



As one of the world's most sensitive tourism developments, Green Island Resort takes great pride in the management and day-to-day operations of the island. The following fact sheets have been compiled to share our commitment, innovation and dedication to the future of this world heritage environment.

We hope you enjoy learning more about our island home.

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**GREEN ISLAND**  
RESORT  
GREAT BARRIER REEF • AUSTRALIA

# GREEN ISLAND IN BRIEF

Green Island is a very unique island. It is one of 300 sand cays on the Great Barrier Reef, but it is the only one with a rainforest.

## LOCATION

Green Island and its reef is very close to the mainland, lying only 27 km (16 miles) from Cairns. The island sits on the north-western edge of the reef flat. The surrounding reef is classified an 'inshore patch reef'.

## A PROTECTED AREA

The Australian government recognises that Green Island is a very special place and has protected it in several ways:

1. The island is a National Park and all commercial activities are regulated by permits.
2. The reef and underwater habitats are part of the Great Barrier Reef Marine Park.
3. Both Green Island and its reef are included in the Great Barrier Reef World Heritage Area, which gives it international protection under UNESCO.

## ISLAND FORMATION

Sand cays are islands that form on top of existing reef structures - they are basically large piles of sand, coral rubble, broken shells and other reef debris.

Wave action pushes the rubble debris into a pile on the leeward, or calm side, of a reef flat. If conditions are just right, this pile of rubble grows into a small sand island.

Seabird droppings help cement the sand together so that it will not wash away with tides. They also provide nutrients for germinating seeds that wash onto the island. Over time, if conditions remain 'just right', the island can develop a complex ecology.

## AGE

The exact age of Green Island is unknown, but best estimates are about 6,000 years old.

Scientists know that all sand cays on the Great Barrier Reef formed since the last Ice Age, about 8,000 years ago, when low sea levels destroyed all previously existing sand cays.



## CLIMATE

Green Island's climate is tropical, with a wet season (January to March) that brings an average yearly rainfall of over 2 metres (86 inches).

Mean air temperatures vary between 24°C - 31°C in summer (November – April) and 19°C - 23°C in winter (June – August). Prevailing winds come from the southeast and can reach speeds of over 35 knots. They are usually strongest in winter.

## GREEN ISLAND FACTS & FIGURES

Island Size . . . . .	12 ha	Length . . . . .	660 m
. . . . .	(30 acres)	Width . . . . .	260 m
National Park Area . . . .	7.93 ha	Circumference . . . . .	1.6 km
Reef Area . . . . .	1,200 ha	Maximum Height . . . . .	4 m

# GREEN ISLAND IN BRIEF



## MARINE LIFE ON THE REEF

The reef surrounding Green Island supports a diverse range of habitats and marine life.

There are two significant habitats:

1. The seagrass beds in the shallows
2. the reef that starts shallow and continues into the depths.

Seagrass beds support a wide range of animals, from juvenile fish that use the grass for protection from predators to large sea turtles and dugong that feed on the seagrass.

The reef around Green Island has over 190 different types of hard corals and over 100 types of soft corals.

## PLANT LIFE ON THE ISLAND

This island supports many diverse plants in a very small area. In fact, there are over 120 types of native plants.

The coastline is ringed by short, scrubby coastal vegetation that can survive the dry harsh conditions along the beach. But, step a few feet in to the centre of the island, and the vegetation changes abruptly to a dense, shady vine-thicket rainforest.

Coconut trees are not thought to be native to the island, but were introduced to the island in 1889 to provide food, drink and shelter for fishermen and stranded sailors.

### PLANT TYPES

Trees . . . . .	49 Species
Palms . . . . .	3 Species
Shrubs . . . . .	7 Species
Vines & Creepers . . . . .	18 Species
Grasses . . . . .	4 Species
Herbs . . . . .	2 Species

## WATER

There are no natural freshwater springs on the island. The vegetation gets all their water for survival from rainwater that percolates through the sand to a small freshwater lens under the island.

The Resort does not access this water ensuring the water lens and plantlife are not disturbed. The Resort has a desalination plant.

## BIRD LIFE ON THE ISLAND

Green Island attracts a wide range of birds, including land birds, seabirds and migratory birds that pass through the Great Barrier Reef on the way to nesting grounds.

There are over 55 species of birds regularly seen on Green Island. Of these, 13 are seabirds and 38 are shore and land birds. About 15 types of birds regularly nest on the island.

*In 1908 a visitor to Green Island wrote in his diary:*

*“The vegetation then was very small, 5 to 6 feet high and you could practically look over it”.*

*This means the large trees that you see today are just over 100 years old.*

# GREEN ISLAND AWARDS

Green Island has received many outstanding awards. These have been received in a range of areas including environmental sustainability, customer service and resort development.

## ECOTOURISM AUSTRALIA



In recognition of ecologically sustainable tourism with a primary focus on experiencing natural areas that fosters environmental and cultural understanding, appreciation and conservation.

Since 2001: Advanced Ecotourism Certification

2007 Winner	Environmental Protection Award Far North Queensland
2006 Winner	Cleanest Beach Far North Queensland
2005 Winner	Protection of the Environment Award Far North Queensland
2004 Winner	Resource Conservation & Waste Management Award Queensland & Far North Queensland

## KEEP AUSTRALIA BEAUTIFUL COUNCIL & ENVIRONMENTAL PROTECTION AGENCY CLEAN BEACH CHALLENGE



These awards recognise the dedication to the care of Green Island by the staff of Green Island Resort and Great Adventures, Queensland Parks & Wildlife Service and the Cairns City Council.

2004 Winner	Litter Prevention Award Far North Queensland Region
2003 Winner	Friendliest Beach Award Far North Queensland
2002 Winner	Resource Conservation & Waste Management Award Far North Queensland Region
2001 Winner	Resource Conservation & Waste Management Award Queensland & Far North Queensland



They acknowledge care for the beaches and coastal environments, environmentally focused infrastructure and responsible day to day maintenance.

2009 Winner	"Resource Recovery" Award Queensland	2001 Winner	Cleanest Beach Far North Queensland
2009 Winner	Environmental Protection, Resource Recovery & Litter Prevention Awards Far North Queensland	2000 Winner	Cleanest Beach Far North Queensland
2008 Winner	Resource Recovery Queensland & Far North Queensland	2000 Winner	Resource Conservation & Waste Management Award Far North Queensland
2008 Winner	Cleanest Beach Far North Queensland		
2007 Winner	Tourism Queensland's Friendliest Beach Queensland & Far North Queensland		

# GREEN ISLAND AWARDS

## QUEENSLAND HOTELS ASSOCIATION (QHA) AWARD FOR EXCELLENCE



Highlighting the professionalism and the high quality of service offered on a daily basis and commitment to environmentally responsible operation.

- 2008 Winner Best Environmental Practice
- 2002 Winner "Hall of Fame"
- 2001 Winner Best Restaurant in Accommodation Hotel/Resort
- 2000 Winner Best Hotel/Resort Accommodation 5 Star and Above
- 1999 Winner Best Hotel/Resort Accommodation 100 Rooms or less
- 1994 Winner Best Redeveloped Hotel/Resort



## AUSTRALIAN HOTELS ASSOCIATION (AHA) NATIONAL AWARDS FOR EXCELLENCE

- 2009 Finalist Best Environmental Practice
- 2007 Finalist Best Environmental Practice
- 2000 Winner Superior Accommodation
- 1999 Finalist Best Hotel/Resort under 100 rooms

## TOURISM TROPICAL NORTH QUEENSLAND (TTNQ) TOURISM AWARDS



- 2004 Finalist Ecotourism
- 2003 Finalist Luxury Accommodation
- 2000 Winner Best Luxury Accommodation
- 1999 Winner Industry Training Private Sector
- 1999 Finalist Deluxe Accommodation

## QUEENSLAND TOURISM AWARDS



- 2000 Winner Deluxe Accommodation
- 1995 Winner Qld Tourism Development Project

## BRITISH AIRWAYS TOURISM FOR TOMORROW AWARDS



- 1999 Highly Commended Long Haul Special Category



## SIGNIFICANT DATES

There has been a lot of activity on Green Island! Throughout history, Green Island has been used for many purposes. This overview allows us a quick glimpse back in time.

Pre-1770	Local Aboriginal tribes (Gungandji & Mandingalbay) used Green Island and its reef for fishing, hunting, and manhood initiation ceremonies.
1770	Captain Cook first marked Green Island on the navigational charts and named it after the astronomer onboard, Charles Green.
1857	A bech-de-mer (sea cucumber) smoking station was established on Green Island. It was operated by a fisherman called JSV Mein, and operated for several decades before closing down.
1863	A ship called the 'Antagonist' shipwrecked on Green Island reef while carrying horses to India (14 May 1863).
1889	<ul style="list-style-type: none"> <li>» Coconuts were planted to provide shelter, food and drink for shipwrecked sailors.</li> <li>» Grass hut accommodation was constructed for fishing and hunting parties</li> </ul>
1890	The first organised pleasure cruises to Green Island commenced on a local coaster called 'Zeus'.
1906	<ul style="list-style-type: none"> <li>» Green Island was declared a Recreational Reserve under the Cairns Council.</li> <li>» The first public jetty was constructed.</li> </ul>
1924	Hayles commenced fortnightly passenger service from Cairns to Green Island.
1930	Kitty & Noel Monkman, pioneers in underwater photography and videography, moved to Green Island. During WW II they acted as volunteer air observers.
1931	The replacement jetty was constructed by Cairns Town Council.
1932	Cairns Town Council was granted a license to remove coral from the Green Island reef flat to make lime for mainland cane fields (operated until 1945).
1934	Green Island declared a Fauna Sanctuary
1936	Management control of Green Island changed from Cairns Town Council to the Queensland State.
1937	<ul style="list-style-type: none"> <li>» Green Island was declared a National Park.</li> <li>» World's first glass bottom boat launched</li> <li>» Research facility built (now Dept. of Primary Industry Research Laboratory).</li> <li>» Hayles was granted the first 20-year lease to develop a hotel with tourism activities.</li> </ul>
1939	First groyne was built to protect the foreshore.

1942	The first hotel, Coral Cay Hotel, was constructed by Hayles.
1946	Jetty was reconstructed after being destroyed by cyclone.
1954	World's first underwater observatory opened.
1958	Island camping permits no longer issued.
1960	Present jetty constructed.
1961	Great Barrier Reef Theatre constructed.
1963	Redeveloped hotel, the Green Island Reef Resort, opens.
1964	Crocodile Farm opens – the first ever on an island. Renamed Marineland Melanesia in 1972
1970	<ul style="list-style-type: none"> <li>» Queen Elizabeth II visits Green Island on her 44th birthday – as part of her tour that followed in Captain Cook's footsteps.</li> <li>» Sandbag retaining wall built near jetty to protect resort land from erosion.</li> </ul>
1974	Green Island Reef declared a Marine National Park by the Queensland Government.
1978	Seaplane access to Green Island permitted.
1981	Green Island Reef zoned a Marine National Park 'B' with a Buffer Zone under the Great Barrier Reef Marine Park Act (extending 500m out from edge of reef).
1982	Daily fast catamaran service from Cairns commenced by Hayles Pty Ltd.
1988	Dreamworld Corporation purchased Green Island Reef Resort and ferry services from Hayles Pty Ltd and renamed the company Great Adventures.
1989	Green Island Reef Resort closed due to disrepair.
1991	Daikyo Pty Ltd purchased the resort and ferry service on Green Island from Dreamworld Corporation
1992	Redevelopment of Green Island Resort and day facilities commenced.
1993	Redeveloped day facilities opened to the public.
1994	The Green Island Resort luxury accommodation opened.
2001	Green Island Resort desalination plant operational – producing over 55,000 litres of freshwater daily.
2005	Quicksilver Connections acquires Great Adventures and Green Island Resort from Daikyo Pty Ltd.

# AN ISLAND OF FIRSTS

Green Island has an amazing history! Even though Green Island is a very small island, it has played an important role in the history of Tropical North Queensland and the Great Barrier Reef region.

## A DIVERSE PAST

Before European discovery, local Gungandji aboriginal people used the island for manhood initiations.

In 1770 Captain James Cook sailed past Green Island onboard the HMS Endeavour and marked its location on his charts. He named the island after the chief observer and astronomer-in-charge on his ship, Mr Charles Green.

Since then, many different groups have relied on Green Island:

- » Fishermen used it as a beche-de-mer (sea cucumber) smoking station
- » Shipwrecked sailors used it as a safe haven
- » Local town folk and tourists used it as a tropical holiday destination.

There are many 'firsts' here on Green Island!



Tourists on the beach, circa 1912

## FIRST ISLAND TOURIST DESTINATION IN THE GREAT BARRIER REEF (1880s)

Tourism on the Great Barrier Reef started right here, on Green Island.

By 1889 there were several Fijian style grass huts on the island that were hired out for fishing expeditions. Green Island's reputation grew and by 1890 the vessel Zeus was running regular pleasure cruises between the mainland and Green Island.

By 1924 a local company, called Hayles (now Great Adventures), started a fortnightly passenger ferry service from Cairns. Later, in 1937, the Cairns Town Council granted Hayles the first tourism facilities lease to build small scale accommodation on the island.

## WORLD'S FIRST GLASS BOTTOM BOAT (1937)

The first glass bottom boat was launched at Green Island in 1937 by the Hayles company. It was a simple small wooden dinghy with glass floats overhanging the sides.

This boat was quite the novelty – it was the first time that visitors could view the reef without getting wet.

By 1948 a more modern version of the glass bottom boat was introduced – it had glass panels inserted into the floorboards, so people could look straight down on top of the reef without hanging over the sides.



The first motorised, glass-bottomed, steel-hulled glass bottom boat (1954)

# AN ISLAND OF FIRSTS

## THE WORLD'S FIRST UNDERWATER OBSERVATORY (1954)

The world's first underwater observatory was the vision of two local men - Vince Vlasoff and Lloyd Grigg. Construction started in June 1953 and took over a year to complete.

They used an old Navy dive chamber for the main chamber and the 22 portholes (with 2.7 cm, or 1 1/8 inch, thick glass) were recycled from a decommissioned WWII submarine.

The chamber walls are 1 cm (3/8 inch) steel plate reinforced with 24 cm (10 inch) steel girders, and are encased inside and out with (12.5 cm (5 inches) ferro-concrete. The entire structure was designed to withstand up to 96,000 lbs of pressure and is held in place by steel pins and sea anchors driven into the reef.

Getting the structure to Green Island was a challenge - it took over 18 hours, travelling at 1 knot, to tow the observatory the 27 km from Cairns.



Observatory under construction

Length . . . . .	7.5 m (25 ft)
Width . . . . .	2.4 m (8 foot)
Height . . . . .	2.1 m (7 feet)
Weight: . . . . .	70 tonnes



The Great Barrier Reef Theatre

## WORLD'S FIRST ISLAND MOVIE THEATRE (1961)

Noel & Kitty Monkman were among the first photographers to venture underwater in the 1930s. They spent years videoing the underwater wonders of the Great Barrier Reef.

In 1961 they opened the world's first movie theatre on an island - the Green Island Great Barrier Reef Theatre. It featured their wonderful videos, and remained in use until the early 1990s.

A stone monument to the Monkman's for their contribution to reef awareness and the conservation of Green Island is located on the island near the research station.

## AUSTRALIA'S FIRST ISLAND TERTIARY SEWAGE TREATMENT PLANT (1993)

When the old resort was acquired by Daikyo in 1990, a multi-million dollar redevelopment was carried out. This included the construction of a state-of-the-art tertiary sewage treatment plant.

This system was the 'first of its kind' used on any island in Australia and has won many environmental awards.

It was designed to process large amounts of waste without impacting on the surrounding coral reef. Rather than using toxic chemicals, it operates using a biological system with sand filters and UV radiation.



Sewage Treatment Plant



# ECOTOURISM ON GREEN ISLAND

Green Island Resort is dedicated to caring for the island while delivering the best and most enjoyable ecotourism experience for visitors. Ecotourism is defined as a tourism experience that takes place surrounded by nature, has negligible impacts on the environment, and provides opportunities to appreciate and learn about the natural area.

## OUR CONCERN FOR NATURE

The major concern of operating a resort in a fragile natural environment is how to protect it from impacts. 'Ecotourism' or 'Sustainable Tourism' becomes the primary focus of all operations.

Green Island Resort understands that keeping the island healthy and beautiful is very important to visitors as well as business. The philosophy behind the development was to achieve a delicate balance between maintaining customer satisfaction, catering to a wide range of visitors, and maintaining a healthy environment.

Green Island Resort strives to maintain this balance at all times. To do so, a 'precautionary principle' is adopted – if any activity or action poses any real or potential threat to the environment, it will not be allowed.

## ECOTOURISM ACCREDITATION

Since 2001, Green Island Resort has been given the highest level of Ecotourism Certification from the Australian Ecotourism Association Certification Program, an internationally recognised program that acknowledges tourist operations that achieve high levels of care for the environment.

## ENVIRONMENTAL AWARDS

Green Island Resort is recognised for providing quality accommodation in a wilderness setting. Many awards have been won since the resort opened in 1994 (please refer to Awards Fact Sheet).

## ACHIEVING ECOTOURISM EXCELLENCE

The resort adopts a range of strategies for delivering the best possible nature-based experience for all visitors and guests. These include:

- » A Company Environmental Policy that clearly outlines dedication to running an eco-friendly operation.
- » Professional Island Naturalists who provide a range of fun educational activities.
- » Quality interpretive materials that promote awareness and understanding of the unique Green Island natural system. Information sheets and brochures are available, as well as a reference book library.
- » The commitment to using biodegradable items wherever possible, such as cornstarch paper goods, paper and fabric shopping bags.
- » Environmentally aware staff who are keen to share the responsibility of protecting this fragile reef and rainforest environment, and eager to share this information with visitors.
- » Educational packages for schools, study programs and special interest groups that explore the complex interactions between nature and tourism and highlight the unique natural features on the island.
- » Strict Maintenance Programs and Standards to continuously maintain and upgrade resort buildings and facilities.



# ECOTOURISM ON GREEN ISLAND

## THE ENVIRONMENTAL MANAGEMENT PLAN

An environmental Management Plan has been specifically developed for the Resort. It identifies all potential environmental risks associated with operating on the island and outlines a series of strategies to minimise operational impacts and reduce the severity of unavoidable impacts. It also sets guidelines for properly responding to situations and incidents. These, in turn, are developed into procedures for all daily operations.

## THE GREEN ISLAND RESORT ENVIRONMENTAL COMMITTEE

Managers of the resort departments form the environmental committee, along with the Environmental Manager, Marine Biologist and island National Parks Ranger.

They work together to achieve several goals:

- » raise environmental awareness amongst both staff and visitors
- » review existing standards and determine ways to improve
- » research new and innovative methods
- » discuss issues facing the resort and the island
- » highlight new research that may affect the resort's operation.

## A POPULAR DESTINATION THROUGHOUT TIME

Since the first organised pleasure cruises to Green Island in 1890, the lure of its unique combination of natural beauty, cultural and historical values and close proximity to the mainland has made it a popular tourist destination for over a century.

The number of tourists visiting the island has increased dramatically over the past several decades, and today it is considered a high-use tourism destination.

Protecting the island's natural beauty, biodiversity and environmental processes are essential to its ongoing health, especially as numbers of tourists increase.

### VISITOR NUMBERS

1957.....	28,000
1960.....	48,000
1965.....	75,000
1970.....	97,000
1975.....	130,000
1990.....	281,000
1995.....	284,184
2004.....	385,211

We believe that...

to increase awareness, and protect the environment for future generations is an essential part of our daily operations and overall philosophy.

We strive to make significant contributions towards environmental awareness by encouraging everyone to get involved. Judging by the condition of Green Island Resort, the feedback from our guests, and the many local, state, national and international awards Green Island Resort has received, we are achieving our goal of providing a special ecotourism product.



# RESORT ECO FEATURES

Prior to 1992, tourist facilities on Green Island were basic. Redevelopment of the resort and island facilities created a world-class environmentally sustainable resort.

## THE RESORT

Green Island Resort is very exclusive with only 46 suites and up to 100 houseguests. The luxurious suites are large, varying from 56 - 66 square metres, each with individual balconies.

The underlying concern with the design of the resort was to ensure that there would not be any negative impacts on any of the island's fragile environments.

## GOVERNMENT & DEVELOPER PARTNERSHIPS

To best achieve the minimal-impact objectives, the resort developers formed strong partnerships with various governmental bodies. All parties shared the philosophy that tourism on the island had to be carefully balanced with the need to protect the environment and promote Great Barrier Reef World Heritage values. The resulting Green Island Resort has set the standard for many other small island resorts.

## BEST PRACTICE CODES FOR CONSTRUCTION

A Code of Environmental Practice for construction provided strict guidelines for all contractors and workers to comply with. This included:

- » No large cranes or trucks on the island - they were unable to manoeuvre without causing damage.
- » All equipment was checked for feral animals, pests, non-native plants and seeds. Equipment was washed down before unloading to prevent weed and disease contamination.
- » Work boots used on the island were left on the island – workers had to change shoes when they left.
- » Concrete mixing was conducted off-island to avoid contamination. All slabs were pre-fabricated on the mainland and brought to the island.

## KEY BUILDING FEATURES

### Building Size and Positions

Buildings were positioned around existing trees. Only diseased, non-native trees were removed. In order to achieve this in the most aesthetic manner, the rooms were designed as small modules (250 sq metres or less) and placed at angles to one another. This arrangement also limited shading impacts.



### Raised Off the Ground

All units were elevated on precast concrete piles, 900mm above ground level, to minimise disturbance on tree roots close to the buildings, natural soil moisture levels and wildlife movement.

No gutters and steep roofs let rain fall naturally. Raised buildings minimise ground and wildlife impacts.

### Building Height

Even visual impacts were considered. The buildings had to be tucked into the natural trees and below tree canopy height (7 - 8 metres) so as not to be visible from sea.

### Building Materials

All building are rendered masonry blocks, roof eaves are constructed from local hard woods, interior wood finishes are Tasmanian Oak, external wood finishes are Spotted Gum, and tiles are Australian and Italian made.

# RESORT ECO FEATURES

## Colour

Limitations were set on the colour that the buildings could be painted. Colour schemes were designed to be compatible with the surrounding environment.

## Gutters and steep roofs

Rainwater is vital to the survival of the rainforest plants on the island. Buildings have several features designed to maximise the amount of rainfall that falls onto the island. For example, gutters and other rain catchment devices are prohibited. Steep roofs help channel the rain to the ground.



## Swimming Pools

The depths of the swimming pools are limited to 2.2 metres so they do not interfere with the water table beneath the island.

## Raised Boardwalks

Buildings are linked with timber boardwalks to eliminate problems with compaction and erosion. These boardwalks also allow animals to move freely along the forest floor and do not interfere with tree root systems.

As with the resort buildings, boardwalks were built around existing trees. The gaps between the boards allow rainwater to fall freely to the ground to replenish the freshwater lens beneath the island.



## Hidden Services (pipes & wiring)

Water and fuel pipes and electrical wires are slung underneath the raised building slabs and boardwalks. This not only hides the unsightly pipes from sight, but also allows prompt and easy access for repairs.

## LANDSCAPING

### Plant Selection

Over 6,000 individual plants (of 60 different native species) were used in landscaping and re-vegetation on the Resort lease area.

Strict landscaping guidelines ensured that no non-native or pest plants were introduced. All plants were native to Green Island (endemic) and propagated from seeds collected from plants on the island.

Exotic plants (those not found locally) were strictly regulated. Only selected exotic plants could be used, and only in pots – never planted directly into the garden beds.

### Pest and Weed Control

Unlike many construction sites, there was no pre-treatment of the soil with pesticides. Instead, the Green Island Weed Eradication Program consists of careful monitoring and hand removal of all weeds and pest plants.

# GREEN ISLAND MANAGEMENT

Management of Green Island is very complex. Many different agencies share jurisdiction over Green Island. Although a large portion of it is National Park, there are diverse tourism and research interests on the island as well.

Even though the island is only very small (12 hectares) it has one of the most complicated management systems of any of the Great Barrier Reef islands, having state, federal and local laws governing various aspects.

## WORLD HERITAGE AREA

The entire Great Barrier Reef, including Green Island, was listed as a World Heritage Area in 1981.

## MOST OF THE ISLAND IS NATIONAL PARK (QUEENSLAND)

More than half of the island, including the rainforest and beaches, is National Park, managed by the Queensland Parks and Wildlife Service (QPWS), which is part of the Environmental Protection Agency. A full time National Parks Ranger resides on the island.

The Green Island Recreational Area Management Plan sets direction for island management to ensure it is conducted in a coordinated and complementary manner.

## SOME OF THE ISLAND IS ALSO A 'RECREATIONAL AREA'

The Green Island Recreational Area extends over the majority of the island, including the National Park, public esplanade, jetty, navigation channel and mooring area. Areas leased by Green Island Resort, Department of Primary Industries and Marineland Melanesia are excluded.

The Green Island Recreational Area was declared in March 1990. It is managed by the Recreational Area Management Board, which is given

advice on management related issues by the Green Island and Reef Advisory Committee (GIRAC). The GIRAC consists of all major island stakeholders.

## THE OCEAN AND REEF SURROUNDING GREEN ISLAND

All the waters and reef surrounding Green Island are part of the Great Barrier Reef Marine Park. However, even management of these areas are complicated. The Marine Park system is divided into two sections:

- » Queensland Marine Park – the waters and beaches between low and high tide marks are managed by the Queensland state government (Queensland Parks & Wildlife Service).
- » Great Barrier Reef Marine Park – the waters and reefs below the low tide mark are managed jointly by the commonwealth government (the Great Barrier Marine Park Authority, GBRMPA) and Queensland state government (QPWS).

Green Island also falls under another management regime called the Cairns Area Plan of Management (CAPOM). Under this Plan, Green Island is categorised as a 'Sensitive Location' with high conservation, cultural, heritage and scientific values.

It sets out limits on numbers of moorings, size of vessels and numbers of tourists allowed to visit the island.

## MANY LEVELS OF PROTECTION

### The Great Barrier Reef Marine Park Act & Regulations 1975

- » Sets out the overall management system for the GBR.
- » Sets out reef-wide laws of the reef.

### Zoning Plans

- » Divides the GBR into zones
- » Sets out what activities are allowed within each zone.

### Plans of Management

- » Only applies to the Cairns, Whitsunday and Hinchinbrook Island areas.
- » Divides individual reefs into fine scale zones.
- » Sets limits on the amount of people and activities that can take place at each reef.
- » Sets limits on the number of vessels that can visit each reef.

# GREEN ISLAND MANAGEMENT

## THE GREEN ISLAND REEFS

All reefs within the Great Barrier Reef Marine Park have been zoned under the GBR Zoning Plans. Green Island's surrounding reefs are classified as Marine National Park, or 'Green Zone'. Additionally, a large area away from tourist activity, is classified as a Scientific Research Zone.

A Green Zone is a 'no-take' area which means that removing things such as shells and activities such as fishing are illegal, but the area can be used for low impact activities including diving, snorkelling and boating.

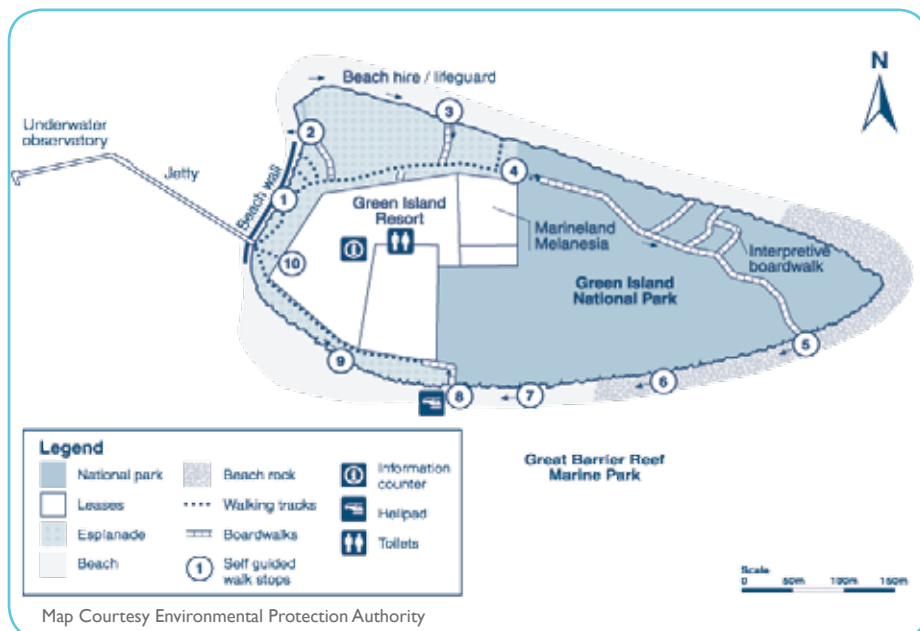
Green Zones are important for protecting the biodiversity and ecological systems that sustain the Great Barrier Reef ecosystem.

## THE PUBLIC BEACH AREA

The area near Beach Hire (technically called the 'Esplanade') is a public beach area that is managed by the local Cairns City Council (CCC). However, the QPWS National Parks Ranger has the authority to manage all day-to-day issues.

## THE JETTY

The Jetty is owned, operated and managed by the Cairns Port Authority (CPA).



## LIMITS TO ISLAND DEVELOPMENT :THE CAIRNS PLAN

Development on the island for recreational or tourist purposes is controlled by the Islands District Plan within the Cairns City Council's 'Cairns Plan' (January 2005). The Plan provides guidelines and criteria for refurbishments and developments of tourism related development on the island, including lease areas.

## LIMITS TO COMMERCIAL ACTIVITIES : PERMITS

All commercial activities require permits to operate.

Commercial activities on the island, such as photography and nature walks, require permits from QPWS, while commercial activities on the reef, such as scuba diving, require permits from the GBRMPA.

## FACTS & FIGURES

- » Visitors allowed on island per day. . . . . 2240
- » Total visitors per year . . . . . Over 300,000

### Leaseholders

- » Green Island Resort
- » Department of Primary Industry Research Station
- » Marineland Melanesia Crocodile Farm

# TERTIARY SEWAGE TREATMENT PLANT

Green Island's state-of-the-art tertiary level sewage treatment plant (STP) is an example of Best Practice Environmental Management. This sewage treatment plant has served as the prototype for many other small island resorts in the Great Barrier Reef and around the world.

## A FIRST OF ITS KIND

Green Island's Tertiary Sewage Treatment Plant was the first of its kind to be built on an island!

Prior to the resort's redevelopment in the early 1990s, there was very little, if any, treatment given to sewage waste. Most of it was released directly off the reef. At this time, scientists had not yet realised the detrimental effect sewage had on the marine environment.

With this new facility, no raw sewage is released. The only thing that is pumped out to sea is treated effluent water that meets strict quality standards.

Today, this STP is still considered one of the best island-based systems in use. In 2007 the STP was upgraded and a Programmable Logic Controller (PLC) was introduced allowing a more efficient operation.



View of the Sewage Treatment Plant

## CONSTRUCTION

The sewage plant was designed by GHD Consultants, constructed jointly with Thiess Contractors, and is currently managed by Green Island Resort. Construction of the STP and surrounding infrastructure took several years. It was completed in November 1992 and cost several million dollars.

The STP processes wastewater from all resort guest rooms, staff accommodation, day-use facility toilets and showers, and pools. It also takes wastewater from the other facilities on the island, including Marineland Melanesia (crocodile farm), the Queensland Parks and Wildlife Service Ranger station, and the Department of Primary Industry research station.

## STANDARDS, BEST PRACTICES AND MANAGEMENT

The plant must consistently meet stringent environmental standards established by a variety of government agencies. Green Island Resort holds several permits and authorities that set out strict water quality standards. These are closely monitored to ensure the protection of both the marine and island environments.

### TREATED EFFLUENT WATER RE-USE

Recycled water is used in the following areas:

- » Resort's toilet system
- » Air conditioning cooling towers
- » Emergency fire fighting reserve
- » Garden irrigation system.



# TERTIARY SEWAGE TREATMENT PLANT

## THE PROCESS

The STP processes around 30 million litres of wastewater annually.

The system is a biological process, with the wastewater flowing through a series of settling tanks and disinfectant systems (including sand filters and UV radiation).

It takes about 6 hours to go through the entire system. All solid waste and sludge is barged off the island back to the mainland. Only very small quantities of treated effluent water are discharged into the ocean via a deep water pipe located a long way off the edge of the reef. Annual surveys of the area show that there are no impacts to the marine environment.

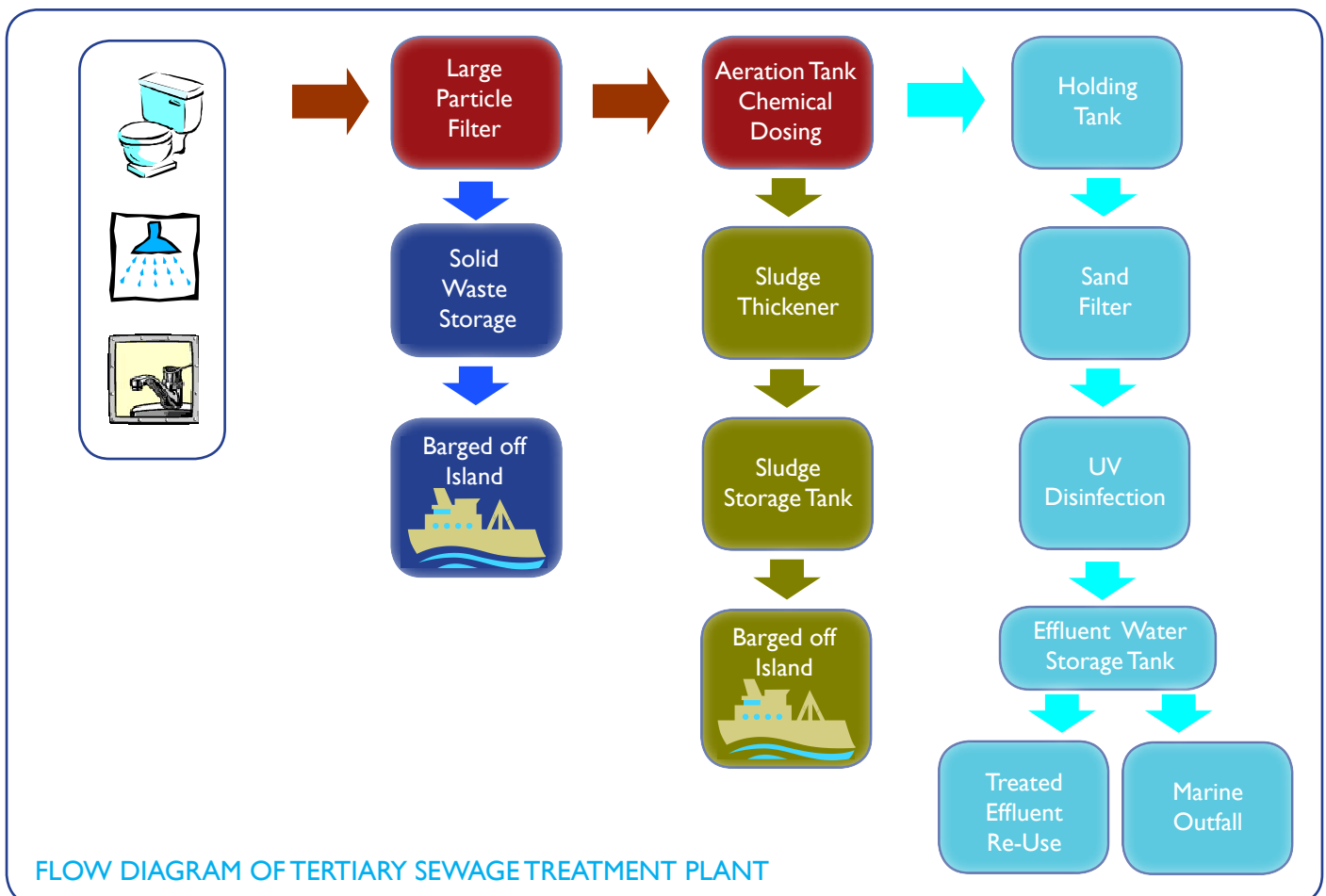
Since the STP upgrade (2007) there have been a

number of benefits including a reduced Carbon footprint (approximately 8 tonnes of CO<sub>2</sub>) and further improvement to the quality of the discharge effluent. The discharge water exceeds not only national standards, but also international guidelines for discharge water quality. The system upgrade also reduced the use of chemicals in the process.

## RECYCLING TREATED EFFLUENT WATER

One of the most innovative features about this STP is the ability to recycle the treated effluent water in areas of the resort that do not require potable (drinkable) water.

The treated effluent water is very clean – although it is not considered drinkable water, it is bacteria free, clear and odourless. By doing this, freshwater usage is minimised, and the amount of treated effluent water released into the ocean is reduced.







# MANAGING CHEMICALS ON GREEN ISLAND

Green Island Resort limits the use of chemicals. Green Island is a very fragile sand cay ecosystem that can be harmed by harsh chemicals. The Resort has a strict Chemical Management system that regulates what types of chemicals can be used, how much can be used, how they are stored and how they are disposed

## PURCHASING ENVIRONMENTALLY FRIENDLY CHEMICALS

Proper chemical management starts at the purchasing level - only approved chemicals can be purchased and used on the island. All efforts are made to choose non-toxic and environmentally friendly chemicals and cleaning products. A lot of time goes into investigating the most up-to-date and innovative products and alternative non-chemical technologies.

## OTHER RESTRICTIONS ON CHEMICAL CHOICES

Not only do we look after the environment, but we also have to watch out for what goes into the Sewage Treatment Plant (STP).

Since STP is a biological system, harsh chemicals can affect the biological balance, which can result in plant failure. Therefore, only certain chemicals can enter the STP system. Only chemicals that the STP can handle are allowed to be used on the island and in the resort.

## LIMITING HOW MUCH IS USED

In addition to limiting the types of chemical allowed on the island, the amounts of chemicals used are restricted:

- » Bulk quantities are kept on the mainland, with only limited amounts sent to the island
- » A detailed register of chemical usage is maintained and reviewed regularly
- » Minimum concentrations are determined – super strong solutions are avoided.
- » Special quantity-adjusted chemical dispensers are used.

## ALL CHEMICALS ARE CAREFULLY STORED

Proper storage of chemicals is very important so there are no accidental spills into the environment. All chemicals are stored in specially designed areas that are properly sealed to contain any leaks and prevent environmental contamination.

## SPILLS ARE CAREFULLY CLEANED UP

Chemical spills are never washed away. A strict set of procedures requires that any spills, no matter how small, must be physically contained (isolated), either swept up or soaked up with special absorbent pads. The chemicals and clean-up materials must then be stored in special containers and transported to the mainland for proper disposal.

A fully equipped Spill Response Kit is always on-site, and staff undergo regular training in chemical use, spill prevention and spill clean up.

### Our strict chemical purchasing procedure states...

- » What types of chemicals can be used and purchased
- » Steps taken to get approval for a new chemical
- » Guidelines for chemical usage.

# MANAGING CHEMICALS ON GREEN ISLAND



## CHEMICAL AUDITS

Chemical Audits are conducted at least once a year. The resulting Chemical Audit Reports present the findings and lists recommendations for chemical use and storage improvements.

These audits assess:

- » What chemicals are being used
- » If there are any old or inappropriate chemicals in storage
- » The chemical consumption rates
- » Condition of storage facilities
- » Spill kit inventory
- » Staff training levels
- » Other safeguards.

## KNOWING ABOUT THE CHEMICALS

Chemical manufacturers must produce information sheets, called Material Safety Data Sheets (MSDS), for all chemicals. These sheets outline the use, storage, clean up and first aid requirements specific to each chemical.

These MSDS sheets are kept on location and available to all employees.

- » The Chief Engineer holds a complete register of all MSDS for all chemicals on the island.
- » Department Managers hold a register of MSDS for all chemicals used in their department.
- » All new chemicals are added when they are introduced.
- » Contractors working on the island must provide relevant MSDS sheets to the Chief Engineer for approval before use.

Employees who use chemicals as part of their daily duties are required to read and understand the information on these sheets before they are allowed to handle any chemicals.

## WELL TRAINED STAFF

All resort staff undergo special chemical awareness training as part of their new staff induction training. Further, chemical specific training, is conducted on the job. During this training, staff are issued with an approved list of chemicals permitted on the island. All new employees are informed of the MSDS locations, and encouraged to review them regularly and keep up-to-date with the information.

# MANAGING WASTE ON GREEN ISLAND

Keeping Green Island waste free is a top priority. Minimising litter, reducing waste and promoting recycling are key elements of both the Green Island Resort Waste Management Plan and Environmental Policy.

## THE PROBLEM WITH WASTE

Poor waste management can result in many harmful impacts on the environment. These include:

- » Unightly visual aesthetics
- » Animal entanglement, injury and illness
- » Pest animal attraction
- » Toxic land or water contamination & health issues.

## TAKING CARE OF SOLID WASTE

Common waste disposal techniques used on the mainland (such as dumping, incineration, composting) cannot be used on Green Island due to its fragile natural environment.

- » The soil is too thin to dig a dumping pit
- » Incineration would result in potentially toxic smoke and air pollution that would affect the local wildlife
- » Composting runs the risk of soil contamination and introduced exotic plants from discarded seeds. It can also be unsightly and odorous, which on a small island can be a problem.

In fact, disposal of any solid waste on Green Island is prohibited. All waste must be taken back to the mainland for disposal.

## WASTE MANAGEMENT GOALS

The underlying goals of waste management are to reduce, re-use, recycle and ensure safe disposal.

### Reduce

- » Minimize the amount of solid waste produced.
- » Buy products in bulk where possible.
- » Buy minimally packaged goods and choose reusable products over disposable ones.
- » Minimise use of plastic bags – offer paper or fabric alternatives.
- » Minimise use of disposable items (plastic utensils and cups) – promote biodegradable options such as cornstarch products.
- » Conduct daily litter clean-up.

### Reuse

To reuse materials wherever possible throughout the operation.

- » Reuse packaging where possible.
- » Refill small bottles from large bulk containers.



Recycling Station

## WHAT IS WASTE?

Waste can be...

- » Solid
- » Liquid
- » Gas
- » A combination of the above.

Waste is anything that is left over. This can include unwanted by-products from industrial, commercial, domestic or other activities. It can be waste whether or not it is of value.

## RECYCLABLES

The resort recycles as much as possible, including:

- » Paper
- » Cardboard
- » Glass and plastic
- » Cooking oils
- » Aluminium
- » Oil filters
- » Corks
- » Bathroom bottles
- » Old uniforms
- » Slippers.

# MANAGING WASTE ON GREEN ISLAND

## Recycle

To increase participation in, and commitment to, recycling programs.

- » Place recycling bins in accessible areas.
- » Separate recyclables before transporting to mainland for disposal.
- » Encourage visitor and employee participation.

## Safe Disposal

To ensure the proper disposal of all solid waste, hazardous or not, to prevent environmental contamination.

- » Follow all best practices and legislative requirements for disposal of waste.
- » Cover all containers to prevent animal interference.
- » Provide special cigarette butt bins to reduce spillage and windblown litter.
- » Never dispose in the ocean, on the ground or down drains.
- » Review current restrictions and advice notices regularly.



Specially designed cigarette ashtrays for beach conditions

## BEING RECOGNISED FOR OUR EFFORTS

Green Island Resort has been repeatedly recognised for its contribution to maintaining good waste practices and keeping Green Island beautiful and litter free.

Such awards (listed below) include the **Environmental Protection Agency Clean Beach Challenge Awards Program** recognising community pride and environmental responsibility.

2008	» Resource Recovery, Queensland & Far North Queensland » Cleanest Beach, Far North Queensland
2007	» Friendliest Beach Award, Queensland & Far North Queensland » Environmental Protection Award, Far North Queensland
2006	» Cleanest Beach Award, Far North Queensland
2005	» Protection of the Environment Award, Far North Queensland
2004	» Resource Conservation & Waste Management Awards, Queensland and Far North Queensland » Litter Prevention Award, Far North Queensland
2003	» Friendliest Beach Award, Far North Queensland
2002	» Resource Conservation & Waste Management Award, Far North Queensland
2001	» Resource Conservation & Waste Management Awards, Queensland and Far North Queensland » Cleanest Beach Award, Far North Queensland
2000	» Cleanest Beach Award, Far North Queensland » Resource Conservation & Waste Management Award, Far North Queensland.

# WATER MANAGEMENT

Natural freshwater on Green Island is very limited. Since there are no natural springs or lakes on the island and all the vegetation relies on rainfall for survival, the resort must provide its own water. Strict water restrictions prevent the resort from catching any rainwater or tapping into the underground freshwater lens.

## WATER USAGE & CONSERVATION FEATURES

Tourists use a lot of water. Showering and bathing uses up the greatest quantities of fresh water. To reduce water usage, a series of water conservation features are installed throughout the resort. These include:

- » Tap aerators
- » Spring loaded automatic turn-off taps
- » Low-flow showerheads
- » Dual/low flush toilets
- » Reused treated effluent water into toilets and irrigation system
- » Signs to encourage guests to reuse room towels before laundering
- » Information cards in guest rooms highlighting the resort's water conservation efforts
- » Low water laundry machines (only fully loaded laundry machines are put through cycles)
- » Special water meters to detect leaks in the system.

Implementation of these water saving initiatives significantly reduced water consumption. Calculations showed that visitor usage was reduced from over 74 litres per person per day to less than 65 litres.

## POTABLE WATER (FOR DRINKING & WASHING)

Prior to 2001, all potable water was barged to the resort from Cairns. To keep up with demand two barges, each carrying 130 kilolitre (kL) of water,

were delivered to the resort every week. That was the equivalent of over six average backyard swimming pools being delivered every week.

In 2001, Green Island Resort installed a desalination plant that removes salt from seawater and produces freshwater.

The desalination plant meets water demand by producing 60,000L of water daily (see Desalination Plant Fact Sheet). Barge water is now only used to supplement potable water storages.

## NON-POTABLE WATER (NOT FOR DRINKING)

The freshwater produced by the desalination plant is used strictly for potable water.

Non-potable water, for toilet flushing, garden irrigation, cooling towers and fire fighting reserves, is recycled treated effluent water from the resort's tertiary sewage treatment plant. Reusing effluent water not only allows for the beneficial reuse of a waste product, but is also cost effective.

## WATER MANAGEMENT TRAINING

All resort staff share the responsibility of conserving water on the island. Upon employment, staff attend Induction training which discusses water issues and conservation steps to be taken while living and working on the island.



Spring loaded taps turn off automatically

## THERE ARE TWO TYPES OF WATER...

### Potable Water

Suitable for drinking and cooking by humans. Complies with relevant drinking water guidelines.

### Non-Potable Water

Not suitable for human consumption (i.e. sewage effluent). Can be used for other purposes such as fighting fires, toilets and irrigation.



# MAKING FRESHWATER - Desalination Plant

Since there are no natural springs or rivers on Green Island, freshwater is very limited. All natural freshwater on the island comes from rainfall. Demand for freshwater by the island's plants is very high - without the water, the rainforest would die. To prevent any conflicts with the natural environment, Green Island Resort produces its own water.

## FRESHWATER FOR THE RESORT

Prior to 2001, Green Island Resort barged all its potable freshwater from the mainland. As costs for this service increased, the resort considered alternative options and chose to install a desalination plant. This plant now supplies water to all the operations on Green Island, including public facilities, Marineland Melanesia, the DPI research station and the National Parks ranger station.

## REVERSE-OSMOSIS DESALINATION PLANT

The system uses reverse osmosis spiral wound membranes. The process uses pressure to force salt or brackish water through membranes where only the clean water passes, leaving behind the salt and other natural impurities. Most other reverse osmosis desalination plants use a disc tube module configuration or hollow fibre membrane module configuration.



Inside the Desalination Plant

## THE DESALINATION PROCESS

The desalination process starts in the ocean and goes through several steps.

- » Seawater is taken from the ocean via a pipe that extends off the jetty.
- » It travels along the jetty, through the resort (in water pipes that are suspended under the boardwalks and buildings) and into a settlement tank.
- » From the settlement tank it is pumped through two sand filters and two progressively finer rope-wound carbon filters.
- » Before the water leaves the plant, it is chlorine dosed to provide residual disinfection.
- » It is then further disinfected with UV (ultraviolet) light.

The only waste product generated in the process is hyper-saline brine. This brine contains rejected salts and other natural impurities. The brine water is discharged into the same deep-water

sewage outfall pipe used by the tertiary treatment plant.



The water pipe runs under the jetty to the resort.

## QUALITY AND SAFETY

The potable water produced is tested regularly and must meet stringent standards, including World Health Organisation guidelines. The plant must comply with strict environmental standards and is regularly monitored and quality tested.

## DESALINATION PLANT FACTS & FIGURES

Freshwater made each day . . . . .	About 60,000 litres
Freshwater produced per hour . . . . .	3,300 litres
Seawater processed per hour . . . . .	Approx. 10.3m <sup>3</sup>
Salinity of seawater . . . . .	32,000 ppm (parts per million)
Salinity of produced freshwater . . . . .	290 ppm (parts per million)
Rejected brine per hour . . . . .	Approx. 5.3 m <sup>3</sup>
Salinity of rejected brine . . . . .	45,600 ppm (parts per million)

# TREATED EFFLUENT WATER RE-USE

## Air Conditioning Cooling Towers

Green Island has very strict water management to reduce water wastage. Since freshwater is very limited on Green Island, water conservation and recycling is very important.

### AN INNOVATIVE IDEA

Green Island Resort identified areas within the resort's operation that could utilise recycled water from the Tertiary Sewage Treatment Plant (STP). The air conditioning cooling towers is one of those areas.

In the early 1990s, this was an innovative idea. There were no other existing systems that operated in this manner. In fact, guidelines for this sort of operation were only just being developed. To reuse treated effluent water, strict quality standards (ANZECC Guidelines and Australian Standard AS3666.1 to 3666.3) must be met.



Tertiary Sewage Treatment Plant

### PRE-TREATMENT

Treated effluent water is pumped from the STP to the cooling towers.

- » Before it reaches the towers, it is dosed with pool-chlorine (a sodium hypochlorite solution).

- » It is circulated through a tank where an Oxidation Reduction Potential Controller (ORP) continuously measures the milli-volt reading. This process assures that the chlorine levels are set properly to effectively kill bacteria, but not cause any harm. The chlorine levels are kept to between 0.8 and 1.0 ppm.

### IN THE COOLING TOWERS

- » The treated effluent water is further treated in the AT512 Controller system with Biocide PI09 and Corrostop 105. The Biocide is a second defence against any bacteria and algae in the water and will prevent build up of algal and bacterial slimes within the cooling tanks. Corrostop is a corrosion and scale inhibitor.
- » At a certain pre-set level, the water in the cooling tower is bled off and returned to the sewage treatment plant for re-treatment and disposal.

### DISPOSAL

- » When the water is drained from the cooling towers, it is pumped back to the Sewage Treatment Plant.
- » Levels of residual chlorine, Biocide and Corrostop are very low and do not cause any problems within the sewage treatment plant. In fact, tests show that no chlorine remains in the final effluent water.



One of the Air Conditioning Cooling Towers

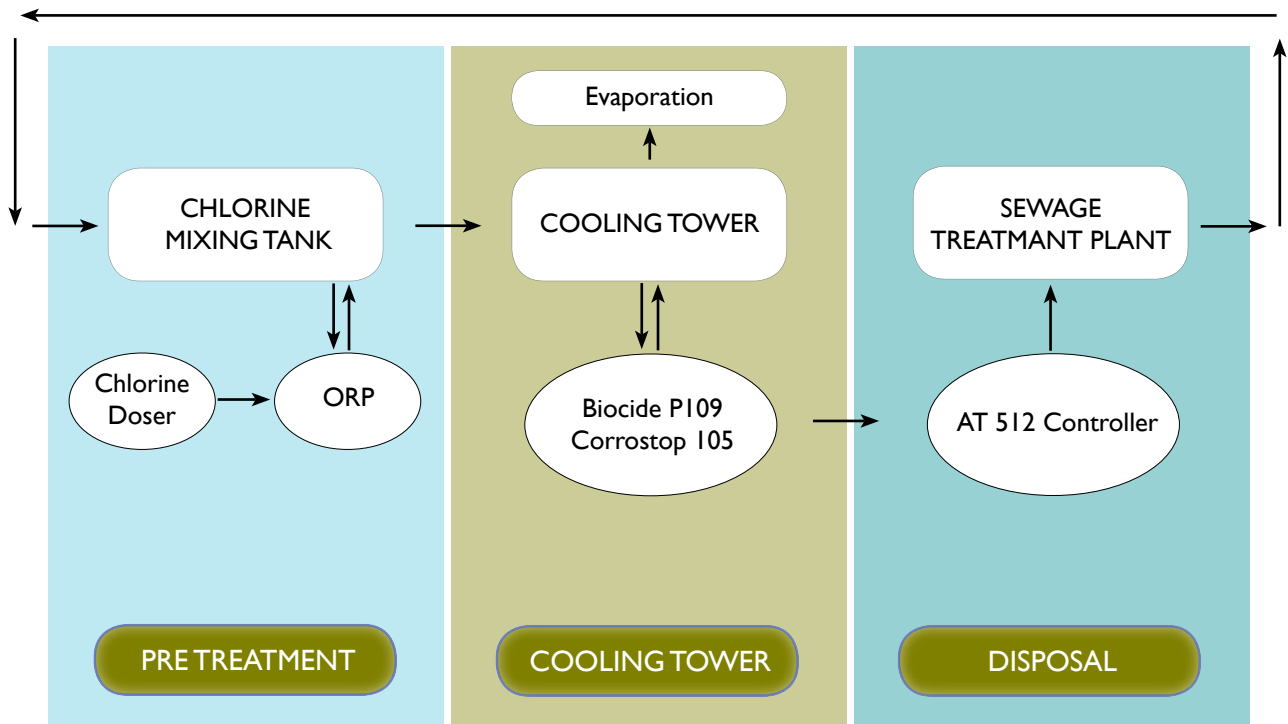
### MONITORING

- » Engineering staff conduct daily monitoring of the equipment and chemicals in both the STP and the cooling towers.
- » A backup emergency system detects problems and can stop incoming treated effluent water to the cooling towers and trigger a switch to potable water.

# TREATED EFFLUENT WATER RE-USE

## Air Conditioning Cooling Towers

FLOW CHART SHOWING RECYCLING PROCESS





# WHAT BIRD IS THAT?

About 15 types of birds nest on Green Island regularly. Over 50 other types visit the island throughout the year.



**EMERALD DOVE**

These birds are commonly seen foraging among the forest floor looking for food.

Their wings look iridescent emerald green. However, although they look green, they are actually grey. The green that you see is the result of sunlight reflecting off very small holes in the feathers – a similar effect as light passing through a prism.



**RUDDY TURNSTONE**

These small shorebirds migrate every year between the Arctic Circle and the Great Barrier Reef (many thousands of kilometres). They arrive on Green Island about September, and leave mid-March.

Their name comes from their habit of using their beaks to flip over rocks and shells as they look for worms, sand fleas, and small crabs to eat.



**BUFF BANDED RAIL**

These birds are ground dwelling and nesting birds. It was feared that they had disappeared off Green Island several years ago due to rat predation. However, with rat eradication, populations are now booming.

Adults are well camouflaged, but chicks are small black balls of fluff. They forage in the ground litter, using their feet to stir up leaves in pursuit of insects and small lizards.



**TORRES STRAIT PIGEON**  
(also Pied Imperial Pigeon)

These large doves are migratory birds, spending winter (April–August) in Papua New Guinea, and summers (September to March) in the Great Barrier Reef. They come to Green Island to nest and feed on tropical fruits.

Over 3000 birds nest on the island every year. Their nests are poorly constructed piles of twigs. Both males and females produce 'milk' in their digestive crop that they use to feed the very young chicks. Although nearly impossible to see in the foliage, their soulful coos are heard throughout the day.



**SILVEREYE**

Silvereyes are small gregarious birds. Their tiny cup-shaped nests are made from grasses and coconut fibres that are held together with cobweb strands.

They start breeding when they are very young, and if they are successful with their first mates, they remain with that mate for life.



**OSPREY**

Ospreys catch fish with their talons, not their beaks. Their feet have sharp spicules to help grip slippery fish. Strongly muscled legs allow them to carry fish up to 2 kg, which is more than the bird itself weighs.

Mating pairs of osprey stay together for life. The pair on Green Island has been here for many, many years.

# WHAT BIRD IS THAT?



**PIED OYSTERCATCHER**

These shorebirds are very distinctive – they have very long, straight bright orange beaks. They use these beaks to probe the sand and mud for shells (mostly clams). They break shells by either hammering them or prying the shells open by stabbing their beaks into the openings. These birds are always seen in mating pairs. They mate for life.



**CRESTED TERNS**

There are two types of Crested Terns – the Greater Crested and the Lesser Crested. Greater Crested are larger and have lemon-yellow beaks, while Lesser Crested have orange beaks. Both types fly over the water with beaks pointing down, looking for food. They plunge straight into the water to catch fish, which are caught and swallowed headfirst.



**NODDY TERN**

The name 'Noddy' comes from the word "noodle", meaning "fool". Apparently, early explorers thought that these birds were stupid because they did not readily fly away. Another possible derivation of the name comes from their habit of nodding their heads during courtship. Noddies are "skimmers" that fly low over the ocean surface, making shallow dives to pick up small fish. They are often seen flying right through wave crests.



**SUNBIRD**

Male Sunbirds are easily distinguished from the females by their brilliant iridescent purple/black colour. These birds make small hanging basket nests with dried leaves and grasses that are woven together with cobwebs. To get the cobwebs, they hover in front of spider webs and extract a single thread at a time with their bills. The nests have a small hole in the side to enter. A little hood over the 'door' keeps the rain out. Sunbirds have one of the fastest reproduction cycles - eggs hatch within 10 days and the chicks are able to fly away within another 10 days. There are usually only two eggs per nest.



**FRIGATE BIRD**

These 'pirates of the sky' chase and harass other seabirds to steal their food. These birds can tell whether another bird is carrying food by the calls that they bird makes. If the seabird has food, then the frigates swoop down and scare the birds into regurgitating the food. As the food falls, the frigates swoop down and grab it before it falls into the water. They are also called "Rainbrother" by native aboriginals - it is believed that if you see frigates flying over land, a rainstorm is on the way.



**REEF HERON**

Reef herons come in two colours – white and grey, but never pied (both colours on one bird). Although they look different, they are the same species. It is a lot like humans having either blue or brown eyes.

These birds are ambush hunters, able to stand still at the water's edge for long periods of time waiting in one place for prey (crabs, fish, squid) to come to them. They use their beaks to stab the prey, then they toss the food into the air and swallow it (fish are always swallowed head first to avoid choking on spiky fins).

# WHAT SEED IS THAT?

There are over 120 types of plants growing on Green Island. The forest in the centre of the island is classified a tropical rainforest. Green Island is the only coral cay in the Great Barrier Reef with a rainforest.



**SHE OAK**  
(also Casuarina)

These trees may look like pine trees, and may even be called 'Australian Pines', but they are not pine trees. The hanging green structures are not needles – they are modified branches. The leaves are very small and form a small 'crown' around each segment. Seeds explode out of prickly pods and are carried great distances by the wind.



**GUETTARDA SPECIOSA**

The fleshy outer coating seals in water for the seeds. The inner fibrous layer provides a protective layer around the seed, and small airspaces allows the seeds to float for long periods of time in the ocean. These seeds can drift for over 50 days before landing on shore and germinating.



**CHEESEFRUIT**  
(also Morinda)

This egg-shaped fruit is used throughout the Pacific for medicinal remedies. The fleshy fruit is edible - if you can tolerate the rotten cheese smell and taste! It is extremely high in Vitamin C, and is considered a 'miracle' cure for a range of ailments.



**CANNONBALL MANGROVE**  
(also Monkey Puzzle Seed)

These seeds belong to mangrove trees that live along riverbanks on the mainland. The seeds can float for many weeks and can actually start to germinate while adrift. When the thick exterior rind dries, it starts to crack, then suddenly explodes – shooting out multiple segments of the seed inside. These segments fit together to form a three-dimensional puzzle, but once separated they are nearly impossible to fit back together again.



**LOOKING GLASS MANGROVE**

These fruits look like small-keeled boats. The keel helps them to float down rivers, where the parent trees are found, and into the ocean. The keels also act as an anchor when the seeds get washed ashore. An air pocket between the shell and the inner seed serves as floatation for the fruit.



**PANDANUS**  
(also False Pineapple)

This plant is one of the most useful tropical plants. Leaves provide fibres for making string and rope and shredded leaves are used for weaving baskets. The trunks are tied together to make rafts. The seed clusters form large bunches that look like pineapples. Fruits of some types of pandanus are edible – but must be cooked a special way.



# WHAT SEED IS THAT?



**BEAUTY LEAF**  
(also *Calophyllum*)

The round seeds are about the size of a golf ball. They are not edible, but the green oil they produce is used for lamp burning oil, soap-making and medicine.



**BEACH ALMOND**

Fresh fruit are covered in a purple flesh that produces a strong permanent dye. Inside, there are small edible seeds that taste like almond nuts. They are very rich in protein and thiamine.



**INDIAN ALMOND**

Seeds are twice as large as Beach Almonds. They are edible and taste like almond nuts. One handful of these nuts has as much protein as a dozen eggs.



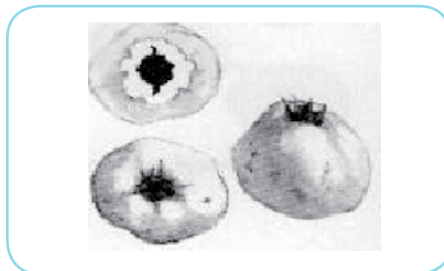
**COCONUT**

Coconuts are the best-known and the largest tropical fruit - they can be as large as footballs. Their thick outer husk allows them to float for many months as they drift in the ocean. This is how they are dispersed.

Research shows that they can:

- » float for up to 214 days before sinking
- » still germinate after floating 110 days at sea
- » travel 5000 km before getting washed ashore.

The husk fibres are used in many products, including doormats, ropes, and mattress filling. The hard inner shells are used as bowls and utensils. The name Coconut derives from the Portuguese word 'coco' meaning ape, because the early Portuguese sailors thought the three holes at the end of the husk shell looked like an ape's face.



**SEA LETTUCE**  
(also *Cardwell Cabbage*)

These small fruits are found on a common shoreline bush. They turn from green to bright white as they ripen. The juice of the fruit is rubbed onto insect bites to relieve the itch and on cuts and burns to hasten healing.



**SEA HEARSE**

Hard, black seeds are located inside a white fleshy fruit. When the fruit fall from the tree, the fleshy outer layer provides an individual water supply for each seed. The seeds are very oily, and in some the Pacific islands these seeds are used as a substitute for candles.



**BOX FRUIT**  
(also *Beach Barringtonia*)

This is the second largest fruit found in the Great Barrier Reef (the coconut is the largest). They have a thick fibrous layer that helps them float for up to 2 years in the ocean. This fruit has been used for generations by native peoples as fishing floats. The seeds inside are grated and used as fish poison.



*Acknowledgement to illustrations from "Fruits of the Australian Tropical Rainforest" by Wendy Cooper and William T Cooper.*