina at Rosslyn Bay as this is a primary point of departure on the mainland for visitors and staff to the island. Impacts have been assessed as minimal.

Terrestrial ecology

Regional ecosystem (RE) mapping of the island indicates 479.5 ha of 'of concern' native vegetation.

The proposed development footprint has been planned and designed as much as practicable to avoid areas of remnant vegetation and wetlands. The estimated upper

¹ A+ standard criteria are defined under Schedule 3C of the Public Health Regulation 2005.

limit of proposed clearing is 15.6 ha of 'of concern' REs and 130.93 ha of 'least concern' REs.

No threatened flora species or ecological communities that are scheduled under State (or Commonwealth) legislation were identified within the development areas. Field surveys identified seven locally significant flora species as being close to their range limit.

Final design of the development will be required to minimise clearing of native vegetation and the native grass *Eriachne stipacea*.

Three fauna species scheduled as threatened under the Nature Conservation (Wildlife Regulation) 2006 were confirmed in the project area including the beach stone curlew, sooty oystercatcher and the eastern curlew. Conservation-significant fauna identified during field surveys included the rusty monitor and the echidna which is regarded as culturally significant and a special 'least concern' species.

The proponent will be required to prepare and gain approval for species management programs for any threatened, special least concern, and species defined as colonial breeders under the Nature Conservation (Wildlife Management) Regulation.

The proponent will be required to provide offsets for 'of concern' REs and essential habitat for the beach stone curlew.

The field surveys identified 81 weed species including 8 species that are declared pests. These weeds, particularly lantana and rubber vine, are largely concentrated on the island in areas that have historically been disturbed.

Surveys have also confirmed that pests including feral goat, black rat, Asian house gecko, and Indian peafowl are present on the island. The proponent has committed to implement a weed and pest management program, which will include the control of pest species.

Water

The EIS indicated that the island has limited surface water and its waterways are largely ephemeral, flowing only during and shortly after storm events

At present, the island's main source of water is the Long Beach aquifer. The EIS demonstrates that extraction of groundwater from the Long Beach aquifer is within the estimated sustainable yield for stage one of the project. Extraction would not exceed the sustainable yield of the aquifer.

During stage one of construction the proponent proposes to source water from a combination of the Long Beach aquifer (via two production bores in the aquifer), captured roof water and stormwater, and recycled effluent. Also in stage 1, the proponent intends to establish a submarine water pipeline connected to the mainland water supply. The water main would be the primary water supply for the development and the proponent has committed to cease groundwater extraction once the mainland water supply connection is in operation.

The proponent also intends to construct sewage collection and treatment systems to recycle effluent for use during construction and, once operational, on the golf course.

The proposed development would have a minimal impact on the island's surface water hydrology through changes of land use (for example, clearing vegetation, earthworks and constructing impervious surfaces, such as roads). The proponent has committed to mitigate surface and stormwater impacts by utilising water sensitive urban design measures such as use of rain water tanks, re-using roofwater run-off, installing detention and retention basins, and harvesting stormwater runoff.

Marine Services Precinct

The project includes a 250-berth marina located on the north-western side of the island. The concept design includes a reclaimed area of approximately 3.7 ha that would incorporate up to 185 accommodation units as well as 7000 square metres of gross floor area for retail and other uses.

Currently, there are no marina or jetty facilities on the island. All ferry passengers arrive and depart by a boarding ramp across Fishermans Beach. At peak periods, it is estimated that 370 passengers would arrive on the island per day. The EIS found that the current operations of ferries and barges landing on the beach would be inadequate for both the construction and operations phases of the project. Also, the EIS found that feasible alternatives to a marina, such as a jetty, were not optimal for reasons of passenger safety and the lack of opportunity to provide additional tourism services.

The proponent selected Putney Beach for the marina location over other feasible sites. The selection process considered a number of factors including minimising environmental impacts, wave exposure and proximity to the proposed development precincts. The selection process eliminated areas that were high protection Great Barrier Reef Marine Park zones as well as areas that were exposed to strong winds and wave impacts.

Marine ecology

The island contains marine ecosystems that are characteristic of the southern region of the Great Barrier Reef. EIS surveys of the island identified marine ecosystems, including coral, seagrass communities and mangroves.

The closest coral communities to the proposed development are located around Putney Point and Passage Rocks, approximately 400 m from the island. Seagrass communities in the project area were surveyed to assess seasonal changes at nine locations around the island. A survey was also conducted of the corridor for the proposed submarine water main/cable alignment.

The EIS identified four species of seagrass and noted that the seagrass communities were typically fragmented, comprising small patches with overall cover of less than five per cent.

Mangrove communities were surveyed at three sites at Putney Creek, ten sites at Leekes Creek and two sites on the mainland at Kinka Beach, to determine the ecological health of mangrove forests and fisheries values.

The EIS reported that mangrove forests were generally in good ecological health with the exception of mangroves in the Putney Creek estuary, which exhibited reduced canopy cover and a large number of dead trees and branches.

The construction of the marine precinct could permanently alter the marine environment within the development footprint and the Putney Creek estuarine area. The concept design of the marina facility includes the permanent modification of the mouth of Putney Creek to enable tidal flows.

Construction works would have temporary effects on levels of underwater noise. Although dredge material is predominantly clean sand, dredging could cause short-term increases to suspended sediment concentrations in adjacent marine waters. This may lead to indirect impacts on adjacent seagrass areas and, under certain conditions, there may be water quality impacts on sensitive areas in the vicinity of Passage Rocks for short periods.

The dredging and construction works would be managed to avoid impacts, including monitoring at key sites. The use of silt screens in conjunction with the dredging works would reduce the extent that turbid plumes may impact areas outside the marina basin.

There are minimal concerns about the disturbance of acid sulfate soils or contaminated sediments, due to preliminary investigations indicating a low risk of encountering contaminated soils. However, further detailed assessment would be necessary prior to commencement of the works to confirm that no contaminated material is released to marine waters.

The proponent proposes to open the mouth of Putney Creek to tidal influence, which would be expected to improve long-term water quality within the creek and improve ecosystem health within the lower reaches of the creek. Some short-term water quality impacts may arise and a more detailed risk assessment of the proposed Putney Creek works is warranted. A detailed investigation would be required prior to construction and appropriate mitigation measures are to be implemented.

The EIS indicated that the proposed design should not adversely affect the stability of Putney Beach. The proposal includes an ongoing program to maintain the natural sediment transport processes of the adjacent beach system.

The EIS presented valid justification for the location and design of the marina but it is important that all activities within the proposed marina precinct are managed carefully and all infrastructure is adequately maintained. Conditions have been stated to ensure that the proponent meets Queensland Government environmental policies and standards in the construction and operation of the marina.

Significant increases in visitor numbers and boating activity are natural consequences of the proposed development. Unless carefully managed, these increases may lead to degraded coastal areas and inshore marine habitats. Poor behaviour of recreational boat operators may also increase the risk of collisions with marine fauna such as turtles. Ongoing management of tourist and visitor activities will be an important part of the overall resort management responsibilities.

The main outcomes required from the proposed marina development include best practice construction management to minimise the potential disturbance to marine areas; the minimisation and management of ship-sourced pollution; and finalisation of a package of offsets for the loss of marine habitat, including contributions to marine park management.

Sustainability

The proponent's proposed sustainability measures for the development include:

- sustainable use and management of land and water resources (totally self-sufficient through rainwater capture and recycling of water)
- efficient use of energy and greater use of renewable energy resources
- commitment to achieving a carbon positive energy status for the resort, through the use of 24 400 solar photovoltaic panels
- reducing consumption, recycling and minimising waste
- protection and enhancement of the Environmental Protection Precinct
- buffer zones to protect habitats and provide fauna corridors
- local economic development and employment growth.

Social and economic impacts

Once fully operational, the project is expected to increase the gross regional product of the Fitzroy Region by \$75 million per annum.² The development is also expected to generate an annual average of 427 construction-related jobs. The EIS estimated over 1055 full-time, part-time and casual jobs would be created when the resort is fully operational. This estimate includes approximately 370 jobs on the mainland, located predominantly in Yeppoon and Rockhampton for supply of goods and services to the resort.

The EIS noted the project's potential benefit for the local communities of Yeppoon and Rockhampton by providing access to the facilities such as walking tracks and other passive recreation opportunities on Great Keppel Island.

In the Fitzroy Region, tourism is the second-largest earner behind coal and is one of the state government's areas of focus in building a four-pillar economy. The project will contribute towards the government's tourism objectives and it will be developed at no cost to the state with an estimated private sector investment of around \$600 million over 12 years.

Coordinator-General's conclusion

I consider that the environmental impact assessment requirements of the SDPWO Act for the Great Keppel Island Resort project have been met and that sufficient information has been provided to enable a thorough evaluation of the potential impacts of the development.

I conclude that there are significant local, regional and state benefits to be derived from the development, and that any adverse environmental impacts can be acceptably avoided, minimised, mitigated or offset through the implementation of the measures and commitments outlined in the EIS documentation. Conditions proposed in this report have been formulated in order to further manage all impacts associated with the project.

² The Fitzroy region contains the major centres of Rockhampton and Gladstone, the coastal areas and popular holiday destination's Agnes Water and 1770, and well as the hinterland areas further west. The region's economy is heavily dominated by coal mining, cattle grazing and industrial activity in Gladstone. The region has a population of 187 916 people [2] and covers an area of 122 971.5 km².

Accordingly, I recommend that the project proceed subject to the conditions set out in the appendices of this report. In addition, it is expected that the proponent's commitments will be fully implemented.

A copy of this report will be provided to the proponent, Rockhampton Regional Council and relevant Commonwealth and state agencies, and will also be made publicly available at www.dsdip.qld.gov.au

Barry Broe

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Barry Broe
Coordinator-General

| March 2013

1. Introduction

This report has been prepared pursuant to section 35 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and provides an evaluation of the environmental impact statement (EIS) for the Great Keppel Island Resort project (GKIR project or the project).

It is not intended to record all the matters that were identified and subsequently settled. Rather, it concentrates on the substantive issues identified during the EIS process. The report:

- summarises the key issues associated with the potential impacts of the project on the physical, social and economic environments at the local, regional, state and national levels
- presents an evaluation of the project, based on information contained in the EIS, supplementary EIS (SEIS), submissions made on the EIS and information and advice from advisory agencies and other parties
- states conditions under which the project may proceed.

2. About the project

2.1. The proponent

The proponent for the project is GKI Resort Pty Ltd (GKIR) (a subsidiary of Tower Holdings), which is wholly owned by Mr Terrence Agnew. Tower Holdings is a privately Australian-owned property investment and development company. The company has 30 years experience in commercial, residential hotel and accommodation property development and investment in New South Wales, Victoria and Queensland.

Responsibility for compliance with conditions in this report, commitments made in the EIS documents and future approvals relating to the project lies with GKIR.

2.2. Project description

GKIR took over the leases for the subject sites in 2007 when it purchased the existing resort. GKIR proposes to develop a low-rise eco-tourism resort featuring a three-storey hotel, two-storey villas and apartments, marina and golf course.

2.2.1. Location

Great Keppel Island is located within the Rockhampton Regional Council (RRC) Local Government Area, 12 kilometres (km) off the coast of Yeppoon in Central Queensland.

The island has an area of approximately 1308 hectares (ha) and the project will occupy 941 ha (this area includes an environmental protection precinct but does not include the proposed marina). Most of the project footprint is proposed to be on Lot 21 on SP192569, which currently has a lease purpose of 'recreation'.

The location of Great Keppel Island is shown in Figure 2.1.

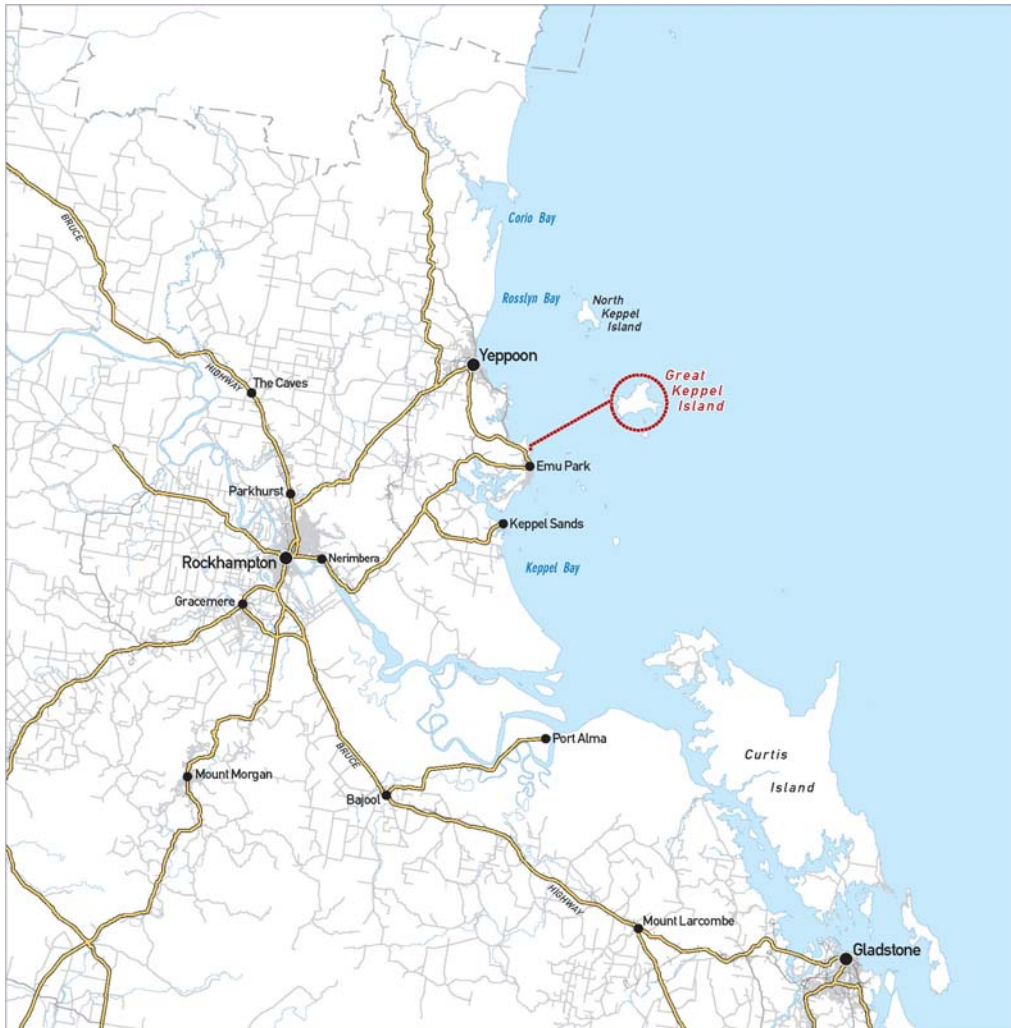


Figure 2.1 Location of Great Keppel Island

2.2.2. Project components

The proponent proposes to demolish the existing 190-room resort, villas and staff accommodation on Great Keppel Island.

The project consists of the following key components:

- 575 ha of environmental protection area (approximately 44 per cent of the island and 65 per cent of Lot 21) to be rehabilitated and protected in perpetuity
- a three-storey hotel at Fishermans Beach comprising 250 suites, restaurants, reception and conference rooms
- marina at Putney Beach comprising 250 berths, emergency services facilities, ferry terminal, yacht club, dry dock storage and retail village
- golf club and 18-hole championship golf course that will integrate with habitat and ecological corridors. The golf course will be irrigated with treated wastewater
- relocating and extending the existing airstrip to facilitate aircraft movements from Brisbane, Cairns, Sydney and Townsville on planes that can carry up to 104 people

- 750 two-storey villas for tourism uses
- 300 two-storey apartments for tourism uses
- submarine connection to the mainland for electricity, water and telecommunications
- utility and services areas for waste collection, wastewater treatment plant, emergency backup electricity plant and associated fuel storage
- emergency service facilities for fire-fighting, police and paramedical services
- resort worker accommodation
- a water cycle management plan developed using water sensitive urban designs
- buffer zones to protect sensitive environmental areas, including surrounding marine waters
- a Research and Heritage Centre
- preservation of Indigenous sites of significance
- restoration of the original Leeke's Homestead.

The current proposal is substantially reduced in scale and extent compared to previous concepts. Following the rejection of the original proposed redevelopment by the Commonwealth Government and the concerns expressed by the community, the proposed project has twice been significantly scaled down and is 50 per cent smaller than the project described in the 2006 initial advice statement (IAS). In 2006, 2700 villas and apartments were proposed as well as three hotels (a total of 700 rooms). The proponent also proposed a 560-berth marina, two golf courses and a two-kilometre airstrip.

2.2.3. Development stages

The EIS stated that project construction would commence in 2013 and conclude in 2024. Table 2.1 summarises the proposed construction and decommissioning phases for the project. The EIS states the first guests will stay at the proposed resort following construction of the hotel, estimated to be in 2014.

Table 2.1 Summary of construction and decommissioning timetable

Infrastructure component	Year	Description of works
Transport	2013	Decommission existing runway
Services	2013	Construct power and water supply to island
Tourism	2013	Decommission existing resort
Transport	2013–15	Construct marina, ferry and barge terminal
Transport	2013–15	Construct runway and airport terminal
Services	2013–22	Construct power and water reticulation systems and wastewater treatment facilities
Tourism	2013–24	Construct Marine Services Precinct, 150 Marine Services Precinct apartments, hotel, staff accommodation
Services	2014	Decommission existing fuel storage and wastewater treatment plant
Social	2014	Research centre and police centre, passive open space areas
Transport	2014–23	Construct roads and public walkways
Social	2015	Sport and recreation oval
Tourism	2015–16	Construct 150 Fishermans Beach Precinct apartments and 150 Fishermans Beach Precinct villas
Tourism	2015–16	Construct golf course and golf resort facility
Social	2015–19	Environmental protection areas
Tourism	2017–19	Construct 233 Fishermans Beach Precinct villas
Tourism	2020–24	Construct 367 Clam Bay Precinct villas

2.3. Project rationale

The project is forecast to provide the following economic benefits to the local region:

- a direct capital injection of approximately \$592.5 million
- forecast annual expenditure of \$83 million on the island
- a substantial increase in visitor days to the region
- increased local business opportunities
- increased local and state government revenue
- estimated economic impact on the gross regional product (GRP) of the Fitzroy region of \$458 million from construction, and around \$75 million per year once fully operational
- approximately 1055 operational jobs per annum (685 on the island and 370 on the mainland) and 427 construction jobs (direct and indirect) on average over the construction period.

2.3.1. Economic

The Gross Regional Product of the Fitzroy Region is underpinned by the mining, manufacturing and construction industries (Office of Economic and Statistical Research 2005–2006). The region is heavily dependent on the performance of the resources sector for its economic stability.

Tourism in Queensland is the second largest export earner behind coal³ and is one of the state government's areas of focus in building a four-pillar Queensland economy. Tourism contributes \$17.5 billion to the Queensland economy and accounts for 6.6 per cent of Gross State Product.⁴ Tourism accounts for 9.5 per cent of employment in the state.⁵

Tourism-related industries (namely retail trade, accommodation and food services) account for higher-than-average employment in the Fitzroy region (16.3 per cent⁶) and 18.1 per cent⁷ of employment in the RRC area.

Based on Rockhampton and Fitzroy regional data as of September 2012, the unemployment rate in the Rockhampton Local Government Area is 5.7 per cent, while the unemployment rate in the wider Fitzroy Statistical Area (Level 4) is 4.5 per cent.⁶ The average unemployment rate for Queensland is 6.3 per cent.⁸

The Forecast Economic Impacts Report undertaken during the EIS process indicated that a number of benefits to the local, regional, state and national economy will occur as a result of the proposed project. The benefits include:

- employment benefits:
 - an average of 427 construction-related jobs on the island and mainland over the 12-year construction period—comprising 263 jobs each year on the island and 164 on the mainland, predominantly at Rockhampton and Yeppoon
 - post-construction, an average of 1055 full-time, part-time and casual jobs on the island and in the Capricorn Region⁹—comprising 685 persons on the island and 370 on the mainland in the surrounding regions (predominantly in Rockhampton and Yeppoon)
 - a residual number of construction workers are likely to remain in the Capricorn Coast region to accommodate increased building activity generated by additional residents and visitors to the locality

³ Office of Economical and Statistical Research, 2011

⁴ Tourism Research Australia, State Tourism Satellite Accounts 2010–11

⁵ Tourism Queensland facts and figures publication Dec 2012

⁶ Queensland Treasury and Trade, Queensland Regional Profile: Fitzroy, Statistical Area Level 4 (ASGS 2011), 25 January 2013, Queensland Treasury and Trade, Brisbane, 2013, viewed 25 January 2013, <http://statistics.oesr.qld.gov.au/qld-regional-profiles>.

⁷ Queensland Treasury and Trade, Queensland Regional Profile: Rockhampton Local Government Area (ASGS 2011), 25 January 2013, Queensland Treasury and Trade, Brisbane, 2013, viewed 25 January 2013, <http://statistics.oesr.qld.gov.au/qld-regional-profiles>.

⁸ Queensland Treasury and Trade, Labour Force Brief December 2012, Queensland Treasury and Trade, Brisbane, 2013, viewed 12 February 2013, <http://www.oesr.qld.gov.au/products/briefs/labour-force/labour-force-201212.pdf>.

⁹ The Island lies within Tourism Queensland's Capricorn Region which comprises nine former local government areas: Rockhampton, Livingstone, Fitzroy, Mount Morgan, Peak Downs, Jericho, Bauhinia, Daringa and Emerald. In March 2008, these councils were amalgamated into the Rockhampton Regional Council, Central Highlands Regional Council and a part of the Barcardine Regional Council.

- increased economic activity due to an increase in the estimated average daily population on the island to 2274 visitors, residents and employees, which is approximately three times that of the previous peak in the early 1990s
- once fully operational, total consumption expenditure on the island is expected to be around \$83 million each year, having significant flow-on effects to the local and regional economy
- a projected increase in GRP of the Fitzroy Region of \$458 million over 12 years resulting from a total construction expenditure of \$592.5 million. This is comprised of a direct increase of \$243.5 million, an indirect increase of \$100 million and an induced increase of \$114.5 million¹⁰
- once fully operational, a projected annual increase in GRP of the Fitzroy Region of \$75.2 million arising from estimated annual expenditure of \$83 million on the island. This is comprised of a direct increase of \$41.7 million, an indirect increase of \$16.6 million and an induced increase of \$16.9 million.

The proposed development will be at no cost to the state with an estimated private sector investment of \$592.5 million over 12 years.

2.3.2. Tourism

The project has the potential to expand and diversify the tourism market in the region and complement other tourist centres.

The region has natural, historical, reef and island attractions and activities that may benefit from an increased visitor base that the resort development is expected to create. The development could add to the numbers of visitors to local attractions such as Carnavon Gorge, Sapphire Gemfields, Capricorn Caves, Rockhampton and the township of Mount Morgan.

The combination of overnight and day visitors to the island, as well as visitors to the marina, is estimated to be nearly 830 000 annual person days. This is equivalent to an average daily population of 2274 on the island.

The EIS advised the project is likely to:

- increase visitation by tourists who have a disability, as a result of the proposed access improvements, including disability access, via the airstrip and marina
- increase regional visitation
- enhance the image of the local area
- address the issue of outdated and lower quality accommodation and facilities in the region.

The proposed resort would provide an eco-tourism facility for international, national, and local visitors. Proposed tourist attractions are:

- walking tracks throughout the vegetated areas of the site
- access to beaches

¹⁰ Induced effects are the impacts of household expenditures, from the income earned in a directly or indirectly affected industry (basically the result of an increased disposable income of people in the region (doing things like spending more at the grocery store, etc)

- a golf course
- marina-based heritage centre
- restoration of Leekes Homestead
- GBR Research Centre.

In its submission on the EIS, the Department of Tourism, Major Events, Small Business and the Commonwealth Games (DTEBS) indicated that it strongly supported the proposed development. The department noted that at a strategic level, the scale of the development with its 'environmentally friendly' focus is a natural fit with the unique aspects of Great Keppel Island and provides a significant opportunity for tourism and economic growth in the state. The revitalisation of Great Keppel Island is also recognised as a catalytic project in the Central Queensland Tourism Opportunity Plan.

2.3.3. Environmental benefits

The EIS reported that the project has been designed through an environmental, world heritage, cultural and visual constraints based approach to ensure the development results in minimal disturbance to the natural environment. This has resulted in a proposed built form which respects the World Heritage values of the island.

The proposed project has incorporated water sensitive urban design initiatives which will see wastewater recycled and reused, and rooftop rainwater harvesting for irrigation of the resort gardens and golf course. Additionally, the proponent has committed to installing 24 000 solar panels to generate 12 444 megawatt hours/year which could make the project Australia's first net carbon positive island resort.

The majority of Lot 21 (575 ha) will be dedicated in an Environmental Protection Precinct, which could result in a minimum area of 44 per cent of the island being rehabilitated and protected. In particular the proponent has proposed to control the island's feral goat population.

The proponent has reduced the scale of the project substantially from when it was first conceived. This has resulted in an infrastructure footprint of just 3.5 per cent of the island. Appropriate setbacks of infrastructure (and all built forms) from beaches and wetlands will improve the resort's resilience to climate variability.

3. Impact assessment process

3.1. Overview

This section details the steps in the project's EIS assessment process. For a detailed explanation of the EIS process, refer to www.dsdip.qld.gov.au/assessments-and-approvals/environmental-impact-statement-process.html

In undertaking this evaluation, the following was considered:

- initial advice statement (IAS)
- EIS
- issues raised in submissions relating to the EIS
- supplementary information
- technical reports
- agency advice from:
 - Department of Agriculture, Fisheries and Forestry (DAFF)
 - Department of Community Safety
 - Department of Energy and Water Supply
 - Department of Environment and Heritage Protection (DEHP)
 - Department of Housing and Public Works (DHPW)
 - Department of National Parks, Recreation, Sport and Racing (DNPRSR)
 - Department of Natural Resources and Mines (DNRM)
 - Department of State Development, Infrastructure and Planning (DSDIP)
 - Department of Tourism, Major Events, Small Business and the Commonwealth Games (DTEsb)
 - Department of Transport and Main Roads
 - Office of Advanced Manufacturing (OAM)
 - Queensland Health (QH)
 - Queensland Police (QPS)
 - Rockhampton Regional Council (RRC)
 - Skills Queensland
- comments and properly made submissions¹¹ from members of the public.

Table 3.1 shows the steps taken in the project's EIS process.

¹¹ For a definition of a 'properly made submission', refer to the Glossary on page 141 of this report.

Table 3.1 Overview of EIS process

Date	Process	Report section no.
16 July 2009	Initial advice statement for current proposal and request for project declaration received	3.2
28 August 2009	Project declared 'coordinated project' by Coordinator-General	3.2
4 July 2010	Australian Government determined that the project is a 'controlled action'	3.3
2 October to 29 November 2010	Draft terms of reference (TOR) released for public and agency comment	3.4
3 June 2011	TOR finalised	3.4
8 December 2011	Draft EIS provided to Coordinator-General for evaluation	3.5
22 June 2012	Final EIS lodged with Coordinator-General	
28 July to 7 September 2012	EIS released for public and agency comment	3.5
17 October 2012	Supplementary information provided to Coordinator-General for evaluation	3.6
29 November 2012 to 10 January 2013	Supplementary project information released for agency comment	3.6

3.2. Coordinated project declaration

On 28 August 2009, the then Coordinator-General declared this project to be a 'significant project' under section 26(1)(a) of the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act). This declaration initiated the statutory environmental impact evaluation procedure of Part 4 of the Act, which required the proponent to prepare an EIS for the project.

The SDPWO Act was amended in December 2012 (with the amendments taking effect on 21 December 2012). The amendments have renamed 'significant projects' to 'coordinated projects'. The project will be referred to as a coordinated project throughout this evaluation report.

3.3. Controlled action

The Commonwealth Environment Minister has determined that the project is a 'controlled action'¹² to be assessed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) (EPBC ref 2010/5521/GBRMPA G33652.1).

¹² For a definition of 'controlled action', refer to the Glossary on page 141 of this report.

The relevant controlling provisions are:

- sections 12 and 15(a) world heritage properties
- sections 15B and 15(c) national heritage places
- sections 18 and 18(a) listed threatened species and ecological communities
- sections 20 and 20(a) migratory species protected under international agreements
- sections 24 and 24A Commonwealth marine areas
- sections 24B and 24C the Great Barrier Reef Marine Park

The Commonwealth Environment Minister elected to conduct an EIS assessment of the project, separate to the EIS assessment process undertaken by the Queensland Government. The project will require approval from both the Queensland and Australian governments before it can proceed.

3.4. Terms of reference

The draft terms of reference (TOR) for the EIS for the proposed project was released for public and advisory agency comment from 2 October to 29 November 2010. 34 submissions were received, comprising 10 from advisory agencies, five from non-government organisations and 19 from public submitters.

A final TOR was prepared having regard to submissions received and was issued to the proponent on 3 June 2011.

3.5. Review of the EIS

The EIS, prepared by the proponent, was released for public and agency comment from 28 July to 7 September 2012.

176 submissions were received including 17 from government agencies, 30 from non-government organisations and 129 from public submitters, including 52 pro-forma letters. 6,312 letters supporting the project were collated by the proponent and forwarded to the Coordinator-General for consideration. A further 410 people signed two petitions in support of the project.

A total of 4095 people signed three petitions opposing the project, which were considered as properly made submissions. Copies of all submissions were forwarded to the proponent and the Australian Department of Sustainability, Environment, Water, Population and Communities (SEWPaC).

The most prominent issues raised in public submissions (including petitions and pro-forma letters) were issues relating to access to Lot 21, water quality, the proposed marina and impacts to the Great Barrier Reef Marine Park.

Other issues included:

- the size of the development, particularly areas outside of the former resort, including villas and apartments
- cut and fill balance in relation to the construction of the proposed new airstrip.

Table 3.2 summarises the number of public and agency submissions on the EIS.

Table 3.2 Public and agency comments received on the EIS

Agency	No. submissions
Queensland Government	16
<ul style="list-style-type: none"> • Department of Agriculture, Fisheries and Forestry • Department of Community Safety • Department of Energy and Water Supply • Department of Environment and Heritage Protection • Department of Housing and Public Works • Department of Local Government • Department of National Parks, Recreation, Sport and Racing • Department of Natural Resources and Mines • Department of State Development, Infrastructure and Planning • Department of Tourism, Major Events, Small Business and the Commonwealth Games • Department of Transport and Main Roads • Office of Advanced Manufacturing • Queensland Health • Queensland Police • Queensland Treasury and Trade • Skills Queensland 	
Local Government	1
<ul style="list-style-type: none"> • Rockhampton Regional Council 	
Private organisations/community groups	30
Private individuals	129
TOTAL	176

3.6. Supplementary information

On 17 October 2012, I requested that GKI Resort Pty Ltd submit supplementary information to address the following substantive issues:

- proposed tenure of Lot 21 requires clarification, in particular, the public access and form of tenure being proposed
- water quality issues in relation to permeability of stormwater and runoff
- gross floor area of the proposed villas and apartments
- cut and fill balance in relation to the construction of the proposed new airstrip

Nine submissions were received from government agencies. Copies of all submissions were forwarded to the proponent and SEWPaC.

4. Project approvals

The SDPWO Act establishes the framework for environmental assessment of declared coordinated projects in Queensland and coordinates the relevant state and local development assessment jurisdictions for the project. The environmental impact assessment is undertaken in accordance with the provisions of Part 4 of the SDPWO Act and evaluation of the EIS is pursuant to section 35 of the Act.

On release of this evaluation report, GKIR needs to obtain a range of statutory approvals under state and Commonwealth law before the project can proceed. In some cases, conditions have been stated to attach to subsequent development approvals. Approving agencies may add further conditions to approvals, if considered necessary, but these cannot be inconsistent with the Coordinator-General's conditions.

4.1. Local government approvals

The project development site is wholly located within the Rockhampton Regional Council (RRC) area. The RRC was formed on 15 March 2008 following the amalgamation of the shires of Rockhampton City, Fitzroy, Livingstone and Mt Morgan. The site is located within the former Livingstone Shire Council area.

Under the transitional arrangements for the amalgamated councils, the planning schemes for the former shires remain applicable in assessing development, until a new regional council planning scheme comes into effect. Therefore, the project will require approval for any material change of use (MCU) and operational works permits under the Livingstone Planning Scheme 2005. RRC is the assessment manager for these approvals.

The key approval is a preliminary approval for material change of use to override the planning scheme (section 242 of the *Sustainable Planning Act 2009* (SPA)).

4.2. State government approvals

At the date of this report, key statutory approvals necessary for the development of the project include:

- authorisation and sales permit/s before taking, destroying, accessing, sampling, quarrying or removing any forest products or quarry material extractive resources owned by the State unless an exemption applies under another Act—taking, destroying, accessing, sampling and quarrying resources—*Forestry Act 1959* (DAFF concurrence agency)
- development permit for operational works—vegetation clearing—*Land Act 1994* (DAFF concurrence agency) and *Vegetation Management Act 1999* (DNRM concurrence agency)
- development permit for operational works—tidal works (DEHP, DTMR and DAFF concurrence agencies)

- development approval for relevant environmentally relevant activities (ERA)—*Environmental Protection Act 1994* and associated Regulation and Policies (DEHP concurrence agency) including ERA 8—chemical storage, ERA 16—extractive activities—dredging ERA 63—sewage treatment
- approval to disturb, harm or destroy a listed species under the *Nature Conservation Act 1992* (NC Act) (DEHP approval agency)
- development permit for operational works—taking or interfering with water—*Water Act 2000* (DNRM concurrence agency)
- development permit for operational works—taking water from aquifers—*Water Supply (Safety and Reliability) Act 2008* (DNRM concurrence agency)
- development permit for operational works—aspects of project that may impact on the Leeke’s Homestead as listed on the Queensland Heritage Register—*Queensland Heritage Act 1992* (DEHP concurrence agency)
- permit to carry out activities—aspects of project that may impact on areas or objects of Aboriginal cultural heritage significance—*Aboriginal Cultural Heritage Act 2003* (DNRM concurrence agency)

4.3. Australian Government approvals

The Commonwealth Environment Minister deemed the proposed project to be a controlled action pursuant to section 75 of the EPBC Act on 4 July 2010. The EIS assessment process has been conducted in parallel between the Queensland and Australian governments with SEWPaC jointly assessing the proposal with the Great Barrier Reef Marine Park Authority (GBRMPA).

5. Land use

5.1. Context

5.1.1. Former resort

Great Keppel Island is an historical tourist destination, with the construction of basic cabins at Fishermans Beach in 1935. The cabins were first sold in 1966 and subsequently renovated and expanded. Since that time, there have been many owners and subsequent redevelopments of the resort. In 2007, the resort was sold to the proponent who continues to own the resort and lease the majority of land required for the proposed development, from the State. As a result of poor occupancy and declining visitors, the resort was closed by the proponent in February 2008.

The entrance to the former GKI Resort is located approximately 200 metres from the ferry landing site on Fishermans Beach and it is located on land proposed to form part of the project.

The former resort facilities are in a state of disrepair and are currently security fenced for public safety.

5.1.2. Existing land uses

Much of Great Keppel Island is State land where tourist-related development leases have previously been granted. The island currently hosts two backpacker accommodation facilities, ten commercial premises and ten residential dwellings.

5.1.3. Access to the island

The island is accessible by aircraft and watercraft. Watercraft access is currently by ferry and barge from Rosslyn Bay state boat harbour. Ferries run daily to and from the island and twice on Fridays. The ferry service currently has a capacity of 200 crew and passengers. The EIS presented anecdotal evidence from the ferry operator, who stated that the average number of daily passengers has fallen to fewer than 40 from a peak of approximately 250 when the resort was operating.

As there is no jetty facility on the island, all vessels are required to land on the Fishermans Beach shore, effectively hindering access to the island for the elderly and people with a disability.

Aircraft access to the island is by airstrip constructed in 1967 which is only suitable for small aircraft up to the size of Metro II and Twin Otters that hold approximately 8–10 passengers.

5.1.4. Current tenure and ownership

The proponent currently leases a number of areas on the island from the state government. The largest leased area is Lot 21 which is 875 hectares and is for recreation purposes. Other land leases include three parcels near Fishermans Beach which equal approximately 21 hectares.

There are facilities located on land outside the proposed project area, which include privately owned freehold title properties that provide a mix of residential, commercial/retail operations and holiday accommodation facilities.

Permits to occupy

The proponent has been granted a permit to occupy under the *Land Act 1994* for the purpose of 'investigation only' for the following areas:

- Lot 1 AP16085 and Lot 11 AP11326 (the proposed airstrip area)
- Lot A on AP20991 (the proposed marine facility area).

Should the project be approved, the proponent will be required to obtain appropriate tenure for access over unallocated State land for the purposes of construction.

5.2. Proposed redevelopment and expansion

An outline of the proposal can be found in section 2.2 of this report.

Four resort precincts are proposed under the GKIRP, being:

- (a) Environmental Protection Precinct—575 ha
- (b) Clam Bay Precinct—225 ha
- (c) Fishermans Beach Precinct—141 ha
- (d) Marine Services Precinct—31.5 ha of marine waters.

A map showing the proposed redevelopment precincts can be found at Figure 5.1 below.

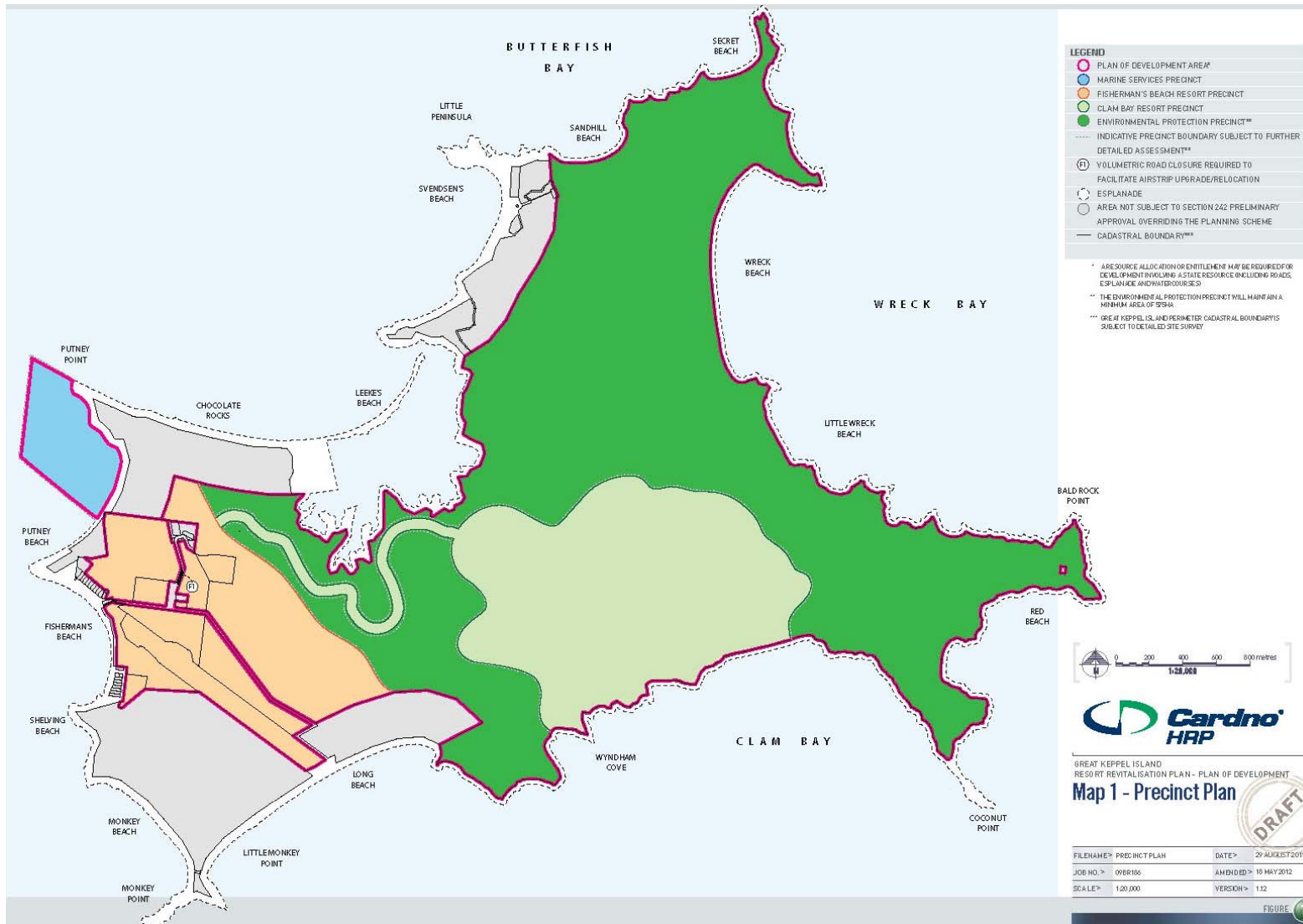


Figure 5.1 Great Keppel Island proposed redevelopment precincts

Land use
Great Keppel Island Resort project:
Coordinator-General's report on the environmental impact statement

5.2.2. Fishermans Beach Precinct

The proposed Fishermans Beach Precinct is located in the south-west of the island and shown in Figure 5.2 below .

The development area is approximately 141 hectares and is located across 10 lots. The land comprises approximately 11 per cent of the total area of the island.

The precinct is adjacent to approximately 10 premises located on the southern part of Fishermans Beach which are privately owned freehold properties and are a mix of residential housing and holiday accommodation facilities

The former Great Keppel Island Resort (closed since 2008) lies within the precinct. It is in a state of disrepair and requires complete demolition.

The proposed precinct will include a relocated airstrip, and a range of supporting tourist accommodation including villas and apartments. The proposed Fishermans Beach Hotel will comprise 250 suites, restaurants, reception, conference rooms, day spa and a range of associated resort recreation activities.

The precinct would also accommodate some of the service infrastructure for the island including a wastewater treatment plant, a waste transfer facility and back-up diesel electricity generation plant.



Figure 5.2 Proposed Fishermans Beach Precinct

Airstrip

The airstrip in its current form is only suitable for small aircraft and it is proposed to construct a new airstrip to accommodate larger aircraft and greater passenger volumes. The proposed airstrip has the potential to facilitate the provision of safe and more efficient air transportation to the island, and may enable direct flights from Brisbane, Cairns, Sydney and Townsville.

The orientation and formation of the proposed airstrip (see 'Infrastructure' on page 31 for further details) has been designed to ensure that there is no conflict with high-masted yachts moored at the proposed marina, and no impact on other anchorages around the island. The EIS has stated that there would be little, if any, conflict between the Rockhampton and island air traffic.

5.2.3. Clam Bay and Environmental Protection precincts

The proposed Clam Bay and Environmental Precincts are located within Lot 21. Lot 21 has been the subject of a private lease since 1866 and continues to be privately leased by the proponent for recreation purposes.

Parts of Lot 21 have previously been used for sheep and beef grazing practices. It has a history of vegetation clearing and feral goats remain on the island from previous grazing activities.

Two dams and fencing are located within Lot 21 as well as the remains of Leeke's Homestead, which includes 1980's stables, engine room and an outside toilet.

The Clam Bay Precinct consists of 225 ha which is approximately 17 per cent of the total area of the island. The proposal is for an 18-hole golf course and associated facilities, low-rise (two-storey) villa accommodation (up to 422 units with a gross floor area of up to 158 250 square metres). At the completion of all development stages the Clam Bay precinct would accommodate up to 1055 persons—which would be approximately 25 per cent of the estimated island population (at full occupancy).

The proposed lease for tourism purposes would include the ability to sub-lease allowing for individual ownership of the villas.

The existing road access is in very poor condition. A portion of the existing road alignment is proposed to be altered to avoid steep grades to provide a larger buffer to Leeke's Creek estuary which will require additional vegetation clearing.

The proponent has proposed that approximately 65 per cent of Lot 21 will be dedicated to an Environmental Protection Precinct. A minimum area of 575 ha would be rehabilitated and is proposed to be used for conservation purposes. The construction and maintenance of walking tracks will be undertaken as part of its ongoing management.

The road into the Clam Bay precinct, and associated parking areas would provide a 'jump-off' point for visitors to access the walking tracks of the Environmental Protection Precinct.

The proposed location is shown in Figure 5.3 below.



Figure 5.3 Proposed Clam Bay Precinct

Golf course

There is currently a nine-hole golf course located on the island, immediately inland of the former resort hotel at Fishermans Beach. The proposed Clam Bay Precinct golf course will occupy an area of the island that has been historically used for grazing and agricultural practices, including vegetation clearing, fencing and stocking.

The golf course is proposed as an essential component of the resort development and the viability of the overall project.

5.2.4. Marine Services Precinct

The proposed Marine Services Precinct would be located in the north-west of the island and include a marina, barge and ferry terminal, restaurants and shops, the GKI Research Centre and apartments. The precinct is intended to improve overall access to the island, including the frequency, safety and accessibility of the public ferry service to the island.

As the island's resort is currently not operating, there are no regular barge services to the island. The regular ferry service running to and from the island disembarks passengers at Fishermans Beach. The proposed marina would be located at the northern end of Putney Beach and within the GBRMP. This area is currently undeveloped with no existing infrastructure.

The proposed marina at Putney Beach will comprise of 250 berths, emergency services facilities, ferry terminal, yacht club and dry dock storage. Other facilities include a sewage pump-out facility and refuelling services, which would be made available to the general public.

The area seaward of the low water mark would be retained within the GBRMP. The reclaimed land area of the proposed marina would require revocation from the State GBR Coast Marine Park via legislative amendment.

5.2.5. Proposed accommodation

Three types of accommodation are proposed:

- (a) Fishermans Beach Hotel—fully serviced suites with a full array of resort amenities located on the site of the former resort hotel. The proponent anticipates that the hotel would be operated by an internationally recognised hotel management group.
- (b) Villas—a low-rise, climate-responsive resort accommodation option to be located in the Clam Bay Precinct. The villas will be free-standing and positioned within the natural topography of the island. They will incorporate ecologically sustainable design features, including rooftop solar panels, solar hot water, rainwater tanks and be designed to maximise natural solar access and natural ventilation.
- (c) Apartments—compact accommodation options, within a low-rise built form to be located around the marina and within the Fishermans Beach precinct.

5.2.6. Proposed tenure and ownership

Villas and apartments will be available for purchase by individuals for tourism purposes and centrally managed by the proponent. Permanent residential accommodation does not form part of the proposals, although villas will be able to be leased by the public.

5.3. Proposed development plan

5.3.1. Draft development plan

The draft Great Keppel Island Resort Revitalisation Plan – Plan of Development (‘draft Plan of Development’) applies to land identified as ‘Plan of Development Area’ in Figure 5.1 above. A copy of the draft GKI Plan of Development can be found in Appendix N of the EIS.

When finalised, the GKI Plan of Development would form part of the preliminary approval under section 242 of the *Sustainable Planning Act 2009* (SPA) to override the current Livingstone Shire Planning Scheme. The draft Plan of Development specifies:

- the type of development that may take place
- a development code, which provides a process to guide the development of the site and a framework for assessing subsequent development applications.

The intent of the preliminary approval is to facilitate the implementation of the proposed project, as represented in the EIS and associated documentation.

Further details on other approvals required under SPA can be found in section 4 of this report.

The draft Plan of Development includes:

- Map 1—Precinct Plan, which organises the Plan of Development area into four precincts:
 - Clam Bay Precinct
 - Environmental Protection Precinct
 - Fishermans Beach Precinct
 - Marine Services Precinct
- Map 2—Development Parameters Plan, which identifies elements pertaining to the type and location of development
- a purpose statement and overall outcomes for precincts
- tables of assessment, which determines the level of assessment of required for different parts of the project
- Place Code, which provides additional and/or overriding assessment provisions for development.

Maximum allowable development

The draft Plan of Development sets an upper limit on the gross floor area (GFA) of allowable development within the precincts of the project. The Marine Services Precinct allows for a maximum 185 resort apartments. The maximum GFA for other uses in the precinct is 7000m². Other uses may include: caretaker's residence, child care centre, restaurants, market, office sales and hire premises and telecommunications facility.

The Fishermans Beach precinct allows for a maximum of 440 resort villas, 185 resort apartments, 250 units of accommodation in the proposed hotel and staff accommodation for 200. The maximum GFA for other uses in the precinct is 2500m². Other uses in the precinct may include: take away food store, shop, convenience restaurant, major utility, vehicle depot and machinery repair station.

The Clam Bay precinct allows for a maximum of 422 resort villas and the maximum GFA for other uses in the precinct is 2500m². Other uses in the precinct may include: outdoor recreation and ancillary facilities such as golf clubhouse, shop and telecommunications facility.

The draft Plan of Development does not provide for major development within the Environmental Protection Precinct. Educational opportunities associated with the recreation and/or conservation values of the precinct will be permitted, along with ancillary facilities such as walking trails, seating, BBQ and toilet facilities. If delivered in accordance with the draft Plan of Development, any construction within the Environmental Protection Precinct should not detrimentally impact the natural environment.

Projected visitors

The proponent estimates that the project will generate nearly 830 000 annual person days.¹³ The SEIS stated that the peak months will be January and December with daily visitors proposed to be over 3500; while June is projected to have approximately 1200 daily visitors. This is equivalent to an estimated average daily population of 2274 visitors to the island, but not residents. In the 1990s the former resort had a peak daily island population of 2600 and an average daily population of 765.

5.3.2. Staging

The construction timeframe for the proposed GKIRP is estimated to be completed by 2023. (The indicative project schedule is in Appendix S of the EIS.) Construction timeframes may be affected by economic market cycles throughout the development period.

The EIS indicates that stage one of the proposal involves the construction of the Fishermans Beach hotel, the marina facility including retail precinct, 100 apartments and internal infrastructure. Roads and associated earthworks required to build them will be one of the critical items to construct in advance of the proposed building facilities.

The first facility proposed to be constructed is a new barge terminal at the marina which is intended to provide permanent construction access to the island. When operational, all construction staff, equipment and material are proposed to access the island via the barge terminal.

Decommissioning of the former resort will be undertaken progressively, with selected infrastructure to be utilised in early construction stages until connection to mainland infrastructure (water, electricity and telecommunications) is made. More details on infrastructure and services can be found in section 6 of this report.

It is expected that stage one will take approximately 18 months to construct. Further details on the development stages can be found in section 2.2.3 of this report.

5.4. Relevant state and local government planning

5.4.1. Livingstone Shire Council Planning Scheme

The Livingstone Shire Planning Scheme 2005 (LSPS) currently applies to the land required for the proposed project. Currently any development proposed on the island is assessed against the LSPS.

The planning scheme contains a detailed structure map and locality code which allocates the island into specific land uses, including accommodation and associated facilities, village commercial, conservation, and aquifer.

Given the proposed expansion, not all of the project's proposed land uses can be consistent with the current LSPS. However, some of the original intent is retained by

¹³ For a definition of 'annual person days', refer to the Glossary on page 141 of this report.

concentrating high density development on the site of the former resort. Additionally the majority of the conservation precinct in the LSPC will be located within the proposed Environmental Protection Precinct, which is consistent with the objective of the planning scheme to restore the area and improve the environmental values.

5.4.2. Regional plan

The current regional plan for Great Keppel Island is the non-statutory Central Queensland Regional Growth Management Framework 2002.¹⁴ Of relevance to the GKIRP project is the plan's desired outcome of 'continued sustainable growth of the region's tourism experience that contributes to the region's growth and prosperity'. The plan identifies the need for a strategy to 'enhance the region's tourism product, with the aim of increasing the number of visitors, yield and employment'. The project meets the purpose of the plan through promotion of the regional tourism industry, making the region less reliant on the commodity price-driven mining and agricultural industries.

At the time of writing this report, the Queensland Government has committed to preparing a new statutory Central Queensland Regional Plan. The new regional plan proposes to increase the focus on tourism by recognising and supporting the importance of tourism to the state's economy and the fundamental role it plays in providing regional services and jobs. Tourism is also one of the four pillars from which the government intends to grow the state's economy.

5.4.3. State planning policies

The Queensland Government has committed to establishing a new approach to state planning policies (SPPs) that simplifies and clarifies the state's interests. The new approach means that a single SPP (SSPP) will be developed to replace the various SPPs in existence. The SSPP will set out policies about matters of state interest in the planning and development assessment system, and forms part of the government's broader commitment to planning reform.

At the time of writing this evaluation report, numerous SPPs currently exist. Once the project development applications are submitted to RRC for assessment, the new SSPP is likely to be in effect.

As the purpose of SPPs is to define the State interests against which development must be assessed, I have considered the following SPPs in my assessment and stated relevant conditions to be attached to subsequent approvals.

- SPP 2/02—Planning and managing development involving acid sulfate soils
 - Details of potential acid sulphate soils (PASS) within the project area are discussed in section 10.2.2 of this report. Development will be required to comply with the relevant provisions of SPP 2/02.
- SPP 1/03—Mitigating the adverse impacts of flood, bushfire and landslide
 - Proposed development will be required to mitigate risks associated with natural hazards, which is discussed in section 5.5.2 of this report.

¹⁴ Central Queensland Regional Planning Advisory Committee, Central Queensland Regional Growth Management Framework, Department of Local Government and Planning, Rockhampton, 2002, viewed 12 February 2013, <http://www.dsdip.qld.gov.au/resources/plan/regional-growth/cqrgfm.pdf>.

5.4.4. Coastal planning

The Draft Coastal Protection State Planning Regulatory Provision—Protecting the coastal environment (October 2012) (draft SPRP)¹⁵ commenced on 8 October 2012. The draft SPRP is an interim measure that will operate for 12 months or until the SSPP commences. The policies in the draft SPRP aim to ensure that development in the coastal zone which is important for the growth of the Queensland economy, is carefully managed to protect the environmental, social and economic coastal resources for present and future generations. The EIS identified the following outcomes for the proposed coastal development:

- buildings or structures within erosion prone areas are designed to withstand potential erosion
- design of essential infrastructure in coastal areas will provide for adaption to a 0.8 metre rise in sea level by 2100
- shoreline erosion management plans will be developed where relevant.

The proposed Marine Services Precinct represents a significant development and commercial use of publicly owned land. It is important that public benefits are provided as part of the proposal, in particular maintaining public access to the coast.

In accordance with the draft SPRP, the project proposes that public access to the coast will be maintained. The Marine Services Precinct proposes a continuous pedestrian boardwalk or promenade around the edge of the marina and in a location which ensures functional and safe vessel access and movement.

5.5. Location specific requirements

Great Keppel Island is located in the World Heritage Area and abuts the Great Barrier Reef Marine Park. Because of the location of the proposed development on an island and entirely within the WHA, the EIS included specific investigations relevant to the unique location.

5.5.1. Visual impacts

The project represents a substantial increase in the scale and intensity of development currently on this island. To mitigate the visual impact of the proposed increase in development, the draft Plan of Development (refer to section 5.3.1 in this report) promotes a built form that integrates with the natural environment in terms of scale, bulk, materials, and colour. It is intended that native vegetation will be retained between and through the precincts, and the built form will be largely below the local tree canopy levels.

¹⁵ Department of Local Government and Planning, Draft Coastal Protection State Planning Regulatory Provision—Protecting the coastal environment, October 2012, Department of State Development, Infrastructure and Planning, Brisbane, 2012, viewed 12 February 2013, <http://www.dsdp.qld.gov.au/resources/laws/state-planning-regulatory-provision/draft-coastal-protection-sprp.pdf>.

Clam Bay precinct

A formula for retaining native vegetation between buildings and open space areas has been identified. Implementing this formula will result in 100 m wide groups of two-storey villas on a 10% slope, with bands of trees of average 14 m height separating each group of villas. Villas would have their lower storeys completely screened and their upper storeys partially-screened by a combination of retained and planted trees.

The EIS included simulated views of the proposed development from several potential viewpoints. The proposed mitigation measures would minimise the visibility of all development in the central valley when viewed from the shoreline on Leekes Beach. A viewpoint from offshore of Leekes Beach would see buildings in the distance.

From Clam Bay a small group of villas on the foothills of Bald Rock Peak have the potential to be visible above the existing vegetation on the Clam Bay escarpment.

Lighting

Distant lights associated with the proposed villas in the Clam Bay Precinct would be visible from offshore and may be seen from the North Keppel Island lookout under clear conditions—although the lookout is unlikely to be accessed at night.

The EIS proposed a number of mitigation measures to reduce the impact of lighting from this precinct.

Access road

There is only one road connection across the Mt Wyndham Range between the Fishermans Beach Resort and Clam Bay Resort Precincts. The proposed route for a new road has been selected to avoid linear stretches of clearing along forested slopes or across skyline ridges which will minimise the potential for roads and associated cuttings to create visual scarring is limited.

Fishermans Beach precinct

Parts of the existing (closed) resort, particularly the accommodation units located on the hillside, are highly visible. The proponent has committed to demolish these buildings in stage one of the project.

The proposed three storey hotel would be set back from the beach front and screened with vegetation. The EIS described the hotel as a low rise (three-storey or 12 metre maximum) built form designed to complement the island's natural landscape.

The draft Plan of Development (discussed in section 5.3.1 of this report) proposed that the villas and apartments in the precinct will have a maximum of two storeys and have low pitched roofs constructed of non-reflective materials. The buildings located on hill sides would be stepped to follow the natural slope of the landscape. The EIS proposed that the use of vegetation screening be utilised as an additional measure to minimise the visual impact of buildings.

The EIS reported that the proposed earthworks for the new airstrip would remove an existing hill and re-shape part of a ridge, which is necessary to create aircraft safety clearance zones. The proponent has undertaken to revegetate the exposed hillside and the fill embankment behind Putney Beach.

5.5.2. Natural hazards

The location of the proposed resort development on the island has potential to increase risks to visitors and staff posed by natural hazards. Events requiring emergency response and/or evacuations can cause additional complexities compared to mainland communities.

The proponent has committed to hazard identification and detailed risk assessments are to be conducted for the construction and operation phases of the project. Natural hazards were identified as storm tide inundation, tropical cyclone, bushfire and heatwaves.

The proponent has committed to develop an evacuation and emergency response plan (EERP), which provides guidelines for actions to be taken during an emergency to minimise the potential for loss of life, injury to people, and damage to the environment and property by covering foreseeable incidents and outlining remediation.

In addition, the proponent has committed to develop a natural disaster strategy to respond to all possible natural disasters that may occur within the proposed project site. The strategy will detail all of the activities that are to be carried out upon receiving the advance notice of a possible natural disaster, in order to facilitate the best use of available resources, relief and rehabilitation in the most practicable approach.

5.5.3. Tenure and ownership

Current government policy is that freehold tenure cannot be issued on offshore islands. New perpetual leases cannot be issued under the *Land Act 1994* (Land Act) therefore a long-term lease (100 years) is the longest tenure available.

The EIS stated that the proponent's preference is for a 100-year up-front lease for the Clam Bay area and that conditions may be attached to the lease specifying development timelines.

DNRM, responsible for administering the Land Act, has stated a preference to issue a conditional 15-year 'significant development' lease. Recent amendments to the Land Act provide that once the proponent meets the terms of the development lease, the minister must issue an operational lease—which in this case would be for 100 years.

Proposed lease purposes will vary according to the development intent for the applicable land. The lease conditions will form a secondary layer of land-use controls to the conditions of development approvals and may specify additional development sequencing requirements.

DNRM has advised that there has been no Native Title claim lodged over the parcels of land required to form the project. The proponent has committed to develop an Indigenous Land Use Agreement with any potential Native Title claimants.

Most appropriate use of Lot 21

The proposed change in lease arrangement of Lot 21 requires an assessment of the most appropriate use of the land in accordance with s16 of the *Land Act 1994*.

The EIS, submissions and advice from state agencies shall inform the decision in relation to the most appropriate land use.

The proponent has committed that public access is to be maintained and improved through Lot 21, via limited road access, walking tracks and visitor facilities.

The public will also have access to Leeke's Homestead and access to the Clam Bay foreshore through the Clam Bay Precinct. It is proposed through the lease conditions, that the lessee will have the ability to restrict access to areas within the Clam Bay Precinct, including the golf course and villas.

5.6. Social impacts

Improved public access, combined with new guests at the proposed resort, will substantially increase the numbers of visitors on the island. The development and the increased visitor population may negatively impact upon some of the existing residents, businesses and a small number of landowners.

The EIS included the results of a social impact assessment (refer Appendix K), which was conducted to determine the potential benefits and negative impacts of the project on the communities potentially affected by the project. Over 400 individuals, groups and organisations participated in consultation activities during the preparation of the EIS and project design.

The EIS indicated that the greatest public interest in the project was in the protection of environmental values of the island and the potential impacts of the project if mitigation measures are not implemented. The EIS noted however, that many stakeholders who expressed concern about the potential impacts of the proposed project also raised a number of potential benefits and opportunities. The potential benefits identified are mostly of a social or economic nature in relation to employment, tourism, the economy, family holidays and an expected improvement in the regional identity.

The EIS proposed a number of strategies to avoid negative impacts and maximise potential benefits of the project, including:

- a recruitment policy that gives preference to local unemployed workers, and other local workers in the first instance
- drug and alcohol management policy for the construction period and operational phase of the project to ensure appropriate behaviour of construction works and guests on the island
- a local procurement policy for the proponent and its contractors to maximise the potential local economic impacts.

The EIS reported that agriculture, forestry and fishing and mining are the main 'engine rooms' for economic activity in the region, accounting for 13.3 percent of the Capricorn Region's employment. This compares to only 5.2 per cent of Queensland's employment (Foresight Partners 2011). A major economic benefit from the project would be to diversify the region's economy and reduce dependence on mining.

5.7. Heritage conservation

5.7.1. Queensland Heritage Place—Leekes Homestead

Leekes Homestead forms an important part of the island's former pastoral industry and has been recognised on the Queensland Heritage Register. The homestead, consisting of timber tin cottage with corrugated iron pyramid roof with open front verandah is a rare physical illustration of the difficulties of grazing sheep on a remote island. The proponent has made a commitment to prepare a Conservation Management Plan which will identify what remedial works will be required to be undertaken and a condition has been included in this report to ensure this outcome.

5.7.2. Aboriginal Cultural Heritage

The EIS (section 3.12) included a summary of the Indigenous cultural heritage investigations conducted to date. The proponent has committed to undertake detailed cultural heritage surveys of the project area and develop management strategies that will encapsulate survey results and provide direction on management of cultural heritage values. A requirement of the *Aboriginal Cultural Heritage Act 2003* is that a Cultural Heritage Management Plan (CHMP) is prepared and registered.

5.8. Coordinator-General's conclusions

I recognise that under the current LSPS, not all of the proposed development areas are identified for tourism or urban development purposes. I note the proponent's intent to seek preliminary approval under the SPA to override the planning scheme. I also note that there are proposed land uses that will complement existing land use designations in the LSPS. For example, the rehabilitation of land in the proposed Environmental Protection Precinct, combined with improved public access, may be considered a positive outcome for this part of the island.

Certain environmental matters will also need to be addressed due to the proposed development activities and increased visitor population on the island—these are discussed in the environmental section of this report. In general terms, the proposed land uses and development controls for the project should deliver acceptable development outcomes.

The EIS included a range of measures that should minimise the impacts of the proposed development on the landscape. Considerable effort has gone into the planning stage to reduce visual impacts. Proposed management of the development site and the Environmental Protection Precinct should facilitate the co-existence of the visitor population with improved natural values on parts of the island.

I consider the proposal will provide major public benefits, including employment opportunities during construction and operations, due to the substantial investment by the proponent. Opportunities for the elderly and people with disabilities to enjoy the natural beauty of the island should also be facilitated by the proposed development through improved access.

Key requirements I have set for the project include:

- development maintains the safety of occupants during, and immediately after natural hazard events
- the proponent is to implement all measures proposed in the EIS to minimise any visual impacts of the development. In particular, areas of native vegetation are to be retained or planted through the golf course and between buildings in the Clam Bay precinct
- ensure public and tourism benefits are delivered in the initial project stages and are maintained throughout the life of the project
- no permanent residents are to be allowed within the development
- the development provides for safe and sustainable public access to the Environmental Protection Precinct and foreshore areas for all visitors to the island
- the proponent is to complete a Cultural Heritage Management Plan.

6. Infrastructure and services

The EIS and supporting documentation discussed the need for substantial infrastructure to support the proposed project and included roads, sewerage, water supply, wastewater, waste management, electricity and telecommunications. The proponent has committed to provide and fund all necessary infrastructure and accepted that the operation and management responsibility for infrastructure within the development area will rest with the proponent.

6.1. Existing infrastructure and services

6.1.1. Water supply

The EIS stated that prior to 2004 the former resort relied exclusively on a series of groundwater bores for its water supply needs. At present, the resort's groundwater bores have all been decommissioned with the exception of the bore known as the Long Beach aquifer.

From late 2004 until the closure of the former resort in 2008, potable water was supplied by a reverse osmosis (RO) desalination plant, that was leased and operated by a third party. Reject brine from the RO process (up to 490 kL per day), was returned to the ocean via a pipeline discharging offshore from Putney Beach. Supplementary water was sourced from the Long Beach aquifer.

It is reported in the EIS that private properties surrounding the former resort also historically extracted groundwater from the Long Beach aquifer, and used to a lesser degree, rainwater tanks. Most of the properties now rely almost exclusively on rainwater tanks.

6.1.2. Services

The EIS reported that the previous resort consumed power from a set of four diesel generators located in an industrial compound shed. The generators have since been decommissioned and removed. A separate set of diesel generators were located at Long Beach to supply energy for the water bore field in the same location.

The EIS stated that the former resort relied on an ageing wastewater treatment plant which ceased use when the resort closed. Private properties on the island are currently serviced by separate individual wastewater treatment and disposal systems (typically in-ground septic). Keppel Haven Backpackers is serviced by a single wastewater treatment plant consisting of an activated sludge treatment system with sand filter and discharges to an irrigation area immediately adjacent to Putney Beach.

Wastes currently produced on the island are either disposed at an old quarry site or transported weekly via wheelie bins on the ferry service for disposal at council landfill.

6.1.3. Internal roads and tracks

The EIS stated that transport around the island currently consists of a series of unsealed bush tracks and trails linking a limited number of residential and tourist facilities. This has resulted in internal roads and tracks only being accessible by foot, bicycle, 4WD or all-terrain vehicle. At present island traffic volumes are negligible.

There are also several short stretches of sealed but poorly maintained road in the vicinity of the former resort. There is no sealed road away from the western end of the island. The largest existing bush path to the southern and eastern ends of the island requires biannual bush clearance with a tractor and is quickly overgrown and unidentifiable without regular motorised trips to keep track marks fresh.

6.1.4. Airstrip

The existing airstrip is located between two hills between Fishermans Beach and Long Beach. The airstrip in its current form is only suitable for small aircraft which carry around 10 passengers.

6.2. Construction infrastructure and services

Select infrastructure from the former resort is proposed to be utilised in early construction stages until connection to mainland infrastructure (water, electricity and telecommunications) is made, via the utilities services corridor, which is discussed in section 6.3.1.

6.2.1. Construction water supply

Water supply (including for fire fighting) for the stage one construction phase of the proposed resort will be sourced from two production bores installed within the Long Beach aquifer. These bores will only be operational for a short period of time until the mains supply is brought across from the mainland. The proponent proposes to equip the bores with pumping systems.

Analysis provided in the EIS stated the total stage one construction water demand would peak at around 90 kL/day and that this is within the sustainable yield of the Long Beach aquifer. Therefore the existing production bores within the Long Beach aquifer are expected to provide adequate water supply to meet the full demand of construction, should the project be approved.

The EIS also stated that construction water supply will be supplemented from captured roof water and stormwater, and recycled effluent. It is proposed to use recycled effluent only for landscape irrigation and/or watering of the disturbed areas adjacent to the upgraded airstrip. Captured roof water and stormwater and recycled effluent are proposed to continue to be used in later construction phases and the operational phase.

6.2.2. Services

The EIS stated that the construction power supply would be by standby diesel generators organised prior to construction. Mainland electricity will be utilised to power later construction phases, once the connection is made.

The EIS proposed that construction wastewater will be treated to a standard that will enable the use of recycled water for irrigation of the golf course, landscaped areas and potentially for toilet flushing. It stated that wastewater treatment for the project during construction will initially be carried out using the wastewater treatment plant (WWTP) that serviced the former resort. The existing plant was licensed under the EP Act and included conditions of operation that provided for treated effluent to be discharged.

6.2.3. Construction waste management

A strategy for managing wastes generated during all phases of the proposed GKIRP has been developed in accordance with the principles of the waste management hierarchy specified in the *Environmental Protection (Waste Management) Policy 2000*.

The EIS estimated that the demolition and construction stage of the project will generate more than 10 000 cubic metres of waste material. The proponent proposes to provide bulk bins for storage of segregated wastes and recyclables. These bins will be emptied as required by an appropriately licensed commercial waste contractor. Waste collection vehicles will travel on the barge services and it is proposed to schedule waste collection trips to and from the island, in conjunction with the delivery of materials to minimise barge movements.

In an effort to minimise waste, the proponent proposes to mandate waste reuse and recycling in the construction contracts. Contractors will be required to salvage and reuse building materials e.g. crushed concrete, bricks and pavers for road base.

Asbestos management

The EIS noted that the former resort is likely to have been constructed with asbestos containing materials. As per the requirements of the Workplace Health and Safety Regulation 2001, the proponent will be required to undertake an inspection of existing buildings and infrastructure to determine whether asbestos, or asbestos containing materials are present, prior to demolition works.

The proponent will be required to ensure that any asbestos containing materials are managed appropriately and use a licensed asbestos removalist to develop a site-specific asbestos removal control plan before starting any asbestos removal.

6.2.4. Keppel Bay staging area

The EIS indicated the proponent will barge materials from Keppel Bay Marina to the island. The proponent has sub-leased a lot on the east side of the marina which provides approximately 2,300m² to accommodate truck loading, unloading and barging operations. The proponent has approval for the operation of two barges from this site as well as the installation of ramps and pontoons to access those barges from the staging area.

However, the EIS noted that access to the barging site is currently limited to heavy vehicles fewer than 13m in length due to the geometry of a roundabout at the intersection of roads heading into the marina. This is discussed further in Traffic and Transport at section 7.

In addition to the constraints at the roundabout, the EIS reported that the entrance to the staging area does also not currently permit large vehicle turns and access from either forward or reverse movements. Mitigation strategies proposed in the EIS include:

- widening the entry to the barging site through partial removal of the existing chain link fence around the property
- acquiring the right to access via an adjoining lot

Additionally, demolition of an unoccupied shed structure in the centre of the staging area will be required to permit manoeuvring of trucks and smaller loading vehicles.

6.3. Proposed infrastructure and services

6.3.1. Utilities services corridor

The EIS proposed that a number of services would be best supplied to the island from the mainland via a utilities services corridor. Information regarding the cable route and construction methodology is contained in section 2.3.2.7 of the EIS. The proposed utilities services corridor is proposed to contain:

- a submarine power cable (22 kV high voltage supply)
- a water main to supply potable water.

A fibre cable would be incorporated into the proposed utilities services corridor and connected to the mainland exchange to allow for high speed telecommunications to be utilised on the island.

A hydrographic survey was conducted during the EIS process to ensure that the alignment of the utilities services corridor avoids ecologically sensitive marine communities. The EIS has stated the preferred point of connection on the mainland is at Emu Park (Kinka Beach).

6.3.2. Internal roads and tracks

The project would provide a system of constructed vehicular carriageways, cycle paths and pedestrian paths in and around the resort to provide adequate access, including for service vehicles and emergency vehicles. In the EIS, the proponent has committed to providing new and existing roads that are sealed with asphalt and incorporate kerb and channelling.

Some roads serving only the villas may have a carriageway width of four metres, on the basis these roads will be predominantly used by EMRVs and occasional service vehicles.

6.3.3. Airstrip

An upgrade of the airstrip is necessary to accommodate larger aircraft and greater passenger volumes. The EIS stated that the airstrip will need to meet demand for 290 seats a day, which is equivalent to the arrival of four 74-seat Dash 8 planes per day. The airstrip has been designed with the capacity to service larger aircraft during peak periods, which seat up to 105 passengers. The preferred design option is shown in the EIS at Appendix R (refer Option 7b) and has the following key components:

- a 30 metre wide, paved and asphalt surfaced runway with an operational length of approximately 1,400 metres compliant with Civil Aviation Safety Authority (CASA) standards
- an alignment approximately parallel to and offset some 350 metres north of the existing airstrip
- taxiway and apron to park up to two aircraft, one scheduled and one delayed
- a basic terminal equipped to provide passenger and checked bag screening appropriate to these aircraft operations as prescribed by the Office of Transport Security.

6.3.4. Wastewater treatment infrastructure

The strategy to manage wastewater generated by the proposed project, will involve:

- a wastewater collection system designed to minimise groundwater infiltration
- an island-based wastewater treatment plant/plants designed to treat wastewater to a standard suitable for reuse
- beneficial reuse of most of the recycled water produced by island-based wastewater treatment plants for irrigation of the golf course and other landscaped areas around the proposed resort and
- a wet weather storage facility with a capacity to account for projected increases in rainfall intensity, which will be incorporated into the golf course design.

The maximum estimated EP (equivalent persons) for the project wastewater flows is 3973 EP. The estimated wastewater flow for the project during operation is 180L/EP/day.

Operation of the WWTP and associated irrigation systems would be subject to a development approval under SPA for material change of use involving an environmentally relevant activity (ERA) 63 – Sewage Treatment.

6.3.5. Waste management services

To service the operation of the proposed resort, a waste transfer station will be established within the industrial compound on the island. Separate wheelie bins and bulk bins will be provided for collection of general waste and recyclable materials. A small stationary compactor will be installed to reduce the volume of waste requiring transfer to the mainland. Composting facilities are also proposed to be provided within the industrial compound for processing of food waste and other organics, including biosolids into soil conditioner. The EIS estimated that these procedures will reduce the

volume of waste requiring disposal during operation of the resort to approximately 8-25% of total waste generated.

The waste transfer station and associated areas for storage and handling of bulk waste materials, are proposed to be located with appropriate setbacks to environmentally sensitive areas, existing residential properties and tourist accommodation.

Containment and drainage systems are to be installed for waste storage and handling areas to prevent the release of contaminants to receiving environments.

The proposed composting facilities will require approval under the SPA for a material change of use involving environmentally relevant activity (ERA) 53 – composting and soil conditioner manufacturing.

6.3.6. Water supply

The EIS estimated the total annual average water demand for operation of the proposed project to be 1884kL/day, using an average domestic water demand of 228L/EP/day.

Emergency water supply

In the event of a disruption to the potable water supply connection to the mainland, the EIS estimated that between three and seven days of emergency potable water supply may be sourced from mainland water stored within reservoirs on the island. In the event of an extended disruption to the mainland water supply connection, water restrictions will be imposed, additional potable water may be barged over from the mainland or consideration may need to be given to reducing guest occupancy and staffing to ensure that adequate water is available.

Fire fighting water supply

Water supply for fire fighting will be provided by the provision of dedicated fire storage within the water storage reservoirs, fire pumps (if required) and the provision of fire hydrants and hose reels within the water reticulation system adjacent to the various buildings throughout the proposed resort.

6.3.7. Operations power supply

The estimated annual electricity consumption and peak demand of the proposed resort is in the order of 11 430 000 kWh/year. The final power demand will be confirmed during the detailed design stage, however, the nominated figures in the EIS assessment are considered to be the maximum power demand.

The proponent of the proposed resort has committed to achieving a carbon positive outcome through the installation of around 24 320 solar photovoltaic panels on the rooftops of the proposed resort villas. The EIS has estimated the number of panels per villa will be around 27. It is estimated that the villas could provide 89 per cent of the total area required for the installation of solar photovoltaic panels. The remaining solar photovoltaic panels will be installed on the rooftops of the proposed resort apartments and hotel. It is estimated that this will produce 12 000 000kW/year. The “carbon positive” aspect of the design is based on the goal of ensuring that the quantity of feed-

in electricity provided to the grid is greater than the electricity drawn from the grid at night.

The proposed project will include a connection to the mainland electrical grid. During sunlight hours, the solar photovoltaic system will feed excess electricity into the electrical grid. The resort will then draw power in reverse to supply its electrical loads at night.

6.4. Coordinator-General's conclusions

I consider that the assessment contained within the EIS adequately demonstrated that the infrastructure and services proposed for the construction and operations of the resort are appropriate to service the estimated peak population of the resort, including staff.

Once the infrastructure and services of the proposed resort are constructed and operating, the proponent has indicated that the existing residents will have the potential to tap into the proposed resort's secure water and electricity supplies.

I note that while the waste management strategy proposed in the EIS deals specifically with wastes generated by the activities proposed under the GKIRP, I consider there may be an opportunity for existing residential and existing commercial properties on the island to utilise the waste management and treatment facilities, which form part of the proposed GKIRP. I have included a condition to ensure this outcome

An outcome I require from the project is that once the mainland water supply connection is operational, there will be no further extraction of groundwater resources.

Under the *Workplace Health and Safety Regulation 2001*, the proponent will be required to ensure that any asbestos containing materials are managed appropriately.

I note the proponent's commitment to creating Australia's first carbon positive resort. The EIS provides a number of case studies where tourism resorts are utilising photovoltaic energy to minimise operating costs. I consider that minimising ongoing operating costs by producing power for resort consumption will be a positive contribution to the ongoing sustainability of the resort.

7. Traffic and transport

7.1. Existing transport infrastructure

7.1.1. Roads

The assessment presented in the EIS primarily focused on the impacts of the proposal on the most direct route to the Keppel Bay Marina from Rockhampton, which is via the Bruce Highway to the Rockhampton-Yeppoon Road. Once at Yeppoon, drivers turn right onto the Scenic Highway, which continues towards the marina. This road, as it approaches the marina, is commonly known as the Yeppoon-Emu Park Road. All traffic accessing the marina turns into the Vin E Jones Memorial Drive and from there into Breakwater Drive, via a roundabout at the intersection of Vin E Jones Memorial and Breakwater Drives.

The Bruce Highway, Rockhampton-Yeppoon Road and Yeppoon-Emu Park Road/Scenic Highway are all state-controlled arterial roads providing access between Rockhampton and the coast. All other roads are locally controlled.

Traffic volumes

The existing traffic volumes were assembled from a combination of intersection and segment volume locations approved by the Department of Transport and Main Roads (DTMR), which has resulted in an impact assessment that is appropriate for the concept design stage of the proposal. A copy of the traffic impact report can be found in the EIS at Appendix AK.

7.1.2. Shipping/waterborne

There is a ferry service to Great Keppel Island which operates daily and twice on Fridays. The trip takes approximately 30 minutes one-way.

There are two separate marinas operating within the Rosslyn Bay state boat harbour: Rosslyn Bay Marina and Keppel Bay Marina. Rosslyn Bay is a private marina that operates on the west side of the harbour and Keppel Bay is the publicly accessible marina on the east side.

The Keppel Bay Marina operates from the east side of the harbour and includes a number of independent sub-leased land uses including the marina police, ferry operators, and Harbour Master office, among others.

Two public boat ramps operate at the southern end of the public marina adjacent to car parks two and three, illustrated in Figure 7.1 below. The EIS stated that these ramps are highly utilised during peak times.

Parking facilities at Rosslyn Bay and Keppel Bay Marina

Currently, there are 928 car parking spaces available within, and in the immediate vicinity of, the marina. This total includes 406 publicly available spaces and 270

spaces at the Great Keppel Island Security Car Park on the Scenic Highway just outside of the marina property.

Within the marina, there are four car parking lots, as shown in Figure 7.1 below, which provide a variety of general, disabled, trailer, loading, coach and reserved spaces.



Figure 7.1 Parking facilities at Rosslyn Bay

In addition to these car parks, the existing Great Keppel Island Security Car Park, used to service the former resort, is located on Rockhampton-Emu Park Road just outside the entrance to Vin E Jones Drive. Since the closing of GKI resort, car parks here have been underutilised.

A study conducted for the EIS concluded there is currently an excess number of car parking spaces at both Rosslyn Bay and Keppel Bay marinas; especially during weekdays. It was noted in the EIS that during the weekend peaks, car park three was at capacity for several hours due to heavy demand for the spaces designed to accommodate vehicles with boat trailers.

Access constraints

Access to Rosslyn Bay and the barging site is currently limited to heavy vehicles less than 13 m in length due to issues with the roundabout on Vin E Jones Drive. This precludes semi-trailers from accessing the site and therefore reduces the average truck's loading capacity and increases the number of overall heavy vehicles required to transport materials.

In addition to the constraints at the roundabout, the entrance to the marina, which is the proposed staging area for the development, does not currently permit large vehicle turns and access from either forward or reverse movements. The size of the entrance to the lot, which is off Vin E Jones Memorial Drive, is a 10-metre-wide road with a single lane in each direction.

7.2. Potential impacts

7.2.1. Construction

Forecast construction traffic generation

Construction-generated truck (and barge) volumes were quantified by the proponent in the EIS, by matching volumes of materials identified in the EIS with the tentative construction programme. These reports calculated the required volume of building materials that would be removed and brought on to Great Keppel Island for the project.

The analysis estimates a total of 15 310 trips to Rosslyn Bay over the course of the construction program. The EIS estimated 28 heavy construction vehicle return movements for an average day in the heaviest construction year, which is 2013.¹⁶ By 2017, the average number of movements would be reduced to 14. These movements would involve construction vehicles of varying sizes, but as discussed above, the capacity of the Rosslyn Bay barging area is currently limited to 12.5-metre-long trucks.

The EIS assessment concluded that neither the construction nor operation of the resort will have significant adverse impact on the mainland road network. The assessment identified a forecast total of 477 vehicle trips per day created by the project in its projected peak month of operations. Approximately 53 per cent of these trips will be from daily commuting staff and another 35 per cent from day visitors. This averages 40 additional vehicle trips per hour over a 12-hour day.

The assessment also concluded that no additional traffic control will be required as a result of the proposed project. Traffic volumes are not predicted to increase more than 5 per cent over the background totals, therefore intersection performance mitigation is not required, as per DTMR guidelines.

Pavement impact assessment

Over the course of the pavement assessment profile (2012–34), the proposed project is anticipated to reduce the overall functioning life of affected network roads by a range varying from 0.1 per cent to 1.1 per cent.

The construction phase of the project will contribute to the premature deterioration of the sealed surface in the vicinity of Yeppoon and Tanby Road and the proponent has committed to the provision of a maintenance contribution to RRC. These impacts can

¹⁶ The construction schedule in the EIS was based on a year 2012 approval.

be reduced if a greater proportion of vehicles are run via the Rockhampton-Emu Park Road, or if larger semi-trailers are permitted into the Rosslyn Bay barging site.

Forecast shipping/waterborne transport generation

The proponent stated in the EIS that it will transport materials by barge from Keppel Bay Marina to GKI and the majority of construction equipment will stay on GKI for the duration of the construction period.

Over the entire construction period, the 15 310 truck trips to Rosslyn Bay results in a forecasted 3811 barge trips to GKI to deliver construction material from Keppel Bay Marina. The volume of construction-related materials (and therefore trips) will be greater during the first half of the programme (2013–2017) than the second (2018–2024).

During peak construction years (2013–2014), an average of two additional barge trips will be required per day. Once the project is fully operational, the two barge trips would be replaced with two additional ferry services.

The EIS noted that, once appointed, the contractors responsible for the barging will need to issue a barging plan to clearly define the protocol for the lawful transport of goods to the island from the mainland marina. The plan will need to demonstrate that all appropriate safety requirements are met and that operations are aligned with the overall transport management plan (TMP) and Harbour Master requirements.

Forecast construction workforce travel behaviour

The number of jobs created by construction is expected to vary across the project lifespan with an expected peak at around 350 full-time equivalent (FTE) positions per year, reducing to 150 in the latter stages of the project. The construction workforce will be based on the island during the week and therefore will not add vehicle trips to the road network during peak times.

Car parking

An increase in parking demand as a result of construction staff commuting from the marina will require mitigation. The proponent has proposed several mitigation options including:

- a staff car park, possibly using the existing Great Keppel Island Security Car Park established for the operation of the former resort
- implementation of a parking management plan, prior to commencement of construction
- providing a staff bus service between staff premises and the ferry.

7.2.2. Operational impacts

It is envisaged that approximately 685 full-time, part-time and casual staff will be required on the island once the resort is fully operational. Most operational staff will work standard shift hours and will be sourced locally. It is proposed that the majority

of staff will travel to the island via ferry for each shift. Up to 200 staff may be accommodated in the new staff accommodation to be provided on the island.

The EIS found that the impacts of guests and staff trips upon the forecast road network would be negligible. The resort is predicted to accommodate a greater proportion of guests flying directly to the island (estimated 70 per cent of overnight guests) and a significant number of staff will be housed on the island and make weekly trips to the mainland. The largest number of trips would be from commuting staff.

The number of private, recreational berths at Rosslyn Bay is currently fixed. Each of these vessels must already venture into the channel to leave the marina and the project would not increase these numbers. Therefore, the assessment does not include increased numbers of recreational craft visitors to GKI.

7.3. Coordinator-General's conclusions

I consider the assessment provided in the traffic impacts report in the EIS to be appropriate and note the findings that there should be minimal impacts resulting from either construction or operations on the road network and Rosslyn Bay harbour operations.

The increase in parking demand as a result of additional staff and construction commuting trips to the marina which services the island will require mitigation in the form of a staff car park, with 150–200 spaces and a direct shuttle service to and from the ferry. This location can double as a construction pre-staging area for the movement of materials to the marina and island.

In the EIS, the proponent has committed to developing a parking management plan, in conjunction with Council and DTMR. The EIS also recommended the implementation of travel demand management plans to either reduce or redistribute traffic volumes to and from the marina.

I note that measures can be taken to confirm, and if necessary, provide access to larger vehicles for transport during construction. If the proposal requires larger semi-trailers to transport barging materials, the proponent will need to modify the roundabout at Vin E Jones Drive, following approval from Council and DTMR to alter the geometry of the intersection roundabout.

While the increased number of trips across the harbour to the island does not constitute a significant impact upon marina operations, I consider it appropriate for the proponent to prepare a marina management plan, to be approved by the Harbour Master.

I require the following outcomes from the marina management plan, to effectively manage the impact of the proposal on the local community:

- maintain the safety, efficiency and existing condition of the road network and transport modes

-
- avoid any hindrance for local vehicles by designating areas for construction vehicles (both parking and transport routes)
 - ensure access to the marina by recreational users is not impeded.

8. Water resources

8.1. Overview

For the stage one construction phase of the project, the proponent proposes to source water from a combination of the Long Beach aquifer (via two production bores in the aquifer), captured roof water and stormwater, and recycled effluent. During stage one of construction, the proponent intends to establish a submarine water pipeline connected to the mainland water supply, at which time water would no longer be sourced from the aquifer.

The proponent also intends to construct sewage collection and treatment systems to recycle effluent for use during construction and, once operational, on the golf course.

This section discusses the use of water on the island during construction and operation, as well as the potential water quality impacts that may occur as a result of activities such as constructing impermeable surfaces (for example, roads), vegetation clearing, use of recycled water infrastructure, and the use and storage of chemicals. The infrastructure required for treating and recycling effluent is discussed under section 6.3.4, while the potential impacts of this infrastructure on the coastal and marine environments is discussed in section 9.

8.2. Surface water

8.2.1. Existing environment

Great Keppel Island has a subtropical climate. The average annual rainfall for the island is 1070 mm, however total rainfall on the island has ranged from as low as 480 mm in 2001 to a high of 1854 mm in 2010. The highest amount of rainfall occurs normally between December and March.

The EIS reported that the waterways on the island are largely ephemeral, flowing only during and shortly after storm events. Only two of the catchments affected by the project discharge to ephemeral freshwater streams—catchment 9 (which discharges to Putney Creek) and catchment 11 (which discharges to Leekes Creek) (refer to Table 8.1 below for more detail). No artificial impoundments or water extraction infrastructure is known to exist along these waterways.

Currently, the mouth of Putney Creek (part of catchment 9) is regularly blocked by a sandbar, which is occasionally washed out by large storm events. The EIS stated that the natural hydrology of Putney Creek is believed to have been modified as a result of a number of previous land use activities, including the construction of the existing airstrip. It is understood that the airstrip was built over a number of semi-permanent waterholes and lagoons, blocking the natural drainage.

8.2.2. Potential impacts and mitigation

The proposed development introduces a number of changes to the surface water hydrology of the island. Changes of land use would involve clearing vegetation, earthworks and constructing impervious surfaces, such as roads. A range of surface water management works are also proposed such as retention basins and artificial swales. The EIS estimates the total infrastructure footprint would represent approximately 3.5 percent of the island.

The EIS defined 14 distinct drainage catchments on Great Keppel Island. Development is proposed in seven of these catchment areas, as described in Table 8.1.

Table 8.1 Great Keppel Island catchment areas

Catchment number	Location	Discharge location	Proposed development in the catchment
5	Clam Bay	Discharges in a dispersed manner via localised flow paths to the small beaches of Clam Bay. No main waterway.	Part of golf course and small number of eco-tourism villas.
7	Long Beach	Discharges in a dispersed manner along the eastern section of Long Beach. There are few recognisable flow paths.	Small number of eco-tourism villas and small part of airstrip.
8	Fishermans Beach	Discharges in a dispersed manner along the southern half of Fishermen's Beach. There are few recognisable flow paths.	Resort hotel, eco-tourism villas and apartments, sporting fields,
9	Putney Creek	Contains Putney Creek, which discharges at Putney Beach.	Eco-apartments and villas, resort commercial/retail, staff accommodation, airport terminal and part of airstrip, and the facilities maintenance compound.
10	Leekes Beach	Contains Leekes Creek, which discharges to Leekes Beach through the existing wetland.	Nil – but downstream of Catchment 11.
11	Central area between Clam Bay and Leekes Beach	Discharges via Leekes Creek in Catchment 10 to Leekes Beach through the existing wetland.	Majority of golf course including clubhouse commercial/retail and eco-tourism villas.
14	Marina Precinct	The Marina Precinct is to be constructed along the existing beachfront at the northern end of Putney Beach.	Marina retail/commercial and apartments.

Stormwater quantity

An increase in the total area of impervious surfaces associated with the construction is expected to increase peak surface flow rates without mitigation. An increase in peak surface flow rates has the potential to increase peak discharge velocities and run-off volumes and the frequency of small run-off events. Impacts from such increases may include scouring and erosion where flows become concentrated, decreased stability within receiving waterways and increased risk of flooding.

State Planning Policy 4/10: Healthy Waters (SPP 4/10) includes a waterway stability objective that requires all new development to manage flows to ensure post-development peak one-year Average Return Interval (ARI) event discharges within downstream waterways to be no greater than pre-development peak one-year ARI event discharge.¹⁷

Modelling of annual surface run-off volumes indicates that, without mitigation, an increase in annual volume of surface run-off would be expected post-development. An increase in groundwater recharge is also expected to a lesser extent in some catchments.

Water sensitive urban design measures are to be incorporated into the proposal. The proponent has committed to these mitigation measures:

- installing rainwater tanks for capturing and re-using roofwater runoff
- installing detention and retention basins to intercept run-off from impervious surfaces before it reaches waterways (Leekes Creek and Putney Creek) and to infiltrate water into the naturally highly permeable sandy soils
- harvesting stormwater runoff from the golf course (and possibly other areas) and re-using it for irrigation water supply
- designing stormwater treatment and drainage systems to manage flow capacities in excess of a one percent annual exceedence probability (AEP)¹⁷ storm event—to account for predicted increases in rainfall due to climate change and reduce the risk of rainfall events exceeding the design capacity of these systems.

The EIS assessed the alteration of flow regimes expected from the proposed activities to be low risk and would meet the SPP4/10 waterway stability objectives. The hydrological characteristics of the stormwater treatment and drainage systems are to be designed to provide seasonal environmental flows that are similar to natural conditions (i.e. volume and timing), matching the ephemeral nature of the island's waterways.

Stormwater quality

Stormwater run-off can transport pollutants (litter), sediment and nutrients (particularly nitrogen and phosphorous) and contaminants to downstream waterways via stormwater drainage systems. These pollutants can affect the health of downstream ecosystems.

¹⁷ For a definition, refer to the Glossary on page 141

Nutrients in the fertilisers and irrigated recycled water that will be applied to the golf course have the potential to reach the marine environment through run-off into creeks.

The proponent proposes to install best-practice vegetated bio-retention systems, including bio-retention basins, swales and infiltration areas to remove gross pollutants, sediments and nutrients from stormwater flows prior to discharge.

The stormwater quality improvement devices will be designed generally in accordance with details and specifications contained in the *Water Sensitive Urban Design Guidelines for South-East Queensland*.¹⁸

Gross pollutant traps will be incorporated into the stormwater treatment system at key locations where gross pollutants are most likely to be concentrated and at risk to entering waterways.

SPP 4/10 specifies that new developments are to manage increased run-off associated with the increase in impervious surfaces through capturing and managing the first 10 mm of run-off from impervious surfaces each day for every event to protect the in-stream ecology of ephemeral freshwater waterways.

The proposed golf course will be located primarily in catchment 11 which subsequently drains to Leekes Creek via catchment 10 and discharges to Leekes Beach. A small part of the golf course will be located in catchment 5 which drains in a dispersed manner and discharges into Clam Bay.

Surface run-off from the golf course would be diverted to stormwater harvesting ponds through a series of grassed swales and/or bio-retention basins for re-use for irrigation of the golf course. These treatment devices would facilitate removal of gross pollutants, sediments and nutrients prior to entering the stormwater harvesting ponds.

Additional stormwater management on the proposed golf course includes re-use of treated stormwater for irrigation of the golf course and design features that prevent stormwater from draining into wet weather storage ponds containing recycled water

The EIS considered the potential for nutrient laden run-off from the golf course to be negligible as run-off would be captured and treated prior to discharge to downstream ecosystems.

Putney Creek

As part of the stormwater management strategy for the site, the proponent proposes to permanently open the mouth of Putney Creek to tidal movements. This is expected to result in increased tidal exchange within the lower reaches of the waterway and it is anticipated that the increased tidal flushing of the creek would reduce the potential for high levels of nutrients to accumulate. The EIS concluded that the re-opening the Putney Creek mouth is the preferred solution to manage flows at the mouth, as it

¹⁸ South East Queensland Healthy Waterways Partnership, *Water Sensitive Urban Design Technical Design Guidelines for South East Queensland*, Brisbane, 2006, viewed 13 February 2012, <http://waterbydesign.com.au/TechGuide>

closely resembles the more natural hydrology that existed before its catchment was altered.

Given its direct connection to tidal flows, the proposed works in Putney Creek have the potential to affect marine water quality. This is discussed further in section 10.2.3 of this report.

Golf course irrigation

Section 6.3 of this report discusses the proposed wastewater treatment infrastructure and services that are proposed as part of this project. The proponent proposes to recycle wastewater from the resort facilities to A+ standard principally for use as irrigation water on the golf course. This would eliminate the need to redirect water to the mainland or discharge it into the marine environment.

Unless carefully managed, potential impacts associated with operating the wastewater treatment system may include:

- mechanical malfunction or a power outage affecting the collection and treatment system, leading to the uncontrolled release of untreated or partially treated sewage to the environment
- recycled water being dispersed at a rate that exceeds the water and nutrient assimilation capacity of soils and vegetation within the irrigation area, resulting in:
 - run-off of contaminants impacting on ecosystems, waterways or recreational areas
 - ponding in the irrigation area or saturation of soils
- elevated nutrient levels within recycled water, which may result in eutrophication¹⁹ causing algal blooms and subsequent odour nuisance, decreased plant health and soil quality
- public exposure to recycled water as a result of spray drift during irrigation or as a result of exposure to open ponds on the golf course, causing nuisance or illness.

The EIS discussed the design of the system and the ability to meet capacity during peak occupancy rates, assessing the mitigated risk of the above impacts occurring as low. The proponent intends to comply with best-practice water quality treatment requirements, specifically the *Australian Water Quality Guidelines for Water Recycling: Managing Health and Environmental Risks* (phase 1).²⁰

As part of the EIS (Appendix AN), the proponent has developed a preliminary irrigation management plan for the project, which includes procedures to ensure acceptable surface water quality.

¹⁹ For a definition, refer to the Glossary on page 141 of this report.

²⁰ Natural Resource Management Ministerial Council, Environment Protection and Heritage Council/National Health and Medical Research Council 2006, *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)*, Environment Protection and Heritage Council, the Natural Resource Management Ministerial Council and the Australian Health Ministers' Conference, viewed 1 March 2013, <http://www.environment.gov.au/water/publications/quality/pubs/water-recycling-guidelines-health-environmental-21.pdf>.

Erosion and sediment control

Construction works will involve vegetation clearing and earthworks which can potentially increase the risk of soil erosion and result in sedimentation of downstream waterways. Erosion and sedimentation of waterways could result in reduced water quality such as an increase in fine sediment loads and associated nutrients and contaminants, and loss of in-stream habitat which could have a detrimental impact on aquatic ecology.

The EIS identified a high potential for soil erosion and sedimentation to occur following vegetation clearing and earthworks activities due to the intense seasonal rainfall and soil characteristics of the site. To manage the potential impacts, the proponent proposes to implement best-practice erosion and sediment control measures in accordance with current guidelines. The general principles include:

- appropriately plan and organise the work activities
- minimise channel or waterway disturbance
- control the movement of the water
- minimise the release of sediment and sediment-laden water
- promptly rehabilitate disturbed areas.

The specific measures proposed are outlined in the preliminary erosion and sediment control plan (Appendix O of the *Water Cycle Management Report*—Appendix AN to the EIS).

8.3. Coordinator-General's conclusions

The EIS identifies a number of potential impacts of the proposed development that may affect the quality and quantity of surface waters of the island. The nature of the proposal provides an opportunity to incorporate water sensitive design measures throughout the development footprint that would effectively mitigate impacts.

The EIS outlined a range of proposed measures to minimise impacts on surface water. Key matters to be managed are stormwater treatment and the use of recycled water for irrigation. In accordance with the proponent's commitments, I require the following outcomes as part of the development:

- design and operate the proposed wastewater treatment facilities and the recycled water irrigation systems to ensure the water quality of creeks and wetlands is maintained
- monitor water quality within water storages and waterways, particularly the Leekes Creek and Putney Creek estuaries
- design and operate stormwater treatment systems to ensure existing water quality conditions are maintained and waterway stability objectives are met
- implement strategies to avoid any exposure to the public of recycled water stored in open ponds on the golf course
- minimise the potential for algal blooms within recycled water storage ponds.

8.4. Groundwater resources

8.4.1. Overview

The proponent proposes to extract groundwater from the Long Beach aquifer during stage one of construction. Groundwater investigations identified the Long Beach aquifer as the most suitable water source during the initial stages of construction. This selection was based on the availability of existing groundwater extraction facilities and the minimal potential effects on groundwater-dependent ecosystems and aquifer water quality.

The proponent does not propose to extract groundwater from the Central Dune, Resort or North-East aquifers as part of the project.

8.4.2. Current environmental values

Aquifers

The *Report on Assessment of Groundwater Resources: Great Keppel Island Resort Revitalisation Plan* (Appendix Z(iv) to the EIS) stated that the groundwater resources within the dune sand deposits on the island are considered to be highly vulnerable to surface contamination due to the shallow depth of the groundwater and the highly permeable sandy soils.

Hydrogeological surveys were undertaken by the proponent to determine potential sources of water supply for stage one of project construction. The surveys identified four distinct groundwater resources (aquifers) on the island:

- North-East aquifer
- Resort aquifer
- Long Beach aquifer
- Central Dune Sand aquifer.

The North-East, Long Beach and Central Dune Sand aquifers all contain viable groundwater resources suitable for potable water supply, based on the available groundwater quality and quantity. Figure 3.56 in Chapter 3 of the EIS shows the location of each aquifer.

Historical groundwater uses

Prior to 2004, the former resort and commercial and private residential properties along Fishermans Beach sourced water primarily from the Resort and Long Beach aquifers. Groundwater supply facilities are still in place at Long Beach, including the Long Beach Pump House, three former production wells, and two production bores.

The Long Beach aquifer was also used for irrigating gardens and the resort golf course until the quality of the aquifer became degraded by salt water intrusion due to over-extraction. Post-2004, until the closure of the resort in 2008, potable water was sourced from a reverse osmosis desalination plant. The Long Beach aquifer was used as a supplementary source when the desalination plant was not in use.

Monitoring was undertaken in 2006 and 2007 on groundwater quality in the Long Beach Pump House. The groundwater was determined to be saline in both 2006 and 2007, indicating that substantial salt water intrusion had occurred from Long Beach. Subsequent monitoring undertaken in 2010 indicated the groundwater was slightly acidic and fresh; and the pH value recorded was similar to those recorded for other bores in the aquifer. The results indicated the aquifer was recovering from salt water intrusion due to the higher rainfall over the previous year and no groundwater extraction.

8.4.3. Potential impacts and mitigation

Sustainable yield

Groundwater investigations estimated the maximum sustainable yield of the Long Beach aquifer as 100 kilolitres per day (kL/day). The modelling indicated that this rate of supply would be sustainable from the aquifer if groundwater is extracted from two bores at a maximum extraction capacity of 50 kL/day each. The yields represent the maximum extraction rates which would not cause excessive drawdown around the bores or groundwater-dependent ecosystems, or salt water intrusion during modelling.

Extraction of groundwater from aquifers exceeding the sustainable yield has the potential to reverse the hydraulic gradient along the coastline and boundary of the aquifers through salt water intrusion. This would result in groundwater resources becoming unsuitable for irrigation and potable use due to high salinity.

Over-extraction of groundwater from aquifers also reduces the volume of fresh groundwater discharging at the freshwater/saltwater interface along the coastline, which may reduce the volume of groundwater available for estuarine/coastal ecosystems and deep-rooted vegetation.

The EIS reported that while a number of registered groundwater extraction bores are installed within this aquifer, none of these bores is currently being utilised. Existing groundwater users currently extract water from the Resort aquifer and are therefore not expected to be affected.

Groundwater quality

The proposal to use recycled treated wastewater to irrigate the golf course has the potential to cause some hydrological impacts unless carefully managed. This includes potential contamination of the aquifer from effluent irrigation above the sustainable rate for the soil conditions; breakdown of effluent treatment facilities in the case where untreated effluent is accidentally irrigated over the golf course; and leakage from sewerage pipelines.

Other impacts include contamination of the aquifer from hazardous substances including chemical, fuel and oils if not stored correctly. Contamination has the potential to occur from leakage or run-off containing hazardous substances infiltrating the groundwater.

The proposed golf course area overlays parts of the Central Dune aquifer. Being composed of highly permeable sandy soils, the aquifer's groundwater resources are considered vulnerable to potential infiltration and dispersal of surface water contaminants. This resource could therefore be potentially impacted by activities undertaken by the project if not properly managed.

As groundwater in the Central Dune aquifer generally flows to the north-west towards the tidal wetland and Leekes Beach, any contamination of groundwater could lead to impacts on the quality of surface freshwater and estuarine/marine ecosystems.

8.5. Coordinator-General's conclusions

The use of groundwater as a primary water supply source during operation is not considered appropriate due to the potential for saline intrusion, other water quality impacts and the unreliability of supplies during periods of drought.

I conclude that extraction of groundwater resources from the Long Beach aquifer is appropriate for stage 1 of construction. With a total peak water demand up to 90 kL/day, the proposed total water demand for stage 1 of construction is within the recommended sustainable yield of the Long Beach aquifer. The aquifer is therefore expected to provide adequate water supply to meet the full demand for stage 1 of construction without adverse impacts on the sustainable use of the aquifer groundwater resource.

As part of the proposed development I require the following outcomes:

- The quality and quantity of the Long Beach aquifer groundwater resources must be maintained during, and immediately following stage 1 of construction. To achieve this outcome, the proponent will be required to monitor groundwater extraction from the Long Beach aquifer to ensure the sustainable yield is not exceeded and to determine any saline intrusion.
- The proponent must cease extraction of groundwater from the Long Beach aquifer as soon as the proposed mainland water supply connection has been commissioned.
- The development must avoid undertaking surface activities with a high risk of contamination (for example, leakage or spills of chemicals, oils and petroleum products) above vulnerable groundwater resources.
- The design and operation of the wastewater treatment system and irrigation of the proposed golf course must ensure no adverse impact on groundwater sources, waterways or marine waters.

9. Terrestrial flora and fauna

9.1. Existing environment

9.1.1. Native vegetation mapping

DNRM regional ecosystem (RE) mapping (Figure 9.1) shows a total of 12 REs within the study area on Great Keppel Island.

DNRM mapping indicates essential habitat for the beach stone curlew in the area surrounding the Leekes Creek Estuary and adjacent to Leekes Beach. The DNRM vegetation description for this habitat area includes ‘All types of undisturbed beaches and littoral habitat, both surf and sheltered exposure on mainland and islands, especially near river mouths and mangrove-backed areas’.

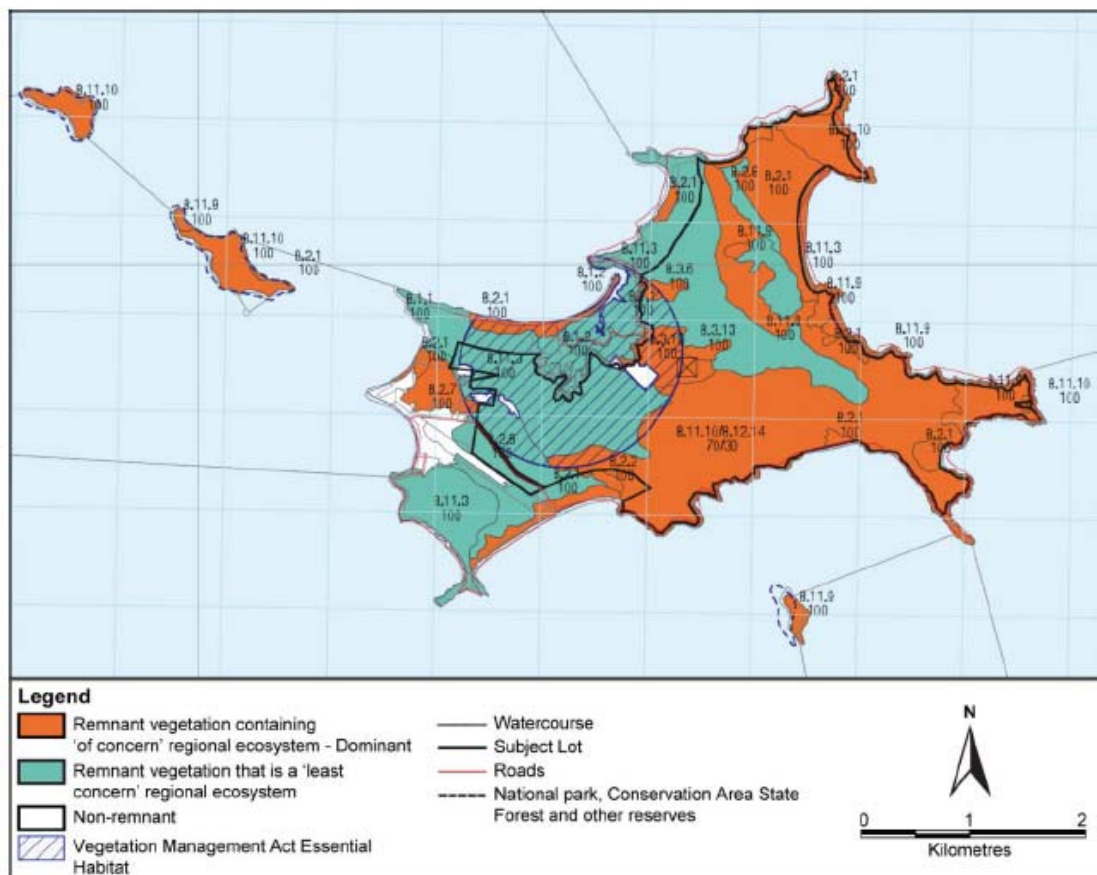


Figure 9.1 RE types of GKI

Eleven REs and two additional major vegetation communities were identified during the field survey for the EIS. Field investigations confirmed 10 of the 12 REs mapped by DNRM and 1 RE (RE 8.11.8b) not previously mapped on the island in the development footprint area.

The proponent will be required to apply for a Property Map of Assessable Vegetation to change any RE mapping. This will be required prior to lodging a development application.

Tables 9.1 and 9.2 describe the ‘of concern’ and ‘least concern’ REs (under the *Vegetation Management Act 1999*) (VM Act) identified by EIS investigations.

Table 9.1 REs identified during ground-truthing as ‘of concern’

RE	Short description	Area (ha)
8.2.1	<i>Casuarina equisetifolia</i> open-forest to woodland with <i>Ipomoea pes-caprae</i> and <i>Spinifex sericeus</i> dominated ground layer, on foredunes	117.89
8.2.2	Microphyll vine forest on coastal dunes	3.94
8.2.7b	Palustrine wetland (e.g., vegetated swamp). <i>Eucalyptus robusta</i> , <i>Melaleuca quinquenervia</i> open-forest to open-woodland (seven to 16 metres tall)	4.98
8.2.7e	<i>Melaleuca quinquenervia</i> and/or <i>M. leucadendra</i> and/or <i>M. dealbata</i> and/or <i>M. viridiflora</i> var. <i>attenuata</i> open-forest to open-scrub (to closed forest) (five to 18 metres tall)	11.7
8.11.9a	<i>Themeda triandra</i> and/or <i>Heteropogon contortus</i> tussock grassland (0.3 to 1.2metres tall), or <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> dwarf shrubland to open-heath (0.7- 1.2 metres tall)	71.32
8.11.10	<i>Lophostemon confertus</i> and/or <i>Acacia</i> spp. and/or <i>Allocasuarina littoralis</i> +/- <i>Corymbia</i> spp. +/- <i>Eucalyptus</i> spp. +/- <i>Melaleucaviridiflora</i> low woodland to open-forest on exposed hillslopes of islands, on metamorphosed sediments	259.69
Total area (ha)		479.52

Table 9.2 REs identified during ground-truthing as ‘least concern’

Regional Ecosystem	Short description	Area (ha)
8.1.1	Mangrove closed-forest to open-shrubland of marine clay plains and estuaries	26.75
8.1.2	Samphire open forbland to isolated clumps of forbs on salt pans and plains adjacent to mangroves	32.02
8.2.8a	<i>Corymbia</i> spp. and/or <i>Eucalyptus</i> spp. open-forest to low woodland (three to 22 metres tall)	145.33
8.11.3a	<i>Corymbia intermedia</i> and/or <i>Eucalyptus portuensis</i> and/or <i>C. clarksoniana</i> and/or <i>E. platyphylla</i> and/or <i>E. drepanophylla</i> open-forest to woodland (15 to 32 metres tall)	101.49
8.11.8a	<i>Corymbia citriodora</i> woodland to open-forest (14 to 28 metres tall)	423.34
8.11.8b	<i>Eucalyptus moluccana</i> woodland to open-forest (15 to 28 metres tall)	14.03
8.12.14x2c	<i>Eucalyptus crebra</i> and/or <i>E. exserta</i> and/or <i>Corymbia clarksoniana</i> and/or <i>Lophostemon confertus</i> and/or <i>Corymbia trachyphloia</i> low woodland to open-forest (2.5 to 15 metres tall)	84.69
Total area (ha)		827.65

9.1.2. Notable flora

No threatened flora species or ecological communities that are scheduled under Commonwealth or State legislation were identified within the development areas. One threatened ecological community scheduled under the EPBC Act—the critically endangered littoral rainforest and coastal vine thickets of eastern Australia—was identified at three sites outside the proposed development footprint.

A search of the EPBC protected matters database for the project area identified three threatened flora species potentially occurring in the project area that may potentially occur in REs identified in Table 9.3 below. These threatened species had not previously been identified in various database records or literature, and were not identified during field surveys for the EIS.

Table 9.3 Endangered flora potential occurring in REs on Great Keppel Island

Species Common name	EPBC Act listing	NC Act listing	RE where species may occur
<i>Cycas megacarpa</i>	Endangered	Endangered	8.2.2, 8.11.10, 8.12.14x2c.
<i>Cycas ophiolita</i> Marlborough blue	Endangered	Endangered	8.11.3a, 8.11.10, 8.12.14x2c.
<i>Taeniophyllum muelleri</i> Minute orchid	Vulnerable	–	8.2.2, 8.12.14x2c, 8.11.9b, 8.11.9a, 8.3.13c.

Field surveys identified seven flora species considered to be locally significant, being close to their range limit, including *Acacia leiocalyx subsp. leiocalyx*, *Canavalia sericea*, *Cyperus stradbrokeensis*, *Eucalyptus robusta*, *Ficus hispida*, *Hibbertia linearis var. floribunda* and *Pouteria sericea* and one grass species *Eriachne stipacea*.²¹

The EIS indicated that while these are all widely distributed and common species, the distribution of *Eucalyptus robusta* on the island is limited to areas of RE 8.2.7b and *Eriachne stipacea* is limited to a relatively small area of RE 8.2.8a.

Field surveys and the Queensland Herbarium Plant Specimen Database, HERBRECS, recorded a number of plant species on the island that may have cultural significance based on their potential use as food, medicine and material and/or considered a timber resource for cultural, commercial or recreational purposes. No flora species of scientific value were recorded.

9.1.3. Notable fauna

Three fauna species scheduled as threatened under the Nature Conservation (Wildlife) Regulation 2006 were confirmed in the project area including the beach stone curlew (*Esacus magnirostris*), sooty oystercatcher (*Haematopus fuliginosus*) and the eastern curlew (*Numenius madagascariensis*) (refer to Table 9.4 below).

No fauna species scheduled under the EPBC Act were identified during field surveys. A search of the EPBC protected matters database for the project area identified 17 species of bird listed as migratory under the EPBC Act that are known, may or likely to occur in the project area. The search tool identified two species of bird listed as threatened under the EPBC Act, including the southern giant-petrel (*Macronectus giganteus*) and the kermadec petrel (*Pterodroma neglecta neglecta*) that may occur in the project area. These species are scheduled under the EPBC Act as endangered and vulnerable respectively.

²¹ G.N. Batianoff and H.A. Dillewaard, Port Curtis District Flora and Early Botanists, Botany Branch, Queensland Herbarium, 1988.

A search of the Wildnet Database, Birds Australia Atlas Database and the Queensland Museum Zoological collection database identified six threatened bird species that are known to occur, or possibly occur, in the project area.

Table 9.4 Birds identified during surveys scheduled under EPBC Act and Nature Conservation (Wildlife) Regulation

Species	NCA status	EPBC status
<i>Burhinus grallarius</i> Bush stone curlew		Migratory
<i>Esacus magnirostris</i> Beach stone curlew	Vulnerable	Marine
<i>Falco cenchroides</i> Nankeen kestrel		Marine, migratory
<i>Haematopus fuliginosus</i> Sooty oystercatcher	Near-threatened	
<i>Haliaeetus leucogaster</i> White-bellied sea-eagle		Marine, migratory
<i>Merops ornatus</i> Rainbow bee-eater		Marine, migratory
<i>Monarcha melanopsis</i> Black-faced monarch		Marine, migratory
<i>Monarcha trivirgatus</i> Spectacled monarch		Marine, migratory
<i>Myiagra inquieta</i> Restless flycatcher		Migratory
<i>Myiagra rubecula</i> Leaden flycatcher		Migratory
<i>Numenius madagascariensis</i> Eastern curlew	Near-threatened	Marine, migratory
<i>Numenius phaeopus</i> Whimbrel		Marine, migratory
<i>Thalasseus bengalensis</i> Lesser crested tern		Marine, migratory
<i>Tringa brevipes</i> Grey-tailed tattler		Marine, migratory
<i>Vanellus miles</i> Masked lapwing		Migratory

Other conservation-significant fauna identified during field surveys include the rusty monitor (*Varanus semiremex*) which is listed as a 'priority species' in the *Fitzroy Natural Resource Management Region Back on Track Actions for Biodiversity* document and the echidna (*Tachyglossus Aculeatus*), which is regarded as culturally

significant and a special least concern species. These species were identified at Leekes Estuary and resort area respectively.

Other special least concern species include least concern birds which apply to any of the following:

- *Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment (JAMBA)*
- *Agreement between the Government of Australia and the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA)*
- *Convention on the Conservation of Migratory Species of Wild Animals (CMS).*

Least concern bird species identified during surveys that apply to these agreements include:

- whimbrel *Numenius phaeopus*
- white-bellied sea-eagle *Haliaeetus leucogaster*
- lesser crested tern *Thalasseus bengalensis*
- grey-tailed tattler *Tringa brevipes*.

DEHP indicated that a number of species identified during surveys also fall within the definition of colonial breeder species, including the rainbow bee-eater. Colonial breeder means a group of animals of the same kind co-existing in close association for breeding purposes.

The proponent will be required to prepare an approved species management program for any threatened species, special least concern species and species defined as colonial breeders under the Nature Conservation (Wildlife Management) Regulation 2006.

Beach stone curlew

Field observations identified beach stone curlew in areas mapped as RE 8.1.1, 8.1.2 and 8.2.1 in the wetland area behind Leekes Beach. These areas are mapped as essential habitat for this species. Essential habitat is defined as vegetation in which a species that is scheduled as endangered, vulnerable or near-threatened under the NC Act has been known to occur. The mapped area includes vegetation that the species is associated with, plus a one-kilometre buffer.

9.1.4. Weeds and pest animals

The field surveys identified 81 weed species including 8 species, which are scheduled as declared pests under the *Land Protection (Pest and Stock Route Management) Act 2002*. These weeds, particularly lantana and rubber vine, are largely concentrated on the island in areas that have historically been disturbed. Table 9.5 shows the weeds identified during field surveys.

Table 9.5 Weeds identified during EIS field surveys

Species Common name	LPA status	Location identified
<i>Lantana camara</i> Lantana	Class 3	Clam Bay Precinct, Marine Services Precinct and outside of precincts.
<i>Lantana montevidensis</i> Creeping lantana	Class 3	Clam Bay Precinct
<i>Cryptostegia grandiflora</i> Rubber vine	Class 2	Clam Bay Precinct, Fishermans Beach Precinct
<i>Sporobolus africanus</i> Paramatta grass	Class 2	Fishermans Beach Precinct
<i>Sporobolus pyramidalis</i> Giant rats tail grass	Class 2	Outside of precincts
<i>Tecoma stans</i> Yellow bells	Class 3	Fishermans Beach Precinct
<i>Sphagneticola trilobata</i> Singapore daisy	Class 3	Fishermans Beach Precinct
<i>Opuntia stricta</i> Common prickly pear	Class 2	Clam Bay Precinct, Marine Services Precinct

Class 2 and 3 pests are defined as being established in Queensland and have, or could have, adverse economic, environmental or social impacts. Under section 77 of the Land Protection (Pest and Stock Route Management) Act, land owners are required to undertake reasonable steps to ensure land is kept free of Class 2 pests.

Field surveys confirmed the presence of four exotic fauna including feral goat (*Capra hircus*), black rat (*Rattus rattus*), Asian house gecko (*Hemidactylus frenatus*) and Indian peafowl (*Pavo cristata*). The feral goat is a declared Class 2 animal under the Land Protection (Pest and Stock Route Management) Act.

Whilst no cane toads (*Bufo marinus*) were identified during EIS field surveys, cane toads have been identified on the island by local residents in January 2013.²²

9.2. Impacts on terrestrial vegetation

9.2.1. Vegetation clearing

Parts of the island have been historically cleared for grazing practices and the development of the existing resort. As such some areas of the island contain vegetation considered to be non-remnant or regrowth. The proposed development footprint has been planned and designed as much as practical to incorporate non-remnant vegetation and avoid areas of 'of concern' REs, remnant vegetation and confirmed wetlands.

²² 'Cane toads found on Great Keppel Island for the first time', *Rockhampton Morning Bulletin*, 16 January 2013.

Direct impacts will be associated with infrastructure including buildings, roads, and airstrip and associated facilities. Clearing will also be required for the development of fairways and open space in the golf course footprint and features associated with access, services and fire management.

To determine the level of impact on remnant vegetation, a lower and upper limit has been determined. The lower limit includes the area that will be cleared solely for provision of buildings and associated infrastructure. The upper limit includes all the areas that would otherwise become exempt for the purposes of the VM Act (for example, areas cleared for the purpose of a firebreak) and the patches of vegetation that would become too small to map (for example, vegetation between buildings). These estimates are provided in Table 9.6.

Table 9.6 Estimated impact on REs on the island

REs	Total minimum area (ha)	Total maximum area (ha)	VM Act status
8.21	0.58	0.58	Of concern
8.2.7b	0.82	0.82	Of concern
8.2.7e	5.06	5.46	Of concern
8.2.8a	46.48	74.2	Least concern
8.11.3a	0.04	0.1	Least concern
8.11.8a	25.47	44.2	Least concern
8.11.9a	0.3	0.3	Of concern
8.11.10	6.1	8.4	Of concern
8.12.14 (2xC)	4.12	12.4	Least concern
Total	89.95	146.5	

The estimated total area of remnant vegetation to be impacted at the upper limit is 146.5 ha. This includes 15.6 ha of 'of concern' and 130.93 ha of 'least concern' remnant vegetation.

A large proportion of the impacts on 'of concern' REs will be associated with the clearing required for the proposed airstrip and golf course. The largest areas of proposed clearing of 'of concern' REs are REs 8.2.7e and 8.11.10, which include an upper impact area of 5.46 and 8.4 ha respectively (refer to Table 9.6). This equates to 46 per cent and 3.25 per cent of the total area of REs 8.2.7e and 8.11.10 on the island, respectively.

It is noted that ground-truthing studies indicated that vegetation mapped as RE 8.3.6c by DNRM are more consistent with REs 8.2.7e. This would be an additional area of 7.1 ha of RE 8.2.7e on the island.

9.2.2. Offset requirements for REs

The project will result in clearing of assessable vegetation and will require a permit under the VM Act. The proponent will need to demonstrate that the development has first avoided and minimised the impacts of the development on vegetation prior to proposing an offset.

The EIS indicated that impacts on vegetation would be avoided and minimised by:

- planning and designing the proposed development footprint as much as practicable, to avoid areas of 'of concern' REs, remnant vegetation and confirmed wetlands
- planning and designing the proposed development footprint as much as practicable, to avoid known habitats of species scheduled as vulnerable or near threatened under the Nature Conservation (Wildlife) Regulation
- retaining corridors of remnant vegetation between buildings.

The Policy for Vegetation Management Offsets²³ has been used to assess the potential impacts to state significant biodiversity values that are required to be offset.

The proponent has prepared a preliminary biodiversity offset strategy (Appendix P of the EIS). The proposed State offsets are for project impacts to 'of concern' REs and essential habitat for the beach stone curlew. The preliminary strategy indicated that the potential extent of disturbance areas identified as requiring offsets are preliminary at this stage and are to be confirmed during the detailed design stage of the project.

The EIS has also indicated that offset liability calculations have not taken into account the co-location of offset values. Therefore it is expected that the total area to be provided for offsets will be less than the sum of the estimated values.

Sixteen strategic offset sites have been identified which include a total available offset area of 1038 ha of 'of concern' vegetation. These potential offset sites have been shortlisted for further investigation, landholder liaison and preliminary site inspection to determine suitability (verify biodiversity values on the ground) and to determine ecological equivalence.

Essential habitat—beach stone curlew

The EIS indicated that the project would impact approximately 36.8 ha of essential habitat of the beach stone curlew. While the area impacted is included in the essential habitat area mapped by DNRM, the EIS indicated that these areas are unlikely to be utilised by the species given its habitat preference for open, undisturbed beaches, islands, reefs, estuarine intertidal sandflats and mudflats. The overlap between the project footprint and the mapped areas is within the one-kilometre buffer. The impact expected is therefore expected to be minimal. The proponent will be required to provide offsets for any impacts on essential habitat.

²³ Department of Environment and Resource Management, Policy for Vegetation Management Offsets, version 3, Department of Environment and Resource Management, Brisbane, viewed 26 February 2013, <<http://www.ehp.qld.gov.au/management/environmental-offsets/pdf/policy-for-vegetation-management-offsets.pdf>>.

DNRM advised that if the proponent requests an RE be changed to a different RE, the application must address essential habitat issues including section 20AC 2(b) of the VM Act (including evidence to show that the species does not use the area at any stage of its lifecycle).

The total offset area required for essential habitat has not been finalised; however, three strategic offset sites have been identified.

9.2.3. Other vegetation impacts

The grass *Eriachne stipacea* was found in areas that would be impacted by proposed villas and is limited to a relatively small area of RE 8.2.8a. While this area will not be entirely cleared of vegetation, there is a risk that the species could be lost from the island during construction

Impacts on this species will be managed by surveying the existing location of the species to determine its extent in environmental protection areas and to assist in the design and construction. The construction footprint will be adjusted where possible to protect the species. Impacts may also be reduced by incorporating this species in the landscaping of the resort. The ongoing presence of the population will be monitored.

9.3. Weed and pest management

The proponent has committed to develop a weed and pest management plan to manage the potential introduction or spread of pests on the island. The management plan is to be developed prior to construction.

Unless carefully managed, the importation of materials and machinery to the island has the potential to spread or introduce weeds and pest animal species.

9.3.1. Weed management

The EIS indicated that the spread or introduction of weeds is most likely to occur during the construction stage of the project and there is some risk during the operation of the resort.

Vehicles have the potential to spread weed seed from one location to another on site and import seed from off the island. There is also potential for weed seed to be carried in construction materials such as sand, soil and mulch. These materials may also contain flora pathogens such as *Phytophthora* and myrtle rust which can be introduced in soils and planting stock.

Some garden plant species may have the potential to become invasive weeds and will need to be managed to reduce this risk.

The EIS outlines measures to manage these risks including:

- all vehicles and machinery must be washed down on the mainland
- all staff trained in identifying environmental and declared weeds, myrtle rust and signs of *Phytophthora*

- disturbed areas are rehabilitated with plant species indigenous to the island. Local provenance planting stock is preferentially used
- landscaping is dominated by plant species indigenous to the island. Other non-invasive native species can be utilised in accordance with a landscape management plan. The golf course is to use non-invasive species as much as practicable.
- the provision of education/awareness material to visitors and villa apartments
- establish a nursery to custom grow stock for the island (possibly based on the island).

9.3.2. Pest management

Construction and operation of the resort has the potential to introduce pests such as mice and cane toads via vehicles and materials.

The cane toad is considered an 'extreme' threat species and is likely to negatively impact on wildlife on the island. Such impacts include:

- displacement of rainbow bee-eater nests
- poisoning of predator species
- competition with native frogs.

These risks are to be managed in accordance with pest management plan. The proponent will be required to adhere to strict hygiene protocols to prevent the introduction of cane toads via vehicles and construction materials and to document the measures that will be undertaken to manage these risks.

Development construction and operation has the potential to increase the abundance of pests including the black rat and goats.

The black rat is scheduled as a non-declared animal under the Land Protection (Pest and Stock Route Management) Act. A non-declared animal is defined as a non-native animal that is widespread but has a minimal negative commercial, environmental or social impact or there are no cost-effective, broadscale control measures available. There is no legal requirement to control a non-declared animal.

The feral goat is a Class 2 declared pest animal under the Land Protection (Pest and Stock Route Management) Act. A Class 2 animal is one that is established in Queensland and has, or could have, a substantial adverse economic, environmental or social impact. Under the Land Protection (Pest and Stock Route Management) Act, the proponent will be required to take reasonable steps to keep the island free of Class 2 pests.

Feral goats can have a negative impact on the environment by overgrazing vegetation, which can result in soil erosion and other forms of land degradation (for example, reducing plant diversity through selective feeding and spreading weed seed).

Feral goats may also pose issues during operation including interference in the Clam Bay development and the airstrip.

The EIS indicated that the construction and operation of the resort is unlikely to exacerbate the current impact of feral goats on the island and is likely to provide an opportunity to improve control measures to reduce existing impacts.

The proponent has committed to develop pest management strategies as part of the Environmental Management Plan (EMP). Such strategies may include an eradication program.

9.4. Indirect disturbances to terrestrial fauna

9.4.1. Construction

The EIS indicated that there may be some indirect impacts on fauna associated with construction activities. Such impacts may include removal of or damage to habitat, temporary disturbances to fauna (for example, noise) and construction related mortalities (for example, vehicle strike). These impacts are expected to be mostly temporary and manageable if effective management strategies are in place and monitored.

The EIS proposed a range of strategies that will be implemented to minimise construction impacts on terrestrial and aquatic fauna. These strategies are to be incorporated into the project's construction EMP and will include provisions to monitor and adapt strategies as required to ensure that impacts are effectively managed.

9.4.2. Operation

The EIS also indicated that potential operational impacts may occur, such as impacts likely to be associated with an increase in human and fauna interactions (for example, feeding wildlife and increased access to garbage waste) and disturbances to fauna (for example, noise). Impacts would be ongoing; however, they are expected to be manageable if effective strategies are in place and subject to management strategies being adjusted in response to monitoring.

The proponent has committed to actively manage sensitive areas to avoid impacts on terrestrial and aquatic fauna during the operation of the resort. In addition, impacts of the airport facility on birds and bats would also be addressed.

9.5. Conservation areas

The project includes the establishment of a 575 ha Environmental Protection Precinct on the island. The precinct will include the balance of Lot 21 (approximately 65 per cent) outside of the proposed development footprint in the Clam Bay Precinct.

The objective of the precinct is to protect existing environmental and cultural values and to maintain access for recreational purposes. The Environmental Protection Precinct will include a wide range of REs and habitat types and the extent of

vegetation retained is to also provide fauna habitat connectivity. The Environmental Protection Precinct is to be rehabilitated and managed as part of the project.

The EIS indicated that the proponent will employ rangers and environmental officers to oversee the management of the Environmental Protection Precinct including:

- the eradication of feral goats
- implementation of the weed management plans
- ongoing maintenance (for example, maintaining walking tracks).

Proposed ongoing tenure arrangements would include the Environmental Protection Precinct and the Clam Bay Precinct within an overall 'head' lease for Lot 21. In this way the management responsibilities of the Environmental Protection Precinct are permanently linked to the development and operation of the resort.

9.6. Coordinator-General's conclusions

I am satisfied that the proposed clearing of native vegetation would be a necessary part of the project. Detailed development plans would need to demonstrate that the extent of clearing is minimised.

Based on an assessment of biodiversity values identified within the proposed development footprint, it has been determined that offsets are available to meet the project requirements. Offsets are proposed for the clearing of mapped 'essential habitat' (36.5 ha) and five 'of concern' REs (15.6 ha). The details of the offsets are to be finalised.

Analysis presented indicated that the proposed clearing will have a minor impact overall on representation of individual vegetation associations within the GBRMP islands.

I require the following outcomes to be achieved as part of the proposed development:

- ensure that the development footprint is designed to minimise clearing of native vegetation and the native grass *Eriachne stipacea*
- finalise a package of offsets for the loss of 'of concern' REs and essential habitat of the beach stone curlew
- ensure best practice weed and pest management is implemented to prevent the introduction or spread of weeds or pest animals. In particular this should include the control of existing weeds and pest animals on the project site
- provide ongoing active management of all activities within the project site, including the Environmental Protection Precinct, by dedicated personnel to ensure the protection and enhancement of environmental values.

10. Marine and coastal environment

10.1. Existing environment

Great Keppel Island is located within the southern part of the Great Barrier Reef World Heritage Area and Great Barrier Reef Marine Park. The island is the largest of 16 continental islands that make up the Keppel Bay Island Group, which include fourteen islands designated as National Park.

The islands host a diverse variety of marine ecosystems which contribute to the outstanding universal values of the Great Barrier Reef.

10.1.1. Commonwealth and State marine park zoning

Great Barrier Reef Marine Park (GBRMP) zoning reserves currently surrounding Great Keppel Island include Marine National Park, Conservation Park, General Use and Habitat Protection Zones. The boundary of the Great Barrier Reef World Heritage Area (GBRWHA) and the GBRMP is defined by the mean low water mark.

The State Marine Park (Great Barrier Reef Coast Marine Park) has zoning complementary to the GBRMP. The boundary of the State Marine Park extends to the line of the highest astronomical tide (HAT) and includes internal waters.

The proposed Marine Services Precinct lies within the Habitat Protection zone of the GBRMP.

- The location of the proposed project components in context to GBRMP zoning is provided in Figure 10.1.

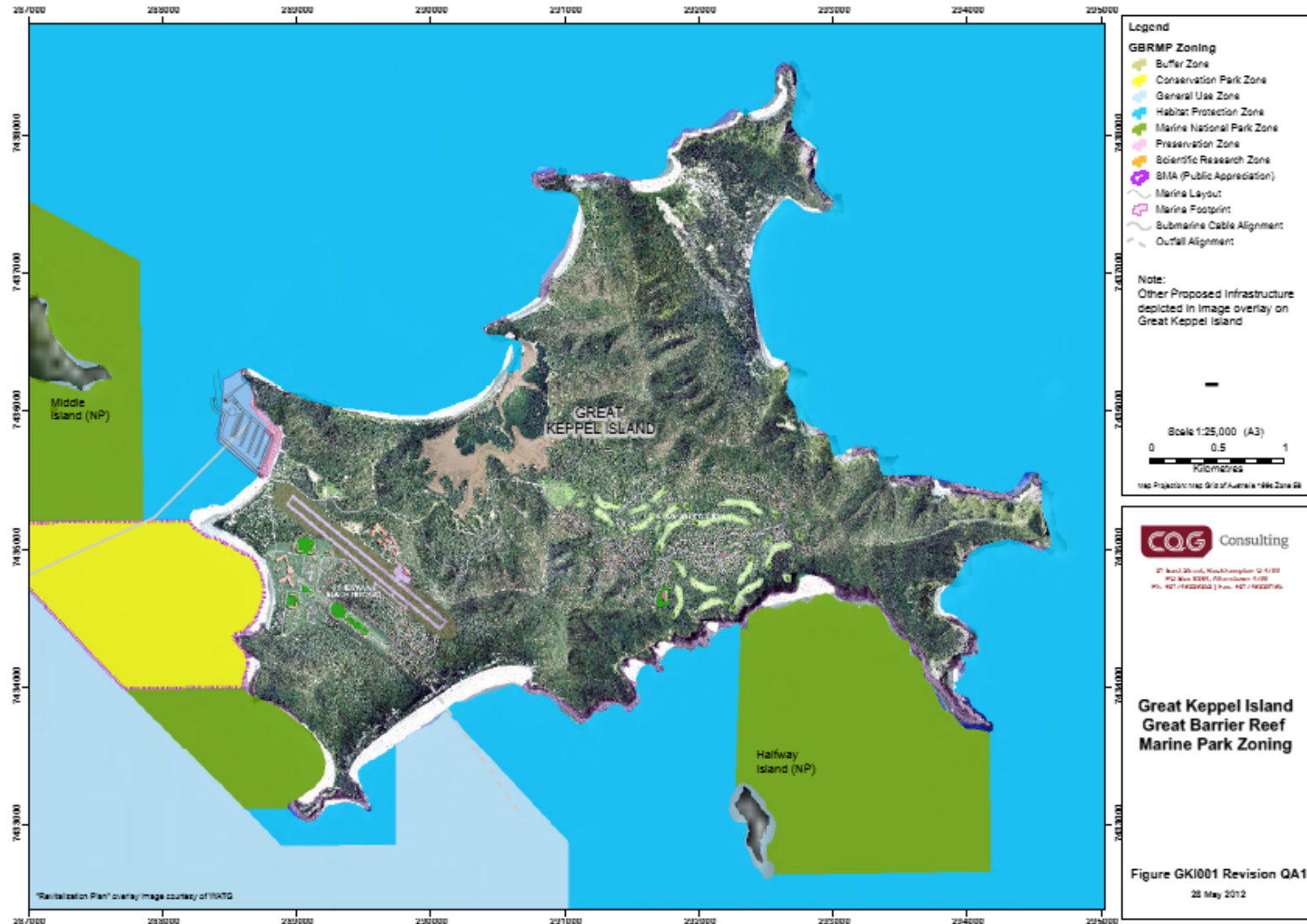


Figure 10.1 GBRMP zoning

Marine and coastal environment
 Great Keppel Island Resort project:
 Coordinator-General's report on the environmental impact statement

10.1.2. Key sensitive areas

The island hosts a range of marine ecosystems that are characteristic of the southern region of the GBR. EIS surveys of the island identified a variety of marine habitats in the project. Figure 10.2 shows the ecological communities that were identified during the surveys including coral, seagrass communities and mangroves.

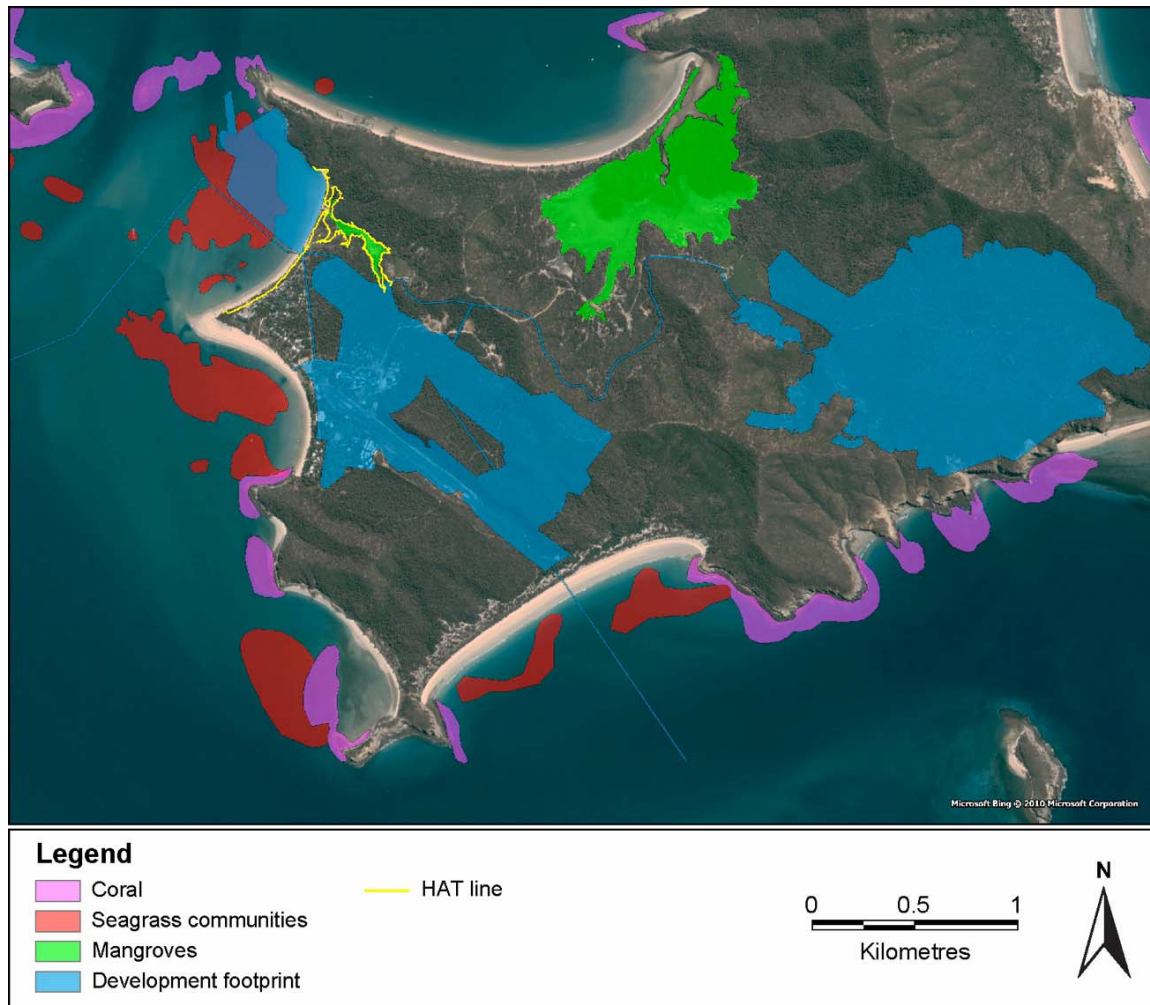


Figure 10.2 Marine ecological communities taken from the EIS

Coral communities

The EIS indicated that coral communities within the Keppel Bay bioregion typically have low diversity of coral species with a relatively high percentage of cover. There are however, some exceptions where some reefs demonstrate a much higher diversity of coral species and percentage of cover compared to other reefs in the region. For example, studies conducted by Central Queensland University²⁴ indicated that the reefs at Middle, Halfway and Pumpkin Islands and reefs surrounding Passage and

²⁴ Jones, A. M., R. Berkelmans and W. Houston (2011). "Species Richness and Community Structure on a High Latitude Reef: Implications for Conservation and Management." *Diversity* (3): 329-355.

Outer Rocks are typified by a higher diversity of species and coral cover compared to other sites in the region.

These sites are identified as important to the region as they have demonstrated rapid recovery post-disturbance events and may act as reef refuges due to high diversity and connectivity to sites with a lower diversity of species and coral cover. EIS surveys identified coral cover to be highest (>41 per cent) at one Middle Island site and at Passage Rocks (>30 per cent).

Literature reviews included in the EIS indicate that coral communities have been repeatedly affected by coral bleaching events in Keppel Bay and may be influenced by episodic Fitzroy River flood plumes. A Great Barrier Reef Marine Park Authority report released in 2007, *Biophysical Assessment of Reefs in Keppel Bay: A baseline study*²⁵ indicated most of the reefs within the Keppel Island region are highly susceptible to elevated sea temperatures. EIS surveys indicated evidence of coral bleaching around the island with those most severely bleached corals being located in Clam Bay, with up to 17 per cent of cover reported as bleached during the wet season survey in January 2011.

The closest coral community to the proposed development is located approximately 400 metres from the island at Passage Rocks and around Putney Point.

A high diversity of fish species was also recorded around the surveyed coral communities.

Seagrass communities

Seagrass communities in the project area were surveyed during the pre-wet (15–19 November 2010), wet (17–21 January 2011), post-wet (30–31 March, 30 April and 30 April – 2 May 2011) and winter (11–14 July) seasons. (The winter season was included in the surveys to quantify recovery post flooding.) Surveys were conducted at nine locations around the island and an additional survey was carried out between 1–3 March 2011, where the submarine cable alignment corridor is proposed.

Seagrass communities were typically fragmented, comprising of small patches of seagrass with overall cover of <5 per cent. A total of four species were recorded with *Halophila ovalis* and *Halodule uninervis* being the most dominant.

A significant reduction in seagrass cover was observed between the pre-wet and post-wet season surveys (refer to figures 5.13, 5.14 and 5.15 in Appendix W of the EIS). Surveys indicated that seagrass meadows had lower cover and covered a smaller area during post-wet and winter recovery surveys than the pre-wet and wet surveys. These results are considered typical of seagrass meadows in the region following large rainfall events and corresponded to the flooding events that occurred between November 2010 and January 2011, which resulted in significant suspended sediment concentrations in Keppel Bay.

Marine ecology surveys of seagrass beds around the island identified a low diversity of fish species and a number of ray feeding pits.

²⁵ Great Barrier Reef Marine Park Authority, *Biophysical Assessment of Reefs in Keppel Bay: A baseline study*, Great Barrier Reef Marine Park Authority, Townsville, 2007.

Wetlands and estuaries

There are no Ramsar wetlands on Great Keppel Island or in the project area. The nearest Ramsar site is located approximately 25 kilometres north-west of the island at Shoalwater and Corio Bays on the mainland.

The 2009 Queensland Wetland Map (Department of Environment and Resource Management) indicated a number of areas on the island that mapped as wetlands including:

- estuarine wetland systems, associated with regional ecosystems (REs) 8.1.1 and 8.1.2 at Putney Creek and a large complex wetland behind Leekes Beach
- a palustrine wetland system associated with RE 8.2.7e
- several riverine/drainage systems and associated drainage lines.

These areas are identified in Figure 10.3.

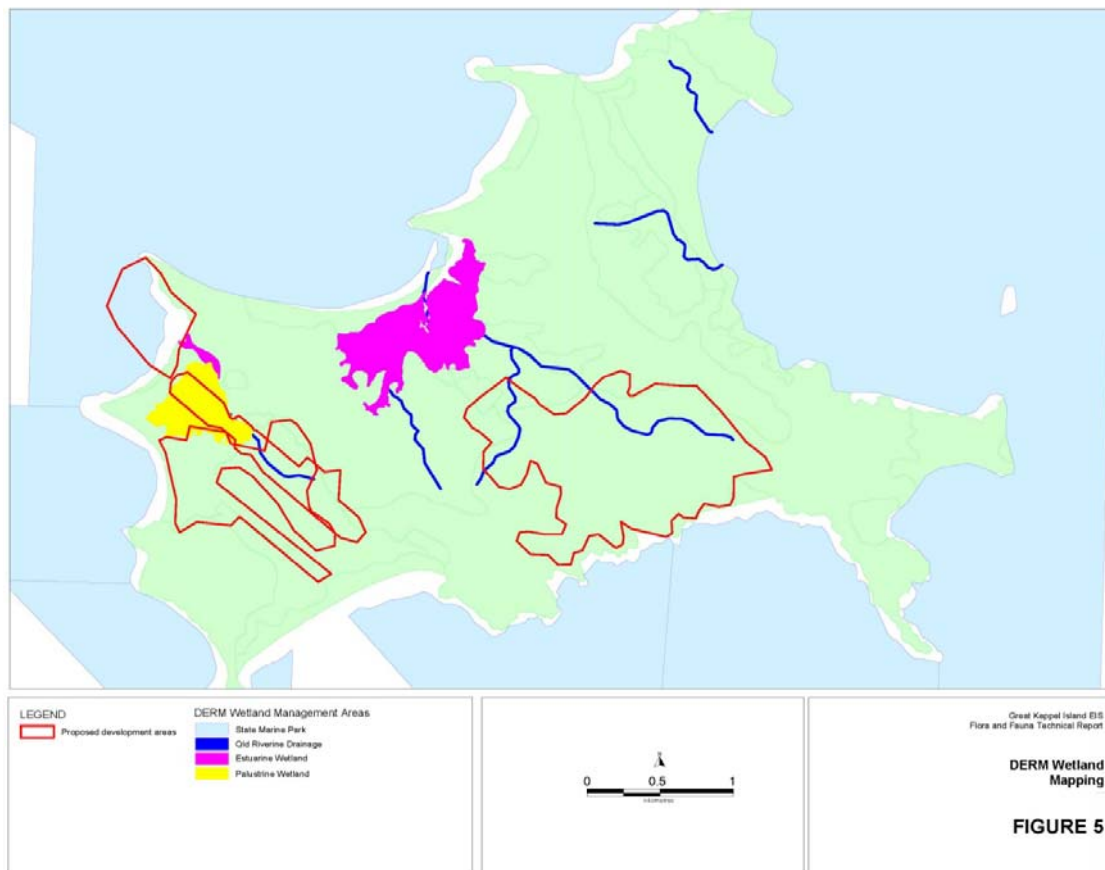


Figure 10.3 Wetland types on GKI taken from EIS

There are several areas on the island that are mapped as ‘wetland management areas’ on maps of referable wetlands produced by the Department of Environment and Heritage Protection (DEHP). However these areas do not include any areas that are mapped ‘wetlands of high ecological significance’.

EIS investigations identified key tidal wetlands behind Putney and Leekes beaches. The wetland area behind Leekes Beach is considered to be relatively large in the context of GBR continental islands, especially in the southern section of the GBRWHA.

This area was reported as being in good health and is important habitat for diverse range fauna including a number of threatened and migratory bird species.

The smaller area of wetland within the Putney Creek estuary was reported as being in generally poor health. Putney Creek is presently an ephemeral waterway that only flows following high rainfall events. For most of the year, Putney Creek is blocked by a sand bar as a result of local wave action and relatively low intermittent freshwater flows. On occasion the sandbar is flushed out by stormwater run-off and tidal flows enter the lower reaches of the creek.

The natural hydrology of Putney Creek is believed to have been modified as a result of a number of previous land use activities including the construction of the existing runway. It is uncertain whether past modification of flows has contributed to the current sand bar building process or whether this is a long-standing natural process.

Mangrove communities were surveyed during pre-wet (15–19 November 2010), wet (17–21 January 2011), and post-wet (30–31 March, 30 April 2011 and 30 April – 2 May 2011) seasons. Surveys were conducted over three sites at Putney Creek, ten sites at Leekes Creek and two sites on the mainland at Kinka Beach, to determine the ecological health of mangrove forests and fisheries values.

Ten species of mangrove were recorded on the island and seven species were recorded at the mainland sites. Mangrove forests were generally reported to be in good ecological health with the exception of mangroves in the Putney Creek estuary, which exhibited reduced canopy cover and a higher number of dead trees and branches. Mangrove communities on the island covered a more significant area at Leekes Creek than Putney Creek. The estimated area of mangrove forest was 1 ha at Putney Creek and 30 ha at Leekes Creek.

Six species of saltmarsh were recorded on the island at Leekes and Putney Creeks and on the mainland at Kinka Beach. The estimated area of saltmarsh was 12 ha at Putney Creek and 19 ha at Leekes Creek.

Fisheries habitat values were generally higher at Leekes Creek, than Putney Creek and Kinka Beach. Mangrove-associated fish communities in Leekes Creek were characterised by mobile and transient species.

Fish communities in Putney Creek were highly variable due to the ephemeral nature of this creek and one freshwater fish, Midgley's carp gudgeon (*Hypseleotris sp.*), was caught at the downstream survey site.

Shorebirds

Field surveys indicated a higher number of significant migratory shorebird species at Leekes Creek estuary than Putney Creek. As Putney Creek is blocked by a sand bar for most of the year, there is limited tidal flushing and poor water quality in the creek—providing relatively poor habitat for aquatic fauna and limited foraging opportunities for shorebirds. Leekes Creek estuary was identified as important habitat for the beach stone curlew and eastern curlew (*Numenius madagascariensis*), both listed as threatened under the *Nature Conservation Act 1992* (Qld) (NC Act) and as foraging and roosting habitat to other listed shorebird bird species not recorded during the current study.

A 2010 survey at Leekes Creek estuary at low tide and high tide and a boat survey of the island recorded four species of bird including the sooty oyster catcher (*Haematopus fuliginous*), which is listed as near threatened under the NC Act.

A follow up survey was conducted in 2011 to coincide with the northward passage of migratory shorebirds. Surveys were conducted in Leekes Creek estuary at low and high tide and at Putney Beach early morning and late afternoon. A total of 37 bird species was recorded including one beach stone curlew on Putney Beach.

Intertidal communities

The intertidal rocky shore at Putney and Fishermans beaches supports a diverse invertebrate community, with rock oysters (*Saccotrea sp.*) dominating the upper intertidal zone at both Putney and Fishermans beaches.

Significant marine fauna

The EPBC protected matters search identified 12 marine fauna species scheduled as threatened under Commonwealth or State legislation that are known or likely to occur in the project area. Three of these species were confirmed during field surveys including the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricate*) and the flatback turtle (*Natator depressus*).

Turtles were identified swimming or feeding near Fishermans Beach, Passage Rocks, Wreck Bay, Clam Bay, Middle island, Long Beach and Bald Rock Point.

Turtle nesting activities were recorded at 29 sites on Leekes, Putney and Long beaches. Most of these activities were recorded on Leekes Beach. (Refer to figures 2.44, 2.45 and 2.46 of Appendix W to the EIS). The results of these surveys were consistent with local resident observations on the island.

No whales were recorded during marine surveys; however, a number of whale and dolphin species are likely to utilise habitat or occur in the waters around Keppel Island. A small pod of bottlenose dolphins (*Tursiops spp.*) was recorded feeding near Fishermans Beach during the 2010 pre-wet field surveys. No dugongs were identified during surveys; however, they have been reported to feed in the waters off the island and have been sighted in Putney Bay.

Exotic marina fauna

No exotic fauna were identified during EIS field surveys. No introduced marine species have been reported outside of designated ports (e.g. Gladstone, Hay Point etc) in the GBR. Nine introduced marine species have been recorded in the Port Curtis region.

10.1.3. Water quality

The *Great Barrier Reef Outlook Report 2009*²⁶ identified coastal development, declining water quality and climate change as the greatest threats to the long-term health and resilience of the GBRWHA. Reduced water quality has resulted in an

²⁶ Commonwealth of Australia 2009, *Great Barrier Reef Outlook Report 2009*, Great Barrier Reef Marine Park Authority, Townsville, 2009, viewed 15 February 2012, <http://www.gbrmpa.gov.au/outlook-for-the-reef/great-barrier-reef-outlook-report>.

ongoing decline in the ecosystem health of much of the inshore sections of the 'urban' coast of the reef.

In 2009, as part of the Reef Water Quality Protection Plan, the Australian and Queensland governments developed a set of reef water quality outcomes aimed at halting and reversing the decline in the quality of waters entering the GBR. This included a minimum reduction of 50 per cent nitrogen and phosphorus loads by 2013 and a minimum reduction in sediment loads of 20 per cent by 2020. Achieving these outcomes relies on best management practices that reduce the input of these contaminants into the marine environment.

The assessment of existing water quality conditions indicated that the study area, encompassing the project site and the surrounding waters, experiences variable water quality conditions. Water quality in this region can be influenced by discharges from the Fitzroy River during flood events.

Water quality assessment for physiochemical parameters was undertaken at 30 sites around the island (refer to Figure 3.1, Appendix W of the EIS). Sampling was undertaken during the pre-wet (15–19 November 2010), wet (17–21 January 2011), and post-wet (30 March – 2 April 2011 and 30 April – 2 May 2011) seasons. A continuous recorder (combination fluorometer and turbidity logger) was located offshore of The Spit between Putney and Fishermans beaches from 11 February to 13 March 2011 to measure chlorophyll-a concentration and turbidity. The physiochemical parameters that were measured in the study area included temperature, pH, salinity, dissolved oxygen, turbidity and total suspended solids (TSS). The results of these water quality assessments are provided in Table 3.1, in Appendix W of the EIS.

Water quality data for the marine sites (Putney Point to Putney Beach and offshore) was compared with relevant water quality objectives (WQOs) derived from the Queensland Water Quality Guidelines (QWQG)²⁷ trigger values for open coastal waters of the Central Coast Queensland region (slightly to moderately disturbed waters). TSS concentrations for marine sites were also compared with trigger values derived from the *Water Quality Guidelines for the Great Barrier Reef Marine Park*.²⁸ Water quality data for the estuarine sites, Leekes and Putney Creeks was compared with relevant WQOs derived from the QWQG trigger values for mid-estuarine waters of the Central Coast Queensland region (slightly to moderately disturbed waters).

The water quality assessments indicated that turbidity and TSS observations were typically higher for post-wet surveys across all sites. Turbidity tended to be highest in Leekes Creek and was also relatively high near Passage Rocks and Putney Point.

TSS concentration exceeded the relevant QWQG trigger value in Leekes and Putney creeks and at both mainland sites. TSS is generally affected by sediment-laden run-off associated with heavy rain.

Water samples were also taken at 12 sites surrounding Great Keppel Island and at 2 sites on the mainland to identify any potential contaminants (refer to figure 3.2 and

²⁷ Department of Environment and Resource Management, *Queensland Water Quality Guidelines, Version 3*, Department of Environment and Resource Management, Brisbane, 2009, viewed 15 February 2013, http://www.ehp.qld.gov.au/water/guidelines/queensland_water_quality_guidelines_2009.html.

²⁸ Commonwealth of Australia, *Water Quality Guidelines for the Great Barrier Reef Marine Park*, Great Barrier Reef Marine Park Authority, Townsville, 2009.

figure 3.3, Appendix W of the EIS). These samples were analysed for TSS, nutrients, metals and metalloids, petroleum and aromatic hydrocarbons and organochlorine pesticides.

Water quality data for metals and metalloids, petroleum and aromatic hydrocarbons and organochlorine pesticides was compared with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*²⁹ (ANZECC and ARMCANZ guidelines) trigger level values for toxicants in slightly to moderately disturbed waters. Ninety-nine per cent protection level trigger values were considered most appropriate, due to the high ecological significance of the waters sampled, and as they were most similar to the GBRMPA trigger values.

Due to endosulfan's potential to bioaccumulate, water quality data for organochlorine pesticide, endosulfan was compared with the 99 per cent protection figure for slightly to moderately disturbed systems derived from Water Quality Guidelines for the Great Barrier Reef Marine Park (GBRMPA 2009).

The water sampling indicated that:

- the concentration of total nitrogen was variable between sites and surveys. The concentration of total nitrogen was highest at the Putney Creek sites during the pre-wet survey and at the Fishermans Beach and Clam Bay sites during the post-wet survey
- the concentration of total phosphorus was highest at the Middle Island and mainland sites across all surveys
- the concentration of chlorophyll-a at the in-situ logger site offshore of The Spit was above the QWQG upper trigger value (0.45 µg/L) for much of the logging duration (this may be related to exceedences in total nitrogen and phosphorus). Concentrations were typically higher during the warmer summer months
- metals and metalloids were typically below trigger values at all sites for all surveys and concentrations were generally higher at the mainland sites and the site at Middle Island. Only one exceedence for lead was recorded at Leekes Creek mouth during the post-wet survey
- the concentrations of petroleum and aromatic hydrocarbons and organochloride pesticides were below laboratory detection limits and/or relevant trigger values at all sites in all surveys.

Putney Creek

Marine water quality surveys in Putney Creek indicated higher concentrations of total nitrogen and phosphorus above the relevant guideline values and exceedences for TSS. Concentrations were generally highest during the post-wet survey. High levels of nutrients are likely to be due to seepage from septic systems and possibly leachate from landfill. Similarly, exceedences for total copper above the relevant trigger values

²⁹ Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, *The Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian Water Association (Artarmon) and NZ Water and Wastes Association (Auckland), 2000, viewed 7 June 2012, http://www.daff.gov.au/oldmincos/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality.

recorded during post-wet surveys, are probably associated with existing and historical land uses in the catchment.

Freshwater surveys indicated that TSS was highest at the downstream and mid stream sites. The concentration of total chromium was above the trigger value at the upstream site. The concentration of the total petroleum hydrocarbons C29 to C36 fraction was relatively high at the downstream site. This may be associated with any exposure to mineral-based oils and lubricants.

10.1.4. Existing sediment quality

Surface sediment sampling was undertaken during pre-wet, wet and post-wet seasons between 2010 and 2011. Sediment samples were collected at 12 sites around island and two sites near the mainland for laboratory analysis of potential contaminants.

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* interim sediment quality guideline (ISQG) values were used to determine sediment quality. Surface sediment quality data was compared to the ISQG-low trigger value in these guidelines where available.

Analysis of the surface sediment sampling indicated that coastal sediments can be generally considered to be uncontaminated. Results included the following:

- the concentration of total arsenic, chromium, copper, mercury and zinc was below the ISQG-low trigger value at all sites during all surveys. The concentration of total lead in the surface sediments at the Leekes Creek mouth exceeded the ISQG-low trigger value during the post-wet survey. The EIS considered that this could be related to boat usage.
- total nitrogen was highest at Putney Creek for the pre-wet survey and Fishermans Beach for the post-wet survey
- total phosphorus was highest at Middle Island during both surveys, and also relatively high at the mainland sites during both wet and post-wet surveys.

Sediment samples undertaken in Putney Creek recorded higher concentrations of total nitrogen at the downstream and mid-stream sites and total phosphorus at the mid-stream site. The EIS considered this is likely to be due to seepage from septic tanks and possibly landfill.

Marina footprint

Sediment core samples were collected from 23 sites in the proposed marina basin and entrance channel footprint at Putney Beach in accordance with the National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009).³⁰

Analysis indicated sediments in the dredging footprint are 95 per cent sand with 5 per cent silt and clay content. The concentration of all contaminants was below the Laboratory LORS and NAGD screening levels. Sediments in the dredging footprint are therefore considered to be uncontaminated.

³⁰ Commonwealth of Australia, National Assessment Guidelines for Dredging, Department of Environment, Water, Heritage and the Arts, Canberra, 2009, viewed 15 February 2013, <http://www.environment.gov.au/coasts/pollution/dumping/publications/pubs/guidelines09.pdf>.

Potential acid sulfate soils were assessed in accordance with *Guidelines for sampling and Analysis Procedure for Lowland Acid Sulphate Soils (ASS) in Queensland 1998* (the ASS guidelines).³¹

The levels of oxidisable sulphur present and acid generation potential in layers of sediment investigated within the proposed marina footprint (EIS Appendix D, Figure 1.3) were low, at less than 0.1 per cent of all sampled material. The majority of samples analysed had no oxidisable sulphur present or had levels above the action criteria (0.03 per cent) with excess acid neutralising capacity. Three of the 32 samples analysed had a net acidity that would require a low level of treatment.

10.2. Potential water quality impacts— construction

10.2.1. Sediment plumes during marina construction

Capital works are expected to have an impact on marine ecosystems through the generation of suspended sediment plumes. Suspension of fine sediments for extended periods can lead to turbid conditions that are harmful to corals and seagrass by reducing available light for photosynthetic processes and smothering by increasing rates of sedimentation.

Approximately 300,000m³ (including an allowance for over-dredging) of sediment is required to be dredged to create the marina basin and approach channel, comprising the following stages:

- Stage 1—57 000m³ of sediment from the marina basin to fill the geotextile tubes for the breakwater core
- Stage 2—40 000m³ of sediment from the marina basin to fill the geotextile tubes for the marina revetment
- Stage 3—185 000m³ of sediment for the remainder of the marina excavation and approach channel to the reclamation.

Potential sources of suspended sediment during the construction of the marina include:

- seabed sediments disturbed directly at the dredge site
- discharges of suspended sediments during filling of the proposed geotextile tubes constituting the core of the breakwaters and revetments
- decant discharges from the reclamation area

The rate of suspended sediment generated during dredging activities will be dependent on the proportion of fines in bed material, the size and type of dredge plant and the skill and experience of the dredge operator.

The sediment to be disturbed by dredging is largely composed of sand sized fractions and around 95 percent of the sediment would be expected to settle almost instantly

³¹ CR Ahern, MR Ahern, and B Powell, *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998*, Queensland Acid Sulfate Soils Investigation Team, Resource Sciences Centre, Department of Natural Resources, Indooroopilly, 1998, viewed 15 February 2013, <http://www.derm.qld.gov.au/land/ass/products.html>.

around the dredge head. The remaining five percent of fines would remain in suspension and potentially transported by tidal and other flows. Assuming these percentages and the use of a small cutter suction dredger, the EIS has estimated a generation rate of 0.15 kg/sec or 4.4 kg/m³.

The process of filling the geotextile bags for the construction of the breakwater and revetment structures is expected to result in the suspension of fine sediment as the bags are filled. As geotextile bags are designed to allow water to flow out as sediment is pumped into the bags it is expected that 100 per cent of the fine sediment fractions would be discharged during this process. The EIS estimates turbidity generated at the overflow ports during the geotextile tube filling to be 1.9 kg/s or 57.7 kg/m³.

Construction of the reclamation area is not expected to generate high concentrations of suspended sediments as the dewatering process has been proposed to include a detention area that will be designed to maximise the length of time for fine sediments to settle out of suspension. It is predicted that 99 per cent of the dredge material will settle out of suspension whilst in the detention area. This would mean that decant discharges from the reclamation area would be unlikely to contain a high proportion of fine sediments. Furthermore, the generation of any suspended sediments during this process would also be likely to be confined to the marina basin through the use of silt curtains.

Hydrodynamic modelling was coupled with a suspended sediment transport modelling to assess the likely magnitude and extent of suspended sediment plumes generated during construction and dredging of the marine facility. The modelling did not include the effects of silt curtains.

Modelling results indicated that turbid plumes created during stage one and two of the construction will be generally confined to the area around the marina footprint but would also extend beyond Putney Point to Fishermans Beach on occasion for short periods during stage one and beyond Putney Point during stage two of construction.

As a key indicator, the EIS modelling predicted maximum TSS concentrations of 5 mg/l above background levels at Passage Rocks for short periods during the initial construction stage (without mitigation measures). This can be compared to the natural variation range up to 2 mg/l recorded as part of the EIS investigations at that location.

Closer to the construction site, maximum TSS concentrations of 50 mg/l above background levels are expected to occur for short periods at the Putney/Fishermans beach spit head. Short-term maximum exceedences of 30 mg/l are predicted at Fishermans Beach.

The first stage of construction would involve construction of the western breakwater component which will help to contain the extent of any turbid plumes generated during the remaining construction phases.

Suspended sediment plumes are generally not expected to extend far beyond the marina footprint during stage three of the construction. The design of the works and the construction sequencing allows for the use of silt containment screens to be placed at the marina entrance during stages two and three.

The EIS also discussed the monitoring and management of dredging operations to reduce the risk of suspended sediment plumes reaching ecologically sensitive areas including the coral reefs of Passage Rocks and Middle Island.

The proponent has committed to ongoing monitoring of seagrass, mangroves and coral communities in the vicinity of the development footprint during construction and following the completion of the development. Monitoring would be focused on the health and community structure of these environments to determine the level of impact.

10.2.2. Potential disturbance of acid sulfate soils and/or contaminated sediments

Acid sulfate soils (ASS) are a characteristic feature of low lying coastal environments in Queensland. Undisturbed, these soils can be present in an anaerobic state within marine muds and sands in the form of potential acid sulfate soil (PASS). When exposed to air either by direct excavation or by indirect changes to the surrounding water table, pyritic material inherent in the ASS is oxidised by sulphur oxidising bacteria leading to the formation of sulphuric acid.

High concentrations of contaminants and acid released into receiving waters can potentially cause significant impacts on ecosystem health. These impacts are dependent on the type of contaminant and the extent of the disturbance.

Preliminary ASS investigations indicated a low risk of encountering ASS although monitoring and potential treatment may be required.

Preliminary sediment quality sampling and analysis indicates no concerns. Further detailed assessment would be necessary prior to commencement of the works to confirm that no contaminated material is released to marine waters.

10.2.3. Proposed works in Putney Creek

The design of the proposed marina facility includes the permanent modification of the mouth of Putney Creek. Putney Creek is an ephemeral waterway that only flows in response to sustained rainfall. The mouth of the estuary is intermittently closed by the physical coastal processes of Putney Beach during periods of low freshwater flow.

The EIS provided an assessment on whether to remove the bar and open the creek mouth to tidal influence or to re-construct the creek mouth with an artificial bar (a weir set at the existing bar level or a collapsible or moveable weir set at the existing level and designed to be lowered to allow occasional washing out).

The option of creating a temporary or permanent barrier to replace the existing sand bar formation/removal process was considered a less suitable option as it was considered this could potentially result in a closed system that would be more susceptible to algal blooms and eutrophic conditions.

Opening Putney Creek to tidal influence was considered to be the most appropriate solution from both an ecological, amenity and maintenance perspective. The EIS concluded that opening Putney Creek mouth to regular tidal movement would be expected to improve water quality within the creek. This would be expected to alter

riparian vegetation and in-stream flora and fauna and significantly improve fisheries productivity within the lower reaches of the creek.

Changes to the tidal regime in the estuary would be expected to cause adjustments to the bed and banks of the waterway over a transition period. This may disturb pockets of fine/contaminated sediments and/or PASS which may then impact on marine water quality.

The proponent has committed to undertake a detailed investigation of sediment prior to construction and to implement appropriate mitigation measures.

Lining of the channel will prevent scouring and subsequent increased deposition of sediment within the marina basin. The preferred lining material will be selected on the basis of its ability to reduce scour, provide fisheries habitat and contribute to the aesthetics of the Marine Services Precinct. The use of placed rock may be considered as it would provide a relatively natural substrate for establishment of various encrusting marine species, as well as creating crevices and gaps to provide habitat and refuge for a wide range of marine flora and fauna.

The concept design of the proposed works includes a sediment basin to trap and reduce suspended sediment loads near the mouth of the creek and therefore minimise the need for ongoing maintenance dredging within the marina basin. The design would provide suitable maintenance access for de-silting equipment.

10.2.4. Coordinator-General's conclusions

The investigations undertaken for the EIS provide an appropriate estimate of the likely impacts of the proposed works, although a more detailed risk assessment of the proposed Putney Creek works is warranted.

Suspended sediment modelling of sediment disturbances associated with the dredging activities indicated that dredge plumes will be largely contained within the marina footprint. Slightly higher than background levels of turbidity have the potential to impact sensitive areas in the vicinity of Passage Rocks for short periods in response to certain hydrodynamic conditions.

The use of silt screens in conjunction with the dredging works would reduce the extent that the turbid plumes may impact areas outside the marina basin. The reclamation area will be designed with multiple cells to maximise the length of time over which fine sediments may settle out of suspension before the decant flows back to the marina basin.

The sediment quality analysis conducted for the EIS indicates that the proposed dredge material is considered to be uncontaminated and the works would not be expected to result in the introduction of contaminants into marine waters. Further assessment is required prior to construction commencing to fully define the extent of potential acid sulfate soils (PASS) that may be present.

The proposed alteration of the Putney Creek estuary mouth may have subsequent effects on the morphology of the waterway which requires further investigation prior to its opening to tidal flows. As the system transitions to its new flow regime, fine

sediments and/or contaminants may become mobilised. The proponent proposes a range of management measures, however further detailed planning will be necessary.

Outcomes required as part of the proposed marina construction works include:

- best practice dredge and construction management to minimise the generation of sediment plumes and avoid the incidence of elevated turbidity at sensitive sites
- continuous monitoring of water quality at sensitive sites, including Passage Rocks during the works.
- regular monitoring of seagrass, mangroves and coral communities in the vicinity of the development footprint during construction.
- the excavation and placement of potential acid sulfate soils is managed to ensure no untreated material is released to marine waters
- contingency planning for the disposal of dredged material considered unsuitable for construction
- water quality monitoring within Putney Creek before, during and after the works
- minimise the risk of any contaminants and/or fine sediments in the Putney Creek catchment becoming exposed to tidal waters.
- ensure the entrance to Putney Creek is suitably designed to accommodate stormwater flows to avoid local flooding and/or adverse impacts within the marina basin.

10.3. Potential water quality impacts—operations

10.3.1. Marina operations

Maintenance dredging

Maintenance dredging is expected to be required over the course of the marina's operation to maintain the minimum navigable depths required in the entrance channel. Sediment transport modelling indicated that removal of approximately 5000 to 7000 m³ of sediment would be required every five years, primarily from the area between the marina entrance and Putney Point.

The design of the marina includes no land-attached structures beyond the mean low water. Under this design the breakwaters are to become detached from the shoreline with a gap that would need to be maintained to allow water to flow freely between the breakwaters and the shoreline at mean low water. The concept design shows a gap width of 20 metres at mean low water and includes sand traps to avoid sediment transport into the marina basin.

Sand will need to be periodically removed to maintain the separation gaps between the breakwaters and the shoreline. The rate of supply of sand is expected to be up to 1500 m³ per year between the gap at the north end of the marina and 350 m³ per year between the gap at the southern end. Sand would be moved to the southern end of Putney Beach.

Marina residence times

The level of concentration of contaminants such as hydrocarbons and nutrients will depend on the rate of tidal flushing in the marina footprint. Longer residence times can result in increased concentration of contaminants, which can lead to issues such as eutrophication and algal blooms.

The EIS indicated that the rate of exchange of water between the marina basin and the adjacent ocean is expected to be very high, due to the relatively small marina basin volume when compared to the entrance dimensions and the relatively large tide range. The EIS estimated that approximately 50 per cent of the marina volume will be exchanged over a single spring tidal cycle and residence times are likely to be no greater than 1–2 days for all locations with the marina basin.

Copper contamination

The EIS indicated that copper concentrations in the waters of the marina basin are likely to be elevated due to the presence of copper in antifouling paints. These concentrations would be dependent on the leaching rate from vessel hulls, number of vessels, hydraulic flushing and background concentrations.

Hydrodynamic model simulations indicated that elevated copper concentrations would be generally confined to the marina basin and would be expected to slightly exceed the ANZECC (2000) guidelines of 1.3 ug/L, for slightly to moderately disturbed systems.

Model simulations indicated that the concentration of copper would rapidly decrease outside of the marina basin and would be expected to be generally, at or below the ANZECC (2000) guidelines of 0.3 ug/L for pristine environments.

Ship-sourced pollution

There are currently no facilities for recreational craft on the island. Typically, visiting yachts anchor on the western or north western side of the island.

The development of the resort and marina facility is intended to increase recreational boating activity in the region. Additionally, increased traffic of commercial ferries and barges from the Keppel Bay boat harbour would be required for both the construction and operational phases.

An increase in vessel traffic poses a risk to marine water quality through increased risk of spills of fuel and other contaminants. The proponent has committed to best-practice marina management to minimise risks of spills and providing sewage reception facilities in the marina for visiting yachts.

10.3.2. Stormwater

The EIS discussed the incorporation of water sensitive urban design principles into the overall project. They will be an integral part of the project's wastewater and water cycle management strategy. A discussion of these systems is provided in section 6.3.4 of this report.

The EIS indicated that where possible, stormwater run-off from all hardstand areas (roads, paved and sealed areas, airstrip and apron, parking areas), including those within the Marine Services Precinct, will be directed into bio-retention cells for treatment prior to absorption into the natural underlying sandy soils. These bio-retention systems will also assist in removing gross pollutants. Gross pollutant traps will also be installed in key locations where litter generation is most likely to be concentrated and at risk of entering waterways.

Given the extent of urban development proposed in the Putney Creek catchment and its direct discharge into the marina basin, careful attention should be paid to stormwater management in that location.

The management of stormwater run-off from the golf course is assessed in section 8.2.2 of this report. The assessment concluded that the potential risks are considered to be low, as stormwater run-off will be adequately intercepted and treated by stormwater quality devices before being discharged to the environment. Stormwater run-off from the golf course is therefore not expected to result in any adverse impacts on the water quality or hydrology of Leekes Creek.

10.3.3. Coordinator-General's conclusions

Careful management of the marina operations will be required to minimise risks to the ongoing quality of marine waters.

The coastal sediments that would require maintenance dredging from the entrance channel of the marina are likely to be clean sand. Similarly the material requiring regular removal from the gaps between the breakwaters and the shoreline would be largely beach sand. The proposed placement of this material on the southern section of Putney Beach should pose minimal risk to marine water quality.

Any maintenance dredging required from within the marina basin is unlikely to be contaminated. However, sediments may be affected by discharges from Putney Creek and/or pollutants derived from vessels or land-side spills. A full assessment of sediment quality would be required before any maintenance dredging was undertaken.

For the majority of time, water quality within the marina basin is likely to be close to that of the adjacent oceanic waters given the configuration of the basin and the relatively large tidal range. Best practice marina management is expected to be implemented to ensure risks of accidental spills are minimised.

To ensure the risks of potential impacts to marine water quality are avoided, the following outcomes are required:

- ensure best practice dredge management to minimise the generation of sediment plumes and avoid the incidence of elevated turbidity at sensitive sites during maintenance dredging
- dredged material may not be placed on beaches unless it is clean sand. Dredged material that is not clean sand may not be disposed at sea.
- provide contingency planning for the disposal of dredged material considered unsuitable for placement within the active zone of Putney Beach

- construct and operate ship-sourced pollution management facilities that would enable ships to comply with the requirements of the *Transport Operations (Marine Pollution) Act 1995* and associated Regulation, especially in regard to sewage, garbage and other waste (for example, oily bilge water)
- implement measures to ensure risks of spills of pollutants from vessels and/or land-side activities are minimised.
- prepare and implement contingency plans for spill events to minimise impacts on the marine environment
- construct and maintain stormwater treatment systems so that run-off from all hardstand areas within the Marine Services Precinct and all urban areas in the Putney Creek catchment is filtered prior to discharge into waterways.
- monitor the water quality discharged from Putney Creek into the marina basin post-construction and prepare contingency plans for remedial actions that may be necessary.

10.4. Impacts on marine flora and fauna

10.4.1. Marina construction

Loss of habitat

Direct losses of habitat would be largely confined to the marina footprint during the construction stages of the project. The estimated loss of habitat within the marina footprint includes:

- a permanent loss of 10 ha of substrate supporting patchy seagrass with approximately 10 percent cover
- alteration of 20 ha of non-vegetated soft sediment and associated macrobenthos (benthic invertebrates) enclosed within the marina basin
- a permanent loss of approximately one ha of intertidal rocky shore.

Temporary impacts during marina construction

It is anticipated that dredge plumes may extend over marine areas near Putney and Fishermans Beaches, affecting up to 27 ha of patchy seagrass. Modelling has also indicated that a small area of seagrass (< one ha) to the south of the marina may be potentially impacted by sedimentation of silt.

The EIS concluded that some coral may be impacted by the dredge plumes. This would include a small coral outcrop (up to approximately 0.1 ha) directly adjacent to the marina and approximately half of the corals in the vicinity of Putney Point (up to approximately 1 ha).

The coral communities near the proposed marina are not expected to be permanently affected by the construction works. The EIS reports that the corals in the area are relatively tolerant to variable turbidity and light penetration intensities that can occur in these inshore waters. The communities of Putney Point are sparse, patchy reefs dominated by species that are typical of inshore, river-influenced communities. As

such, these species are likely to be tolerant of elevated suspended solid and nutrient concentrations.

The EIS finds that impacts of dredging on these nearby coral communities are expected to be temporary and reversible.

The construction of the marina is likely to result in an increase in noise and activity in the waters off Putney and Fishermans Beaches. These activities, particularly pile driving, are expected to cause disturbances to marine fauna such as fish, dolphins, dugongs and turtles and may cause fauna to temporarily move away from the area until construction activities are completed.

In the initial stages of the project's construction, vessels transporting materials and machinery would be offloading onto the beach. Vessels may also be moored in the sheltered waters off Putney and Fishermans Beaches. This would be similar to the existing ferry and barge operations to the island although at higher frequency. Once the terminal facilities are completed in the marine precinct, this type of operation would no longer be required.

Potential habitat gain

The proponent has committed to incorporating 'fish-friendly' structures into the design of the marina to maximise the potential gain to fish habitat. The EIS indicated that the construction of the Marine Services Precinct could result in a gain of approximately 2 ha of marina breakwater (rocky substrate), and the gain of approximately 0.55 ha associated with walkways and pontoons. This substrate is likely to be colonised by a variety of flora and fauna that would consequently encourage a variety of fishes and other fauna to utilise these areas for food and shelter.

The proposed works to permanently open the mouth of Putney Creek would change the tidal regime in the estuary and promote additional areas of marine plants and fish habitat.

All these features should be considered in determining the required fish habitat offset.

10.4.2. Utilities services corridor footprint

The preliminary alignment of the utilities services corridor has been selected to avoid ecologically sensitive marine communities such as coral reefs and seagrass beds and to minimise impacts on the marine environment.

The submarine cable and pipes will be buried in the seabed by continuous jet-trenching or similar process and then backfilled to minimise impacts on marine environment. Burial of the cables and pipelines will also reduce the potential for damage caused by dragging anchors and fishing equipment.

The construction of the submarine utilities corridor would cause a temporary disturbance of the seabed to a depth of 1 m over area width of approximately 2.5 m and a length of 16 km. Such disturbances may result in habitat loss or a temporary increase in turbidity and sedimentation.

The submarine cable footprint is principally bare sediment. These bare sediment ecosystems are typically dominated by polychaete worms and sparse epifauna, and

may shift to include a variety of flora and fauna including macroalgae, hard and soft corals, sponges, ascidians and a variety of other invertebrates and fish. The EIS indicated that there is unlikely to be any negative impacts to ecosystem functioning, given the large area of bare sediment habitat in the wider area. The hard surfaces of these components would also support similar communities to those currently found on rocky substrate in the survey area.

Development of the connection of the service corridor to the mainland may disturb approximately 0.04 ha of mangrove forest based on a 2.5-metre-wide installation corridor at Kinka Beach which may or may not be permanent.

10.4.3. Potential fauna disturbance and habitat damage during operation

Recreational activities

Activities on beach areas and in nearby offshore waters during the operation of the resort are expected to have a minor impact on fauna and flora. The EIS found that there is some risk of physical destruction and/or depletion of ecosystems associated with these activities. Increases in human activity on turtle nesting beaches, such as Leekes Beach, may interrupt nesting marine turtles. Although, as the island is not identified as an important turtle rookery, these disturbances are not expected to significantly impact on turtle populations in the region.

The EIS stated that the overall resort management would include active management of environmental areas on the island with all activities undertaken in accordance with current best practice, including GBRMPA's *The Tourism Operator's Handbook for the Great Barrier Reef and Reefed's Best Environmental Practices*.

This is to include a long-term monitoring program of beach erosion and coral damage/stress near impacted areas.

Leekes Creek wetland

The Leekes Creek wetland has significant conservation values and provides habitat for key marine and shorebird species.

The Clam Bay Precinct elements (fairways and resort villas) have been setback 200 m from the Leekes Creek estuary at the nearest point. The separation area is illustrated in Figure 10.4.

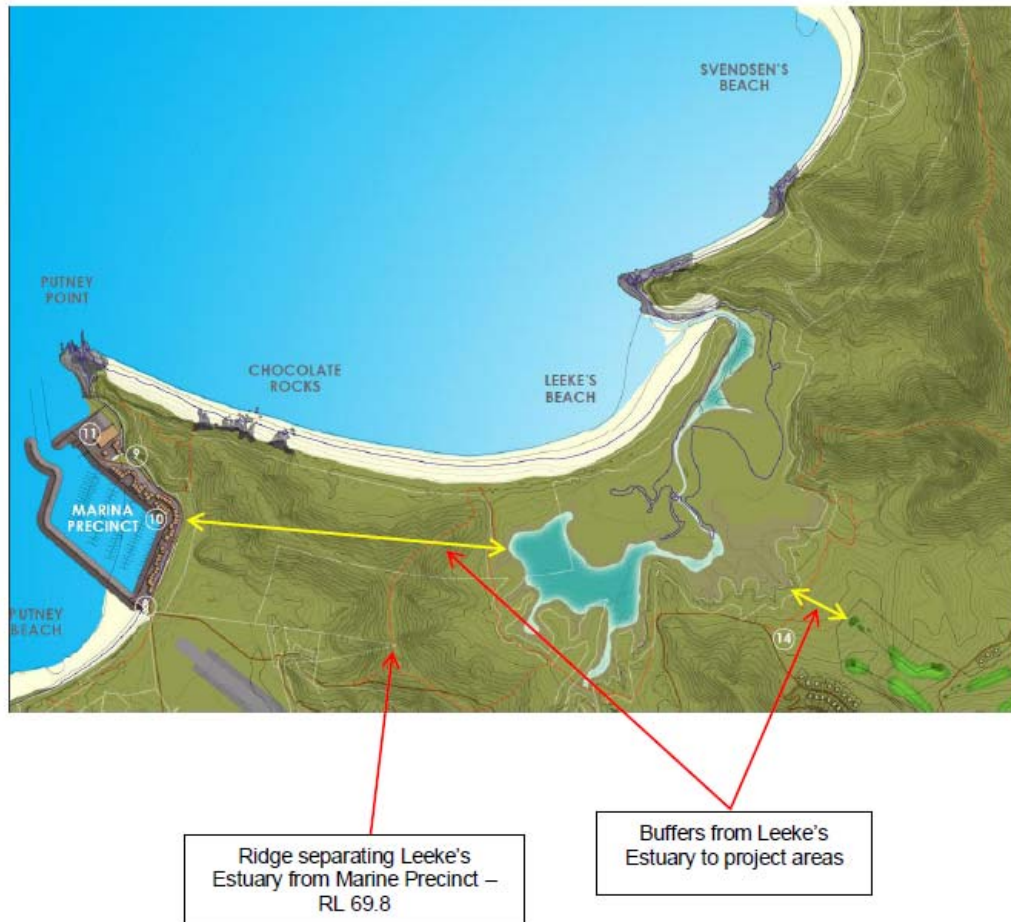


Figure 10.4 Setbacks between Leekes Creek estuary and development areas

The proposed Marine Services Precinct is separated from the Leekes Creek estuary by a high ridgeline. The EIS finds that the ridgeline would provide adequate buffering from impacts such as noise associated with construction and operational activities.

Disturbances associated with human activity will also be minimised by restricting public access (by vehicles and humans) from areas identified as important to migratory shorebirds. Access may be restricted by constructing adequate barriers such as fencing. Recreational activities may be restricted in some areas between October and March when migratory birds are present. The EIS indicated that the proponent will employ rangers and environmental officers who will be responsible for overseeing the management of human activities to reduce impacts on key fauna species.

Disturbances will be also minimised through landscape and urban design features that incorporate sympathetic lighting strategies and sound attenuation and by providing community education through mechanisms such as interpretive signs at access points to shorebird habitats.

Vessel management

The presence of the marina will lead to an increase in the use of recreational vessels around the island, inevitably resulting in more frequent interactions between boating traffic and megafauna (e.g. turtles and dugongs). Such interactions may result in

altered behaviour of the megafauna—for example, changing swimming direction or reducing time spent resting and may also cause longer-term displacement of fauna to deeper waters, where less food resources may be located.

Boat strike accounts for a large number of turtle and dugong injuries and mortalities in Queensland. An increase in boat traffic in the project area would increase the risk of boat strike in areas that are frequented by turtles and dugongs. Green turtles are most at risk due to their habit of basking at the surface of the water.

The proponent has considered the risk of boat strike within the marina area to be low as the waters off the island are not considered to support significant seagrass feeding grounds for dugongs or green turtles and the nearest coral-dominated feeding grounds for loggerhead and hawksbill turtles are relatively distant from the proposed marina.

The EIS included a number of mitigation measures to protect megafauna, including the design of channel areas to include construction of small coves where turtles can rest away from boating traffic and 'go slow zones' to reduce boat strike around the marina and Passage Rocks.

Marine pests may potentially be introduced via bio-fouling on non-trading vessels (for example tugs, ferries, dredges, barges, heavy lift vessels and cable ships).

No exotic marina pests have been identified in the project area. Biosecurity Queensland has requested that the proponent develop a monitoring, prevention and mitigation plan for invasive marine pests in accordance with the National System for the Prevention and Management of Marine Pest Incursions.

Lighting

Lighting from coastal development can disrupt the behaviour of nesting adult turtles and hatchlings, as well as other animals.

Although the island is not considered a significant rookery, the EIS found that some of the beaches on the island are used for turtle nesting. Use of the beaches for nesting will already be currently affected by lights from existing development on the island, which could potentially be exacerbated by further development.

While the EIS indicated there may be some impact associated with lighting on marine turtles and migratory species, impacts are not expected to be the significant. Most of the nesting on the island has been recorded in remote areas where there is no existing or proposed development.

A range of measures has been proposed to minimise impacts on marine turtles and other fauna such as low-pressure sodium vapour external lighting, vegetation screening and positioning lights away from beaches.

10.4.4. Coordinator-General's conclusions

The construction and operation of the project could lead to some impacts on the marine flora and fauna in the vicinity of island.

The construction of the marine precinct could permanently alter the marine environment within the development footprint and the Putney Creek estuarine area.

Construction works would have temporary effects on levels of underwater noise and dredging may lead to indirect impacts on adjacent seagrass areas. In the longer-term, beneficial changes to the estuarine habitat of Putney Creek are expected.

The proponent has prepared a draft biodiversity offset strategy (Appendix P of the EIS) to determine the offset requirements triggered by the project. The strategy identified a total area of approximately 21 ha of marine fish habitat that would require an offset.

Potential offset solutions that have been considered include:

- the protection, restoration and management of land that contains marine plants and habitat
- a biodiversity conservation fund to provide significant and ongoing funding for marine conservation research. The fund will be managed through a research partnership with key environmental associations and the Reef and Rainforest Research Centre. It is intended that funds would be spent on research and conservation works throughout the Keppel Island Group.

DAFF (Fisheries Queensland) has advised that marine fish habitat offsets cannot be finalised until the detailed design is completed.

Significant increases in visitor numbers and boating activity are inherent components of the proposed development. Unless carefully managed, these increases may lead to degraded coastal areas and inshore marine habitats. Poor behaviour of recreational boat operators may also increase the risk of collisions with marine fauna such as turtles. Ongoing management of tourist and visitor activities would be an important part of the overall resort management responsibilities.

I require the following outcomes to be included as part of the proposed development:

- ensure best practice construction management is implemented to minimise the potential disturbance to marine fauna. In particular, this is to include the control of underwater noise generation and the management of construction vessels during the initial stages.
- construction management procedures are implemented to ensure the potential for the introduction of marine pests is minimised in accordance with the National System for the Prevention and Management of Marine Pest Incursions.
- finalise a package of offsets for the loss of marine habitat, taking into account the direct and indirect impacts and the potential habitat gain within the marina and the Putney Creek estuary
- tourism and visitor activities are managed to minimise degradation of coastal areas and inshore marine habitats. In particular this is to include:
 - restricting access to sensitive areas including turtle nesting beaches and the Leekes Creek wetland area while migratory birds are present
 - long term monitoring program for beach erosion and coral damage/stress for areas frequented by resort guests
 - providing support to marine park management operations.

11. Marine Services Precinct

11.1. Location and need

11.1.1. Marine transport infrastructure

The proponent has indicated that the proposed marina facility is an integral and essential component of the Great Keppel Island Resort Revitalisation project. The EIS estimates that 70 per cent of guests could arrive and depart by air. The remaining arrivals and departures would be by ferry from Keppel Bay marina. Based on these figures and including day visitors and commuting staff, it is estimated that the average passenger arrivals/departures by ferry would be approximately 370 per day.

At present there are no marina or jetty facilities on the island. Marine vessels transporting passengers and material to and from the island have historically landed directly on Fishermans Beach when tide levels have been suitable. The EIS found that the current operation would not be adequate for the proposed development due to the following reasons:

- the transfer of persons and supplies directly on to a beach does not provide for all-weather accessibility to the island nor equitable access for elderly or disabled passengers
- the transfer of goods (including construction materials, food, fuel and waste bins) and equipment via the island's main tourist beach would conflict with tourist and recreational activities on the beach and increase safety risks for swimming and other water activities
- barge operations, particularly for construction and demolition uses, on a beach poses risks of contamination of marine waters.

11.1.2. Location options analysis

Assessment of viable options for a marina location considered a number of factors, including: minimising environmental impacts; ensuring navigation safety; engineering of coastal structures; and providing land-side access not too distant from the other development areas.

The EIS described the selection process used in determining the proposed marina location. Key considerations include:

- the western side of the island is relatively sheltered from the prevailing south-east to north-east wind-wave direction. Utilising this lower wave climate would provide a higher degree of natural protection and therefore reduce the infrastructure footprint of the breakwaters structures
- high protection GBRMPA zones (Conservation and Marine National Park) or areas supporting extensive inshore coral reefs such as Monkey Beach and Clam Bay would preclude marina development

- Leekes Beach and Svendsens Beach, although relatively sheltered from south-easterly waves are open to northerly waves from tropical cyclones. Land-side access to the development areas would also be difficult
- Long Beach has good access to the Fishermans Beach precinct however it is exposed to south-easterly waves and is relatively open to the effects of tropical cyclones
- the lower wave energy along the island's western shoreline indicates lower rates of sediment transport, which in turn should minimise the scale and frequency of any maintenance dredging required.

The EIS concluded that the northern section of Putney Beach would be the most suitable location because of the relatively low energy wave climate and the opportunity to minimise the length of the dredged access channel. A potential marina location at Fishermans Beach was discounted to avoid the GBRMP Conservation zoning and to avoid conflict with its primary use as a recreation beach. The southern end of Fishermans Beach is also constrained by freehold land that is not available to the project.

As a marina location, Putney Beach was found to have lower conservation values than other feasible sites and was suitable in terms of its proximity and access to the resort precinct and other developed areas on the island.

11.1.3. Potential alternatives to a marina

The EIS discusses the viability of potential alternatives to an enclosed marina including a jetty structure. While this would provide a much reduced development footprint, it lacks many advantages of the marina—particularly the marine-based tourism opportunities (e.g. day excursions, fishing trips), emergency services berthing facilities and vessel sewage reception facilities.

Although the island is located within the GBR lagoon, it is exposed to long fetches to the south-east and is subject to long-period swell waves. These swells refract around the island and, although diminished in height, are typically present at the western beaches most of the time. Vessels moored at a jetty facility would be affected by these waves to a much greater degree than an enclosed marina. This exposed nature of a jetty structure, in combination with the five-metre tide range, therefore presents greater engineering and navigation safety challenges. It is likely that a jetty facility would be inaccessible during some conditions and would also be exposed to potential damage from cyclonic waves.

11.1.4. Proposed uses

The proposed marine precinct would include a 250-berth marina, up to 185 apartment-style accommodation units and 7000 m² GFA of retail and other uses. The EIS describes this as 'an active mixed-use hub comprising resort apartments, cafes, restaurants and shops'. The draft staging plan provided as part of the EIS indicates that the entire marine precinct would be completed in stage 1 of the project.

The development would require reclamation of approximately 3.7 ha of intertidal area landward of the GBRWHA boundary—defined by the line of ‘mean low water’. This would also require revocation of a section of the State marine park.

Upon completion of reclamation, a 100-year term lease may be issued over the area created above high water mark. The balance of the marine precinct areas may have a term lease for 50 years. Overall, the leased area for the marine precinct would be 31.5 ha.

Once fully developed, the reclaimed land area would be principally taken up by the proposed accommodation buildings, up to 185 units and three storeys in height. Additional facilities are proposed to include emergency services facilities, the ferry terminal, a yacht club and hardstand boat storage. Refuelling and sewage reception facilities would also be provided at market rates.

Access to the site would include construction of a road on part of the existing esplanade (unformed road reserve) adjoining the site. Other than the access road, no development is proposed on the esplanade.

The concept design of the marina includes openings between the breakwater structures and the foreshore in the vicinity of the GBRWHA boundary. This is required to maintain the current location of the boundary and avoid the need for revocation from the GBRMP. Bridges are proposed to allow vehicular access to the breakwaters. No commercial development is proposed on structures located seaward of the GBRWHA boundary.

The proposed marine precinct would be highly visible when approached from the sea. From most viewpoints, the area would be dominated by yacht masts and the rock armour of the breakwater structures. The three-storey building height limit would be below the height of the rocky headland of Putney Point and the tree canopy, thereby minimising impacts. (further details are contained in section 5.3.1 of this report).

11.1.5. Maritime infrastructure

The EIS included an estimate of design wave conditions associated with an extreme tropical cyclone event. The design includes the effects of climate variability and potential sea level rise. Significant quantities of appropriate armour rock for the breakwater construction would need to be imported for the breakwater construction.

The reclaimed land area within the marine precinct would need to be constructed and stabilised to a level that appropriately minimises risk of storm tide inundation, taking into account climate change factors. Investigations undertaken for the EIS estimate potential storm tide levels on the island are substantially lower than the adjacent mainland coast. Including a 0.8-metre allowance for sea level rise, the predicted 1 per cent annual exceedence probability storm tide level is in the order of 1.0 m above highest astronomical tide (HAT).

The breakwaters and internal revetment structures are intended to be formed using sand filled geotextile tubes as a core. Sand would be obtained via a cutter suction dredge operating in the marina basin. Similarly the reclaimed land would use sand dredged from the marina and entrance channel area. As with all coastal structures and

dredged areas, appropriate maintenance would be necessary and attention needs to be paid to settlement and the long-term stability of the sand-bag core. This would be the responsibility of the proponent or the subsequent lessee of the marine precinct area.

The proposed entrance channel is relatively short and is oriented in a north-south alignment, which passes relatively close to Passage Rocks. Modelling undertaken for the EIS indicates that peak tidal flows in this area can exceed 0.6 m/s.

11.2. Potential impacts on coastal processes

11.2.1. Wave and tidal conditions

The wave climate around the island is largely influenced by wind-waves generated in the southern GBR lagoon and from decaying swells propagating from the Coral Sea. Prevailing south-east to north-east winds generate short wind waves, with wave heights generally less than 1.5 m. The region generally experiences greater wave activity during the summer months.

Putney and Fishermans beaches experience a different wave climate to the other beaches on Great Keppel Island due to their westerly aspect and the degree of sheltering provided by the bounding headlands and nearby offshore islands. Most of the time, wave energy impacting Putney Beach originates from the remnants of longer period north-east to easterly waves that propagate into Keppel Bay from the Coral Sea and have refracted around the northern headland of Putney Point. Putney Beach is only occasionally impacted directly by locally generated wind-waves and can be affected by tropical cyclone waves. Wave heights at Putney Beach are typically less than 0.5 m with periods exceeding 7.5 seconds.

The EIS investigated tidal flows in the Keppel Bay region. The tide propagates primarily from east to west however the complicated bathymetry and numerous island outcrops generate current fields with a high degree of spatial and temporal variability. Notably, the tide model indicates a significant asymmetry in the vicinity of Putney Beach that results in a relatively strong residual flow from south to north.

11.2.2. Sediment transport

Putney Beach and Fishermans Beach are within the same coastal compartment on the western shoreline of the island, bounded by rocky headlands. The littoral system is relatively shallow and is characterised by a distinct 'trailing spit' formation. Analysis of historical aerial photographs has shown that the spit is relatively mobile with the potential to migrate north and south over decadal time scales. The location of the spit has consequent effects on the shoreline positions of Putney and Fishermans beaches, although the extreme ends of the coastal compartment are stabilised by the headlands.

The analysis of aerial photographs shows that the southern end of Putney Beach has experienced significant shoreline recession over the last decade (refer Figure 11.1). This shoreline recession has resulted in a general decline in the beach widths on Putney Beach. Recently, Putney Beach suffered further recession in January 2013 as a

result of the effects of ex-tropical cyclone Oswald. In contrast, Fishermans Beach has remained relatively stable over the recent period although the EIS noted a reduction in beach volume compared with earlier periods.

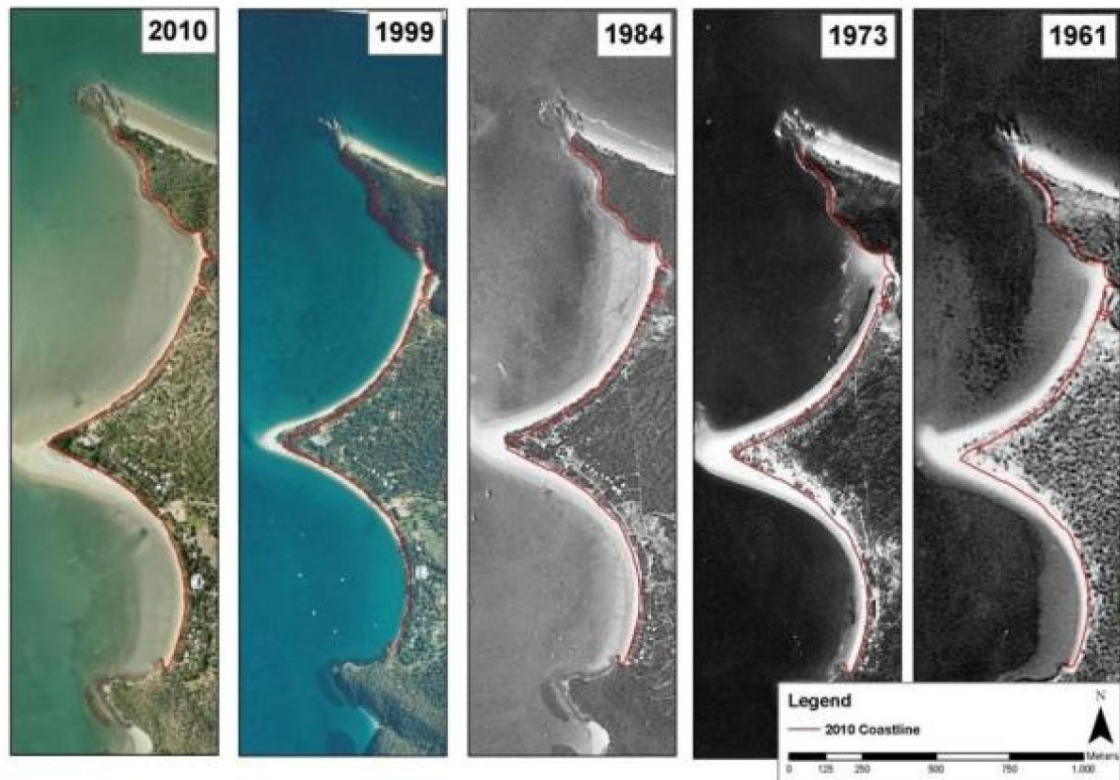


Figure 11.1 Comparison of beach width of Putney Beach over the past decade

Source: Water Technology, *Great Keppel Island Revitalisation Plan, Coastal Environment Technical Report*, 2012, p. 28.

A sediment transport assessment undertaken for the EIS showed relatively low longshore transport rates and indicated a potential input to the compartment from Leekes Beach in the order of 1500 m³ per annum. The refracted waves around the northern and southern headlands cause net longshore transport on both Putney Beach and Fishermans Beach to be directed towards the spit. This is the primary mechanism that maintains the size and location of the spit.

11.2.3. Potential impacts of the marina

The assessment of the potential impacts of the marina on physical coastal processes provided in the EIS finds that the stability of Putney Beach should not be adversely affected. The introduction of the breakwater structure would reduce the length of the overall Putney–Fishermans Beach coastal compartment and therefore would potentially reduce the long-term fluctuation of the spit location.

Wave refraction around the marina structure would lower the angle of incidence to the beach and locally reduce or reverse potential longshore transport rates. The remaining

section of Putney Beach would adjust to the presence of the structure causing local accretion against the southern breakwater.

The design of the breakwaters as detached structures is predicted to trap beach sand within the openings. Sand would also be trapped in the entrance channel requiring maintenance dredging approximately five-yearly and/or following a tropical cyclone.

The EIS discussed the need to actively manage sand deposits and adjoining beaches including the requirement to bypass the 1500 m³ per year entering the system from Putney Point. Shoreline erosion management plans are proposed as part of the project to assist in mitigating impacts, particularly where property or infrastructure may be affected.

11.3. Maritime transport management

The development of the resort and marina facility would increase marine vessel activity in the region. This would include:

- the 250 boats accommodated in the marina
- regular ferries (estimated 370 passenger movements per day)
- barges and workboats transporting materials, machinery and workers during construction stages
- vessels delivering supplies for the resort or loading construction and operational waste materials
- visiting recreational boats (nearby Rosslyn Bay boat harbour has berths for approximately 400 boats).

The orientation of the entrance channel and the prevailing wind and wave conditions would not be expected to cause particular concerns about navigation safety. However, the expected type and volume of vessel traffic likely to access the marina would require some management attention.

The proponent has committed to a marina management plan as an integral part of the overall resort management responsibilities. MSQ advised that the proponent would be responsible for implementing all maritime safety aspects of the marina operation including vessel traffic management and aids to navigation.

11.4. Coordinator-General's conclusions

Improved marine access to the island is considered to be integral to the proposed development. Apart from allowing safe access for visitors and construction activities, the marine precinct would provide a third focal point for the development and provide opportunities for further marine-based tourism services, such as tours and charters.

I accept that a jetty structure would not have been a sufficient solution to provide access to the island for the proposed visitor population. In addition, engineering of the facility would be difficult considering the five-metre tide range and its exposure to tropical cyclone wave action.

I agree with the findings of the EIS in relation to the most suitable marina location on the island.

The environmental impacts of the marina construction and operation (discussed in section 11) are considered by the proponent to be relatively minor and manageable. However, given its location in an undisturbed part of the island and within the world heritage area, it is critical that all activities within the proposed marine precinct are managed carefully and infrastructure is adequately maintained. I require the following key outcomes as part of the proposed development:

- the total footprint of the Marine Services Precinct is not to exceed 31.5 ha and the site is to be developed generally in accordance with the EIS concept plan (drawing number 3100-SK21/D).
- All proposed works are fit for purpose and are maintained throughout the lifecycle of the development, including breakwater structures and dredged areas.
- Reclaimed land areas must have a finished level of at least 1.5 m above HAT and must be appropriately stabilised prior to any building work
- Minimise risks to navigational safety resulting from the construction and operation of the proposed development. In particular, ensure all necessary maritime safety infrastructure and supporting systems (particularly aids to navigation) are established and maintained throughout the lifecycle of the development
- Minimise potential impacts on the users and lease holders of the Rosslyn Bay boat harbour considering the land-side requirements for both passengers and the transport of goods
- Breakwaters are to be designed and maintained to allow the flow of water between the structure and the shoreline during all stages of the tide equal to and above mean low water
- The undeveloped section of Putney Beach must be actively managed to maintain natural sediment transport processes.

11.4.1. World Heritage impacts

The proposed marine precinct would alter the world heritage landscape of Great Keppel Island. It represents a new urban use that is located apart from the existing developed areas on the island but within their general proximity.

Compared to the current situation, the visual impacts of the proposed development would be significant. Impacts of apartment buildings would be minimised by height limits that keep them below the rocky headland of Putney Point and the height of built form will be consistent with the height of yacht masts. Visual impacts of the apartment buildings would be minimised through the use of subdued colours and tones and by staggering the alignment of the buildings so that they are parallel to Putney Point. Consequently only part of the complex will be visible from within the Putney Beach setting

In addition to the impacts associated with built form, there would also be lighting associated impacts. Construction of the marina would mean a significant change on

Putney Beach from existing dark night condition to a brightly lit area that would be visible from the waters and islands of the GBRWHA.

The 'trailing spit' formation between Putney and Fishermans Beaches is a relatively unusual geomorphological feature within the GBRWHA. There are a few examples of similar features, including the western shoreline of Dunk Island, but not on the same scale. Although the marina structure is proposed to be located within the coastal compartment, the spit area is not directly affected. Any effects on the underlying sediment transport processes that control the geomorphology of the feature are to be maintained by active management of the volumes of beach sand in and around the marina.

Construction of the marina would see the loss of some minor coral outcrops and seagrass areas. This is estimated to include:

- a permanent loss of 10 ha of substrate supporting patchy seagrass with approximately 10 percent cover
- alteration of 20 ha of non-vegetated soft sediment and associated macrobenthos (benthic invertebrates) enclosed within the marina basin
- a permanent loss of approximately one ha of intertidal rocky shore.

The proponent has included an offset proposal to mitigate the impacts on marine ecosystems.

12. Conclusion

In undertaking my evaluation of the EIS, I have considered the following:

- the EIS and SEIS prepared for this project
- submissions on the EIS and SEIS
- the additional information document (SEIS Submission Report dated November 2012).

I am satisfied that the requirements of the SDPWO Act have been met and that sufficient information has been provided to enable the necessary evaluation of potential impacts, and development of mitigation strategies and conditions of approval.

The environmental assessment commenced with the declaration of this project in August 2009 and has involved a comprehensive body of work by the proponent. More detailed work will occur in the detailed design phase of the project.

The potential impacts identified in the EIS documentation and submissions have been assessed. I consider that the mitigation measures adopted by the proponent and required by the conditions stated in this report would result in acceptable overall outcomes. Further, an offsets package has to be provided by the proponent to address residual impacts.

The project is anticipated to provide a significant boost to tourism in the Capricorn Region and would assist to diversify employment and economic activity in the region.

Accordingly, I approve that the project as described in this evaluation report proceed, subject to the conditions in appendices 1 and 2. In addition, it is expected that the proponent's commitments will be fully implemented as presented in the EIS documentation and summarised in Appendix 3 of this report.

To proceed further, the proponent will be required to:

- obtain the relevant development approvals under the Sustainable Planning Act
- finalise and implement the construction and operations environmental management plans
- finalise the environmental offsets package.

If there are any inconsistencies between the project (as described in the EIS documentation) and the conditions in this report, the conditions shall prevail. The proponent must implement all the conditions of this report.

Copies of this report will be issued to the following entities:

- the proponent (Great Keppel Island Resorts Pty Ltd)
- Rockhampton Regional Council
- Commonwealth Minister for Sustainability, Environment, Water, Population and Communities
- Department of Environment and Heritage Protection
- Department of Agriculture, Fisheries and Forestry
- Department of Natural Resources and Mines

Conclusion

- Department of Community Safety
- Department of National Parks, Recreation, Sport and Racing
- Department of Transport and Main Roads.

A copy of this report will also be available on the Department of State Development, Infrastructure and Planning's website at **www.dsdip.qld.gov.au**

This report will generally lapse three years from the date it is publicly notified or when all applications for development approval are decided for the project, unless a later time is decided by the Coordinator-General.

Appendix 1. Stated conditions

This appendix includes the Coordinator-General's stated conditions, under section 39 of the SDPWO Act. 13 These conditions must be attached to a development approval issued under SPA and are taken to be concurrence agency conditions.

The conditions stated do not limit the assessment manager's power to assess the development application. Under section 39(3) of the SDPWO Act the assessment manager may impose conditions not inconsistent with the conditions stated in this report.

Rockhampton Regional Council

Advice: GKIR Plan of Development

The Council has requested that the proponent rewrite the current draft Development Plan using the terms, definitions and structure as prescribed in the Queensland Planning Provision Version 3 (or the latest version at the time of approval).

Condition 1. Development generally

- (a) The total number of accommodation units and total gross floor area shall not exceed the limits set out in Table 3.2 (Built Form Parameters) in Appendix N of the environmental impact statement.
- (b) Accommodation units in the development must not be used as the permanent residence of any person, apart from essential resort employees.

Condition 2. Built form and lighting

The visual amenity and natural environment of Great Keppel Island must be protected by ensuring that the following measures are implemented:

- (a) tones and non-reflective materials and finishes of all buildings are to enhance visual integration with the natural environment of the island
- (b) all roofing materials must be non-reflective
- (c) implementing 'black sky' lighting (that is, no up-lighting) for the development, including roads (excluding any lighting associated with the airstrip necessary to meet Civil Aviation Safety Authority standards or in the event of emergency aircraft landings, or where for the marina in respect to any navigational aides to meet Marine Safety Queensland standards)
- (d) shield external lighting in environmentally sensitive areas within the development to limit extraneous light where necessary or face away from coastal and habitat areas
- (e) apart from the Clam Bay precinct, all development must be limited to a maximum of three storeys which visually integrates with the natural environment's landforms and vegetation of the relevant precincts.

Condition 3. Clam Bay Resort Precinct

- (a) In the Clam Bay precinct:
 - (i) all development must be limited to a maximum of two storeys to visually integrate with the natural environment's landforms and vegetation
 - (ii) areas of native vegetation must be retained or planted through the golf course and between buildings (taking into account requirements for firebreaks) to minimise the visual impact of the development when viewed from the Leekes Beach area
 - (iii) development must be set back at least 200 metres from the Leekes Creek wetland, and
 - (iv) development must avoid, where possible, clearing areas of the native grass *Eriachne stipacea*.

Condition 4. Staging and public safety

- (a) The Marine Services Precinct must be limited to a maximum of 10 accommodation units unless and until:
 - (i) all demolition works within the Fishermans Beach precinct are completed, with the site cleared and made safe, with all waste (including potential asbestos containing materials) removed from the island
 - (ii) a sealed access road to the Clam Bay precinct is constructed allowing conventional vehicular access.
- (b) The development must not be used for short-term accommodation until a permanent water supply from the mainland is connected.

Condition 5. Services

- (a) All physical infrastructure required for essential services to the development must be provided and maintained at no cost to state or local government.
- (b) All development must be connected to a reticulated water supply system and provided with a supply of potable water in accordance with applicable health and safety standards and water for fire fighting purposes.
- (c) All development must be connected to a reticulated sewerage system and sewage is treated and disposed of in accordance with applicable environmental standards.
- (d) Septic tanks must not be installed within the development.
- (e) All development must be provided with refuse collection facilities appropriate to service the development.
- (f) A system of constructed vehicular carriageways, cycle paths and pedestrian paths must be provided to all premises with adequate access including access for service vehicles and emergency vehicles.
- (g) Water and wastewater services provided for the development must be made available for connection to all existing residents of Great Keppel Island. The connection costs are to be borne by parties seeking to connect to this infrastructure. Further, any businesses seeking to connect to water and

wastewater infrastructure are to enter into an agreement in respect to usage and financial terms.

Condition 6. Stormwater

- (a) Stormwater systems must be designed to comply with the Queensland Urban Drainage Manual and the Rockhampton Regional Council's planning scheme and policies, and to:
 - (i) where practicable, make use of stormwater for recycling and water conservation
 - (ii) make use of drainage corridors for improved recreational values and open space or landscape area
 - (iii) avoid local flooding or increased risk to public safety
 - (iv) maintain existing runoff conditions and peak flow rates within existing drainage paths.
- (b) The quality of stormwater from the Great Keppel Island development site must be managed to avoid any contamination of groundwater or surface waters. Stormwater systems must be designed to:
 - (i) comply with the Urban Stormwater Quality Planning Guidelines 2010 (Department of Environment and Heritage Protection), the State Planning Policy for Healthy Waters 2010 (Department of Environment and Heritage Protection), the Queensland Urban Drainage Manual and Rockhampton Regional Council's planning scheme and policies; and
 - (ii) maintain environmental values specified in the Environmental Protection (Water) Policy 2009.
- (c) Stormwater treatment systems must be constructed and maintained so that runoff from all hardstand areas within the Marine Services Precinct and all urban areas in the Putney Creek catchment is filtered prior to discharge into waterways.
- (d) The stormwater designs and runoff assessment must be submitted to the Department of Environment and Heritage Protection and the Rockhampton Regional Council as part of any application for a development permit for operational works, as applicable.
- (e) Where the Queensland Urban Drainage Manual and the Rockhampton Regional Council's planning scheme and policies are in conflict with the Water Cycle Management Report dated 21 October 2011, the Water Cycle Management Report prevails.

Condition 7. Water storages

- (a) All permanent water storages must be constructed in accordance with the Queensland Water Recycling Guidelines (EPA 2005) and the Australian Mosquito Control Manual (Mosquito Control Association of Australia 2002).
- (b) Temporary water storages must be constructed in accordance with the *Water Sensitive Urban Design Technical Design Guidelines* (Healthy Waterways 2006).

Condition 8. Water quality monitoring

- (a) The proponent must develop and implement a water quality monitoring program (WQMP) which is to be designed in accordance with relevant guidelines including the *Queensland Water Quality Guidelines* (DERM 2009), the *Urban Stormwater Quality Planning Guidelines 2010* (DERM), the *State Planning Policy for Healthy Waters 2010* (DERM), the ANZECC/ARMCANZ (2000) Guidelines and the *Water Quality Guidelines for the Great Barrier Reef Marine Park* (GBRMPA 2009). The objective of the WQMP is to ensure that the stormwater discharges from the development do not significantly affect the environmental values of adjacent receiving water bodies.
- (b) The WQMP required in (a) above must be submitted to the Department of Environment and Heritage Protection and Council for review prior to an application for a development permit for operational works.
- (c) As part of the WQMP, the proponent must undertake water quality baseline monitoring of turbidity, sediment pollutant concentrations and other parameters in streams and waterways impacted by the development and in the GBRWHA adjacent to the development.
- (d) The WQMP must include at least one monitoring point in the Leekes Creek estuary.
- (e) The findings of the WQMP must be made publicly available and preferably published on a website.

Condition 9. Environmental Management Plans

- (a) The proponent and/or its contractor(s) must finalise the environmental management plans (EMPs) for construction and operational management to the satisfaction of DEHP and Council prior to the issue of a development permit for operational works.
- (b) The EMP must take account of the results of investigations and plans developed in accordance with other conditions relating to the development.
- (c) The EMP must include practical measures that minimises the interaction between construction activities and tourism uses.
- (d) The EMP must include specific measures to minimise risks to marine ecosystem health by activities in the marina and must include response plans for a fuel/contaminant spill event and introduction of marine pests.
- (e) The proponent and/or its contractor(s) must comply with all requirements of approved EMPs.
- (f) The proponent and/or its contractor(s) must regularly review the EMP and implement further or alternative mitigation measures in response to monitoring results, where non-conformance is notified and corrective action is required.

Department of Transport and Main Roads

Condition 10. Maritime operations

(a) To ensure the safety of vessels and the marine environment, the proponent must develop a management plan, in accordance with the *Maritime Safety Queensland guidelines for major development proposals*, for the following:

- (i) vessel traffic management
- (ii) ship-sourced pollution prevention
- (iii) project-related maritime traffic aids to navigation

The plan is to be submitted to Maritime Services Queensland for approval, prior to the commencement of project construction.

(b) To ensure that issues of accessibility and traffic management at Rosslyn Bay boat harbour, as impacted by the development, are addressed, the proponent must:

- (i) consult with the Department of Transport and Main Roads regarding the development of strategies to manage access, traffic and parking issues for both the construction and operational phases of the project
- (ii) submit a marina management plan to the Department of Transport and Main Roads for review and approval prior to the commencement of project construction
- (iii) implement the approved strategies during project construction and operation, unless otherwise agreed with the Department of Transport and Main Roads.

Department of Community Safety

Condition 11. Natural Hazards

- (a) A risk assessment must be completed in consultation with the Department of Community Safety and Council in accordance with the State Planning Policy 1/03: Mitigating the adverse impacts of flood, bushfire and landslide (SPP 1/03) Guideline.
- (b) The proponent must prepare a Bushfire Management Plan which complies with the requirements of Appendix 5B of the SPP 1/03 guideline. The plan must be completed by a suitably qualified professional and must consider the dual requirement to retain areas of native vegetation within the Clam Bay Precinct (to minimise visual impact) and to ensure sufficient firebreaks are provided.
- (c) If flood or landslide hazard is present, the development must comply with the relevant provisions of the SPP 1/03 Guideline for buildings and structures and community infrastructure.

Condition 12. Emergency management

- (a) The proponent must provide for the safety of visitors and staff during, and immediately after, emergency events. Emergency events include tropical cyclones, local flooding, fire or any other serious disruption that requires a coordinated response by State or local government entities.

- (b) Emergency management and contingency planning must be developed and implemented, for all stages of the project. Plans must be developed in consultation with the Department of Community Safety, Queensland Police Service, Queensland Fire and Rescue Service (QFRS) and Council. Sufficient resources are to be allocated to ensure that emergency response does not significantly affect the resourcing of regional emergency services agencies and Council. At minimum, measures shall include:
- (i) fire fighting equipment and associated systems
 - (ii) at least one cyclone shelter constructed to withstand a category five storm event
 - (iii) provision of staff training and visitor induction
 - (iv) a paramedical service on site
 - (v) facilities and equipment to enable the transporting of patients from the island including possible landing sites for both the rescue helicopter service and fixed wing aircraft services, if required.

Advice: The siting, design and construction of cyclone shelters should take into account *Design Guidelines for Queensland Public Cyclone Shelters*, available from www.hpw.qld.gov.au/construction/Projects/CycloneShelters/Pages/default.aspx

Condition 13. Queensland Police Service

To ensure an appropriate police presence on the island, the proponent must provide the following, at no cost to government, prior to commencing operations:

- (a) radio communications facilities comprising suitable site and provision of a standalone communications tower
- (b) office space for up to four police, should an incident occur on the island which requires an extended operational police presence for a period of time
- (c) accommodation, should there be a need for a police presence for an extended period
- (d) a vehicle to be made available upon request to assist the operational requirements of the Queensland Police Service on the island
- (e) a marina berth for a 22-metre police catamaran (9 m beam) with 3 phase power (32 amp) and potable water supply.

Condition 14. Fire safety

As part of detailed building design work, the proponent must consult with the QFRS on the design of any fire systems to be installed within the development, including construction accommodation facilities.

Department of Natural Resources and Mines

Condition 15. Performance guarantee bond—Marine Services Precinct

- (a) The proponent must provide to DNRM, prior to commencement of construction, a performance guarantee bond for the development.

- (b) The bond noted in (a) above is surety for the restoration of the Marine Service precinct development site to its pre-development condition should construction not be completed in accordance with the relevant development permits.
- (c) The bond must include a provision for long-term environmental impact mitigation measures required under state and Australian Government approvals.

Advice: The amount of, and arrangements relating to, the performance guarantee bond for the development should be negotiated with DNRM in consultation with the Office of the Coordinator-General.

Condition 16. Acid sulfate soils

- (a) Acid sulfate soil investigations for proposed disturbances must be conducted in accordance with:
 - (i) *State Planning Policy 2/02 Guideline: Planning and Managing Development involving Acid Sulfate Soils*
 - (ii) *the Guideline for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland* (Ahern et al. 1998).
- (b) If acid sulfate soil is identified in land or marine areas to be excavated or filled, a site specific acid sulfate soils management plan (ASSMP) must be prepared in consultation with DNRM and approved by DNRM prior to any on ground disturbance. Dredging and disposal of marine sediments containing potential acid sulphate soils must also be undertaken in accordance with the ASSMP and incorporated into a Dredge Management Plan (DMP). Preparation of the ASSMP must be conducted in accordance with:
 - (i) the SPP 2/02 Guideline, Planning and Managing Development involving acid sulfate soils
 - (ii) the Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines (Dear et al. 2002) or latest version.

Condition 17. Groundwater management

- (a) All activities within the development site are to be managed to protect groundwater resources and avoid degradation of groundwater dependent ecosystems and vegetation. Specific measures are to be implemented to avoid:
 - (i) contamination from recycled water irrigation
 - (ii) contamination from leakage or runoff from surface activities including chemical and/or fuel storage
 - (iii) salt-water intrusion through over-extraction of groundwater
 - (iv) reduction in water supply available for existing users.
- (b) Groundwater may be extracted from the Long Beach aquifer for use in the initial construction phase of the development until a water supply from the mainland is commissioned.
- (c) Flow rates in bores should be regulated and monitored regularly to ensure the sustainable long term yield of the borefields are not exceeded for more than one month.

- (d) All bores must be constructed and maintained at all times in accordance with the latest edition of the standard 'Minimum construction requirements for water bores in Australia' that is current at the time of construction. Any subsequent decommissioning of water bore must also be carried out in accordance with the latest edition of that same standard that is current at the time of decommissioning
- (e) Steel protective covers and a fence should be installed around each bore location to restrict general public access, potential vandalism, and protect the quality of the groundwater resource.
- (f) Groundwater monitoring requirements include:
 - (i) groundwater level monitoring within PB1, PB2, MB10, Long Beach Bore 1 monitoring bore, and Long Beach pump house monitoring bore on a fortnightly basis for the first 6 months of borefield operation, and then every 2 months thereafter
 - (ii) monitoring of groundwater pH and EC using hand held calibrated meters within PB1, PB2, MB10, Long Beach Bore 1 monitoring bore, and Long Beach pump monitoring bore on a monthly basis for the first 12 months of borefield operation, and then every 3 months thereafter
 - (iii) monitoring of groundwater quality (at least EC, pH, ammonia, total nitrogen, nitrate heavy metals and E.coli) within the production bores is to be carried out every 6 months
 - (iv) current rainfall monitoring should be continued
 - (v) the monitoring data should be recorded and reviewed by a qualified hydrogeologist every 12 months.
- (g) The proponent must report on the above matters to the Department of Natural Resources and Mines (DNRM) Chief Executive including:
 - (i) a final construction groundwater report, including investigative, operational and monitoring reports within 60 business days from the end of the initial construction phase of the development.
 - (ii) an annual report on groundwater levels and quality relating to ongoing monitoring data within 60 business days at the end of each calendar year.

Condition 18. Property vegetation management plan

- (a) The clearing of remnant vegetation associated with the project must be avoided and minimised.
- (b) Ensure any exempt clearing of native vegetation associated with the development is exempt under Schedule 24 of the Sustainable Planning Regulation 2009.
- (c) A property vegetation management plan (PVMP) must be prepared by stage (or whole of development) by a suitable qualified professional and provided to and approved by the Chief Executive administering the *Vegetation Management Act 1999* as a requirement of an Operational Works development application. The PVMP must include, but not be limited to the following:
 - (i) the purpose for clearing

- (ii) details on how the clearing of vegetation has been avoided or minimised
 - (iii) the location and confirmation of the full extent of the areas proposed to be cleared
 - (iv) details of how the proposed clearing meets the performance requirements of the relevant Regional Vegetation Management Code (the Brigalow Belt and New England Tableland Bioregion Code)
 - (v) a vegetation offset proposal consistent with the relevant policy for Vegetation Management Offsets.
- (d) The offset proposal must include:
- (i) how the proposed operational works have been designed and located on the lot/s to avoid and minimise the extent of impact
 - (ii) the number of hectares needing to be offset for each performance requirement criteria under the relevant code
 - (iii) the availability of offset areas within the landscape (Bioregion) which meet the Vegetation Management Offsets Policy for each performance requirement
 - (iv) if Offset Transfer is proposed:
 - (A) provide DNRM with a copy of a legally executed contractual agreement with an offset broker (Broker agreement)
 - (B) enter into an agreement with DNRM whereby DNRM confirms approval of the broker agreement, and the applicant provides financial surety in the form of an unconditional bank guarantee.
- (e) If a Development Approval is issued and it is proposed that the offset is to be provided by way of an Offset Transfer, then within 12 months of the date upon which the Development Approval is issued by the State of Queensland, the applicant must legally secure the offset area that meet the requirements set out in the relevant Policy for Vegetation Management Offsets, and provide an Offset Area Management Plan in accordance with clause 8.5.3 of the Vegetation Management Offsets Policy.

Note: Where duplication of offsets occurs between Queensland State Government and Australian Government offsets, satisfaction of Australian Government offsets is taken to satisfy Queensland State Government offsets to the extent of the duplication.

Advice: Prior to the lodgement of any development application, the applicant may apply for a Property Map of Assessable Vegetation (PMAV) to change the regional ecosystem mapping if any inaccurate mapping data is identified whilst ground truthing.

Condition 19. Indigenous Cultural Heritage

The proponent must submit a Cultural Heritage Management Plan (CHMP) prepared in consultation with the traditional owners to DNRM for approval prior to commencing development.

Department of Environment and Heritage Management

Condition 20. Environmental protection precinct

The Environmental Protection Precinct must be enhanced and protected by:

- (a) rehabilitating vegetation (including weed control) in the areas within the Environmental Protection Precinct where the natural environment is degraded and requires enhancement
- (b) construct and maintain walking tracks to ensure visitor safety and minimise risk of environmental degradation through uncontrolled access
- (c) managing visitor access to minimise impacts on native vegetation, beaches, areas of essential habitat and other environmentally sensitive areas
- (d) regular monitoring of beaches, areas of essential habitat and other environmentally sensitive areas.

Condition 21. Heritage site—Leekes Homestead

- (a) A Conservation Management Plan (CMP) pertaining to Queensland Heritage Register (QHR) Place identified as # 601216 “Leekes Homestead”, must be prepared and approved by the administering authority prior to the commencement of construction.
- (b) The CMP must include:
 - (i) a structural assessment of the homestead and any other structures within the place
 - (ii) a landscape and tree management plan including management options for the hoop pine which is currently supporting one corner of the building
 - (iii) measures to address any potential impacts on the aesthetic significance of the Place including views to and from the ‘Place’
 - (iv) consideration of all aspects of the pastoral history of the ‘Place’ and how these relate to the State-listed heritage place including the pastoral and settlement history of Barrier Reef islands
 - (v) detailed arrangements for storage, care and conservation of all documents, photographs, diaries, furnishings and other moveable heritage items associated with the Homestead and pastoral activity, including preparation of copies and lodgement with relevant library or archive, in accordance with the Department of Environment and Heritage Protection archival recording guideline:
www.ehp.qld.gov.au/heritage/documents/gi_archival_recording.pdf
- (c) In the event of any new information being identified relating to the Homestead and associated pastoral activity on Great Keppel Island, the CMP should state whether a recommendation should be made to the Queensland Heritage Council to amend the boundary of the State Heritage Place with respect to any additional features on the island.
- (d) The approved CMP must be implemented from commencement of construction.

Department of National Parks, Recreation, Sport and Racing

Condition 22. Marine park management

- (a) The proponent must conduct regular monitoring of coral communities and marine ecosystem health in at least six locations around the island, at least annually. Monitoring results are to be made publicly available and preferably published to a website.
- (b) To manage risk of degradation of inshore marine areas in the vicinity of Great Keppel Island, the proponent must contribute to the management of the marine park (monetary and/or in-kind) to at least the equivalent of the following:
 - (i) A marina berth to be made available for a marine parks vessel.
 - (ii) Installation and maintenance of marine parks signage and marker buoys around the island.
- (c) The requirements in (b) would not be additional to any monetary contributions to marine park management imposed by the Australian Government.

Department of Agriculture, Forestry and Fisheries

Development approvals

Development approvals must be sought for any part of the proposal that impacts marine plants, fish habitats or includes waterway barrier works.

Condition 23. Fisheries Offsets

- (a) Disturbance to fish habitats as a result of this development must be offset in accordance with Queensland Government Environmental Offset Policy and sub-policy, 'Fisheries Habitat Management Operational Policy - Mitigation and Compensation for Works of Activities Causing Marine Habitat Loss'.
- (b) The offset must be included in a deed, or other formal written agreement between the State of Queensland acting through DAFF and the proponent. The proponent must ensure the offset Deed, or other formal written arrangement, must be executed by both parties within 12 months of the commencement of construction, unless otherwise agreed to in writing by both parties.

Note: Where duplication of offsets occurs between Queensland State Government and Australian Government offsets, satisfaction of Australian Government offsets is taken to satisfy Queensland State Government offsets to the extent of the duplication.

Condition 24. Waterway barriers

The proponent must meet DAFF requirements for waterway barriers, proposed creek crossings or in-stream infrastructure at the detailed planning stages and during construction and operation of the development

Appendix 2. Conditions to be attached to a preliminary operational works approval under the Sustainable Planning Act 2009

Schedule 1. Operational Works—Dredging

Conditions for Development Approval under the *Sustainable Planning Act 2009* (SPA) for operational works that are tidal works (dredging) for the marina and access channel. The administering authority for these conditions is the Department of Environment and Heritage Protection.

1. Development approval under the *Sustainable Planning Act 2009* for operational works that are tidal works or prescribed tidal works associated with dredging for the marina and access channel, shall be a preliminary approval.
2. All dredging works are to be conducted as generally described by the environmental impact statement.
 - 2.1. The boundary of the marina basin shall be generally in accordance with Drawing 3100-SK21/E (International Marina Consultants)
 - 2.2. Dredged depths in the marina and entrance channel are not to exceed –4.0 m LAT
 - 2.3. Dredged material that is clean sand (as determined by the administering authority) and not required for the marina construction shall be placed in the active zone of the southern part of Putney Beach at a location approved by the administering authority.
 - 2.4. Dredged material that is not clean sand may not be placed below the HAT
 - 2.5. Dredging operations, and marine waters receiving dredge material or the discharge water from dredge material disposal, must be fully enclosed by fixed sediment curtains and/or coastal structures (as practicable) in order to limit the release of sediment to waters outside the boundary of the construction activities.
3. All tidal works (dredging) associated with the Great Keppel Island Resort Project must be managed appropriately to avoid any release of untreated acid sulfate material, and particularly to avoid contamination of groundwater or surface water.
 - 3.1. A comprehensive acid sulfate soil investigation must be completed prior to approval of works to determine if acid sulfate soil or organic acidity is present in material to be excavated or disturbed that is associated with the marina and access channel. The acid sulfate soils survey must be undertaken to comply with all current and relevant legislation, policies, guidelines and manuals which includes, but is not limited to the following:

- Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland 1998; and
 - State Planning Policy 2/02 Guideline Acid Sulfate Soils.
- 3.2. If acid sulfate soil or organic acidity is found in material to be excavated or disturbed then an acid sulfate soil management plan must be provided in support of any application for a development permit for operational works.
- 3.3. The acid sulfate soil management plan must be prepared by a suitably qualified professional and be in accordance with all current and relevant legislation, policies, guidelines and manuals which includes, but is not limited to the following:
- State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils;
 - State Planning Policy 2/02 Guideline Acid Sulfate Soils; and
 - Instructions for the Treatment and Management of Acid Sulfate Soils.
4. All dredging associated with the marina and access channel must be managed appropriately to minimise impacts on water quality and ecological values by incorporating sustainable dredging practices.
- 4.1. A detailed dredge management plan is to be prepared by a suitably qualified professional and provided to the administering authority in support of an application for development approval for operational works (tidal works involving dredging). The dredge management plan shall include, but not be limited to the following:
- a. detailed plans showing the boundary of the land to be dredged; the extent and depth of dredging; the foreshore and the line of the high-water mark
 - b. a hydrographic survey of the area to be dredged on lines not more than 20 metres apart
 - c. the location(s) of placement of capital and maintenance dredge material, estimated volumes, and details of material containment and dewatering system(s) design including engineering certification of containment system design
 - d. management strategies and defined actions to ensure that impacts on marine fauna are minimised, including further information on the turtle 'coves' proposed within or adjacent to the navigation channel
 - e. alternative disposal options, for maintenance dredge material that is too fine to use for beach nourishment, or that may contain contaminants
 - f. the water quality objectives relevant to potentially affected marine ecosystems based on at least 12 months of water quality data (at least turbidity and TSS, nutrients, metals and metalloids)
 - g. turbidity monitoring data at potentially affected seagrass and coral communities for a range of sea states and tides that could be expected during construction

- h. mapping showing the estimated extent of water quality change, particularly total suspended sediment (TSS) and turbidity, as a result of dredging and dredge material disposal activities
 - i. the potential impact of changed water quality on marine ecosystems, and especially seagrass and coral communities, defined in terms of level of impact (high, medium, and low with associated definition) based on the intensity, duration and frequency of adverse water quality conditions
 - j. management strategies and defined actions to ensure that impacts on water quality and dependant marine ecosystems do not exceed that stated in the management plan
 - k. dredge material drain water discharge locations, volumes, water quality monitoring parameters and discharge limits (including pH, turbidity and metals/metalloids)
 - l. monitoring locations, water quality parameters and triggers/limits to be applied to inform the management of dredging and limit impacts to marine ecosystems outside the project boundary.
 - m. water quality monitoring must include continuous recording of turbidity at a site near Passage Rocks throughout the construction period.
- 4.2. The dredge material must be assessed for contaminants in accordance with the National Assessment Guidelines for Dredging (NAGD) (DEWHA 2009) or as approved by the administering authority.
- 4.3. The results of the maintenance dredge material contaminant and particle size assessment must be provided to the administering authority at least one month prior to commencement of maintenance dredging.
- 4.4. All dredge material from maintenance dredging shall be placed in the active zone of the southern part of Putney Beach, unless the administering authority determines that any part of the material is unsuitable for the purpose based on an assessment of the particle size and contaminant levels in the material prior to dredging.
5. All dredged areas are to be maintained in proper operational condition until their decommissioning.
- 5.1. Hydrographic surveys of the navigable areas within the entrance channel and marina basin must be conducted at least bi-annually
- 5.2. The minimum depths in navigable areas within the entrance channel and marina basin must be maintained to between –2.5 m and –3.5 m LAT per the Coastal Environment Technical Report dated May 2012 v07 prepared by Water Technology Pty Ltd.

Schedule 2. Tidal works associated with the marina other than dredging for the marina and access channel

Conditions for Preliminary Development Approval under the *Sustainable Planning Act 2009* (SPA) for operational works that are tidal works or prescribed tidal works associated with the marina other than dredging for the marina and access channel.

The administering authority for these conditions is the Department of Environment and Heritage Protection.

1. Development approval under the *Sustainable Planning Act 2009* for operational works that are tidal works or prescribed tidal works associated with the marina, other than dredging for the marina and access channel, shall be a preliminary approval.
2. All tidal works (other than dredging) are to be designed and constructed as generally described by the environmental impact statement.
 - 2.1. The location and design of the marina shall be generally in accordance with Drawing 3100-SK21/E (International Marina Consultants) and information contained in the environmental impact statement.
 - 2.2. Breakwater structures are to be designed and constructed to withstand a 2% AEP storm event, taking into account predicted 2100 climate conditions and 0.8 m sea level rise.
 - 2.3. The seaward extent of all revetment structures must be landward of the line of the mean low water mark.
 - 2.4. Finished levels of reclaimed land areas must exceed a level corresponding to at least 1.5 m above HAT.
3. All tidal works associated with the marina must be undertaken and managed appropriately to minimise impacts on water quality and ecological values
 - 3.1. The following information must be provided to the administering authority in support of an application for development approval for operational works (tidal works or prescribed tidal works other than dredging) associated with the marina:
 - a. layout and cross sectional drawings (by a Registered Professional Engineer of Queensland) of the marina, including levels relative to Australian Height Datum for reclamation or filling, and the Putney Creek entrance to the marina
 - b. details of materials to be used in the revetment walls and reclamation
 - c. details of construction methodology and any temporary construction works
 - d. any requirement for bed levelling before placement and filling of the geotextile tubes
 - e. means by which the geotextile tubes will be held in place during filling
 - f. the permeability of the geotextile tubes and the expected solids to water ratio of the dredge material
 - g. the longevity/durability of the geotextile tubes under constant weight loading (e.g. rock armour)
 - h. the possible re-suspension of sediments during filling and placement activities.
 - 3.2. Any pile driving at times when the pile is partly submerged in tidal waters shall be subject to the following measures to minimise the impacts of underwater noise on marine fauna:

- a. piling shall not commence if dolphins, dugongs or turtles are sighted within 500 metres of the works (the safety zone) based on a minimum pre-piling observation time of 30 minutes and ongoing monitoring during pile driving operations
 - b. start-up of piling shall increase the force of piling from minimum to maximum force over a three minute period
 - c. piling shall cease if dolphins, dugongs or turtles are observed within the safety zone
 - d. piling shall not recommence until dolphins, dugongs or turtles sighted within the safety zone are observed to leave the safety zone or are not sighted for at least 10 minutes
 - e. the underwater noise from piling operations shall be recorded at a location not more than 500 metres from the piling activity at a location agreed with the administering authority.
- 3.3. Construction activities below the limit of highest astronomical tide shall be fully enclosed by fixed sediment curtains and/or revetment walls at all times in order to limit the release of sediment to waters outside the boundary of the construction activities.
4. All tidal works (other than dredging) are to be maintained in their proper operational condition until decommissioning.
- 4.1. The structural integrity of all breakwater structures, particularly the crest levels and seaward armour layers, must be maintained to 'as constructed' standard.
 - 4.2. All aids to navigation must be maintained to operate to their design standard.
 - 4.3. Publicly accessible areas (such as wharves and boardwalks) seaward of the high water mark must be maintained for the operational life of the precinct to ensure public safety and visitor amenity.
5. The coastal processes of Putney Beach must be managed to maintain the natural movement of beach sand within the littoral system.
- 5.1. Breakwaters are to be designed and maintained to allow the flow of water between the structure and the shoreline corresponding to the mean low water level.
 - 5.2. A shoreline erosion management plan is to be prepared for Putney Beach by a suitable qualified professional and provided to the administering authority in support of an application for development approval for operational works (tidal works not involving dredging). The shoreline erosion management plan shall include, but not be limited to the following:
 - a. a description of historical changes in Putney Beach
 - b. a regular beach monitoring program
 - c. an evaluation of the fate of the placement of clean sand derived from maintenance dredging and/or sand bypassing operations
 - d. contingency measures to address severe beach erosion that may be attributed to the effects of the marina.

Schedule 3. Prescribed tidal works associated with modification of the lower section of Putney Creek

Conditions for Development Approval under the *Sustainable Planning Act 2009* for operational works that are tidal works or prescribed tidal works associated with modification of the lower section of Putney Creek.

1. Development approval under the *Sustainable Planning Act 2009* for operational works that are tidal works or prescribed tidal works associated with modification of the lower section of Putney Creek shall be a preliminary approval.
2. All tidal works associated with Putney Creek must be undertaken and managed appropriately to minimise impacts on water quality and ecological values.
 - 2.1. The following information shall be provided to the administering authority in support of an application for development approval for operational works (prescribed tidal works) associated with modification of Putney Creek:
 - a. plans showing the location and design of modifications to the lower section of Putney Creek and discharge of the creek into the marina;
 - b. the expected flow velocities through Putney Creek after the proposed modifications;
 - c. estimated sediment loads in the Putney Creek flows;
 - d. sediment trap design criteria and trapping efficiency; and
 - e. frequency of removal, estimated volume, and proposed assessment and disposal of material from the sediment trap.
 - 2.2. Prior to commencement of the works conduct an investigation into the likelihood of any contaminants in the Putney Creek catchment that are, or may become exposed to tidal waters. Where practicable, remove or isolate any potential contamination sources from contact with tidal waters.
 - 2.3. Monitor the water quality within Putney Creek before, during and after the works
 - a. monitoring is to include at least three key locations in Putney Creek and at least one location adjacent to the Creek's entrance in the marina basin
 - b. monitoring at key locations is to be conducted at least weekly during the works and for three months immediately following completion of the works and then over two successive wet seasons (December to March inclusive)
 - c. monitoring of water quality must include appropriate water quality parameters to detect pollutants associated with landfill, refuse and sewage.
 - 2.4. Install fixed sediment curtains near the entrance of Putney Creek during and for a period of at least three months after completion of the works to limit the release of suspended sediments to marine waters

- 2.5. Prepare a contingency plan for any remedial actions in Putney Creek or its catchment that may be necessary to avoid risks to marine ecosystem health.
- 2.6. Where water quality monitoring in the marina basin indicates exceedence of WQO trigger levels, install a temporary barrier and conduct an investigation into the source of any contaminants in the Putney Creek catchment. Where practicable, remove or isolate any sources of contaminants in the Putney Creek catchment prior to removal of the temporary barrier.

Appendix 3. Conditions to be attached to a development approval for the commencement of environmentally relevant activities

ERA 63 – Sewage Treatment

Conditions for Development Approval under the *Sustainable Planning Act 2009* (SPA) for material change of use involving environmentally relevant activity (ERA) 63 – Sewage Treatment

The administering authority for these conditions is the Department of Environment and Heritage Protection.

Development approval under the *Sustainable Planning Act 2009* for a material change of use involving Environmentally Relevant Activity 63 – Sewage Treatment shall be a preliminary approval.

Site Location, Layout and Design

The holder of this approval must provide the following information to the administering authority prior to the commencement of ERA 63 at any location subject to this approval:

- lot on plan description for the area subject to the approved activity at each location the activity is carried out;
- a plan(s) showing cadastre, site boundaries, location of equipment;
- a plan(s) showing the location of all stormwater management system components;
- a plan(s) showing location of points of contaminated water discharge to any waters or lands; and
- the peak design capacity of the sewage treatment plant at the site including the equivalent persons effluent capacity and kilolitres of sewage generated per day to be treated under peak dry weather flow conditions.

Notification of Environmental Incidents – Duty to Notify

The holder of this approval must notify of environmental incidents in accordance with section 320 to section 320G of the *Environmental Protection Act 1994*.

Schedule of Conditions:

SCHEDULE A - General

- (A1) This approval authorises the following activities to be conducted;
- (a) operating sewage treatment plants, other than on-release works, with a total peak design capacity of 1500 to 4000 Equivalent persons; and
 - (b) releasing treated effluent via an irrigation scheme.

Site Plans

- (A2) Within 60 days of commencing operation under this approval, a scaled copy of the “as constructed plans” for the site must be forward to the administering authority. The plans must include all sewerage infrastructure, materials storage areas, pump stations and wet weather storages.

Flooding

- (A3) The operator must ensure that essential operational components of the sewage treatment plants are not constructed in a way which results in a failure of these components in the event of a one-in-100-year flood event.
- (A4) The operator must ensure that sewage treatment plants are constructed so that storm and flood waters can not enter the pump wells or treatment infrastructure (excluding ponds).

Records

- (A5) If a condition of this approval requires the person undertaking the activity to which this approval relates to make or keep a record (however described), or prepare a document³², the person must:
- (a) keep the record or document at the approved place
 - (b) keep the record or document in a place that is accessible by all persons engaged in the activity
 - (c) produce the record or document for inspection by an authorised person or the administering authority for inspection if requested
 - (d) for each document or record made or created in response to a monitoring requirement, reporting requirement, investigation or incident—keep the record for a minimum of five (5) years from the date the document is made or created
 - (e) if the record or document is sent (in any form) to the administering authority—keep a copy of the document at the approved place in a way that is accessible to any person engaged in the activity at the approved place.

Maintenance of Measures, Plant and Equipment

- (A6) The operator must:
- (a) maintain all measures, plant and equipment in an effective condition and keep records of the maintenance, and
 - (b) operate such measures, plant and equipment in an effective manner.

Trained/experienced Operator(s)

- (A7) The **operator** must ensure that the daily operation and maintenance of sewage treatment plant(s) is carried out by a person with experience and/or qualifications appropriate to ensuring the effective operation of the pumping station.

³² Note: Unless a condition of this approval requires a document to be made or kept in a specific format (e.g. in hardcopy), the *Electronic Transactions (Queensland) Act 2001* applies to the document.

Equipment Calibration

- (A8)** The operator must ensure that all instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this approval are calibrated, operated and maintained in accordance with the manufacturer's specifications

Site Based Management Plan

- (A9)** From commencement of an ERA to which this approval relates, a Site Based Management Plan (SBMP) must be implemented. The SBMP must identify all sources of environmental harm, including but not limited to the actual and potential release of all contaminants, the potential impact of these sources and what actions will be taken to prevent the likelihood of environmental harm being caused. The SBMP must also provide for the review and 'continual improvement' in the overall environmental performance of all ERA's that are carried out.

The SBMP must address the following matters:

- (a) environmental commitments—a commitment by senior management to achieve specified and relevant environmental goals
 - (b) identification of environmental issues and potential impacts
 - (c) control measures for routine operations to minimise likelihood of environmental harm
 - (d) contingency plans and emergency procedures for non-routine situations;
 - (e) organisational structure and responsibility
 - (f) effective communication
 - (g) monitoring of contaminant releases
 - (h) staff training
 - (i) record keeping
 - (j) complaint management
 - (k) periodic review of environmental performance and continual improvement.
- (A10)** The SBMP must not be implemented or amended in a way that contravenes any condition of this approval.

Annual Monitoring Report

- (A11)** An annual monitoring report must be prepared and submitted to the administering authority accompanying the submission of the annual return. This report shall include but not be limited to:
- (a) a summary of the previous twelve (12) months monitoring results obtained under any monitoring programs required under this approval and, in graphical form showing relevant limits, a comparison of the previous twelve (12) months monitoring results to limits stated in this approval and to relevant monitoring results in preceding years;
 - (b) an evaluation/explanation of the data from any monitoring programs;

- (c) a summary of any record of quantities of releases required to be kept under this approval;
- (d) a summary of the record of equipment failures or events recorded for any site under this approval;
- (e) an outline of actions taken or proposed to minimise the environmental risk from any deficiency identified by the monitoring or recording programs;
- (f) throughput volumes/tonnages for the financial year if applicable to this ERA; and
- (g) a summary of any trade waste agreements entered into or amended during the year.

Notifiable release

- (A12)** The operator must notify the administering authority via the 24 hour Pollution Hotline or the district office no later than three hours after becoming aware of a sewage release that:
- (a) poses a threat to public health (for example, contamination of waters with primary recreation values);
 - (b) results in any observable environmental impact (for example, fish kill, distress to wildlife, marine plants or other aquatic life);
 - (c) discharges to, or is likely to impact, a sensitive environment (for example, Ramsar wetland, marine park, or area designated as a conservation zone under a relevant planning scheme); or
 - (d) is 10 000 L or more during dry weather.
- (A13)** Within 24 hours after becoming aware of a notifiable release in accordance with condition A13, email or written notification of the release must be submitted to the administering authority outlining the event, its nature and the circumstances in which it happened.
- (A14)** A final report must be provided to the administering authority within 14 business days of the conclusion of the spill response and remediation of a notifiable release, but no later than 20 business days after the commencement of the release.

General release reporting

- (A15) All releases must be reported to the administering authority in the form of an annual report by 30 September covering the period 1 July – 30 June of the previous year.
- (A16) Annual reports outlining all releases in accordance with condition A16 must clearly identify:
- (a) the number of releases;
 - (c) the volume (or estimate of the volume) of each release;
 - (d) the location of each release; and
 - (e) if the release was reported under ss. 320-320G of the *Environmental Protection Act 1994*.

Monitoring

- (A17) The operator must ensure that all monitoring, assessments and reports required by this approval are conducted by a person with appropriate experience and/or qualifications. Water quality monitoring must be undertaken in accordance with the administering authority's Water Quality Sampling Manual and other relevant standards.

Sewage Treatment Works

- (A18) The sewage treatment works are to be designed, constructed and operated consistent with an advanced wastewater treatment plant, with treatment quality achieving Class A+ standard, consistent with the specification provided in the Queensland Water Recycling Guidelines 2005.

End of Schedule A

SCHEDULE B - Air

Odour Nuisance

- (B1) The release of noxious or offensive odours or any other noxious or offensive airborne contaminant(s) resulting from the ERA must not cause an environmental nuisance at any nuisance sensitive place.
- (B2) When requested by the administering authority, odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any nuisance sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring. Monitoring must be carried out at a place(s) relevant to the potentially affected odour sensitive place and at upwind control sites and actions must:
- (a) address the complaint including the use of appropriate dispute resolution if required; and/or
 - (b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.

End of Schedule B

SCHEDULE C - Water

Release to Waters (contaminants)

- (C1) Unless expressly permitted under this approval and subject to any exemption, restriction or proviso about the release of the contaminant under that condition, contaminants must not be released to waters.

Stormwater Management (contaminants)

- (C2) Suitable banks, structures and/or diversion drains must be installed and maintained to exclude stormwater runoff from entering any structures used for the storage of contaminants or wastes.
- (C3) There must be no release of stormwater runoff that has been in contact with any contaminants at the site to any waters, the roadside gutter or stormwater drain.

Back up Power and Alarms

- (C4) There must be sufficient backup power available to operate the sewage treatment plant, associated infrastructure, alarms and any instrumentation.
- (C5) Sewage pump stations must be fitted with stand-by pumps and pump-failure alarms and/or telemetry, as well as high-level alarms to warn of imminent pump station overflow.
- (C6) All alarms and telemetry systems must be able to raise an alarm should mains power failure occur at the pump station and sewage treatment plant. When triggered the alarm must be reported to the appropriate person to respond to the failure.

- (C7) The operator must test and validate the alarm system at least once per month and maintain a log of all alarm testing, faults identified and remedial action taken.

Emergency response plan

- (C8) The operator must comply with an emergency response plan prepared prior to the commencement of this activity.

The emergency response plan must provide for:

- (a) an implementation manual;
- (b) staff training;
- (c) identification of the part of the environment to which a sewage release may occur (for example, for water bodies, a description of where contaminants may enter the particular water body);
- (d) remediation and clean up of areas affected by sewage releases;
- (e) receiving environment (surface waters/land) monitoring program for all notifiable releases to examine and assess environmental impacts; and
- (f) ongoing investigation and review to establish the cause of sewage releases, initiate corrective and/or preventative measures, and report on the effectiveness of such corrective and/or preventative measures.

Network Management

- (C9) On commencement of operation of a sewage treatment plant(s), an ongoing Network Management Strategy for discharges from the sewage treatment works must be implemented. The Network Management Strategy must address the following:

- (a) infiltration management plans to minimise the amount of infiltration to the sewerage system; and
- (b) maintenance plans to ensure the function and integrity of sewerage infrastructure.

Volumes and Flows

- (C10) The daily volume and flow rate of sewage entering the Sewage Treatment Plant must be determined or estimated by an appropriate method with an accuracy of +/- 5%, for example a calibrated flow meter, and records must be kept of such determinations.

Bypassed flows

- (C11) The quantity of bypassed flows must be measured and recorded for each bypass event.
- (C12) A written procedure must be developed for initiating the Sewage Treatment System bypass lines for maintenance purposes. The procedure must clearly detail triggers for initiating the bypass system, operational processes for returning to normal operations and control mechanisms to ensure the bypass system is not accidentally initiated or left on.

Wet Weather Storages

- (C13)** When conditions prevent the irrigation of effluent to land (such as during or following rain events), the effluent must be directed to a wet weather storage.
- (C14)** Wet weather storage ponds with a capacity of at least 44ML (including a 7ML storage buffer to account for potential increase in rainfall intensity due to climate change) must be installed prior to the commencement of operation of a sewage treatment plant.
- (C15)** Wet weather storage ponds, stormwater harvesting ponds and effluent irrigation areas must be designed to limit the seepage rate to less than 0.1 mm/day.
- (C16)** All storage ponds used for the storage or treatment of contaminants, sewage or wastes at or on the authorised place must be constructed, installed and maintained:
 - (a) to minimise the likelihood of any release of effluent through the bed or banks of the pond to any waters (including ground water);
 - (b) to provide freeboard of 0.5 metres or greater except following a 24 hour duration one in ten year Average Recurrence Interval (ARI) design storm event determined in accordance with the latest version of Australian Rainfall and Runoff - A Guide to Flood Estimation (AR&R); and
 - (c) to ensure the stability of the ponds' construction.

Treatment of excess wastewater

- (C17)** When conditions prevent the irrigation of effluent to land (such as during or following rain events) and the wet weather storages have reached maximum capacity, the effluent from the treatment plant will undergo tertiary treatment. In those circumstances all treated wastewater will be tertiary treated and disposed as part of the proposed stormwater management strategy
- (C18)** The holder of this approval must establish limits for **Schedule C - Table 1** acceptable to the administering authority prior to commencement of the ERA.

Schedule C - Table 1: Treated Effluent Quality Characteristics

Quality Characteristics	Release Limit			Monitoring Frequency
	Minimum	90 th Percentile	Maximum	
Total Suspended Solids		30	45	Quarterly
Biochemical Oxygen Demand (mg/L, 5 day inhibited)		20	30	Quarterly
Total Chlorine (mg/L)	0.5		2	Quarterly
Faecal Coliform (CFU/100mL)			1000	Quarterly
Total Nitrogen (mg/L)			5	Quarterly
Total Phosphorus (mg/L)			1	Quarterly
pH	7.0		8.5	Quarterly

The holder of this approval must produce a report on the monitoring program including an assessment of the impact of treated effluent release. This report must include an interpretation of the results and conclusion carried out by a person with relevant experience and/or qualifications.

- (C20)** All determinations of the concentrations of contaminants in treated effluent must be:
- (a) made in accordance with methods prescribed in the latest edition of the administering authority's water monitoring standard (however described); and
 - (b) carried out on samples that are representative of the discharge.
- (C21)** Only samples of treated effluent that are manually collected and analysed by a NATA certified laboratory are to be used for the purposes of determining whether the wastewater meets the release quality characteristics specified in this approval.

End of Schedule C

Conditions for Development Approval under the *Sustainable Planning Act 2009* (SPA) for material change of use involving environmentally relevant activity (ERA) 53 – Composting and Soil Conditioner Manufacturing.

Recommended conditions:

The administering authority for these conditions is the Department of Environment and Heritage Protection.

Development approval under the *Sustainable Planning Act 2009* for a material change of use involving Environmentally Relevant Activity ERA 53 - Composting and Soil Conditioner Manufacturing shall be a preliminary approval.

Site Location, Layout and Design

The holder of this approval must provide the following information to the administering authority prior to the commencement of ERA 53 at any location subject to this approval:

- lot on plan description for the area subject to the approved activity at each location the activity is carried out;
- plan(s) showing cadastre, site boundaries, location of storage;
- storage design plans;
- plan(s) showing the location of all stormwater management system components and leachate management systems;
- plan(s) showing location of points of contaminated water discharge to any waters.

Notification of Environmental Incidents – Duty to Notify

The holder of this approval must notify of environmental incidents in accordance with section 320 to section 320G of the *Environmental Protection Act 1994*.

Schedule of Conditions:

SCHEDULE A – General

Site Plans

- (A1)** Within 60 days of commencing operation under this approval, a scaled copy of the “as constructed plans” for the site must be forwarded to the administering authority. The plans must include all infrastructure, materials storage and handling areas as well as internal and external drainage systems.

Access to Copy of Approval

- (A2)** A copy of this approval must be kept in a location readily accessible to personnel carrying out the activity.

Records

- (A3)** Any record or document required to be kept by a condition of this approval must be kept at the licensed place for a period of at least five (5) years and be available for examination by an authorised person. The record retention requirements of this condition will be satisfied if any daily and weekly records are kept for a period of at least five (5) years and these records are then kept in the form of annual summaries after that period.

Maintenance of Measures, Plant and Equipment

- (A4)** The operator of an ERA to which this approval relates must:
- (a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this approval;
 - (b) maintain such measures, plant and equipment in a proper and efficient condition; and
 - (c) operate such measures, plant and equipment in a proper and efficient manner.

Trained/experienced Operator(s)

- (A5)** The daily operation of the ERA and pollution control equipment must be carried out by a person(s) with appropriate experience and/or qualifications to ensure the effective operation of that ERA and control equipment.

Equipment Calibration

- (A6)** All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this approval must be calibrated, and appropriately operated and maintained.

Notification of contaminant release

- (A7)** Any release of contaminants not in accordance with the conditions of this approval must be reported by telephone to the administering authority's Pollution Hotline³³. Any such release must be reported as soon as possible but no later than 24 hours after the registered operator becomes aware of the release. A written notice detailing the following information must be provided to administering authority within 7 days:
- (a) the name of the registered operator, including their registration certificate number
 - (b) the name and telephone number of a designated contact person
 - (c) quantity and substance released
 - (d) person/s involved
 - (e) the location and time of the release
 - (f) the suspected cause of the release
 - (g) a description of the effects of the release
 - (h) the results of any sampling performed in relation to the release
 - (i) actions taken to mitigate any environmental harm caused by the release and
 - (j) proposed actions to prevent a recurrence of the release.

³³ The Pollution Hotline number is 1300 130 372.

Site Based Management Plan

(A8) From commencement of an ERA to which this approval relates, a Site Based Management Plan (SBMP) must be implemented. The SBMP must identify all sources of environmental harm, including but not limited to the actual and potential release of all contaminants, the potential impact of these sources and what actions will be taken to prevent the likelihood of environmental harm being caused. The SBMP must also provide for the review and 'continual improvement' in the overall environmental performance of all ERA's that are carried out.

The SBMP must address the following matters:

- (a) Environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals;
- (b) Identification of environmental issues and potential impacts;
- (c) Control measures for routine operations to minimise likelihood of environmental harm;
- (d) Contingency plans and emergency procedures for non-routine situations;
- (e) Organisational structure and responsibility;
- (f) Effective communication;
- (g) Monitoring of contaminant releases;
- (h) Staff training;
- (i) Record keeping;
- (j) Complaint Management and
- (k) Periodic review of environmental performance and continual improvement.

(A9) The SBMP must not be implemented or amended in a way that contravenes any condition of this approval.

(A10) The SBMP must be kept at the authorised place.

Annual Monitoring Report

(A11) An annual monitoring report must be prepared each year and submitted to the administering authority accompanying the submission of the annual return. This report shall include but not be limited to:

- (a) a summary of the previous twelve (12) months monitoring results obtained under any monitoring programs required under this approval and, in graphical form showing relevant limits, a comparison of the previous twelve (12) months monitoring results to both this approvals limits and to relevant prior results;
- (b) an evaluation/explanation of the data from any monitoring programs;
- (c) a summary of any record of quantities of releases required to be kept under this approval;
- (d) a summary of the record of equipment failures or events recorded for any site under this approval;

- (e) an outline of actions taken or proposed to minimise the environmental risk from any deficiency identified by the monitoring or recording programs;
- (f) throughput tonnages for the financial year if applicable to this ERA; and
- (g) a summary of any trade waste agreements entered into or amended during the year.

End of Schedule A

SCHEDULE B - Air

Odour Nuisance

- (B1)** The holder of this approval must locate and maintain a suitable buffer distance between any composting operations and dust or odour sensitive places. The buffer distance shall be established based on the composting method and feedstock to ensure that dust and odour impacts on nuisance sensitive receptors are avoided.
- (B2)** The release of noxious or offensive odours or any other noxious or offensive airborne contaminant(s) resulting from the ERA must not cause an environmental nuisance at any nuisance sensitive place.
- (B3)** When requested by the administering authority, odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any nuisance sensitive or commercial place, and the results must be notified within fourteen (14) days to the administering authority following completion of monitoring. Monitoring must be carried out at a place(s) relevant to the potentially affected odour sensitive place and at upwind control sites and actions must:
 - (a) address the complaint including the use of appropriate dispute resolution if required; and
 - (b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.

Dust Nuisance

- (B4)** Windrows must be designed, maintained and managed to prevent the release of dust and windblown material to the atmosphere.
- (B5)** Dust and particulate mater resulting from the activity must not cause the following levels to be exceeded at the boundary of the approved place;
 - (a) Dust deposition of 120 milligrams per square metre per day, when monitored in accordance with Australian Standard AS 3580.10 of 2003 (or more recent editions); and
 - (b) Matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM10) suspended in the atmosphere of 150 micrograms per cubic metre over a 24 hour averaging time when monitored in accordance with Australian Standard AS 3580.9.6 "Ambient air - Particulate matter - Determination of suspended particulate PM10 high-volume sampler with

size-selective inlet - Gravimetric method” or any alternative method of monitoring PM10 which may be permitted by the “Air Quality Sampling Manual” as published by the administering authority.

- (B6)** When requested by the administering authority, dust and particulate monitoring must be undertaken to investigate any complaint of environmental nuisance caused by dust and/or particulate matter, and the results notified within 14 days to the administering authority following completion of monitoring. Monitoring must be carried out at a place/s relevant to the potentially affected dust sensitive place and at upwind control sites and must include:
- (a) for a complaint alleging dust nuisance, dust deposition; and
 - (b) for a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM10) suspended in the atmosphere over a 24hr averaging time.

SCHEDULE C – Water

Release to Waters

- (C1)** The holder of this approval is not permitted to release contaminants to any waters or the bed and banks of any waters including groundwater.

Stormwater Management

- (C2)** From commencement of an activity, a stormwater management plan must be developed and implemented. The Stormwater Management Plan must include but not be limited to:
- (a) minimisation of the size of contaminated areas
 - (b) cleaning of contaminated areas without water
 - (c) paving and roofing of contaminated areas
 - (d) sampling and monitoring program for potentially contaminated stormwater released from the licensed place and assessment of the impact of any such release on the receiving environment
 - (e) reporting of results from the monitoring of potentially contaminated stormwater releases and any assessment of the impact of the releases on the receiving environment to the administering authority
 - (f) site plan detailing all stormwater catchments, collection drains, holding tanks, treatment systems and disposal points
 - (g) contingency plans and emergency procedures for routine and non-routine situations
 - (h) holding capacities of dams and predicted volume and flow rate for routine and non-routine situations including details including wet weather storage.

Leachate Management

- (C3)** Any leachate generated must be stored and managed in a manner such that it will not escape into surface water or groundwater, will not cause offensive odours and will minimise human contact with the leachate. Management options for leachate are:
- (a) evaporation
 - (b) discharge to sewer, with or without pre-treatment
 - (c) treatment, or
 - (d) providing moisture for the compositing process.
- (C4)** Leachate must not be used for dust suppression including on internal roads.
- (C5)** Any leachate holding dams at or on the approved place must be constructed, installed and maintained:
- (a) to minimise the likelihood of any release of contaminants through the bed or banks of the pond to any waters (including ground water)
 - (b) to provide freeboard of 0.5 metres or greater except following a 24 hour duration one in ten year Average Recurrence Interval (ARI) design storm event³⁴, and
 - (c) to ensure the stability of the ponds' construction.
- (C6)** Groundwater monitoring network must be installed. The network must be:
- (a) installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters, and
 - (b) include a sufficient number of 'bore(s)' to represent;
 - (i) groundwater samples from the uppermost aquifer
 - (ii) background groundwater quality in hydraulically up-gradient or background bore(s) that have not been affected by any release of contaminants to groundwater, and
 - (iii) quality of groundwater down gradient of any release of contaminants to groundwater including groundwater passing the relevant bore(s).
- (C7)** Groundwater monitoring shall be conducted at locations determined by the groundwater monitoring network, at a frequency and for water quality characteristics as stated in Schedule C - Table 1 - Groundwater Monitoring Parameters and Frequencies.

³⁴ determined in accordance with the latest version of Australian Rainfall and Runoff - **A Guide to Flood Estimation** (AR&R)

Schedule C - Table 1: Groundwater Monitoring Parameters and Frequencies

Quality Characteristic	Frequency
pH	Six monthly
Calcium	Six monthly
Magnesium	Six monthly
Sodium	Six monthly
Potassium	Six monthly
Chloride	Six monthly
Copper	Six monthly
Manganese	Six monthly
Nickel	Six monthly
Zinc	Six monthly
Iron (total)	Six monthly
Lead	Six monthly
Ammonia (as N)	Six monthly
Nitrate (as N)	Six monthly
Nitrite	Six monthly
N (NOx)	Six monthly
Phosphorus	Six monthly
Arsenic	Six monthly
Cadmium	Six monthly
Chromium	Six monthly
TOC	Six monthly
COD	Six monthly
Acetic Acid	Six monthly
BOD	Six monthly

End of Schedule C

SCHEDULE D - Noise

Noise Nuisance

- (D1) Noise resulting from the activity must not cause an environmental nuisance at any nuisance sensitive place.
- (D2) Noise from activities must not result in measured levels greater than those specified in Table 1 and Table 2 and Table 3 of Schedule D.

Schedule D - Table 1: Intermittent Noise

Time period	Noise level at a 'Nuisance sensitive place' measured as the Adjusted Sound Pressure Level $L_{A10 \text{ adj, } 10\text{mins}}$
7am - 6pm	Background noise level plus 5 dB(A)
6pm - 10pm	Background noise level plus 3 dB(A)
10pm - 7am	Background noise level plus 0 dB(A)
Time period	Noise level at a 'Commercial place' measured as the Adjusted Sound Pressure Level $L_{A10 \text{ adj, } 10\text{mins}}$
7am - 6pm	Background noise level plus 10 dB(A)
6pm - 10pm	Background noise level plus 8 dB(A)
10pm - 7am	Background noise level plus 5 dB(A)

Schedule D - Table 2: Intermittent Noise

Time period	Noise level at a 'Nuisance sensitive place' measured as the Adjusted Sound Pressure Level $L_{A1 \text{ adj, } 10\text{mins}}$
7am - 6pm	Background noise level plus 10 dB(A)
6pm - 10pm	Background noise level plus 8 dB(A)
10pm - 7am	Background noise level plus 5 dB(A)
Time period	Noise level at a 'Commercial place' measured as the Adjusted Sound Pressure Level $L_{A1 \text{ adj, } 10\text{mins}}$
7am - 6pm	Background noise level plus 15 dB(A)
6pm - 10pm	Background noise level plus 13 dB(A)
10pm - 7am	Background noise level plus 10 dB(A)

Schedule D - Table 3: Steady Noise

Time period	Noise level at a 'Nuisance sensitive place' measured as the Adjusted Sound Pressure Level $L_{A90,adj,15mins}$
7am - 6pm	Background noise level plus 5 dB(A)
6pm - 10pm	Background noise level plus 3 dB(A)
10pm - 7am	Background noise level plus 0 dB(A)
Time period	Noise level at a 'Commercial place' measured as the Adjusted Sound Pressure Level $L_{A90,adj,15mins}$
7am - 6pm	Background noise level plus 10 dB(A)
6pm - 10pm	Background noise level plus 8 dB(A)
10pm - 7am	Background noise level plus 5 dB(A)

Note 1: Background noise level, $L_{A90, 15 mins}$. In no case is the background noise level, $L_{A90, 15 mins}$ to be less than 25 dB(A). In the event that measured background is less than 25 dB(A), then 25 dB(A) is to be used.

Note 2: The noise levels specified for $L_{A90, adj, 15 mins}$ are measured outdoors in the free field at a location at least 4m from the external facade of a building at the nuisance sensitive or commercial place and 1.2m to 1.5m above ground level.

Note 3: If steady or intermittent noise is tonal or impulsive, the following adjustments are made to the measured noise level to derive $L_{A90,adj,15mins}$ or $L_{Ar,15mins}$, respectively.

Noise Characteristic	Adjustment added to Noise Level
Tonal — just audible	+ 2 dB(A)
Tonal — clearly audible	+ 5 dB(A)
Impulsive — just audible	+ 2 dB(A)
Impulsive — clearly audible	+ 5 dB(A)

Noise Monitoring

- (D3)** When requested by the administering authority, noise monitoring must be undertaken and recorded, to investigate any complaint about noise nuisance being caused by the activity, and the noise monitoring results notified to the administering authority within **fourteen (14) days**.

Noise monitoring must include but not be limited to —

- (a) L_{A10} , adj, 10 mins;
 - (b) L_{A1} , adj, 10 mins;
 - (c) L_{A90} , adj, 15 mins;
 - (d) the level and frequency of occurrence of impulsive or tonal noise;
 - (e) atmospheric conditions including wind speed and direction;
 - (f) effects due to extraneous factors such as traffic noise;
 - (g) location, date and time of recording;
 - (h) details of measurement instrumentation and measurement procedure;
and
 - (i) analysis of monitoring data in the context of defined limits as stated in this approval.
- (D4)** The method of measurement and reporting of noise levels in response to any noise monitoring conducted under this approval must be in accordance with the most recently published edition of the administering authorities Noise Measurement Manual or an equivalent authoritative document approved by the administering authority (e.g. AS 1055 Acoustics – Description and measurement of environmental noise). Monitoring must be carried out at a place(s) relevant to the potentially affected nuisance sensitive place and actions must:
- (a) address the complaint including liaison with the complainant and/or administering authority and the use of appropriate dispute resolution if required; and/or
 - (b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.

End of Schedule D

SCHEDULE E – Waste

Waste Acceptance

- (E1)** The only materials permitted to be accepted for use in onsite soil conditioning or composting operations are green waste³⁵, wood chip, compostable food wastes, and biosolids from sewage treatment plants associated with the resort.
- (E2)** Grease trap wastes, liquid wastes and/or vehicle wash down waters are not permitted to be accepted at the approved place.
- (E3)** All wastes accepted in accordance with development condition E2 must be free from visual litter contamination.

³⁵ Means the vegetative portion of the waste stream arising from various sources including waste from domestic and commercial premises and municipal operations.

- (E4) Putrescible or highly odorous feedstock must be processed immediately on receipt of the material to ensure that an impact on surrounding land users is suitably controlled.
- (E5) Records of source, volumes and composition of all waste types accepted must be kept and maintained and made available to the administering authority on request.

Waste Acceptance Criteria

- (E6) The operator must develop and implement waste acceptance criteria that clearly specifies the waste types permitted to be received at soil conditioning or composting operations. The waste acceptance criteria must;
 - (a) assess the levels of contaminants of incoming wastes to ensure that composting processes achieve the physical contaminant levels specified in Australian Standards *AS4454 Composts, soil conditioners and mulches*
 - (b) assess the levels of contaminants of incoming wastes to ensure that composting processes achieve the heavy metal limits and pesticide limits specified in or the NSW EPA Guidelines for Class A Biosolids
 - (c) establish procedures to minimise the bio-availability of heavy metals present in 'at risk' materials including biosolids with woody plant materials
 - (d) establish procedures to minimise the amount of pesticides present in 'at risk' organics including green waste, and
 - (e) establish procedures for inspection of incoming wastes and rejection of unpermitted wastes.

Waste handling

- (E7) All open air stockpiling areas must be conducted on hardstands with drainage designed to contain run off generated by incident rainfall or the liquid constituents of feedstock. The permeability of the hardstand area must be engineered to prevent the migration of contaminants into groundwater.
- (E8) Waste must not be burned or allowed to be burned on the site unless by approval of the administering authority.
- (E9) Waste must not be buried, or be allowed to be buried on the site unless by approval of the administering authority.
- (E10) If the operation includes the removal of physical contaminants such as glass, plastics or metals as part of the feedstock receipt stage, the area must be supplied with suitable storage facilities to ensure that the material is contained onsite and that litter and odour are managed until removal occurs.
- (E11) Compost windrow heights shall not exceed 4 metres.

Regulated waste

- (E12) All regulated waste produced by the site must be collected, transported, stored and treated by an operator authorised for the collection, transport, storage and treatment of regulated waste.

End of Schedule E

SCHEDULE F – Land

Preventing contaminant release to land

- (F1) The holder of this approval is not permitted to release contaminants to any land.
- (F2) Prior to the commencement of soil conditioning or composting activities, the operator must undertake a soil investigation to determine the suitability of the underlying soil in relation to:
- (a) erosion and sedimentation management
 - (b) leachate infiltration to groundwater
 - (c) vulnerability to subsidence and structural instability
 - (d) existing contamination problem, acid sulfate soils etc.
- (F3) All open air stockpiling areas must be conducted on appropriate hardstands with drainage designed to contain run off generated by incidental rainfall or the liquid constituents of feedstock. The permeability of the hardstand area must be of a suitable engineering standard to prevent the migration of contaminants into groundwater.

End of Schedule F

SCHEDULE G - Community

Complaint response

- (G1) All complaints received must be recorded including investigations undertaken, conclusions formed and action taken. This information must be made available to the administering authority on request.
- (G2) The holder of this approval must record the following details for all complaints received and provide this information to the administering authority on request:
- (a) name, contact address and contact telephone number of the complainant (note: if the complainant does not wish to be identified then “Not Identified” is to be recorded)
 - (b) time, date and nature of the complaint
 - (c) type of communication (telephone, letter, personal etc)
 - (d) investigations undertaken
 - (e) conclusions formed
 - (f) actions taken to resolve complaint
 - (g) any abatement measures implemented, and
 - (h) name of person responsible for resolving complaints.

Acronyms and abbreviations

Acronym	Definition
AEP	Annual exceedence probability
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS/NZS	Australian standard/New Zealand standard
ASSMP	acid sulfate soils management plan
CHMP	cultural heritage management plan
CMP	conservation management plan
DAFF	Department of Agriculture, Fisheries and Forestry
DEHP	Department of Environment and Heritage Protection
DERM	The former Department Environment and Resource Management (now DEHP)
DMP	dredge management plan
DNRM	Department of Natural Resources and Mines
EA	environmental authority
EIS	environmental impact statement
EMP	environmental management plan
EP Act	<i>Environmental Protection Act 1994</i> (Qld)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
ERA	environmentally relevant activity
ESA	environmentally sensitive area
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
HAT	Highest Astronomical Tide
IAS	initial advice statement
LAT	Lowest Astronomical Tide
MCU	material change of use
ML	megalitres
MNES	matters of national environmental significance
MRA	<i>Mineral Resources Act 1989</i> (Qld)
MSQ	Maritime Safety Queensland
NATA	National Association of Testing Authorities
NC Act	<i>Nature Conservation Act 1992</i> (Qld)
PMAV	Property Map of Assessable Vegetation
PVMP	Property Vegetation Management Plan
QFRS	Queensland Fire and Rescue Services
QHR	Queensland Heritage Register

Acronym	Definition
QWQG	Queensland Water Quality Guidelines
RE	regional ecosystem
RO	reverse osmosis
SBMP	site-based management plan
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i> (Qld)
SDWPO Regulation	State Development and Public Works Organisation Regulation (Qld)
SEIS	supplementary environmental impact statement
SEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities
SPA	<i>Sustainable Planning Act 2009</i> (Qld)
SPP	state planning policy
TMP	transport management plan
DTMR	Department of Transport and Main Roads (Qld)
TOR	terms of reference
TSP	total suspended particles
VM Act	<i>Vegetation Management Act 1999</i> (Qld)
WQMP	Water Quality Management Plan
WSUD	water sensitive urban design

Glossary

Term	Definition
Annual exceedence probability	The probability that a given intensity of an event will be exceeded in any one year.
Annual person days	The number of days spent by a person visiting the island for any given parameter. For example if a person visits for a 6-day holiday that would constitute 6 annual person days.
assessment manager	For an application for a development approval, means the assessment manager under the <i>Sustainable Planning Act 2009</i> (Qld).
bathymetry	The study and mapping of seafloor topography.
bilateral agreement	The agreement between the Australian and Queensland governments that accredits the State of Queensland's EIS process. It allows the Australian Government Minister for the Environment to rely on specified environmental impact assessment processes of the state of Queensland in assessing actions under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth).
construction areas	The construction worksites, construction car parks, and any areas licensed for construction or on which construction works are carried out.
controlled action	A proposed action that is likely to have a significant impact on a matter of national environmental significance; the environment of Commonwealth land (even if taken outside Commonwealth land); or the environment anywhere in the world (if the action is undertaken by the Commonwealth). Controlled actions must be approved under the controlling provisions of the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth).
controlling provision	The matters of national environmental significance, under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth), that the proposed action may have a significant impact on.
Coordinator-General	The corporation sole constituted under section 8A of the <i>State Development and Public Works Organisation Act 1938</i> and preserved, continued in existence and constituted under section 8 of the SDPWO Act.
environment	As defined in Schedule 2 of the SDPWO Act, includes: <ol style="list-style-type: none"> a) ecosystems and their constituent parts, including people and communities b) all natural and physical resources c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).
environmental effects	Defined in Schedule 2 of the SDPWO Act as the effects of development on the environment, whether beneficial or detrimental.
environmentally relevant activity (ERA)	An activity that has the potential to release contaminants into the environment. Environmentally relevant activities are defined in Part 3, section 18 of the <i>Environmental Protection Act 1994</i> (Qld).
equivalent person	Water supply demand or the quantity and/or quality of sewage discharge for a person resident in a detached house.

eutrophication	Degradation of water quality due to enrichment by nutrients such as nitrogen and phosphorus, resulting in excessive algal growth and decay and often low dissolved oxygen in the water.
initial advice statement (IAS)	<p>A scoping document, prepared by a proponent, that the Coordinator-General considers in declaring a significant project under Part 4 of the SDPWO Act. An IAS provides information about:</p> <ul style="list-style-type: none"> • the proposed development • the current environment in the vicinity of the proposed project location • the anticipated effects of the proposed development on the existing environment • possible measures to mitigate adverse effects.
limit of reporting (LOR)	The minimum concentration (mg/kg) of a residue used for reporting purposes.
mean low water	A tidal level. The average of all low water heights over a national tidal datum epoch
properly made submission (for an EIS or a proposed change to a project)	<p>Defined under section 24 of the SDPWO Act as a submission that:</p> <ol style="list-style-type: none"> a) is made to the Coordinator-General in writing b) is received on or before the last day of the submission period c) is signed by each person who made the submission d) states the name and address of each person who made the submission e) states the grounds of the submission and the facts and circumstances relied on in support of the grounds.
proponent	The entity or person who proposes a significant project. It includes a person who, under an agreement or other arrangement with the person who is the existing proponent of the project, later proposes the project.
Ramsar	<p>Convention of wetlands of international importance (Ramsar, Iran 1971)</p> <p>The Convention on Wetlands is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. It was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975.</p>
residence time	The measure of the average time a substance spends within a physical system.
significant project	A project declared as a 'significant project' under section 26 of the SDPWO Act. As of 21 December 2012, 'significant projects' were referred to as 'coordinated projects'.
stated condition	<p>Conditions stated (but not enforced by) the Coordinator-General under sections 39, 45, 47C, 49, 49B and 49E of the SDPWO Act. The Coordinator-General may state conditions that must be attached to a:</p> <ul style="list-style-type: none"> • development approval under the <i>Sustainable Planning Act 2009</i> • proposed mining lease under the <i>Mineral Resources Act 1989</i> • draft environmental authority (mining lease) under Chapter 5 of the <i>Environmental Protection Act 1994</i> (EPA) • proposed petroleum lease, pipeline licence or petroleum facility licence under the <i>Petroleum and Gas (Production and Safety) Act 2004</i> • non-code compliant environmental authority (petroleum activities) under Chapter 4A of the EPA.

Department of State Development, Infrastructure and Planning
PO Box 15517, City East Qld 4002
tel 13 QGOV (13 74 68)
fax +61 7 3225 8282
info@dsdip.qld.gov.au

www.dsdip.qld.gov.au
