Ministry of Marine Resources
TU'ANGA O TE PAE MOANA
COOK ISLANDS

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AITUTAKI WATER QUALITY REPORT
JULY 2025

SUMMARY

Water samples were collected in the morning of Tuesday 22nd July, 2025. The weather during collection was reportedly calm with a slight breeze. All marine sites were accessible and sampled. Boodlea, turbinaria, dictyota and cyanobacteria algae were observed at 8 out of 12 marine sites. Only Tautu stream was flowing and sampled, with the four remaining streams reported dry or stagnant. The table below provides a summary of total suspended solids, enterococci and dissolved oxygen levels.

Lagoon Site	Total Suspended solids (mg/L)	Enterococci (MPN/100 mL)	Dissolved oxygen (%)
Ootu	3.6	10	93
Vaipeka	3.0	<1	89
Vaipae Wharf	2.6	10	102
Tautu Wharf	3.3	110	104
Taravao	3.3	<1	94
Vainamu	11.8	30	89
Vainamu Wharf	6.3	<1	103
Arutanga Wharf	4.6	<1	95
Rapae	1.0	<1	105
Maunga Pu	1.0	20	83
Maina Nursery	0.3	10	92
Amuri Wharf	1.0	<1	93
Stream Site	**Total Suspended solids (mg/L)**	**Enterococci (MPN/100 mL)**	**Dissolved oxygen (%)**
Tautu	8.3	39	62

Grading Scale	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

Lagoon:

- Enterococci bacteria levels were good to excellent, observing low counts between <1 MPN/100 mL and 110 MPN/100 mL. This indicates safe swimming areas.
- Levels of total suspended solids ranged from excellent to very poor, with a low level of 0.3 mg/L observed at Maina Nursery and an elevated level of 11.8 mg/L observed at Vainamu, respectively.
- Dissolved oxygen levels were good to excellent, with a low level of 83% observed at Maunga Pu, and an excellent, high level of 105% observed at Rapae.
- Temperatures ranged from 22.9 °C at Vaipeka to 26.5 °C at Maunga Pu, giving an average lagoon temperature of 25.4 °C.
- Levels of salinity were stable, ranging from a low of 30.9 ppt observed at Vainamu to a high of 35.2 ppt observed at Maina Nursery, giving an average salinity of 33.8 ppt.
- pH levels were stable, ranging from a low of 7.78 observed at Vaipeka to a high of 8.07 observed at Vaipae Wharf, giving an average pH of 7.95.

Stream:

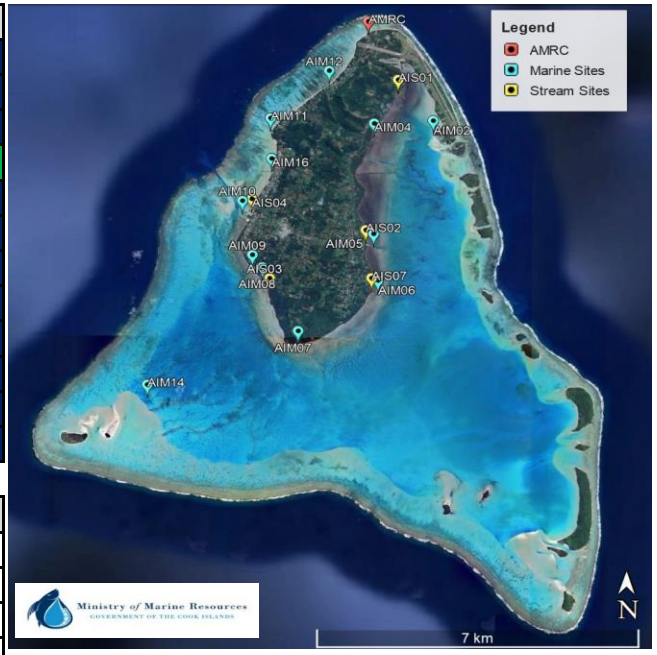
- An excellent, low level of enterococci bacteria was detected at Tautu, and observed at 39 MPN/100 mL.
- Levels of total suspended solids and dissolved oxygen were poor and observed at 8.3 mg/L and 62%, respectively.
- Physical parameters of temperature, salinity and pH were stable and observed at 24.0 °C, 0.2 ppt, and 7.2 respectively.

An updated lab study report and rainfall data until July 2025 are available at the end of this report.

1. BACTERIAL COUNTS - AITUTAKI - Most Probable Number of Enterococci per 100 mL (MPN/100mL)

Lagoon Site	Site ID	Feb	Mar	Apr	May	Jun	Jul
Ootu	AIM02	97	ND	<1	<1	<1	10
Vaipeka	AIM04	<1	ND	<1	30	52	<1
Vaipae Wharf	AIM05	63	ND	10	<1	<1	10
Tautu Wharf	AIM06	<1	ND	<1	<1	638	110
Taravao	AIM07	<1	ND	41	132	63	<1
Vainamu	AIM08	121	ND	63	10	52	30
Vainamu Wharf	AIM09	<1	ND	41	98	146	<1
Arutanga Wharf	AIM10	<1	ND	10	63	10	<1
Rapae	AIM11	10	ND	<1	20	10	<1
Maunga Pu	AIM12	63	ND	<1	<1	10	20
Maina Nursery	AIM14	10	ND	<1	<1	<1	10
Amuri Wharf	AIM16	10	ND	10	30	20	<1

Stream Site	Site ID	Feb	Mar	Apr	May	Jun	Jul
Vaitiare	AIS01	NW	ND	NW	NW	88	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	225	ND	238	101	NW	39



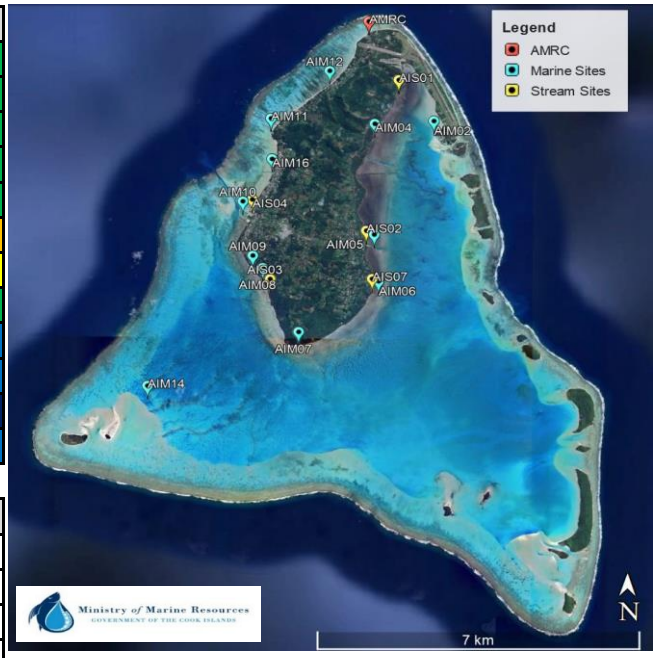
Bacteria Standards GRADING SCALE	< 41	41 ≥ 100	101 ≥ 200	201 ≥ 350	351 ≥ 500	> 500
	A	B	C	D	E	F
	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

REFERENCE: WHO 2021 Guidelines on Recreational Water Quality for Coastal and Fresh Waters.

2. TOTAL SUSPENDED SOLIDS - AITUTAKI - Milligrams per Litre (mg/L)

Lagoon Site	Site ID	Feb	Mar	Apr	May	Jun	Jul
Ootu	AIM02	2.3	9.3	6.2	6.7	4.9	3.6
Vaipeka	AIM04	3.5	6.7	4.7	4.4	13.1	3.0
Vaipae Wharf	AIM05	4.3	6.0	9.6	4.9	4.4	2.6
Tautu Wharf	AIM06	2.3	3.0	10.9	10.0	2.3	3.3
Taravao	AIM07	6.3	7.0	16.2	23.3	41.7	3.3
Vainamu	AIM08	7.1	8.9	16.7	7.3	44.4	11.8
Vainamu Wharf	AIM09	3.3	3.0	3.9	3.4	16.7	6.3
Arutanga Wharf	AIM10	3.3	4.0	5.5	3.2	3.1	4.6
Rapae	AIM11	2.3	1.0	0.3	2.6	1.3	1.0
Maunga Pu	AIM12	3.2	2.0	1.3	2.4	1.3	1.0
Maina Nursery	AIM14	2.3	1.0	0.3	3.0	1.3	0.3
Amuri Wharf	AIM16	3.3	0.3	3.3	4.1	3.3	1.0

Stream Site	Site ID	Feb	Mar	Apr	May	Jun	Jul
Vaitiare	AIS01	NW	3.1	NW	NW	26.7	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	5.8	4.5	6.7	12.3	NW	8.3



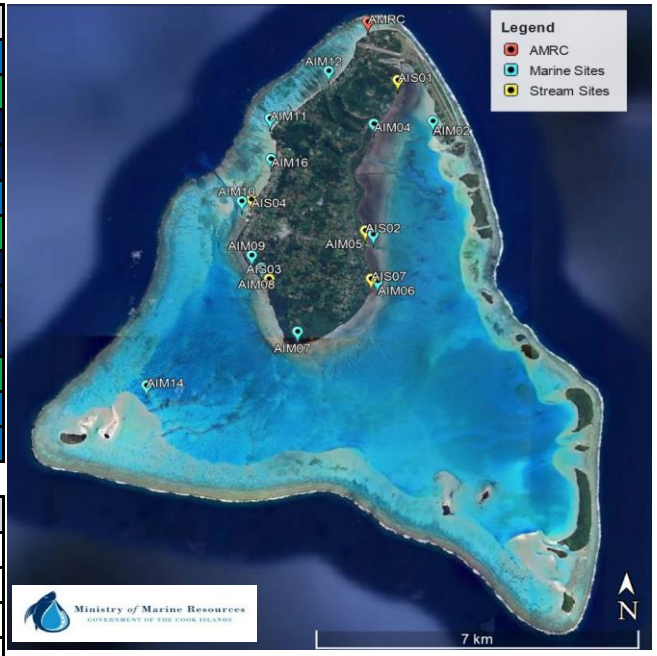
Total Suspended Solids	< 1.0	1.0 ≥ 2.5	2.5 ≥ 5.0	5 ≥ 10	10 ≥ 20	> 20
Standards	A	B	C	D	E	F
GRADING SCALE	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

REFERENCE: Bell 1992, total suspended solids recommended limit is ≤5mg/L for healthy coral reef.

3. DISSOLVED OXYGEN - AITUTAKI - Percent (%)

Lagoon Site	Site ID	Feb	Mar	Apr	May	Jun	Jul
Ootu	AIM02	75	66	77	80	102	93
Vaipeka	AIM04	38	50	99	96	110	89
Vaipae Wharf	AIM05	68	57	102	103	110	102
Tautu Wharf	AIM06	68	54	101	101	108	104
Taravao	AIM07	44	58	101	97	114	94
Vainamu	AIM08	53	47	77	69	81	89
Vainamu Wharf	AIM09	30	78	91	84	95	103
Arutanga Wharf	AIM10	75	73	96	62	68	95
Rapae	AIM11	71	73	71	74	93	105
Maunga Pu	AIM12	64	68	69	72	101	83
Maina Nursery	AIM14	90	74	94	74	92	92
Amuri Wharf	AIM16	69	56	81	87	95	93

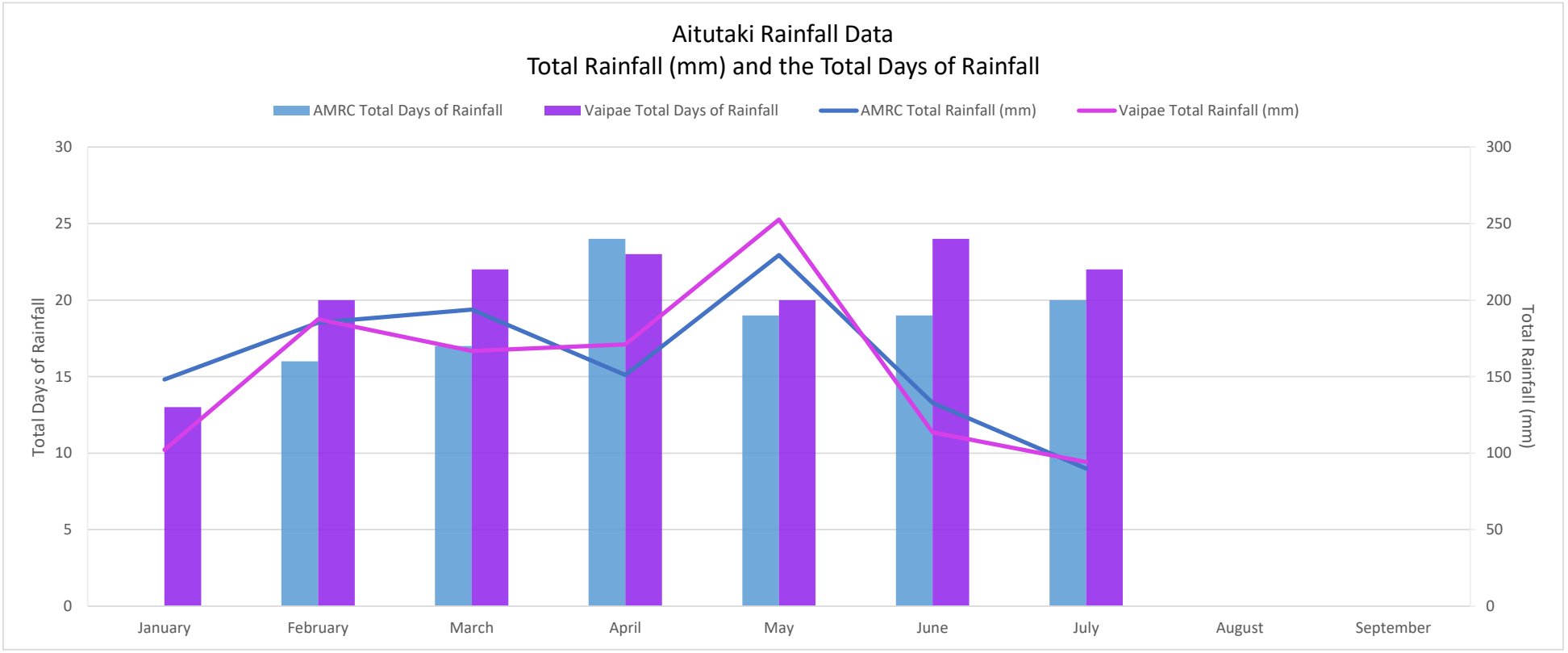
Stream Site	Site ID	Feb	Mar	Apr	May	Jun	Jul
Vaitiare	AIS01	NW	40	NW	NW	24	NW
Vaipae	AIS02	NW	NW	NW	NW	NW	NW
Pata	AIS03	NW	NW	NW	NW	NW	NW
Arutanga	AIS04	NW	NW	NW	NW	NW	NW
Tautu	AIS07	28	19	40	19	NW	62



Dissolved Oxygen	> 95	90 ≥ 95	80 ≥ 90	60 ≥ 80	40 ≥ 60	< 40
Standards	A	B	C	D	E	F
GRADING SCALE	Excellent	Very Good	Good	Poor	Very Poor	Extremely Poor

REFERENCE: Department of Health, Clean Water Branch Hawaii 1994: Dissolved oxygen recommended limit is ≥75% saturation for oceanic waters, embayments, open coastal waters & estuaries; ≥80% saturation for streams.

4. AITUTAKI RAINFALL DATA - AMRC & VAIPAE



	January	February	March	April	May	June	July	August	September	October	November	December
AMRC Total Rainfall (mm)	148.1	185.2	193.8	151.0	229.4	132.9	89.9					
AMRC Total Days of Rainfall	ND	16	17	24	19	19	20					
AMRC Day of Highest Rainfall	ND	19th 43.8mm	3rd 39.6mm	6th 75.8mm	24th 95.0mm	26th 72.4mm	11th 20.4mm					
Vaipae Total Rainfall (mm)	102.2	187.4	166.8	171	252.6	113.6	94.2					
Vaipae Total Days of Rainfall	13	20	22	23	20	24	22					
Vaipae Day of Highest Rainfall	10th 26.2mm	19th 44.4mm	3rd 33.0mm	6th 68.4mm	24th 100.2mm	26th 52.0mm	11th 20.0mm					

5. AVERAGE TEMPERATURE - AITUTAKI - Degrees (°C)

Month	January	February	March	April	May	June	July	August	September	October	November	December
Lagoon	26.2	29.2	28.6	24.7	26.9	25.7	25.4					
Stream	25.1	26.4	26.8	24.1	25.2	25.3	24.0					

Report Date: 30.07.2025	AITUTAKI LAB STUDY REPORT – JULY 2025	Lab Report No.: 07L5254 – 07L5266

SAMPLE DESCRIPTION

Date Samples Collected:	Name of Sample:	Collected By:	Submitted By:	Time of Receipt:	Physical Description:	Quantity Per Site Received:
Tuesday 22nd July	Marine	MMR		10:15 am	Clear	2.5L
	Stream				Slightly turbid	

Study No.		1	2	3	4	5	6	7
SITE ID	LAB ID	Enterococci	Temperature	Salinity	Dissolved Oxygen	Dissolved Oxygen	pH	Total Suspended Solids
MARINE		(MPN/100ml)	(°C)	(ppt)	(%)	(mg/L)		(mg/L)
AIM02	07L5254	10	25.4	34.4	92.8	6.27	7.96	3.6
AIM04	07L5255	<1	22.9	34.0	88.5	6.25	7.78	3.0
AIM05	07L5256	10	26.4	31.0	102.3	6.91	8.07	2.6
AIM06	07L5257	110	25.8	34.0	103.6	6.96	7.96	3.3
AIM07	07L5258	<1	25.2	32.2	93.5	6.41	7.94	3.3
AIM08	07L5259	30	26.0	30.9	89.1	6.08	7.89	11.8
AIM09	07L5260	<1	26.4	35.0	102.8	6.80	7.99	6.3
AIM10	07L5261	<1	25.0	35.1	95.1	6.43	8.02	4.6
AIM11	07L5262	<1	25.2	34.5	105.3	7.12	7.99	1.0
AIM12	07L5263	20	26.5	34.5	83.4	5.52	7.89	1.0
AIM14	07L5264	10	24.8	35.2	91.9	6.24	8.04	0.3
AIM16	07L5265	<1	25.6	34.5	92.8	6.24	7.90	1.0
STREAM								
AIS07	07L5266	39	24.0	0.2	61.7	5.19	7.24	8.3
Study Method		IDEXX Enterolert*	YSI Manual	YSI Manual	YSI Manual	YSI Manual	YSI Manual	MMR Lab Manual Water Quality Monitoring V5
Recommended Limit		Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments	Ref. Comments

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Abbreviation

NL: Not Listed, MPN: Most Probable Number, cfu: Colony Forming Unit, mL: milli Litre, FAU: Formazin Attenuation Unit, NTU: Nephelometric Turbidity Unit, ppt: Parts Per Thousand, DB: Designated Bathing Beach, MB: Moderate Use of Bathing, LB: Light Use of Bathing, IB: Infrequent Use of Bathing, NA: Not Available, however data will be available at a later date; ND: No Data due to equipment failure or logistics problems or time delay or methodology problem or combination of all; NW: No Water, stream dry or water stagnant or water level too low for sample collection or water dirty/murky.

Comments

1. Temperature[#]
   Subtropical regions (south of Cape Canaveral and Tampa Bay, Florida, and Hawaii).
   Short-term Max. 32.2^{o}C, Max. True daily mean 29.4^{o}C (average of 24-hourly temperature reading).
   Temperature is the measure of warmth and coldness, reported as an average and measured in degrees celcius (°C).
2. pH
   Changes to pH can be caused by a range of potential water quality problems (e.g., low values due to acid sulphate runoff). pH values are also related to soil geology and may be naturally low or high (in limestone areas). High pH values can also be caused temporarily when high rates of photosynthesis by aquatic plants (including algae) lead to a decrease in carbon dioxide, and therefore a decrease in carbonic acid in the water.
3. Salinity
   A measure of the amount of dissolved salts in the water, and therefore an indicator of salinity. Excess salinity in freshwater streams occurs as a result of excess soil salinity, which may be caused by excess land clearing and changes to the groundwater table. Salinity is reported as parts per thousand (ppt).
4. Dissolved Oxygen^
   DO levels indicate how much oxygen is in the water. Low DO levels indicate an abnormal disturbance in the ecosystem such as an algal bloom. DO is measured in percentage (%).
   Low DO: 3.5 mg/L at 26C leads to 100% mortality of *Acipenser oxyrhincus*
   2.7 mg/L at 19C leads to 22% mortality of *Acipenser oxyrhincus*
   <3.7 mg/L Demersal finfish biomass diminishes
   <3.5 mg/L Species richness diminishes
   Below 2 mg/L infaunal species migrate to sediment surface and epifaunal species move to better aerated water.
   Oxygen is essential for life processes of most aquatic organisms. Many aquatic organisms will suffocate if there is insufficient oxygen in the water.
5. Suspended Solids[@]
   Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonably established norm for aquatic life. Total suspended solids (TSS) are non-living (inorganic) such as silt and mud; and organic matter such as animal and plant material found in the water. The presence of large amounts of particles are responsible for creating the murky appearance of dirty water and can quickly kill coral reefs. TSS is measured in milligrams per litre (mg/L).
6. Turbidity
   Water clarity (the degree of light penetration) is important as aquatic plants depend on light to photosynthesize and produce oxygen. Large amounts of sediment in a water body can also smother benthic organisms. Suspended solid results are interactive and interdependent with turbidity. Expert interpretation needed. Turbidity is measured as FAU.
7. Enterococci[β]
   The presence of bacteria Enterococci *sp* is monitored as an indicator of human and animal waste pollution. The higher the numbers of Enterococci bacteria present in a sample, the greater the amount of faecal pollution in the water. Bacteria count is measured in Most Probable Number of Enterococci cells per 100mL of sample (MPN/100mL).
8. Nutrients (Nitrate, Nitrite, Ammonia, Phosphate)
   High nutrient concentrations in a water body (eutrophication) may lead to excessive weed and algal growth. Excess nutrients enter a water body through several means, including discharge of treated sewage, storm water, and in run-off from land, for example as fertiliser, animal waste, or decaying plant matter.
9. Chlorophyll-a
   Chlorophyll-a is a pigment found in green plants, including aquatic plant. Measuring the amount of chlorophyll-a in the water therefore indicates the amount of green algae present in the water. High concentrations of algae (algal blooms) may harm other aquatic organisms, either through the production of toxins, reduction of available light through covering the water surface, or by using all available oxygen during respiration at night. Chlorophyll-a is measured in micrograms per litre (µg/L).
10. Rainfall
    Rarotonga: daily rainfall data is provided by the Cook Islands Meteorological Service.
    Aitutaki: daily rainfall data is recorded by MMR Staff (Aitutaki Marine Research Centre – AMRC) at Amuri and by Rowan Strickland at Vaipae.
    Rainfall is measured in millimetres (mm) and reported as an average per month, total number of days that had no rainfall and the highest amount of rainfall in 1-day.

[#]EPA Quality Criteria for Water Gold Book 1986
^EPA Ambient Aquatic Life Water Quality Criteria for DO (Saltwater): Cape Cod to Cape Hatteras Nov 2000
[@]EPA Quality Criteria for Water Red Book 1976
[β]WHO Guidelines on Recreational Water Quality for Coastal and Fresh Waters 2021

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