



Great Keppel Island  
REVITALISATION PLAN

# 7. CUMULATIVE IMPACTS





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# 7. CUMULATIVE IMPACTS

The purpose of this chapter is to provide a summary of the impacts identified in earlier chapters of the EIS and to provide a description of the cumulative effect of these impacts both in isolation and in combination with those of other existing or known proposed projects.

The impacts associated with the GKI Revitalisation Plan are grouped under the following topics:

- Environment;
- Amenity;
- Economy;
- Indigenous and non-Indigenous culture;
- Society; and
- Matters of National environmental significance.

## 7.1 Intra-Project Cumulative Impact

**Table 7.1** details the impacts of the GKI Revitalisation Plan in isolation of other projects. The assessment assigns each project impact, an impact score (mitigated and unmitigated) and identifies the associated EIS section and relevant EMP reference applicable to each impact.

Each impact derives its impact rating from the various scientific studies and technical reports associated with the EIS. In the event that an impact is identified, appropriate mitigation measures have been put forward by the individual specialists to either avoid or reduce the impact to an acceptable level.

In circumstances where the impact is unable to be mitigated due to direct loss, these have been described in the Biodiversity Offset Strategy (refer **Appendix P**).

TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
<b>Environment- Flora</b>									
	•	•		Loss of vegetation communities that are remnant and non remnant <sup>1</sup> .	High	Medium	-	3.3.2	2.3
•		•		Over clearing of vegetation resulting in encroachment into retained vegetated areas and loss of vegetation.	High	Low	-	3.3.2	2.3
•		•	•	Changes to hydrological regimes, with particular impacts on wetland associations.	Medium	Low	-	3.3.2, 3.5	2.3, 3.3, 2.4, 3.4
•		•		Increase in vegetation 'edge effects' specifically related to construction of new airstrip and golf course, affecting the integrity, structure and composition of vegetation communities.	Medium	Low	-	3.3.2	2.3, 3.3
•		•	•	Movement of weed seed and / or introduction of new weeds on vehicles, affecting the integrity, structure and composition of vegetation communities.	High	Low	-	3.3.2	2.3, 3.3
•		•		Introduction of new weeds or pathogens in construction materials, affecting the integrity, structure and composition of vegetation communities.	High	Low	-	3.3.2	2.3, 3.3
•		•	•	Introduction and / or lack of management of existing pest animals (e.g. grazing goats), affecting the integrity, structure and composition of vegetation communities.	Medium	Low	Medium <sup>2</sup>	3.3.2	3.3
•		•	•	Introduction of exotic plants in landscapes affecting the integrity, structure and composition of vegetation communities.	Medium	Low	-	3.3.2	2.3, 3.3
•		•	•	Uncontrolled public access to remnant vegetation causing weed proliferation, litter, fire and erosion.	Medium	Low	-	3.3.2	3.3
•		•	•	Inappropriate burning regimes affecting the integrity, structure and composition of vegetation communities.	High	Low	-	3.3.2	2.3, 3.3
	•	•		Loss of the locally significant grass <i>Eriachne stipacea</i> .	High	Medium	-	3.3.2	2.3



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
<b>Environment – Fauna</b>									
•		•		Removal of hollow bearing trees and ground habitat features for construction purposes.	Low	Low	-	3.3.3	2.3
•		•		Construction noise on fauna temporarily disrupting the normal patterns of wildlife behaviour.	Medium	Low	-	2.5.3; 3.3.3	2.3
•		•	•	Standby generator noise on fauna disrupting the normal patterns of wildlife behaviour.	Low	Low	-	3.9	3.3
•		•		Construction related mortality associated with tree clearing and earthworks.	High	Low	-	3.3.3	2.3
•		•		Habitat fragmentation permanently affecting resident fauna populations.	Medium	Low	-	3.3.3	2.3
•		•	•	Changes to hydrological regimes, with particular impacts on wetland habitats.	Medium	Low	-	3.3.3, 3.5	
•		•	•	Increase in road kill as a result of increased traffic movement.	Medium	Low	-	3.3.3	2.3, 3.3
•		•	•	Increased human – animal interactions affecting wildlife health, behaviour and population dynamics.	Medium	Low	-	3.3.3	2.3, 3.3
•		•	•	Increased pedestrian and recreational activity causing disturbance to wildlife and potentially affecting breeding success.	Medium	Low	-	3.3.3	2.3, 3.3
•		•	•	Introduction of pests, such as cane toads, resulting in extensive and potentially irreversible impacts to common native wildlife.	High	Low	-	3.3.3	2.3, 3.3
•		•	•	Spread of pests, including an increase in their abundance and associated impact to common native wildlife.	High	Low	-	3.3.3, 3.10	2.3, 3.3
•		•	•	Bird strike at airstrip.	High	Low	-	3.3.3	2.3, 3.3



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•		•	•	Shift in fauna assemblages as a result of development activities.	High	Low	-	3.3.3	2.3, 3.3
<b>Environment – Aquatic Ecology (Marine Ecosystems)</b>									
•	•	•		Loss of marine habitat and floral communities as a result of construction activities, such as disturbance to the seabed required for the marina and submarine cables. <sup>3</sup>	High	High	-	3.3.4, 3.5	2.3
	•		•	Gain of habitat (including marina hard surfaces and improved condition of saltmarsh and mangrove communities in Putney Creek).	-	-	High	3.3.4	3.3
	•	•	•	Increased turbidity and sediment deposition as a result of dredging and maintenance activities - impacts on the health of floral and faunal communities.	High	Medium	-	3.3.4	2.3, 3.3
•	•	•	•	Altered hydrodynamics and flushing impacting on habitat characteristics - marina.	Medium	Low	-	3.3.4	2.3, 3.3
•	•	•	•	Altered hydrodynamics and flushing impacting on habitat characteristics - Putney Creek.	Medium	Low	-	3.3.4, 3.5	2.3, 3.3
•	•	•	•	Spills of hydrocarbons and other contaminants impacting water quality and habitat characteristics.	Medium	Medium	-	3.3.4, 3.5	2.3, 3.3
•	•	•	•	Waste and litter affecting water and sediment quality.	Medium	Low	-	3.3.4	2.3, 3.3
•	•	•	•	Nutrient enrichment affecting water quality.	Medium	Low	-	3.3.4, 3.5	2.3, 3.3
	•	•		Acid sulfate or potential acid sulfate sediment.	Low	Low	-	3.3.4, 3.5	2.3
	•		•	Copper contamination from vessels impacting water quality and ecosystem characteristics.	Medium	Medium	-	3.3.4	3.3
	•	•	•	Artificial lighting affecting normal habitat behaviour, including turtle breeding.	Medium	Medium	-	3.3.4	2.3, 3.3
•		•	•	Human activities affecting marine ecology, e.g., turtles.	Medium	Medium	Medium <sup>4</sup>	3.3.4	2.3, 3.3



**TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)**

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•		•	•	Introduction of marine pests.	Medium	Low	-	3.3.4	3.3
•	•	•	•	Marine noise: Noise from piling impacting on marine animals.	High	Low	-	3.9	2.3, 3.3, 2.7, 3.7
<b>Environment – Aquatic Ecology (Freshwater Ecosystems)</b>									
•	•	•	•	Hydrocarbon contamination of freshwater ecosystems from vehicles and equipment, impacting ecosystem health.	Medium	Medium	-	3.3.4	2.3, 3.3
•	•	•	•	Vegetation clearing and earthworks leading to decreased habitat for aquatic fauna.	Low	Low	-	3.3.4, 3.5	2.3
•	•	•	•	Increased turbidity and sediment deposition as a result of permanent and temporary creek crossings leading to erosion of water channels and impacts on water quality.	Medium	Medium	-	3.3.4	2.3, 3.3
•	•	•	•	Creek crossings – affecting the passage of freshwater fauna.	Medium	Low	-	3.3.4, 3.5	2.3, 3.3
•	•	•	•	Litter and waste affecting water quality and freshwater ecosystem health.	Medium	Low	-	3.3.4	2.3, 3.3





TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•		•	•	Nutrient enrichment caused by contaminants being washed into waterways affecting freshwater ecosystem health.	Medium	Low	-	3.3.4, 3.5	2.3, 3.3
	•		•	Loss of catchment area impacting water quality.	Low	Low	-	3.3.4	3.3
•			•	Water quality issues within water features (blue green algae and stratification).	Medium	Low	-	3.3.4, 3.5	3.3
<b>Environment – Coastal Environment</b>									
	•	•	•	Tidal flows and hydrodynamics affecting water levels, tidal phase and ebb and flood tide around the marina, along Putney Beach and between Putney Point and Passage rocks.	Low	Low	-	3.6	2.5
	•		•	Tidal and wind driven current sediment transport potential resulting in mobilisation and deposition impacts on coastline.	Medium	Low	-	3.6	2.5
•		•	•	Putney and Fisherman's Beach coastal processes affected by a reduction in gross and net longshore sediment transport potential.	Medium	Low	-	3.6	2.5, 3.5
•		•	•	Siltation within and in proximity to marina and breakwall.	Medium	Low	-	3.6	2.5
•		•	•	Marine wave climate affecting berth locations in the marina.	Low	Low	-	3.6	2.5, 3.5
•			•	Climate change – shoreline recession affecting beach amenity and beach access at Putney and Fisherman's Beach.	Medium	Low	-	3.6	3.1, 3.5
•			•	Climate change – increase in storm tide elevations resulting in an increased overtopping of the breakwaters leading to increased wave action within the marina.	Medium	Low	-	3.6	3.1, 3.5



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•			•	Climate change – coastal inundation of marina infrastructure and reclamation.	Medium	Low	-	3.6	3.1, 3.5
•			•	Marine water quality – marine residence times.	Low	Low	-	3.6	3.5
•			•	Marine water quality – antifouling from copper concentrations associated with marine vessels.	Medium	Medium	-	3.6	3.5
•		•		Sediment quality and dredging – marina construction stages 1 to 3 suspended sediment plume.	Medium	Low	-	3.6	2.5
<b>Water Resources</b>									
•		•		Excessive extraction of groundwater resulting in lowering of water tables and saline intrusion, which could impact on availability of suitable water supply to other users.	High	Low	-	2.5.6, 3.5	3.4
•	•		•	Irrigation of recycled water resulting in excessive leaching of nutrients causing contamination of groundwater resources.	High	Low	-	2.5.6, 3.5	3.4
•			•	Irrigation of recycled water resulting in raised water tables, saturation of soils and / or ponding within the irrigation area.	Medium	Low	-	3.5, 3.5	3.4



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•				• Water quality issues within water features (blue green algae and stratification).	Medium	Low	-	3.3.4, 3.5	3.4
•				• Deterioration of water quality within recycled water storage ponds causing algal blooms.	Medium	Low	-	2.5.6	3.4
•				• Water consumption within Resort facilities exceeds projected water demands resulting in increased supply costs, need for infrastructure upgrades and increased pressure on valuable water resources.	Medium	Low	-	3.5	3.4
<b>Environment – Soil</b>									
	•		•	Ground disturbance as a result of underground reticulation.	Medium	Low	-	2.5.3	2.2
	•		•	Removal of vegetation for construction of water supply and stormwater infrastructure resulting in increased risk of erosion.	High	Medium	-	2.5.4, 3.5	2.2
	•		•	Excavation and filling for construction of water and stormwater infrastructure resulting in increased risk of erosion.	High	Low	-	2.5.4, 3.5	2.2
	•		•	Increased peak discharge velocities causing scouring and erosion in downstream drainage lines and impacting on waterway stability.	High	Low	-	2.5.5, 3.5	3.2
•				• Irrigation of recycled water resulting in raised water tables, saturation of soils and/or ponding within the irrigation area.	Medium	Low	-	2.5.6, 3.5	3.2



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
	•		•	Irrigation of recycled water resulting in decreased soil quality within the irrigation area due to excessive salinity.	Medium	Low	-	2.5.6, 3.5	3.2
	•	•	•	Contamination of soils as a result of waste-related incidents during storage and handling on the Island, including spills or loss of containment.	High	Low	-	3.10	2.2, 3.2
	•	•	•	Contamination of soils as a result of waste-related incidents during transportation of waste from the Island, including spills.	High	Low	-	3.10	2.2, 3.2
<b>Environment – Greenhouse Gases</b>									
	•		•	Non-renewable resources (mainland coal-fired substations) being utilised to generate energy.	Low	Low	-	2.5.3	3.1
	•		•	Non-renewable resources (diesel for standby generators).	Medium	Low	-	2.5.3	3.1
	•		•	Carbon positive electricity generated via Resort rooftop solar panels.	-	-	High	2.5.3	3.1
<b>Infrastructure<sup>5</sup></b>									
	•		•	Improved Island access to water supply, electricity and telecommunications (utilities services mainland connection).	-	-	Medium	3.5, 2.4	
	•		•	Water consumption within Resort facilities exceeds projected water demands resulting in increased supply costs, need for infrastructure upgrades and increased pressure on valuable water resources.	Medium	Low	-	3.5	3.4
	•		•	Improved Island based waste management procedures.	-	-	Medium	3.10, 2.4	
	•	•	•	Contributing to increased pressure on the capacity of Council's landfill facilities (including cross contamination of wastes).	Medium	Low	-	3.10	



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID	
Indirect	Direct	C	O							
•	•	•	•	Transport (vehicular) road infrastructure and traffic operations impacts on the Island.	High	Low	Medium	3.11, 2.4		
•	•	•	•	Transport (vehicular) road infrastructure and traffic operations impacts on the mainland.	Medium	Low	-	3.11		
•	•	•	•	Transport (car-parking) infrastructure and traffic operations impacts on the mainland.	Medium	Low	-	3.11		
•		•	•	Transport (marine) infrastructure and vessel operations impacts.	Medium	Low	Medium	3.11, 2.4		
•			•	Transport (air) infrastructure and aircraft operations impacts (excluding accident related risks).	Medium	Low	Medium	3.11, 2.4		
<b>Amenity - Visual Amenity</b>										
	•	•	•	Visual intrusion on coastline by marina construction, built form, lighting and boating use.	High	Medium	-	3.2.2	2.13, 3.13	
	•	•		Noticeable changes to landform for new airstrip.	Medium	Low	-	3.2.2	2.13	
•	•	•	•	Visual intrusion on Keppel Bay by hillside Eco Resort Villas in Fisherman's Beach Precinct.	Medium	Low	Low <sup>6</sup>	3.2.2	2.13, 3.13	
•	•	•	•	Visual intrusion on Keppel Bay by 3-storey Hotel visible above Fisherman's Beach tree canopies.	Medium	Low	-	3.2.2	2.13, 3.13	
•	•	•	•	Visual intrusion on World Heritage waters, by villas, clubhouse, solar panels and lights visible through trees and on distant skyline, behind Clam Bay and Long Beach.	Medium	Low	-	3.2.2	2.13, 3.13	
	•	•		Change in Island character as seen from World Heritage waters, associated with visible parts of golf course.	Medium	Low	-	3.2.2	2.13	
	•		•	Change in island bushland character because some ridge-line sections of bushwalking tracks will be within view of Clam Bay Precinct and golf course.	Medium	Low	-	3.2.2	3.13	



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
	•	•		Visual scarring of a hillside associated with road across ridge.	Medium	Low	-	3.2.2	2.13
	•		•	Night time 'small town' glow of lighting.	Medium	Low	-	3.2.2	3.13
•		•	•	General perception of over-development and character change.	Medium	Low	-	3.2.2	3.13
•		•	•	Littering contributing to impacts on visual amenity.	Medium	Low	-	3.10	2.8, 3.8
<b>Amenity - Air Quality</b>									
	•		•	Impacts to air quality due to the deterioration of water quality within recycled water storage ponds causing an odour nuisance.	Medium	Low	-	3.5	3.6
	•		•	Impacts to air quality due to the generation of odour caused by operation of the sewerage treatment plant and associated collection and storage systems causing nuisance at a sensitive place.	High	Low	-	3.5	3.6
	•	•		Impacts to air quality caused by excessive dust from construction at existing residences and proposed accommodation.	High	Low	-	3.7	2.6
	•		•	Impacts to air quality caused by excessive air pollutants from fuel storage at proposed staff accommodation.	High	Low	-	3.7	3.6
•			•	Impacts to air quality caused by excessive odour from solid waste facility at proposed staff accommodation.	Medium	Low	-	3.7	3.6
•			•	Impacts to air quality caused by excessive odour from wastewater treatment facility at proposed staff accommodation.	High	Low	-	3.7	3.6
<b>Amenity - Noise and Vibration</b>									
	•		•	Loss of amenity from night-time aircraft noise causing sleep awakening at existing residences and Resort accommodation.	High	Low	-	3.9	3.7



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•			•	Loss of amenity from excessive aircraft noise at Resort.	Medium	Low	-	3.9	3.7
			•	Loss of amenity from generators: excessive noise from generators at existing residences.	Low	Low	-	3.9	3.7
	•		•	Loss of amenity from generators: excessive noise from generators at proposed guest and staff accommodation.	Medium	Low	-	3.9	3.7
	•	•	•	Loss of amenity from wastewater treatment: excessive noise from wastewater treatment plant at existing residences.	Low	Low	-	3.9	3.7
	•		•	Loss of amenity from wastewater treatment: excessive noise from wastewater treatment plant at proposed guest and staff accommodation.	Medium	Low	-	3.9	3.7
	•		•	Loss of amenity from solid waste management: excessive noise from onsite activities at existing residences.	Low	Low	-	3.9	3.7
	•		•	Loss of amenity from solid waste management: excessive noise from onsite activities at proposed guest and staff accommodation.	Medium	Low	-	3.9	3.7
•			•	Loss of amenity caused by excessive noise from golf course maintenance onsite activities at proposed guest accommodation.	Medium	Low	-	3.9	3.7
			•	Loss of amenity caused by excessive noise from barge and maintenance activities at proposed guest accommodation.	Medium	Low	-	3.9	3.7
	•		•	Loss of amenity caused by excessive noise from onsite activities at proposed guest accommodation.	Medium	Low	-	3.9	3.7
•			•	Loss of amenity caused by excessive noise from ferry activities at proposed guest accommodation.	Low	Low	-	3.9	3.7



TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
•	•	•	•	Loss of amenity caused by excessive noise at residences and accommodation, and waking at night.	Medium	Low	-	3.9	2.7, 3.7
•	•	•		Loss of amenity caused by excessive noise from construction at existing residences.	High	Low	-	3.9	2.7
•	•	•		Loss of amenity caused by excessive vibration from blasting and construction equipment.	High	Low	-	3.9	2.7
<b>Economy<sup>7</sup></b>									
•	•	•	•	Expenditure by contractors, visitors and employees to the Island.	-	-	High	5.1	-
•	•		•	Amount of visitor days spent in the Capricorn Region.	-	-	High	5.1	-
•	•		•	Diversification of the Capricorn Regional economy.	-	-	Medium	5.1	-
•	•	•	•	Business opportunities in the Capricorn Region.	-	-	Medium	5.1	-
•	•		•	Local and state government revenue through rates, headworks charges, property transaction duties, land tax and payroll tax.	-	-	Low	5.1	-
•	•	•	•	Gross Regional Product of the Fitzroy Region.	-	-	High	5.1	-
•	•	•	•	Creation of jobs in the Capricorn Region.	-	-	High	5.1	-
•	•	•		Residential market impacts due to demand for construction worker accommodation.	Medium	Low	Medium	5.1	-
<b>Indigenous and non-Indigenous Culture<sup>8</sup></b>									
	•	•	•	Loss of and disturbance to culturally significant sites (Indigenous and non-Indigenous).	High	Low	-	3.12; 3.13	2.10, 2.11, 3.10, 3.11





TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
	•	•	•	Potential disturbance to undiscovered culturally significant sites (Indigenous and non-Indigenous).	High	Low	-	3.12; 3.13	2.10, 2.11, 3.10, 3.11
•		•	•	Ongoing involvement with Traditional Landowners in the management of land and cultural sites on the Island.	High	Low	-	3.12; 3.13	2.10, 2.11, 3.10, 3.11
•		•	•	Restoration of Leeke's Homestead.	Medium	Low	Medium		
<b>Society</b>									
	•	•	•	Community division on Island.	Low	Low	-		-
	•	•	•	Law and order issues.	Medium	Low	-		-
	•	•	•	Concern over environmental stewardship.	Medium	Low	-		3.3
•		•	•	Local employment.	Low	Low	High		-
	•		•	Local business opportunities.	Medium	Low	Medium		-
•	•	•	•	Emergency accident response.	Medium	Low	Medium		3.12
	•	•	•	Changes the demographic profile of existing Island residents.	Low	Low	Medium	4.2	-
	•	•	•	Effect of increased visitor numbers and impact of potential anti-social behaviour (including drunkenness) on law and order on the Island.	Medium	Low	-	4.2	-
	•		•	Social infrastructure accessibility.	-	-	Medium	4.2	-
	•	•	•	Perception of over-development and character change.	High	Medium	-	3.2.2	2.2, 3.2
<b>Matters of National Environmental Significance</b>									
•	•	•	•	<i>Criterion vii</i> : Contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.	Medium	Low	-		2.13, 3.13



**TABLE 7.1 GKI REVITALISATION PLAN CUMULATIVE IMPACTS (CONTINUED)**

Impact Type		PHASE*		Description of Impact	Impact Level (Unmitigated)	Impact Level (Mitigated)	Impact Benefit	EIS Section Reference	EMP ID
Indirect	Direct	C	O						
	•	•	•	<i>Criterion viii:</i> Outstanding examples representing the major stages of Earth's history or significant geomorphic or physiographic features.	Medium	Low	-		2.13, 3.13
•		•	•	<i>Criterion ix:</i> Outstanding examples of on-going evolution.	Medium	Low	-		2.3, 3.3
•		•	•	<i>Criterion x:</i> Contains important and significant habitats for in-situ conservation of biodiversity, including threatened species.	Medium	Low	-		2.3, 3.3
•		•	•	Wetlands of international importance.	Low	Low	-		2.3, 3.3
•		•	•	Listed threatened flora and fauna species and ecological communities.	Medium	Low	-		2.3, 3.3
•		•	•	Listed migratory and marine species.	Medium	Low	-		2.3, 3.3

\* C = Construction Phase

O = Operational Phase

1. The residual impact of vegetation clearing for the Project necessitates the use of offsets to ensure a no net loss outcome. The Great Keppel Island Biodiversity Offset Strategy (2011) (refer **Appendix P**) demonstrates that sufficient offsets exist to meet the requirements of the Vegetation Management Act 1999. An offset differs from mitigation in that it addresses post-mitigation residual impacts.
2. An impact benefit rating of "Medium" is relevant to the establishment of the Environmental Protection Precinct, consisting of a minimum area of 575 hectares. This area will include active management including rehabilitation and control of flora and fauna pest species.
3. The residual impact of loss of marine habitat for the Project necessitates the use of offsets to ensure a no net loss outcome. The Great Keppel Island Biodiversity Offset Strategy (2011) (refer **Appendix P**) identifies offsets exist to meet the requirements of both the Commonwealth and State Government. An offset differs from mitigation in that it addresses post-mitigation residual impacts.
4. The Great Keppel Island Research Centre is identified as a "Medium" anthropogenic impact benefit achieved through the facilitation of marine based ecological monitoring research.
5. Identified transport related impact ratings are an interpretive summary of findings detailed in **Section 3.11**. Infrastructure impact benefits are an interpretive summary of the benefits associated with Project related key infrastructure.
6. The visual intrusion of the hillside Eco Resort Villas is considered to have an impact benefit rating of "Low" through demolition of the existing hillside villas which have reflective roofs which provide a distinct contrast to the landscape setting.
7. Identified economic impact ratings are an interpretive summary of findings detailed in **Section 5.1**.
8. Identified Indigenous and non-Indigenous impact ratings are an interpretive summary of findings detailed in **Section 3.12** and **3.13**.



**Table 7.1** shows that the residual impacts and benefits of the GKI Revitalisation Plan (in isolation of other projects) vary across the sustainability pillars (i.e. environmental, social, cultural and economic). The outcomes are:

- mitigation measures if implemented appropriately could remove any “high” negative residual impacts for all assessed impacts except “high” impacts due to loss of marine habitat associated with construction of the marina and utilities services pipeline. However, mitigation measures to reduce potential impacts are proposed, including but not limited to the avoidance of sensitive ecological communities through detailed design and the employment of construction methods sensitive to the marine environment. Further, loss of marine habitat is proposed to be offset to ensure a no net loss outcome (refer **Appendix P**).
- the majority of environmental impacts will be short-term impacts associated with the construction phase and have an identified maximum residual impact of “low” or “medium”. Further, the proposed Environmental Protection Precinct will provide long-term environmental management and protection benefits;
- all Indigenous and non-Indigenous cultural heritage impacts are likely to be short-term impacts associated with the construction phase and have an identified maximum residual impact of “low” if appropriate controls are implemented, including preparation of a CHMP. Further, restoration of Leeke’s Homestead is an identified Project benefit;
- the Resort, once operational will produce more electricity than it consumes and therefore the Project will make a positive contribution toward carbon emission reductions;
- the Project represents a mix of social impacts and benefits, and overall may be considered to improve the resilience and persistence of the Island community through providing an improved local employment outlook and improved air and sea access to the mainland and its associated essential services;
- in general, the GKI Revitalisation Plan will generate “medium” and “high” economic benefits during construction, and will result in long-term “medium” to “high” economic benefits to the Capricorn Region once operational;
- the Project is located outside the CMA but is likely to have an indirect beneficial benefit on this areas by reducing marine recreational vessel traffic; and
- the Project will improve the social value of the GBRMP by increasing user access to facilities, including research and increasing interactions with flora and fauna iconic to the GBRMP.

- An evaluation of the cumulative effect of Project impacts against existing developments of a similar nature on Matters of National Environmental Importance (MNEI) is summarised as follows:
- there are no wetlands of international importance directly associated with GKI, and no terrestrial species of flora or fauna which are listed as threatened within the Project footprint. The EPBC-listed “Littoral Rainforest and Coastal Vine Thickets of Eastern Australia” occur on the Island, but are outside the proposed development footprint area and will not be impacted. The locally-important habitat area associated with Leeke’s Estuary will be protected and buffered, as will all the coastline apart from the proposed marina location;
  - a number of migratory and listed marine species have been recorded or are likely to use the Island and surrounding waters, but there are no ‘important habitats’ for migratory birds (as defined by DEWHA 2009) nor is the Island a significant turtle rookery;
- the World Heritage Values associated with geomorphology and associated processes (terrestrial and marine) are not at risk from the proposed development;
- in terms of World Heritage aesthetic values (including the ‘existence value’ of the Island as a relatively undeveloped place close to and within view of the Capricorn Coast), the constraint-based approach to project planning has ensured that most of the proposed development will be screened from view and separated into several discrete precincts. The main visual impact will be associated with the proposed marina which, although its location and building heights will ensure it is partly-screened by Putney Point, Sand Spit and Middle Island, the built form and night-time lighting will be visible from within an arc of offshore view. All built form will be low-rise (three–storey maximum), set back from the shoreline and landscaped, such that other visual impacts are of a minor nature; and therefore, the proposed GKI Revitalisation Plan is likely to cause little degradation of World Heritage or National Heritage values, and is unlikely to significantly affect other matters of national environmental significance. The few environmental impacts which could potentially occur are “low” risk and capable of being mitigated, managed or offset.

This assessment ensures that no intolerable risks from cumulative events for the GKI Revitalisation Plan remain.

A risk assessment of unplanned events has also been undertaken for the EIS (refer **Chapter 6**, Hazard and Risk for details).

The potential impacts of climate change on the GKI Revitalisation Plan are separately identified in **Section 3.1** (where not identified as a coastal environment impact) as the majority of impacts are not reasonably associated with or worsened by the Project.



## 7.2 Inter-Project Cumulative Effect

### 7.2.1 Current Projects

The Central Queensland Major Projects Status Report (April 2011) prepared by Capricorn Enterprise estimates the total value of major projects in the Central Queensland region at approximately \$142 billion comprising:-

- \$41.41 billion in coal projects;
- \$7.766 billion in mineral projects;
- \$74.976 billion in energy related projects;
- \$7.732 billion in port projects;
- \$6.869 billion in rail projects;
- \$1.248 billion in water supply works;
- \$528.637 million in transport infrastructure works;
- \$311 million in social infrastructure projects; and
- \$959 million in a range of residential, industrial, commercial development projects.

Further, only \$185 million of identified major projects can be attributed to tourism related development in the Central Queensland region and comprise the following projects:-

- The Haven Wellness Resort, Emu Park (\$100 million);
- Gracemere Hotel, Gracemere (\$21 million);
- Beachside Resort, Gladstone (\$24 million); and
- Gladstone City Central Hotel, Gladstone (\$40 million).

The GKI Revitalisation Plan is not directly relevant to the range of major projects occurring within the Central Queensland Region, largely due to the relative isolation of the Project. Therefore, the impacts identified in **Table 7.1** are considered to be isolated in their effect and are not considered to contribute to or exacerbate the impacts of current projects in the Central Queensland Region.

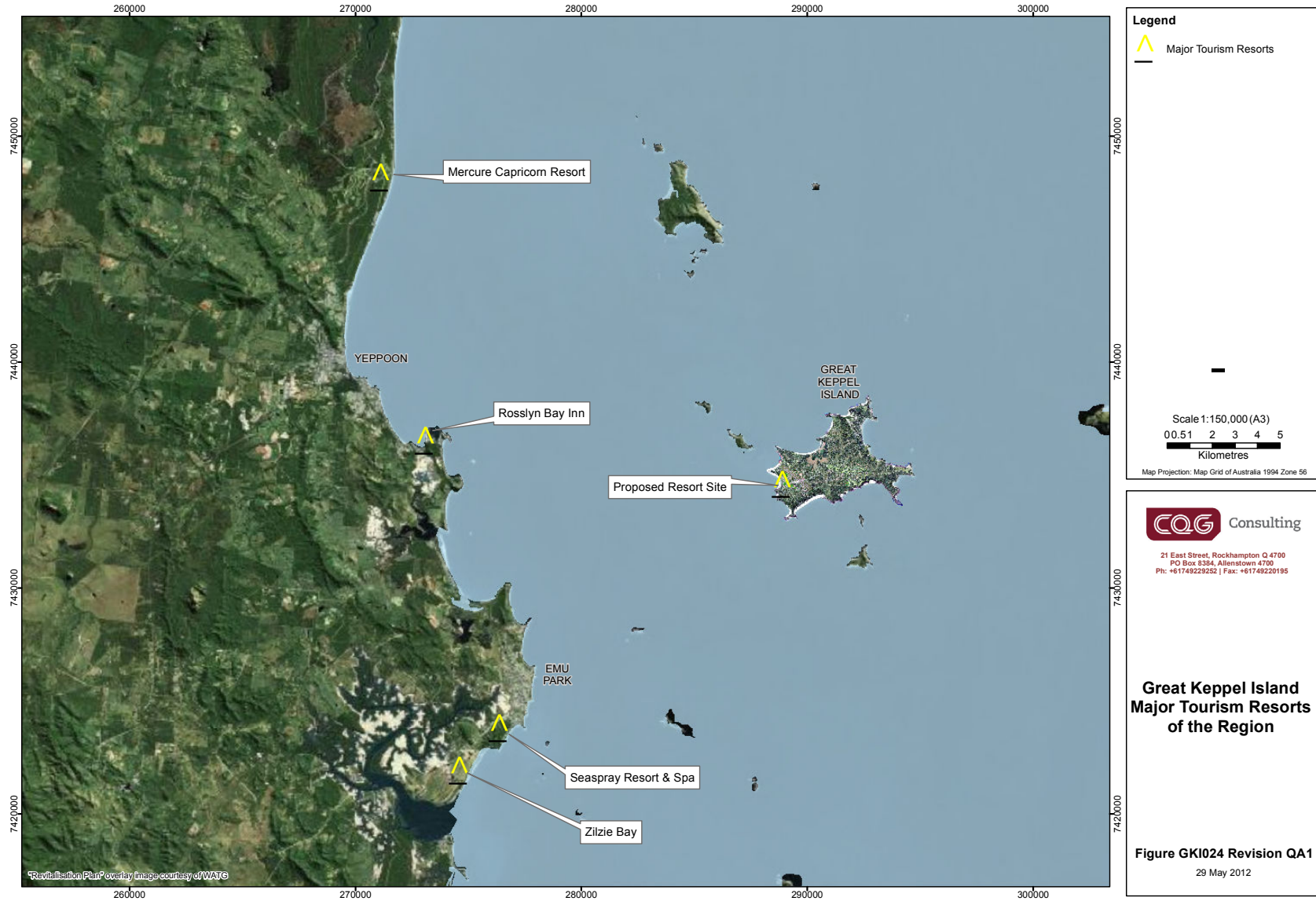
### 7.2.2 Existing Projects

Nearby tourism developments identified by the Federal Governments for assessment include:

- Rosslyn Bay Resort (previously known as the Rosslyn Bay Inn), Rosslyn Bay, approximately 15 kilometres to the west;
- Seaspray Resort and Spa, Zilzie (near Emu Park), approximately 18 kilometres to the south-west;
- Zilzie Bay, Zilzie, approximately 20 kilometres to the south-west; and
- Mercure Capricorn Resort (previously known as Capricorn Resort and Iwasaki's Capricorn Resort), Yeppoon, approximately 24 kilometres to the north-west.

Refer to **Figure 7.1**.

Figure 7.1 GKI MAJOR TOURISM RESORTS OF THE REGION



### 7.2.2.1 Rosslyn Bay Resort and Keppel Bay Marina

The Rosslyn Bay Resort is a medium sized (29 studio and suite rooms, six ocean view balcony apartments and 12 private spa bungalows) resort located between Keppel Bay Marina (Rosslyn Bay) and Kemp Beach. Activities offered by the Resort (relevant to aquatic ecology) include beach and harbour fishing, snorkelling and diving, charters and day cruises to GKI, sailing, surfing, general activities along the shoreline, and national park walks. Keppel Bay Marina has 400 marina berths, a restaurant and a retail outlet.

There are similarities in the potential impacts associated with the operation of the Rosslyn Bay Resort and the Keppel Bay Marina and the proposed development associated with tourism activities including:

- depletion of recreational fisheries;
- marina activities such as dredging, mooring of vessels, disposal of effluent from vessels, litter and waste, hydrocarbons spills and copper contamination (associated with antifoul);
- trampling (physical destruction) of coral reef adjacent to the Resort and around GKI;
- increased boat traffic associated with day cruises to GKI, and associated boat strike of dugongs and marine mammals;
- interactions with marine mammals and turtles in association with sailing and other water sports (although boat strike is not expected to be a major issue where motor boats are not offered for guest usage);
- degradation of coastal ecosystems (e.g. sandy and rocky shores) associated with litter and waste, habitat destruction, and collection of shells and other coastal resources as souvenirs; and
- disturbance to turtle nesting activities, assuming there is some turtle nesting on Kemp Beach.

Whilst these are potential impacts, education programs being run by tourism bodies and operators continue to see an improved awareness of the need to protect our natural environments.

### 7.2.2.2 Seaspray Resort and Spa

The Seaspray Resort and Spa is a relatively small resort (17 two and three bedroom fully self-contained apartments) located adjacent Cocconut Point National Park; this resort is not beachside. Activities offered by the Resort (relevant to aquatic ecology) include nature hikes within the Cocconut Point National Park and Wetlands Reserve.

There are similarities in the potential impacts associated with the operation of Seaspray Resort and Spa and the proposed GKI Revitalisation Plan, including:



- degradation of coastal ecosystems associated with litter and waste, habitat destruction, and collection of shells and other coastal resources as souvenirs; and
- degradation of freshwater ecosystems as discussed in **Appendix W**.

#### 7.2.2.3 Zilzie Bay

Zilzie Bay is an urban development (accommodation) with the first synthetic golf course alongside the GBR. Potential cumulative impacts include:

- degradation of coastal ecosystems associated with litter and waste, habitat destruction, and collection of shells and other coastal resources as souvenirs;
- disturbance to turtle nesting activities, assuming there is some turtle nesting along the Resort's shoreline; and
- degradation of freshwater ecosystems as discussed in **Appendix W**.

#### 7.2.2.4 Mercure Capricorn Resort

The Mercure Capricorn Resort is a large (281 rooms) beachside resort at Yeppoon. The Resort's facilities (relevant to aquatic ecology) include two international golf courses, guided beach horse riding, sea kayaks, stand up paddle boards, beach fishing, wetland canoe eco-tours, Great Keppel Islands tours and general activities along the shoreline.

There are similarities in the potential impacts associated with the operation of the Mercure Capricorn Resort and the proposed GKI Revitalisation Plan, including:

- run-off from the golf course, particularly nutrients from fertilisers;
- trampling (physical destruction) of coral reef adjacent to the Resort and around GKI;
- increased road traffic due to services and guests;
- increased boat traffic associated with day cruises to GKI, and associated boat strike of dugongs and marine mammals;
- degradation of coastal ecosystems associated with litter and waste, habitat destruction, and collection of shells and other coastal resources as souvenirs;
- disturbance to turtle nesting activities, assuming there is some turtle nesting along the Resort's shoreline; and
- degradation of freshwater ecosystems as discussed in **Appendix W**.

Note that as these facilities are existing and documentation is unavailable for their construction. Cumulative impacts are determined upon their operational functions.

### 7.2.3 Potential Impacts Associated with the Resort Developments

The extent of potential impact of the GKI Revitalisation Plan is likely to be minimal where appropriate mitigation measures are developed and adhered to (refer to **Table 7.1**). The cumulative impact of the operation of the development and nearby resorts is therefore also likely to be negligible for most potential operational impacts that the resorts have in common. For example:

- potential impacts to recreational fishing are expected to be minor where managed with a combination of legislation and education including fisheries regulations (e.g. bag limits and no catch species) and GBRMP zoning information at all resorts;
- potential impacts associated with marina activities are expected to be minor where managed through marine-specific EMPs at GKI and the Keppel Bay Marina, including the Dredge Management Plans and Spill Management Plans overseen by state and federal agency permits and auditing and proponent monitoring and reporting;
- potential impacts associated with trampling of coral reef is expected to be minor where managed through education and guided tours and in accordance with GBRMP zoning and regulations; impacts to reef environments at each of the resorts are unlikely to have a significant cumulative impact given each respective reef is unlikely to rely on other respective areas for ecosystem functioning (many resident coral reefs species have small home ranges), and there are large areas of coral reef near each of the resorts (e.g. fringing the mainland, Middle Island and other islands of the Keppel Group) that can contribute to local and regional ecosystem functioning for transient coral reef species;
- potential impacts associated with degradation of coastal ecosystems (associated with litter and waste, habitat destruction, and collection of shells and other coastal resources as souvenirs) are considered minor where managed through the EMP and GBRMP and national park regulations; impacts to coastal environments at each of the resorts are unlikely to have a cumulative impact given each respective reef is unlikely to rely on other respective areas for ecosystem functioning (many resident coral reefs species have small home ranges), and there are large areas of coral reef near each of the resorts (e.g. fringing the mainland, Middle Island and other islands of the Keppel Group) that can contribute to local and regional ecosystem functioning for transient coral reef species;
- potential impacts associated with disturbance to turtle nesting is expected to be minimal where construction and maintenance activities are undertaken outside of the nesting and breeding seasons and in accordance with the EMP, and resort lighting is not directed to the shoreline (particularly considering beaches around the GKI and along the mainland adjacent to each of the resorts are not major rookeries for marine turtles); and
- potential impacts associated with nutrient-laden run-off from the golf courses are considered negligible where all run-off is captured for treatment (there will be no impact to the downstream ecosystems of Leeke's Creek).

There is a risk of cumulative impact associated with visitation to GKI by nearby resort guests, such as litter and waste, hydrocarbon spills, boat strike, noise disturbance, disturbance of nesting turtles and trampling of coral. Where nearby resorts apply the same mitigation measures as those proposed by the GKI Revitalisation Plan, and adhere to GBRMP and other regulations, impacts are expected to be manageable. There remains the potential for a major cumulative impact where island visitation is not managed collaboratively. However, although other facilities 'offer' GKI tours it is assumed that they will continue with the current practice of using the existing tour providers that operate from the Rosslyn Bay Marina. The scale of the land based operations are not expected to increase tour operators capacity, therefore management of existing tour operations will mitigate any cumulative impact of these facilities

Other proposed projects in the Region are the Xstrata Balaclava Island Coal Export Terminal (BICET) and the Fitzroy Terminal Project (FTP) independently owned projects both proposed at Port Alma some 45 kilometres south-east of Great Keppel Island. The BICET Project proposes a dredge campaign of approximately six million cubic metres of material to allow entry of Panamax vessels to its berths at Balaclava Island. FTP proposes limited dredging within Raglan Creek near Port Alma to allow entry of the shallow draft barges to its terminal in Raglan Creek.

Increased shipping resulting from either of these projects if approved are not predicted to have an impact on the GKI Revitalisation Project as they will be accessing existing shipping channels away from GKI. Impacts from the dredging from the BICET Project could potentially have a cumulative impact on the corals and marine aquatic ecosystems of GKI if ocean disposal is adopted and hydrodynamic modelling is shown to deposit excess amounts of sediment within the vicinity of GKI.

The Great Barrier Reef Outlook Report 2009 identified the most serious threats to the GBR ecosystem. Of primary concern were climate change, rural and agricultural development and catchment runoff, urban and industrial development and runoff, and fishing pressure. Specifically, the most significant risks were sea level rise, sea temperature increase, ocean acidification, fishing of top predators and nutrient and pesticide run-off; with moderate risk attributed to fishing concerns, coastal clearing, sediment run-off and marine debris. Existing projects in the vicinity of GKI will have negligible if any contribution to these risks, thus the cumulative impact of surrounding projects with GKI are negligible provided that all other operations also operate at best practice with respect to elements such as run-off control and contribution to climate change. Proposed projects in the vicinity of GKI will need to determine that they do not further contribute significantly to catchment runoff through dredging disposal to be determined to have negligible contribution to the cumulative impact upon GKI.

Project developments have the potential to have social and economic impacts if not planned collaboratively. Flow-on business opportunities for the BICET Project are likely to be in Rockhampton, FTP in Rockhampton, Gracemere and the Capricorn Coast (if employees are ferried from Rosslyn Bay) and GKI Revitalisation Plan predominantly on the Capricorn Coast and a lesser extent in Rockhampton.

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(To allow for A3 pages to be included within hardcopy submissions.)