

Results for 2012 - first quarter January - March



Ministry of Marine Resources
GOVERNMENT OF THE COOK ISLANDS

Rarotonga Annual Water Quality Report 2012

Grading scale	
A	Excellent
B	Very Good
C	Good
D	Poor
E	Very Poor
F	Extremely Poor
-	No Data

	Lagoons			Streams				
	Bacteria	Water Clarity (TSS + Chl a)	Nutrients	Bacteria	Water Clarity (TSS)	Nutrients	Dissolved Oxygen (DO)	
TJs	A	C	D	Avana	F	A	C	A
Club Raro	A	C	D	Drain 1	F	B	E	B
Pouara Rai	A	B	D	Drain 2	F	C	E	D
Avana Mudflat	A	C	E	Aroko 3	F	C	E	D
Nukupure Park	A	B	D	Aroko 1	F	B	D	B
Sails	A	C	D	Aroko 2	F	C	C	F
Taakoka	A	D	D	Aremango 3	F	C	E	F
Paringaru	A	D	E	Aremango 2	F	C	C	F
Tikioki	A	C	E	Paringaru	F	A	D	D
Packing Shed	A	C	E	Akapuao	F	C	E	E
Kent Hall	A	C	F	Totokoitu	F	B	D	B
Totokoitu Research Station	C	C	E	Rutaki	F	A	D	B
Papua	A	C	E	Betela	F	B	D	D
Kaena Restaurant	A	B	D	North Airport Drain	F	C	D	A
Arorangi School	A	C	F	Avatiu	F	B	D	B
Public Works	A	C	D					
Social Centre	A	B	D					
East Airport Drain	A	C	E					
Avatiu Harbour	A	C	E					

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Understanding the information

Bacteria: *Enterococci* occur naturally at very low levels in all waters, however if found in high concentrations are a strong indicator of human or animal faecal contamination and can pose a serious risk to human health. The higher the number of *Enterococci* bacteria present in a sample, the greater the amount of faecal contamination in the water. Very low *Enterococci* counts are **A Excellent**, whereas high *Enterococci* counts signal **F Extremely Poor** water quality.

Water Clarity (TSS & Chlorophyll a): Total Suspended Solids (TSS) are silt, mud and organic matter found in suspension in the water; Chlorophyll a (Chl a) is the green pigment which

gives algae (plants) their colour. Together these are the components which determine the colour and clarity of water. The presence of large amounts of particles and/or algae is responsible for creating the murky appearance of dirty water and can quickly kill coral reefs. Low TSS/Chl a concentrations are **A Excellent**, whereas high TSS/Chl a concentrations signal **F Extremely Poor** water quality.

Nutrients: Nitrogen and Phosphorous are elements commonly found in fertilisers and washing detergents. They are normally present in water in small amounts and are needed for the growth of plants and algae. However, if their concentration becomes high

an excessive amount of algae will grow which is harmful to corals and may pose a public health concern. Low nutrient concentrations are **A Excellent**, whereas high nutrient concentrations signal **F Extremely Poor** water quality.

Dissolved Oxygen (DO): DO is found in microscopic bubbles of oxygen that are mixed in the water and occur between water molecules. It is a good indicator of a water bodies' ability to support aquatic life. Tropical waters have lower oxygen levels combined with higher respiratory rates of organisms. High DO concentrations are **A Excellent** whereas low DO concentrations signal **F Extremely Poor** water quality.

Introduction

Rarotonga's lagoon is of central importance to all of our lives – be it through providing food, attracting tourism, or protection from severe ocean conditions. In some way, we all rely on the lagoon. For that reason it is of critical importance that we monitor and protect our precious resource. Many of our actions on land can have unintended and unexpected consequences with regards to water quality and lagoon health. Excrement from poorly located farms can introduce bacteria to streams; fertilisers washed off crops by rain can promote algae growth; and cutting down trees may allow sediment from the hillsides to wash into the water. The Ministry of Marine Resources (MMR) works in collaboration with the National Environment Services, the Ministry of Infrastructure and Planning, the Ministry of Health, and the Meteorological Service, and is assisted by aid partners, European Union, NZAid, Ausaid, and the Integrated Water Resources Management. The Water Quality Monitoring Programme aims to provide reliable and accurate scientific data on the water quality not only in the marine environment around Rarotonga, but also all waters which feed into the lagoon.

In 2011 the Water Quality Monitoring Programme surveyed 18 lagoon and 14 stream sites on a monthly basis to assess for nutrient, bacteria, chlorophyll and suspended solid content as well as for temperature, salinity and dissolved oxygen. By consistent monitoring of these variables the Water Quality Monitoring Programme makes it possible to catch declines in water quality early and allows stakeholders to make informed management decisions as they undertake to safeguard public health and

protect the lagoon environment.

This is the fifth water quality report published for Rarotonga and shows results for the 2012 reporting period (year ending December 2011), as well as the monthly results for the first quarter of 2012. Also, using the ever-growing bank of information created from our monitoring programme, we have produced two other separate reports showing the trends in water quality for streams and lagoons over the past 5 years.

Water Quality Scores

Nutrients

Nutrients such as nitrogen and phosphorous, found in fertilisers, detergents, human and animal waste, are normally in seawater in very small amounts and are needed for the growth of plants and algae. If the concentrations become high, the algae will grow, potentially damaging coral reefs. The nutrient concentrations have been assessed against a standard for the protection of coral reef health. For good reef health low nutrient concentrations are needed; high nutrient concentrations can be harmful due to increased algal growth.

Water Clarity

This includes the amount of algae and suspended solids (silt, mud and organic matter) in the water. If there is a high level of algae or suspended solids the water looks cloudy, so water clarity is poor. High levels of algae and suspended solids can harm coral reefs.

Bacteria

Bacteria (*Enterococci*) have been monitored as an indicator

of potential contamination of water by animal and human wastes. The higher the number of bacteria, the more the contamination.

Key Findings

Lagoon

The nutrient levels varied between sites resulting in good to very poor water quality.

Nutrient levels are above the maximum recommended by Bell (1992) for the protection of coral reef health at all sites except at TJs, Club Raro, Social Centre and Nukupure Park where the levels were good.

Water Clarity was generally good at all sites.

All sites had low indicator bacteria levels showing that the water quality was generally very good to excellent.

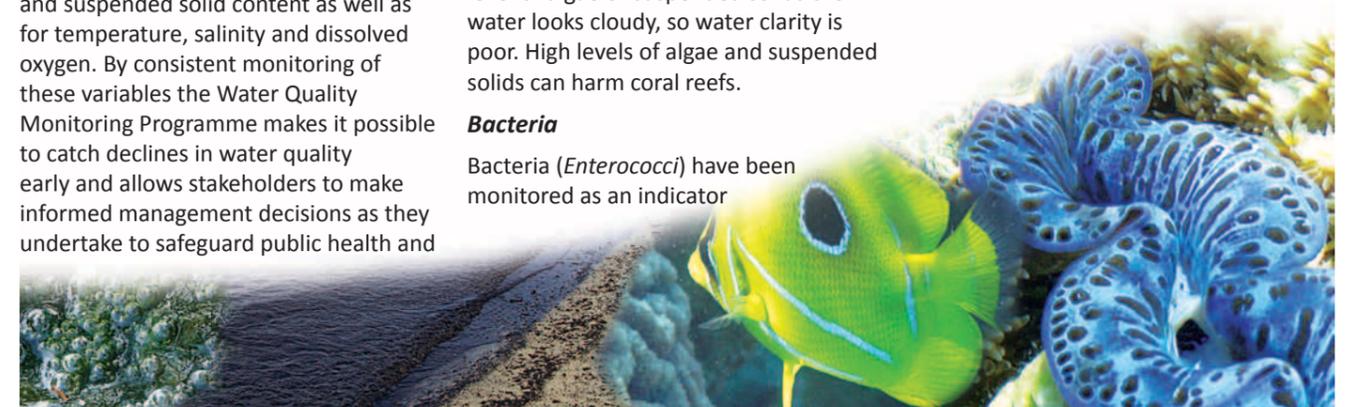
Streams

The nutrient levels varied between all sites resulting in good to very poor water quality.

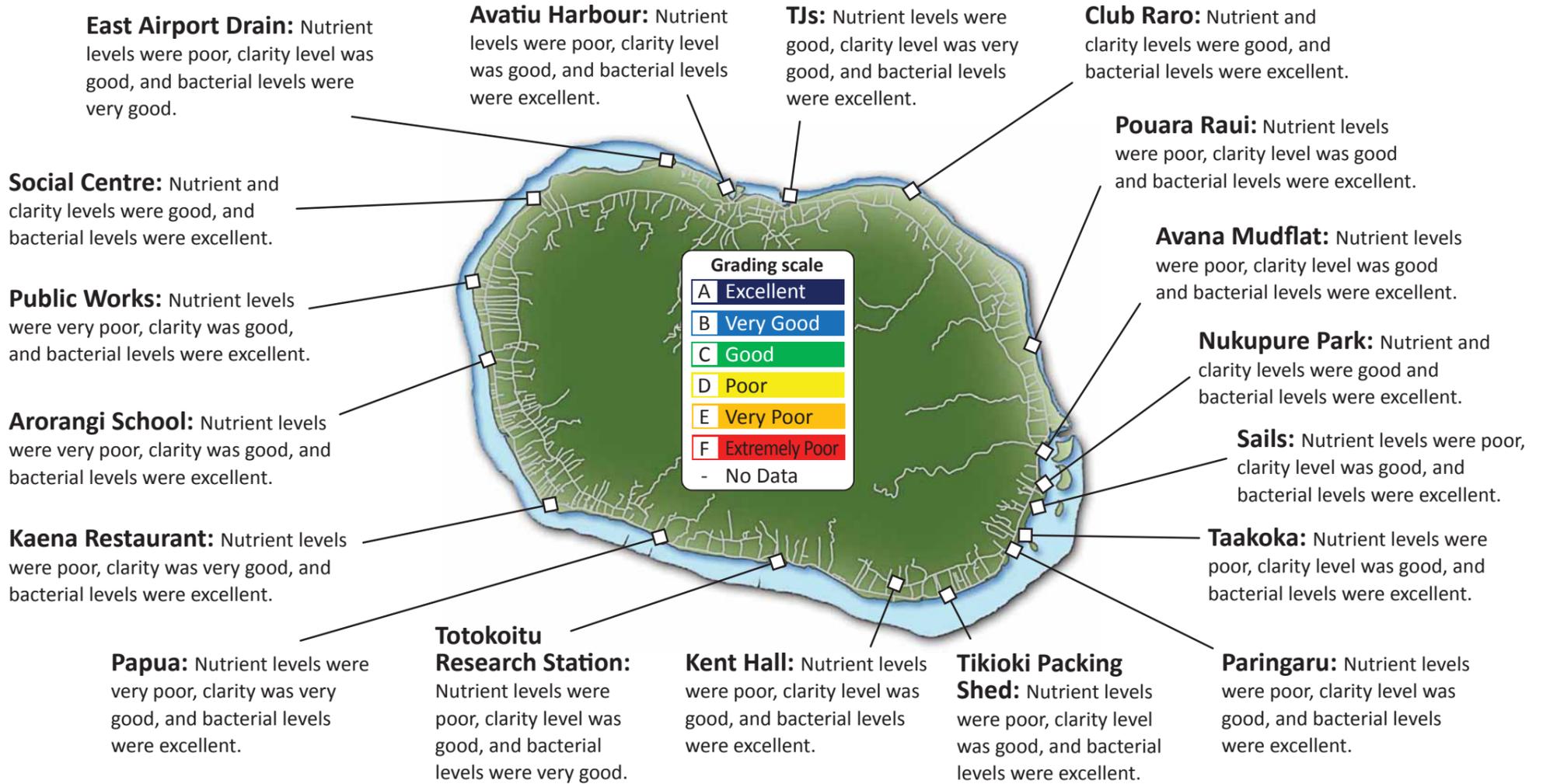
Nutrient levels are above the maximum recommended by ANZECC (2000) and NIWA (2011) for subtropical and tropical streams, except at Rutaki and North Airport Drain where the levels were good.

Water Clarity varied resulting in excellent to very poor water quality.

All sites had high indicator bacteria levels showing that the water quality was poor to extremely poor except at North Airport where the level was very good.

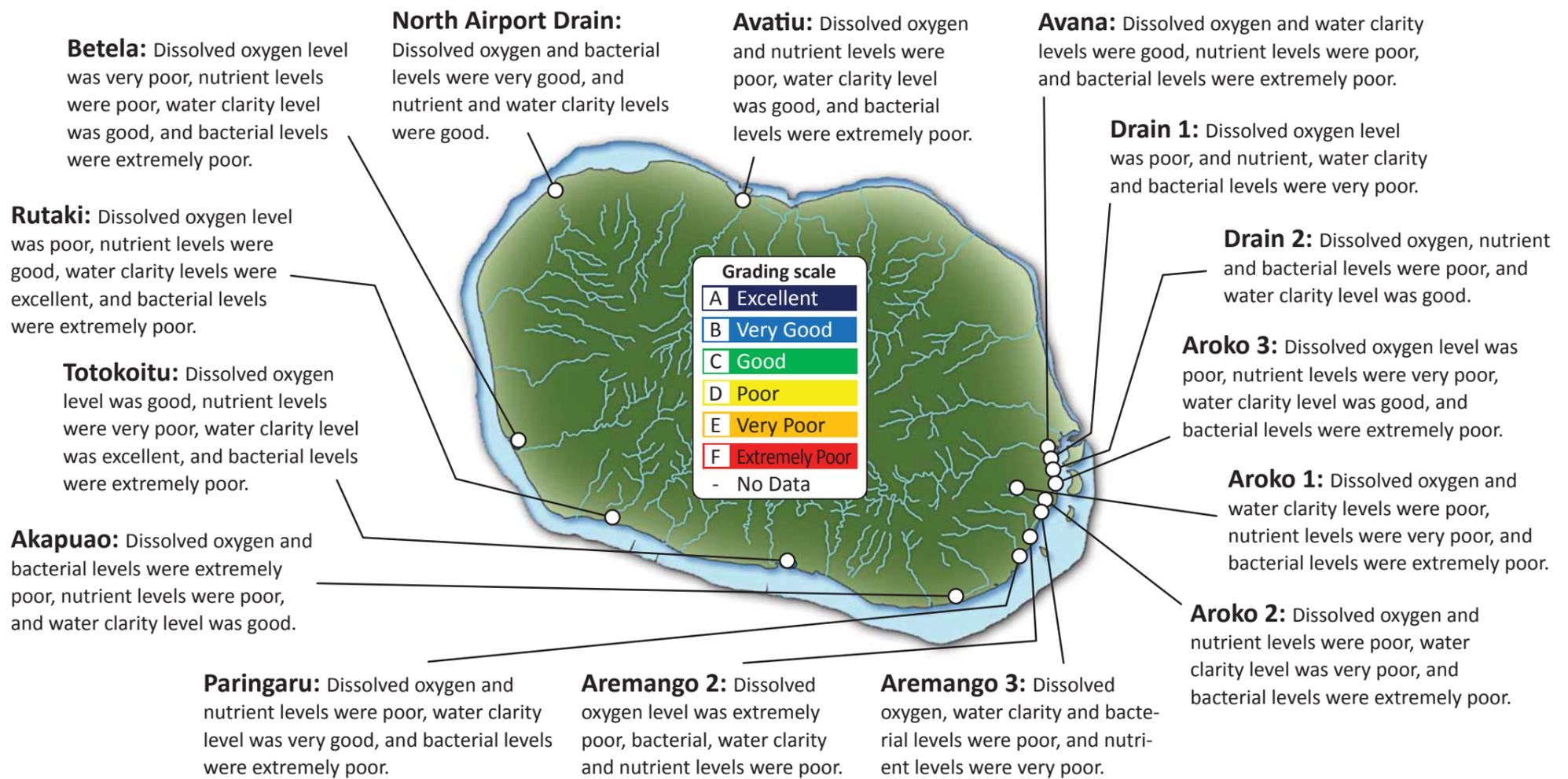


Lagoon Sites - data for year ending December 2011 analysed



	TJs	Club Raro	Pouara Rau	Avana Mudflat	Nukupure Park	Sails	Taakoka	Paringaru	Tikioki Packing Shed	Kent Hall	Totokoitu Research Station	Papua	Kaena Restaurant	Arorangi School	Public Works	Social Centre	East Airport Drain	Avatiu Harbour
Nutrients	C	C	D	D	C	D	D	D	D	D	D	E	D	E	E	C	D	D
Water Clarity	B	C	C	C	C	C	C	C	C	C	C	B	B	C	C	C	C	C
Bacteria	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	A	B	A

Stream Sites - data for year ending December 2011 analysed



	Avana	Drain 1	Drain 2	Aroko 3	Aroko 1	Aroko 2	Aremango 3	Aremango 2	Paringaru	Akapuao	Totokoitu	Rutaki	Betela	North Airport Drain	Avatiu
Dissolved Oxygen (DO)	C	D	D	D	D	D	D	F	D	F	C	D	E	B	D
Nutrients	D	E	D	E	E	D	E	D	D	D	E	C	D	C	D
Water Clarity (TSS)	C	E	C	C	D	E	D	D	B	C	A	A	C	C	C
Bacteria	F	E	D	F	F	F	D	D	F	F	F	F	F	B	F

See the back of this report for definitions and descriptions to help with understanding this information