



Beachwatch

State of the beaches 2021–22

Mid-North Coast Region

© 2022 State of NSW and Department of Planning and Environment (DPE)

With the exception of photographs, the State of NSW and Department of Planning and Environment are pleased to allow this material to be reproduced in whole or in part for educational and non-commercial use, provided the meaning is unchanged and its source, publisher and authorship are acknowledged. Specific permission is required for the reproduction of photographs.

The Department of Planning and Environment (DPE) has compiled this report in good faith, exercising all due care and attention. No representation is made about the accuracy, completeness or suitability of the information in this publication for any particular purpose. DPE shall not be liable for any damage which may occur to any person or organisation taking action or not on the basis of this publication. Readers should seek appropriate advice when applying the information to their specific needs.

Every effort has been made to ensure that the information in this document is accurate at the time of publication. However, as appropriate, readers should obtain independent advice before making any decision based on this information.

All content in this publication is owned by DPE and is protected by Crown Copyright, unless credited otherwise. It is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0), subject to the exemptions contained in the licence. The legal code for the licence is available at Creative Commons.

DPE asserts the right to be attributed as author of the original material in the following manner: © State of New South Wales and Department of Planning and Environment 2022.

Front cover: Sawtell Beach (Beachwatch/DPE)

Published by:

Environment and Heritage

Department of Planning and Environment

Locked Bag 5022, Parramatta NSW 2124

Phone: +61 2 9995 5000 (switchboard)

Phone: 1300 361 967 (Environment, Energy and Science enquiries)

TTY users: phone 133 677, then ask for 1300 361 967

Speak and listen users: phone 1300 555 727, then ask for 1300 361 967

Email: info@environment.nsw.gov.au

Website: www.environment.nsw.gov.au

Report pollution and environmental incidents

Environment Line: 131 555 (NSW only)

or info@environment.nsw.gov.au

See also www.environment.nsw.gov.au

ISBN 978-1-922840-69-1

EHG2022/0319

July 2022

Contents

Mid-North Coast region summary 2021–2022	1
Beach monitoring in NSW	1
Rainfall impacts	1
Coffs Harbour City Council	4
Overall results	4
Management	7
Safety Beach	10
Woolgoolga Main Beach	11
Emerald Beach	12
Diggers Beach	13
Park Beach	14
Jetty Beach (Coffs Harbour)	15
Sawtell Beach	16
Sawtell Rockpool	17
How to read this report	18
Beach Suitability Grades	18
Explanation of tables	22
Explanation of graphs, charts, and information bars on beach pages	22
References	26
More information	26

Recreational water quality has been monitored in the Mid-North Coast region since 2021 by Coffs Harbour City Council under the Department of Planning and Environment's Beachwatch Partnership Program. This report summarises the performance of 8 swimming sites on the Mid-North Coast of NSW, providing a long-term assessment of how suitable a site is for swimming. Monitored sites include ocean beaches and an ocean baths.

In 2021–2022, 75% of swimming sites in the Mid-North Coast region were graded as Good or Very Good, including 5 ocean beaches and one ocean baths. These sites were suitable for swimming for most or almost all of the time. This a great result despite the very wet summer and extreme wet weather events and flooding experienced in the region.

Mid-North Coast region summary 2021–2022



Park Beach

Photo: Beachwatch/DPE

Beach monitoring in NSW

The water quality of beaches and other swimming locations is monitored under the NSW Government's Beachwatch programs to provide the community with accurate information on the cleanliness of the water and to enable individuals to make informed decisions about where and when to swim. Routine assessment also measures the impact of pollution sources, enables the effectiveness of stormwater and wastewater management practices to be assessed and highlights areas where further work is needed.

Swimming sites in NSW are graded as Very Good, Good, Fair, Poor or Very Poor in accordance with the National Health and Medical Research Council's 2008 *Guidelines for Managing Risks in Recreational Waters*. These Beach Suitability Grades provide a long-term assessment of how suitable a beach is for swimming. The grades are determined from the most recent 100 water quality results (2–4 years' worth of data depending on the sampling frequency) and a risk assessment of potential pollution sources.

See the section on **Quality assurance** in the Statewide Summary for results of the quality assurance program.

Recreational water quality has been monitored in the Mid-North Coast region by Coffs Harbour City Council since 2021.

A **quality assurance** program ensures the information collected and reported by Beachwatch and its partners is accurate and reliable.

During 2021–2022, 8 swimming sites were monitored including ocean beaches and an ocean bath.

Rainfall impacts

Rainfall is the major driver of pollution to recreational waters, generating stormwater runoff and triggering untreated discharges from the wastewater treatment and transport systems. Changes in rainfall patterns are reflected in beach water quality over time due to variation in the frequency and extent of stormwater and wastewater inputs.

The Beach Suitability Grades for 2021–2022 are based on water quality data collected since November 2021. Rainfall during 2021–2022 has varied, with a relatively dry winter and then above average rainfall in spring and summer, and significant wet weather and flood events.

See the section on **How to read this report** on page 18 for an explanation of the graphs, tables and Beach Suitability Grades.

Winter 2021 was relatively dry on the Mid-North Coast with rainfall below the long-term monthly averages in the region.

Relatively dry conditions continued in September 2021. The remainder of spring on the Mid-North Coast experienced above average rainfall, with October 2021 notably wet. Coffs Harbour recorded the highest monthly rainfall in NSW for October 2021, with 342 mm of rainfall for the month. Coffs Harbour was impacted by several severe thunderstorms in late October, bringing large hail and causing extensive damage to homes and property.

Above average rainfall conditions were experienced in summer 2021–2022 across the Mid-North Coast region, with a summer rainfall total of 938 mm recorded at Coffs Harbour.

Consecutive days of significantly heavy rainfall fell in late February and during March 2022, with Coffs Harbour recording more than 400 mm of rain from 23 February to 1 March 2022, and from 25–31 March 2022. The extreme wet weather caused flooding of the rivers and coastal waterways on the Mid-North Coast. Stormwater, debris and discolouration impacted the Mid-North Coast beaches during and following the extreme wet weather conditions.

Wet weather conditions continued in April 2022 with rainfall recorded consistently throughout the month.









Health risks



Contamination of recreational waters with faecal material from animal and human sources can pose significant health problems to beach users owing to the presence of pathogens (disease-causing micro-organisms) in the faecal material. The most common groups of pathogens found in recreational waters are bacteria, protozoans and viruses.

Exposure to contaminated water can cause gastroenteritis, with symptoms including vomiting, diarrhoea, stomach-ache, nausea, headache and fever. Eye, ear, skin and upper respiratory tract infections can also be contracted when pathogens come into contact with small breaks and tears in the skin or ruptures of the delicate membranes in the ear or nose.

Certain groups of users may be more vulnerable to microbial infection than others. Children, the elderly, people with compromised immune systems, tourists, and people from culturally and linguistically diverse backgrounds are generally most at risk.

Beach Suitability Grades for Mid-North Coast region

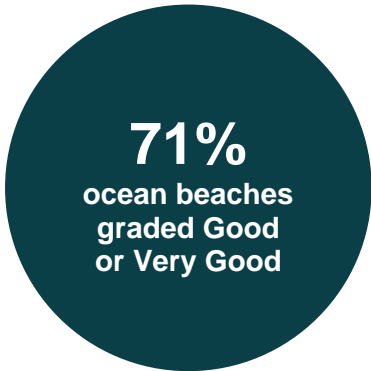
Swimming site	Site type	Beach Suitability Grade	Change
Coffs Harbour City Council			
Safety Beach*	Ocean beach	 ^	—
Woolgoolga Main Beach*	Ocean beach	 ^	—
Emerald Beach*	Ocean beach	 ^	—
Diggers Beach*	Ocean beach	 ^	—
Park Beach*	Ocean beach	 ^	—
Jetty Beach (Coffs Harbour)*	Ocean beach	 ^	—
Sawtell Beach*	Ocean beach	 ^	—
Sawtell Rockpool*	Ocean baths	 ^	—

Beach Suitability Grade					Change		
							
Very Good	Good	Fair	Poor	Very Poor	Improved	Stable	Declined

* New site

^ Provisional: Information required for the analysis is incomplete due to limited bacterial data or limited information on potential pollution sources in a beach catchment.

Coffs Harbour City Council



Overall results

Six of the 8 swimming sites were graded as Very Good or Good in 2021–2022. Monitoring of these sites commenced in November 2021. Coffs Harbour City Council previously monitored these swimming sites from 2002–2003, and from 2006–2010.

Percentage of sites graded as Very Good or Good

	2019– 2020	2020– 2021	2021– 2022	Trend
Ocean beaches (7 sites)	–	–	71%	–
Ocean baths (1 sites)	–	–	100%	–

Eight swimming sites were monitored by Coffs Harbour City Council. Samples were collected weekly between November and March and sampling and laboratory analysis was fully funded by the council.

See the section on **How to read this report** on page 18 for an explanation of the graphs, tables and Beach Suitability Grades.

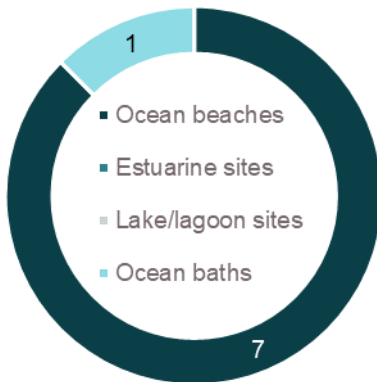
Best beaches

Sawtell Beach.

This site had excellent water quality and was suitable for swimming almost all of the time.

Swimming sites monitored in the Coffs Harbour region include ocean beaches and an ocean baths, with each site type having a different response to rainfall-related impacts.

As a general precaution swimming should be avoided during and for at least one day after heavy rain at ocean beaches or ocean baths, or if there are signs of stormwater pollution such as discoloured water or floating debris.



Site types in Coffs Harbour City Council



Beach Suitability Grades for Coffs Harbour City Council ocean beaches

Ocean beaches

Sawtell Beach was graded as Very Good in 2021–2022. This beach had excellent water quality and was suitable for swimming almost all of the time during the assessment period.

Safety Beach, Diggers Beach, Park Beach and Jetty Beach (Coffs Harbour) were graded as Good in 2021–2022. Water quality at these beaches was suitable for swimming most of the time. Elevated enterococci levels were mostly recorded following heavy rainfall.

Woolgoolga Main Beach and Emerald Beach were graded as Poor in 2021–2022. While these sites were mostly suitable for swimming after little or no rain, elevated bacterial levels were recorded following heavy rainfall.

While the grades are provisional due to limited bacterial data, they were also heavily influenced by wet weather impacts, with the majority of samples collected during and following rainfall.

It is recommended that swimming should be avoided during and for up to one day after rainfall at ocean beaches or if there are signs of stormwater pollution such as discoloured water, flowing drains or outflow from creeks or lagoons, due to the possibility of pollution.

Ocean baths



Beach Suitability Grades for Coffs Harbour City Council ocean baths

Sawtell Rockpool was graded as Good in 2021–2022. Water quality at this site was mostly suitable for swimming in dry weather conditions, with 71% of dry weather samples within the safe swimming limit. Elevated enterococci levels were recorded after heavy rainfall.

While the water quality has been of a good standard, the grade is provisional as the assessment is based on limited bacterial data.

It is recommended that swimming should be avoided during and for up to one day following rainfall, or if there are signs of pollution such as discoloured water or floating debris.

Management

Coffs Harbour City Council



Coffs Harbour City Council has commenced the development of several coastal management programs (CMPs) for the estuaries and coastline in the local government area. These programs will identify issues impacting these catchments and provide a long-term strategy to manage and protect the environment, recreational, social and economic values.

Coffs Harbour City Council is developing the Central Coffs Estuaries CMP for the estuaries of Moonee Creek, Coffs Creek and Boambee/Newports Creek. The program will identify key issues and pressures and outline a plan to address these. With funding and support from the NSW Government's Coastal and Estuary Grants Program, council completed the scoping study for the CMP in 2021 and is underway with stage 2 to further analyse the issues identified. This CMP will replace the Coffs Harbour Coastal Zone Management Plan (CZMP).

A coastal management program (CMP) outlines a long-term strategy for managing the coast, in line with the *Coastal Management Act 2016*.

The NSW Government provides guidance and funding through the Coastal and Estuary Grants Program for local councils to prepare and implement CMPs.

Coffs Harbour City Council has implemented several actions as part of the Coffs Harbour CZMP with funding and support from the NSW Government's Coastal and Estuary Grants, including the replacement of an existing retaining wall at England's Park in Coffs Creek Estuary in 2021 and an estuary and freshwater ecohealth monitoring program in 2018–2020 to monitor and identify issues in ecosystem health over time.

Coffs Harbour City Council is finalising the Northern Coffs Estuaries CMP for the estuaries of Corindi River, Pipe Clay Lake and Arrawarra Creek. With funding and support from the NSW Government's Coastal and Estuary Grants Program, council completed the scoping studies in 2020, and a detailed analysis of the identified issues in 2021. In 2021–2022, council will working through stage 3 of the CMP process, which involves identifying the management actions to address the identified issues. It is hoped the final CMP will be developed and on public exhibition in 2022.

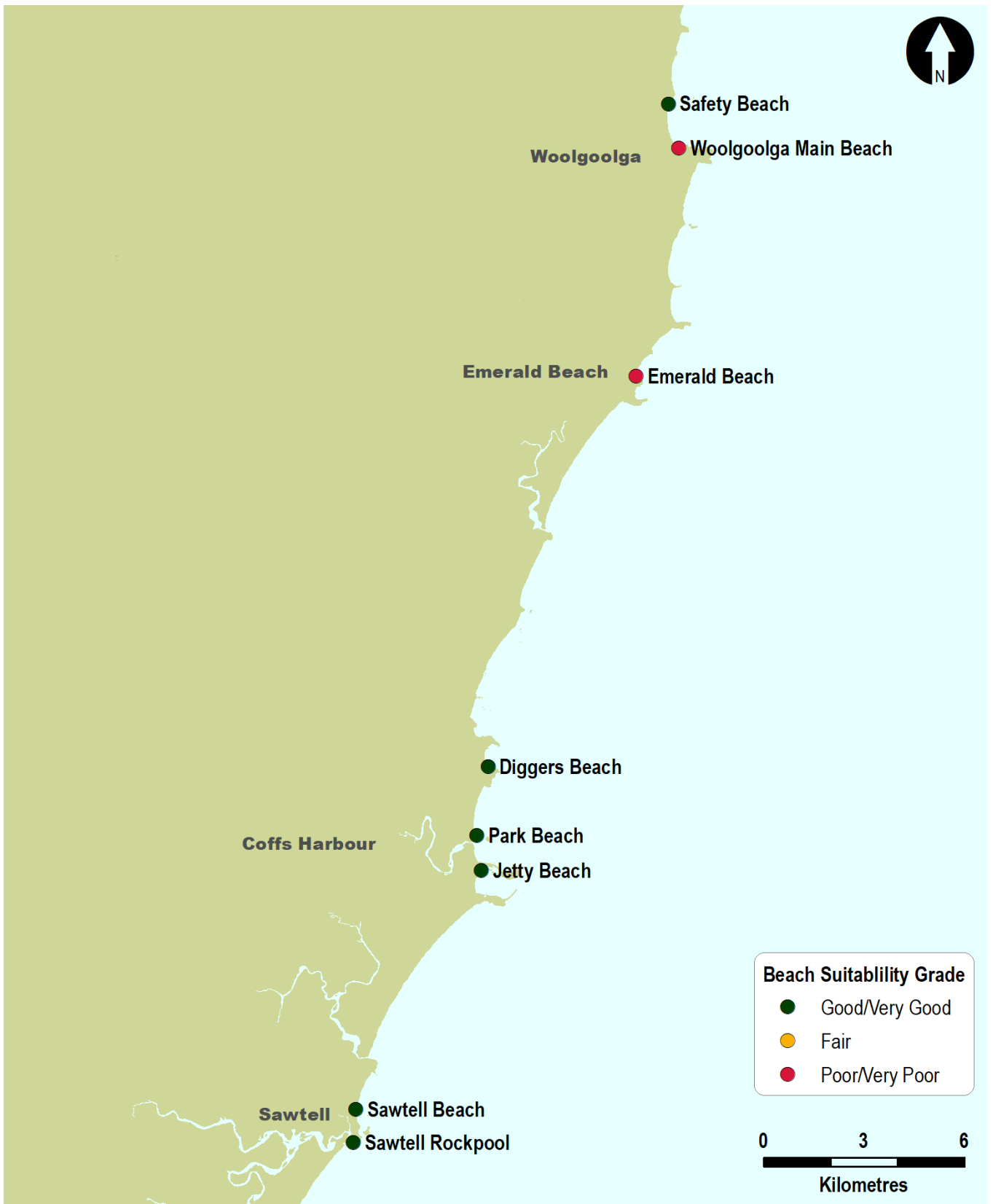
Coffs Harbour City Council developed the Bonville and Pine Creek CMP in 2021 with funding and support from the NSW Government's Coastal and Estuary Grants Program. The plan, in consultation with the community and stakeholders, has identified key issues and threats in these catchments and developed a long-term strategy to address them. This CMP is awaiting certification from the NSW Government, but once certified, Coffs Harbour City Council can access funding from the Coastal and Estuary Grants Program to implement actions identified in the CMP.



Diggers Beach

Photo: Beachwatch/DPE

Coffs Harbour City Council developed the Woolgoolga Region Estuaries CMP in 2021 for the estuaries of Darkum Creek Woolgoolga Lake, Willis Creek and Hearn's Lake with funding and support from the NSW Government's Coastal and Estuary Grants Program. The plan, in consultation with the community and stakeholders, has identified key issues and threats in these catchments and developed a long-term strategy to address them. This CMP is awaiting certification from the NSW Government, but once certified, council can access funding from the Coastal and Estuary Grants Program to implement actions identified in the CMP.



Sampling sites and Beach Suitability Grades in Coffs Harbour City Council

Safety Beach

Beach grade: **G**



Safety Beach is located north of Woolgoolga Main Beach and lies between Darkum Creek and Woolgoolga Lake. The beach is not patrolled.

The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several sources of potential faecal contamination including Woolgoolga Lake.

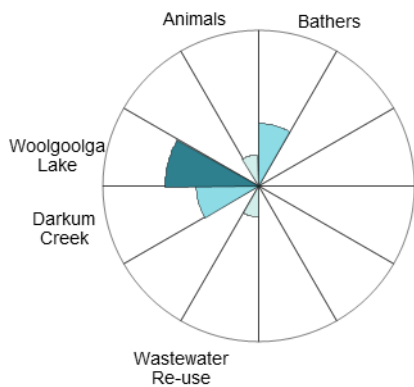
Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and after 5 mm or more of rain.

See 'How to read this report' for key to map.

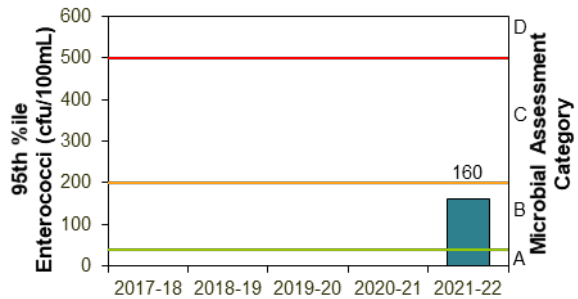
The site was monitored from 2002 until 2003, and since 2021.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	86%	21	—

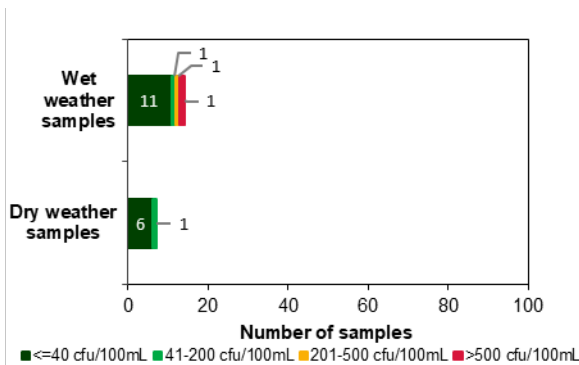
Sanitary inspection: Moderate



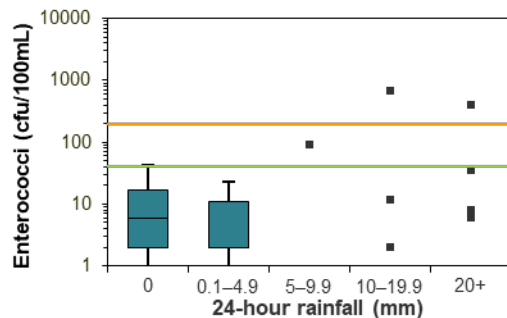
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Woolgoolga Main Beach

Beach grade: P[^]



Woolgoolga Main Beach is popular for swimming and surfing and is patrolled seasonally. The beach is backed by dunes and is adjacent to the town centre.

The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from stormwater.

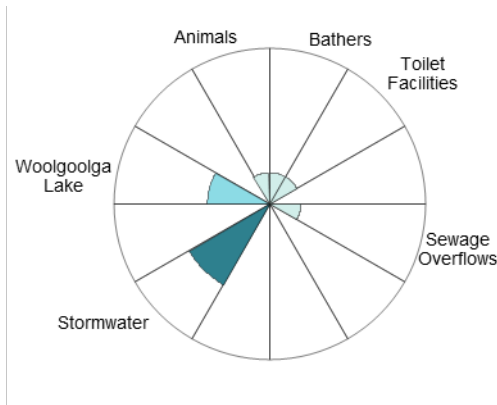
Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and often after 10 mm or more of rainfall.

See 'How to read this report' for key to map.

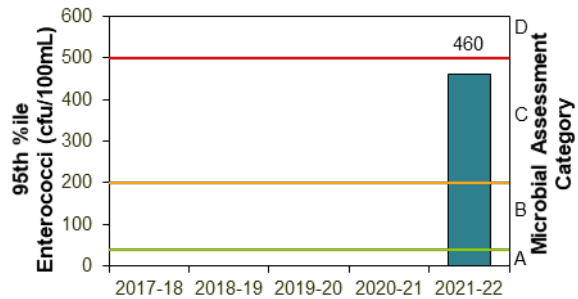
The site was monitored from 2002 until 2003, from 2008 until 2010, and since 2021.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	86%	21	—

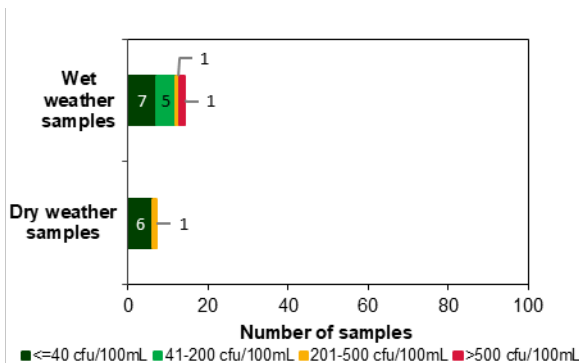
Sanitary inspection: Moderate



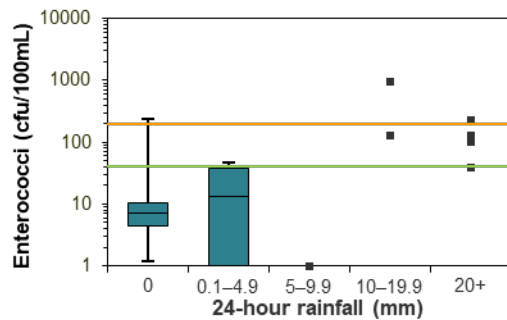
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Emerald Beach

Beach grade:



Emerald Beach lies to the north of Dammerels Head and is patrolled in summer. The beach is accessed at the southern end, where there are amenities, picnic facilities and a park.

The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from Fiddamans Creek.

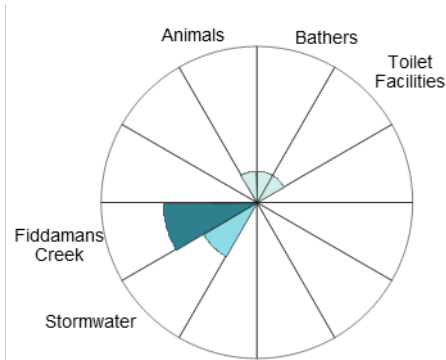
Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and often after 10 mm or more.

See 'How to read this report' for key to map.

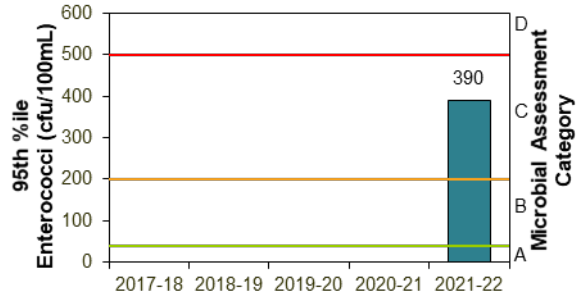
The site was monitored from 2002 until 2003, from 2006 until 2010, and since 2021.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	86%	20	—

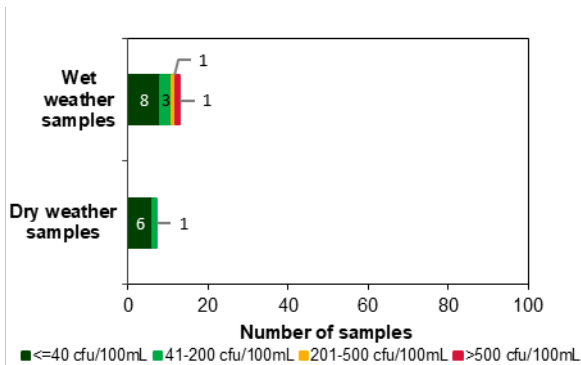
Sanitary inspection: Moderate



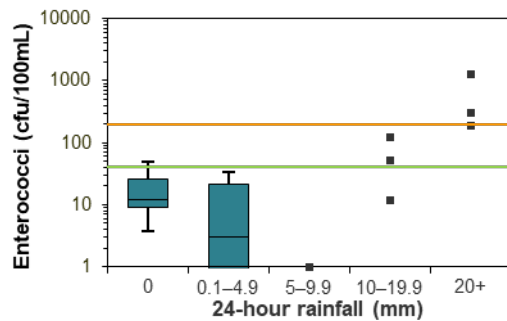
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Diggers Beach

Beach grade:



Diggers Beach is positioned between Diggers and Macauleys headlands and is patrolled by lifeguards. The southern end of the beach is a popular swimming and surfing location.

The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including Jordans Creek.

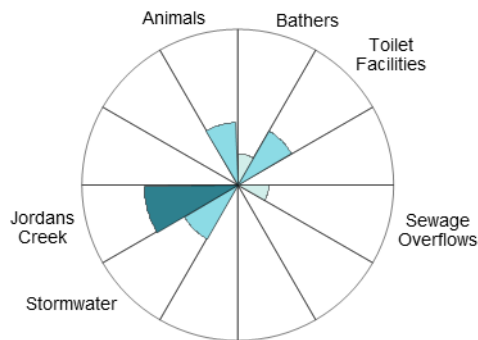
Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after 10 mm or more of rain.

See 'How to read this report' for key to map.

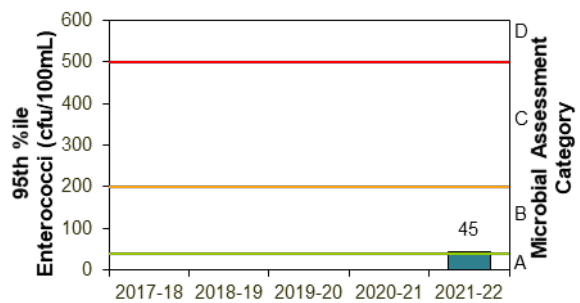
The site was monitored from 2002 until 2003, from 2006 until 2007, from 2008 until 2010, and since 2021.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	100%	21	—

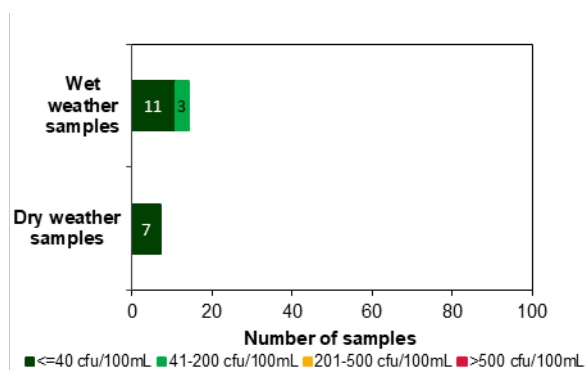
Sanitary inspection: Moderate



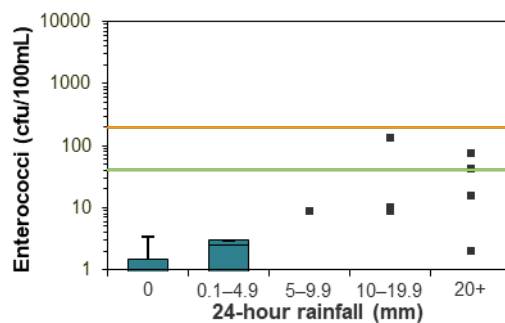
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Park Beach

Beach grade:

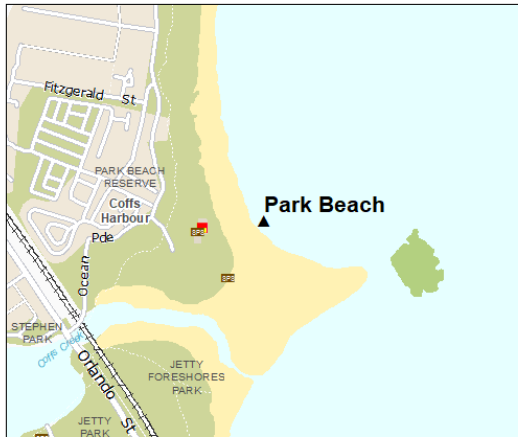


Park Beach is a popular beach located in Coffs Harbour and is patrolled. The beach is backed by dunes and the catchment is densely urbanised.

The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including Coffs Creek.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after 10 mm or more of rain.

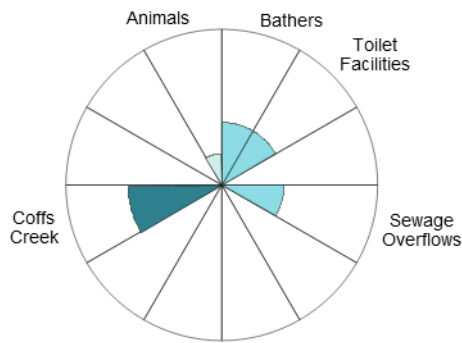
The site was monitored from 2002 until 2003, from 2006 until 2007, from 2008 until 2010, and since 2021.



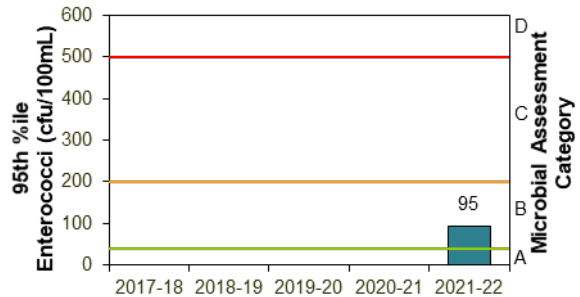
See 'How to read this report' for key to map.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	100%	19	—

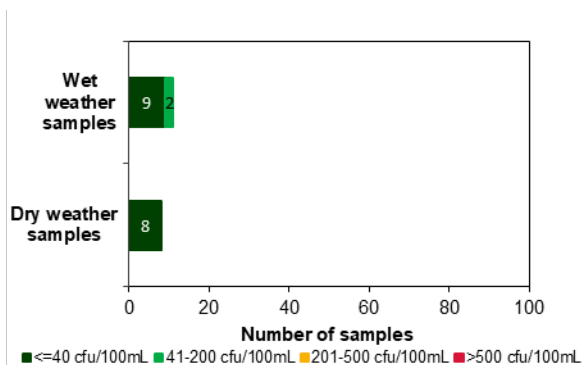
Sanitary inspection: Moderate



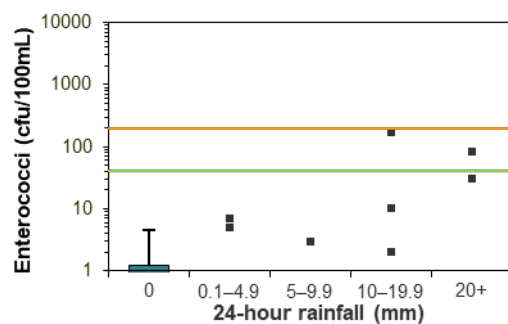
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Jetty Beach (Coffs Harbour)

Beach grade:



Jetty Beach is approximately 1.4 km long and extends south from a marina to Corambirra Point. The beach is a popular swimming location and is patrolled during summer.

The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination.

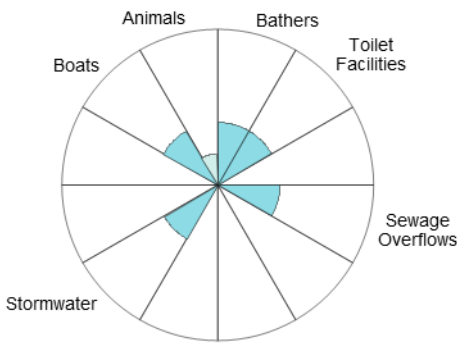
Enterococci levels increased slightly with increasing rainfall, regularly exceeding the safe swimming limit after 20 mm or more of rain.

See 'How to read this report' for key to map.

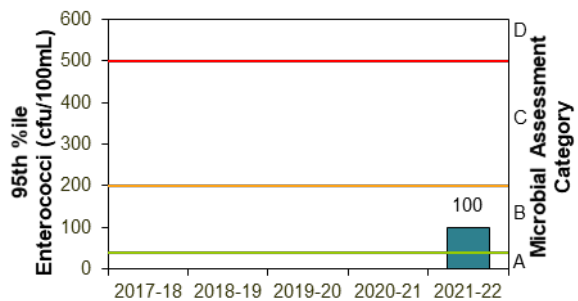
The site was monitored from 2002 until 2003, from 2006 until 2010, and since 2021.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	100%	21	—

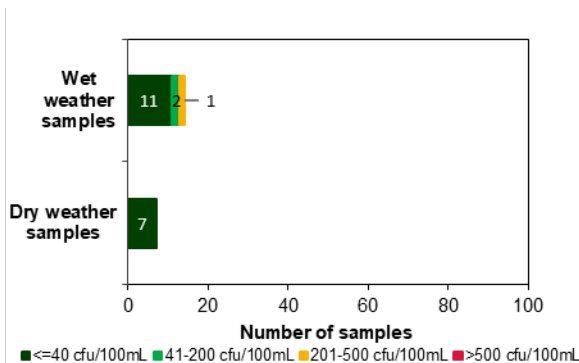
Sanitary inspection: Moderate



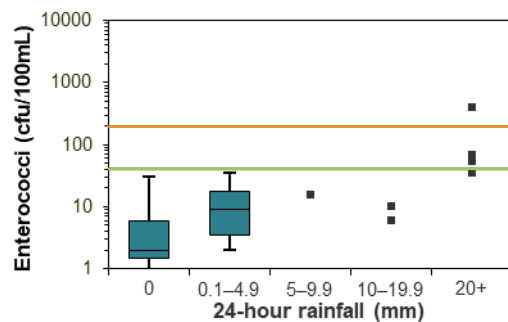
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Sawtell Beach

Beach grade:



Sawtell Beach is 2 km long and is patrolled during summer. The beach is backed by dunes and urban development.

The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

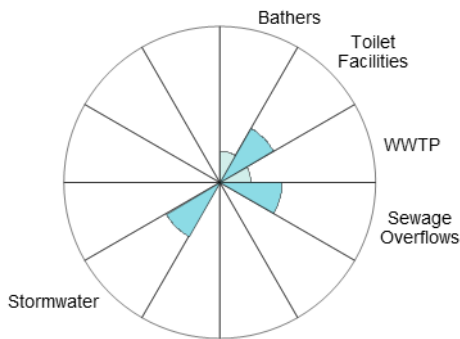
Enterococci levels had little response to rainfall and remained below the safe swimming limit across all rainfall categories.

The site was monitored from 2002 until 2003, from 2006 until 2007, from 2008 until 2010, and since 2021.

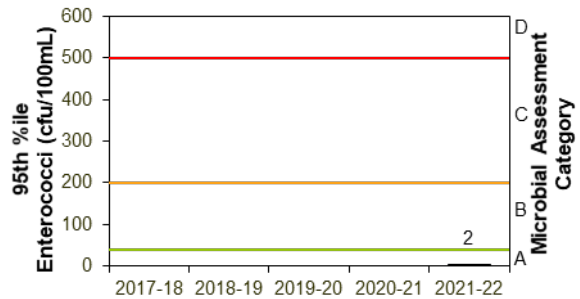
See 'How to read this report' for key to map.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2021 to Mar 2022	100%	20	–

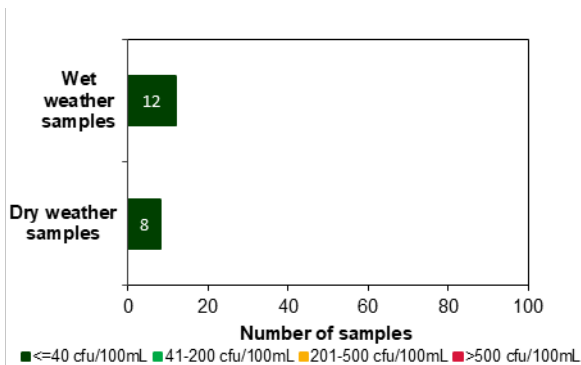
Sanitary inspection: Low



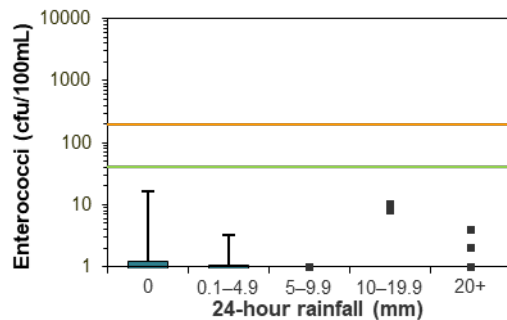
Microbial Assessment Category: A



Dry and wet weather water quality

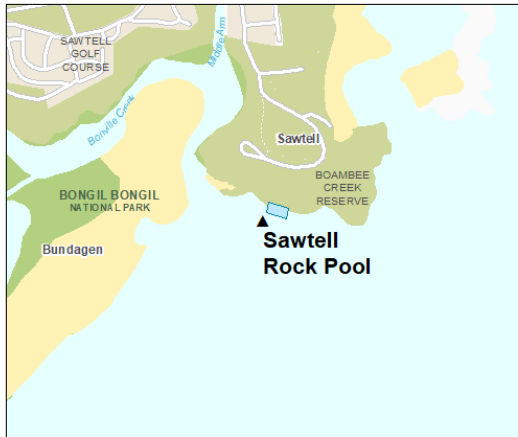


Water quality in response to rainfall



Sawtell Rockpool

Beach grade: **G**



Sawtell Rockpool is located at the northern end of Bonville Beach, near the mouth of Bonville Creek. The pool has moderate use all year round and is popular in the summer with children and the elderly.

The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including Bonville Creek.

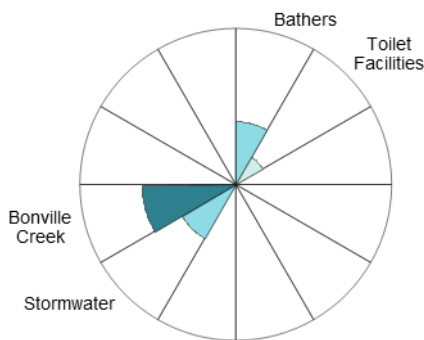
Enterococci levels generally increased with increasing rainfall, often exceeding the safe swimming limit after no rain, and regularly after 10 mm or more.

See 'How to read this report' for key to map.

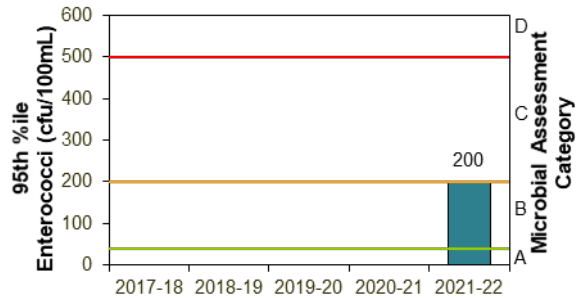
The site was monitored from 2002 until 2003, from 2006 until 2010, and since 2021.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean baths	Nov 2021 to Mar 2022	71%	20	–

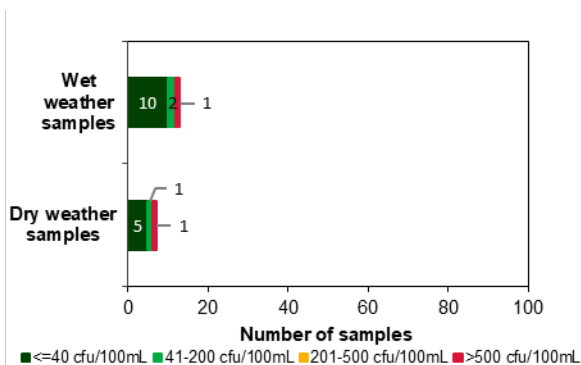
Sanitary inspection: Moderate



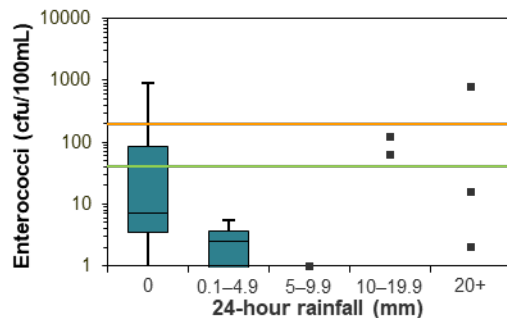
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



How to read this report

Beach Suitability Grades

Beach Suitability Grades provide an assessment of the suitability of a swimming location for recreation over time and are based on a combination of sanitary inspection (identification and rating of potential pollution sources at a beach) and microbial assessment (water quality measurements gathered over previous years). There are 5 grades ranging from Very Good to Very Poor:

VG Very Good

Location has generally excellent microbial water quality and very few potential sources of faecal pollution. Water is considered suitable for swimming almost all of the time

G Good

Location has generally good microbial water quality and water is considered suitable for swimming most of the time. Swimming should be avoided during and for up to one day following heavy rain at ocean beaches and up to 3 days at estuarine sites

F Fair

Microbial water quality is generally suitable for swimming, but because of the presence of significant sources of faecal contamination, extra care should be taken to avoid swimming during and for up to 3 days following rainfall or if there are signs of pollution such as discoloured water or odour or debris in the water

P Poor

Location is susceptible to faecal pollution and microbial water quality is not always suitable for swimming. During dry weather conditions, ensure that the swimming location is free of signs of pollution, such as discoloured water, odour or debris in the water, and avoid swimming at all times during and for up to 3 days following rainfall

VP Very Poor

Location is very susceptible to faecal pollution and microbial water quality may often be unsuitable for swimming. It is generally recommended to avoid swimming at these sites almost all of the time

Some of the Beach Suitability Grades in this report are **provisional**, as the information required for the analysis is incomplete due to limited bacterial data or limited information on potential pollution sources in a beach catchment.

The guidelines

The National Health and Medical Research Council's guidelines for managing risks in recreational water (NHMRC 2008) were adopted for use in NSW in May 2009. These guidelines have been adopted in all Australian states and territories and are supported by guidance notes developed by the Department of Health Western Australia (WA Department of Health 2007).

Enterococci

The national guidelines advocate the use of enterococci as the single preferred faecal indicator in marine waters.

These bacteria are excreted in faeces and are rarely present in unpolluted waters. Enterococci have shown a clear dose–response relationship to disease outcomes in marine waters in the northern hemisphere. In accordance with the guidelines, Beachwatch tests for enterococci only. The enterococci density in water samples is analysed in the laboratory using method AS/NZS 4276.9:2007 (Standards Australia 2007).

Enterococci are measured in colony forming units per 100 mL of sample (cfu/100 mL).

Beach Suitability Grades are determined by using the following matrix:

		Microbial Assessment Category			
		A	B	C	D
Sanitary Inspection Category	Very Low	Very Good	Very Good	Follow Up	Follow Up
	Low	Very Good	Good	Follow Up	Follow Up
	Moderate	Good	Good	Poor	Poor
	High	Good	Fair	Poor	Very Poor
	Very High	Follow Up	Fair	Poor	Very Poor

Using the Beach Suitability Grade classification matrix, sites assigned a moderate Sanitary Inspection Category can only be rated as Good or Poor, with no option of Fair grades. This can create the impression of a large change in water quality when in fact there need only be a slight increase in bacterial counts to push it over the threshold, with no significant increase in the risk to public health.

Microbial Assessment Category (MAC)

There are 4 Microbial Assessment Categories (A to D) and these are determined from the 95th percentile of an enterococci dataset of at least 100 data points. Each MAC is associated with a risk of illness determined from epidemiological studies. The risks of illness shown below are not those associated with a single data point but are the overall risk of illness associated with an enterococci dataset with that 95th percentile (Wyer et al. 1999).

Risk of illness associated with Microbial Assessment Categories

Category	Enterococci (cfu/100 mL)	Illness risk*
A	≤40	GI illness risk: <1% AFR illness risk: <0.3%
B	41–200	GI illness risk: 1–5% AFR illness risk: 0.3–1.9%
C	201–500	GI illness risk: >5–10% AFR illness risk: >1.9–3.9%
D	>500	GI illness risk: >10% AFR illness risk: >3.9%

* GI = gastrointestinal illness; AFR = acute fever and rash

Calculating the MAC

The 95th percentile is a useful statistic for summarising the distribution of enterococci data at a site. It embodies elements of both the location of the distribution (how high/low the enterococci counts are) and the scale of the distribution (how variable the enterococci counts are).

The 95th percentile values for each of the 4 Microbial Assessment Categories were determined by the World Health Organization using enterococci data collected from swimming locations across Europe. These values will represent different probabilities of illness if the distribution of enterococci data from swimming locations in NSW differs from the European distribution.

In recognition of this issue, Dr Richard Lugg (Department of Health, Western Australia) has developed a Microsoft® Excel tool for calculating a modified 95th percentile that takes into account the distribution of data. This tool has been used to calculate the 95th percentile values presented in this report and has been adopted for use by other state governments in Australia.

The tool can be downloaded from the WA Government's 'Environmental waters publications' webpage, under *Forms and templates*.

Sanitary Inspection Category (SIC)

More information about the **sanitary inspection** process is available on the DPE 'Sanitary inspection of beaches' webpage.

The aim of a sanitary inspection is to identify all sources of faecal contamination that could affect a swimming location and assess the risk to public health posed by these sources. It is an assessment of the likelihood of bacterial contamination from identified pollution sources and should, to some degree, correlate with the bacterial water quality results obtained from sampling.

The main sources of faecal contamination considered in the sanitary inspection are: bathers, toilet facilities, wastewater treatment plants (WWTPs), sewage overflows, sewer chokes, onsite systems, wastewater re-use, stormwater, river discharge, lagoons, boats and animals.

Rivers, lakes and estuaries themselves can be potential sources of faecal contamination to sites located in these waterbodies, with contaminated water from upstream or surrounding areas impacting water quality at the swimming location. This source is captured in river discharge or lagoon category, and shown as the waterbody in the sanitary inspection charts.

Through the sanitary inspection process, beaches are categorised to reflect the overall likelihood of faecal contamination. There are 5 categories: Very Low, Low, Moderate, High and Very High.



Stormwater drain flow
Photo: Beachwatch/DPE

Stormwater in urban areas often contains sewage from leakages, overflows or sewer chokes when the sewerage system fails.

Sewage overflows can occur in wet weather when the network has exceeded capacity due to rainwater entering the system. The mix of sewage and rainwater discharges from designated overflow points and drains to waterways, usually via the stormwater system. Overflows from the sewerage system can also occur in dry weather due to mechanical failure or power outage.

Sewer chokes occur due to blockages in the pipes usually due to tree roots, oil, grease or debris. This causes sewage to back up and escape via sewer inspection points, designed overflow structures or cracks in the pipes, then drain to waterways, usually via the stormwater system.

Explanation of tables

Each region contains tables listing all monitored swimming sites including site type, beach grade and change in grade from the previous year.

The following symbols are used to show the change in beach grade from the previous year:

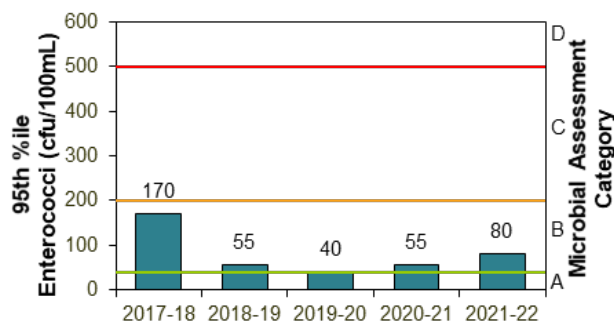
- Stable
- ↑ Improved
- ↓ Declined

A provisional grade indicates the assessment is based on limited data collected during the assessment period and should not be compared to the beach grade from the previous year.

Explanation of graphs, charts, and information bars on beach pages

Microbial Assessment Category (MAC) chart

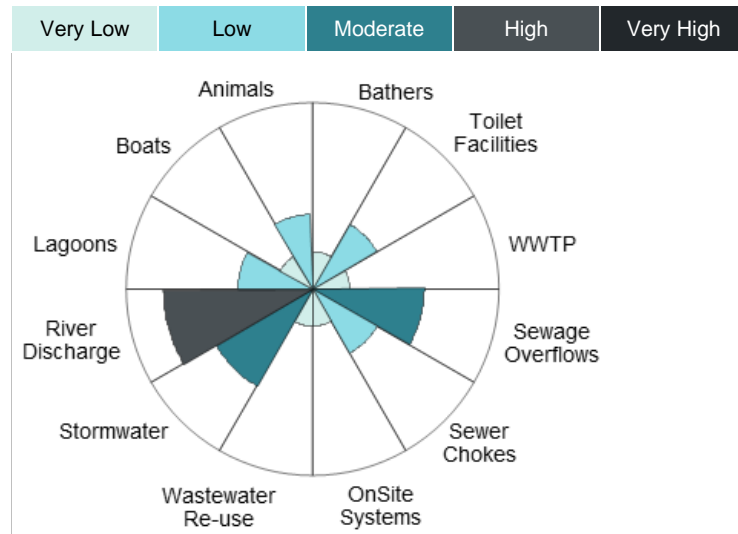
On each beach page, the MACs for the last 5 years are displayed on a simple bar chart. The MAC for the current year is based on enterococci data collected during the assessment period. The bars are labelled with the 95th percentile value for each year and the thresholds dividing the A, B, C and D categories are marked in green, amber and red for reference.



Sanitary Inspection Category (SIC) chart

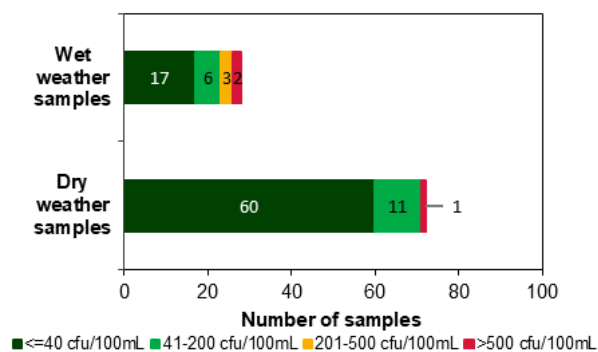
The results of the sanitary inspection for each swimming location are presented in a radar pie chart. The chart shows the likelihood that each identified pollution source will contribute to faecal contamination at a swimming site, as indicated by the size and colour of the segment, ranging from

very low (lightest colour) to very high (darkest colour) as shown below. The sum of these contributions is the overall likelihood, or Sanitary Inspection Category.



Wet and dry weather water quality chart

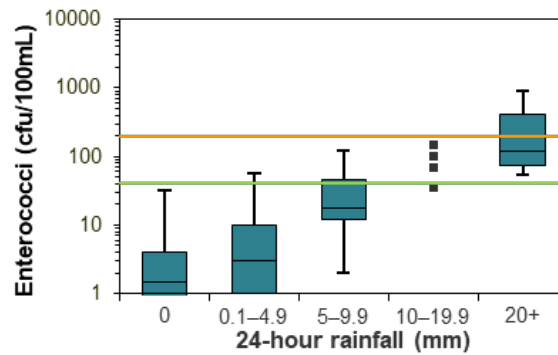
Enterococci levels in wet and dry weather conditions are presented for each swimming location as a bar graph. All data collected during the assessment period is included in the analysis. Dry weather is defined as no rainfall recorded in the previous 24 hours. Each bar is colour coded to show the number of enterococci results up to 40 cfu/100 mL, between 41 and 200 cfu/100 mL, between 201 and 500 cfu/100 mL and greater than 500 cfu/100 mL. These categories reflect the Microbial Assessment Category thresholds and are coloured on the graph as dark green, light green, amber and red respectively.



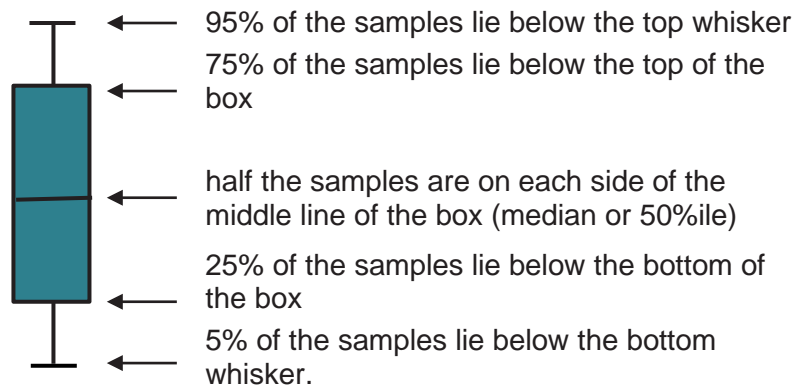
It is expected that swimming sites with lower levels of flushing will show some elevated bacterial results in dry weather samples (no rainfall in the previous 24 hours) due to the longer time needed to recover from a rainfall event. At some estuarine and lake/lagoon swimming locations the impacts of stormwater pollution on beach water quality may be detected up to 3 days after rainfall.

Water quality in response to rainfall

Trends in enterococci levels in response to rainfall are shown using a box plot. For reference, enterococci levels of 40 cfu/100 mL and 200 cfu/100 mL are indicated with a green and orange line, respectively. The 40 cfu/100 mL level is referred to as the 'safe swimming limit'. The enterococci data were obtained from the last 5 years of monitoring. Rainfall data were obtained from rain gauges situated close to the sample site and are 24-hour totals to 9am on the day of sampling. If there are fewer than 5 enterococci data points in a rainfall category, individual data points are presented instead of a box plot. At sites where many results are below the detection limit (1 cfu/100 mL), only the upper portion of the box plots will be visible.



Each part of the box plot represents a significant percentile value of the sample population:



Information bars
















Information bars on each beach page provide a summary of details about the swimming site.

The **assessment period** shows the timeframe in which the water samples were collected. The NHMRC guidelines state beach grades should be determined from the most recent 100 water quality results collected within a 5-year period. The assessment period varies between sites depending on sampling frequency.

Dry weather samples suitable for swimming (**dry weather swimmability**) shows the percentage of water samples with enterococci levels below 40 cfu/100 mL. Dry weather is defined as no rainfall in the previous 24 hours. Swimming sites with lower levels of flushing often have a lower percentage of dry weather samples within the safe swimming limit due to the impacts of rainfall detected up to 3 days after the event.

Explanation of maps

A map of individual swimming locations is presented on each beach page. The scale of the maps is 1:10,000. Each map shows the location of the sampling site, land use and features such as surf lifesaving clubs. Potential pollution sources such as stormwater drains, sewage pumping stations, wastewater treatment plants, lagoons, rivers and creeks, are shown where accurate data is held.

Key to maps	
	Sampling Site
	Surf Life Saving Club
	Wastewater Treatment Plant
	Sewage Pumping Station
	Sewage Overflow
	Stormwater Drain
	Water
	Baths
	National Park/Reserve/ Other Park
	Built-up Area
	Sand
	Roads
	Major Roads
	Baths – Netted Area
	Breakwater/Wharf

References

NHMRC (2008) *Guidelines for managing risks in recreational water*, National Health and Medical Research Council, Australian Government Publishing Service, Canberra, ACT.

Standards Australia (2007) *AS/NZS 4276.9:2007, Water microbiology Method 9: Enterococci – Membrane filtration method (ISO 7899-2:2000, MOD)*, Standards Australia International Ltd, Sydney and Standards New Zealand, Wellington.

WA Department of Health (2007), *Microbial quality of recreational water guidance notes in support of chapter 5 of the National Health and Medical Research Council guidelines for managing risks in recreational water, 2006*, Department of Health, Western Australia and The University of Western Australia, October 2007, ww2.health.wa.gov.au/Articles/A_E/Environmental-waters-publications, accessed 23/06/22.

Wyer MD, Kay D, Fleisher JM, Salmon RL, Jones F, Godfree AF, Jackson G and Rogers A (1999) 'An experimental health related classification for marine waters', *Water Research*, 33(3):715–722.

More information

- [Beachwatch webpage](#)
- [Coastal management program progress](#)
- [Sanitary inspection of beaches](#)
- [Subscribe to environment and heritage newsletters](#)
- [WA Government environmental water publications](#)