NSW GOVERNMENT

Department of Planning, Industry and Environment

State of the beaches 2020–2021

North Coast region

Beachwatch

environment.nsw.gov.au/beachwatch

Find out more about your environment at:

www.environment.nsw.gov.au

Front cover: Tallow Beach, Suffolk Park
(Byron Shire Council)

Published by:
Environment, Energy and Science
Department of Planning, Industry 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 978-1-922672-11-7
EES 2021/0263
July 2021

Contents

Recreational water quality has been monitored in the North Coast region since 2002 by Ballina Shire Council and Richmond Valley Council under the Department of Planning, Industry and Environment's Beachwatch Partnership Program. This report summarises the performance of 22 swimming sites on the north coast of New South Wales, providing a long-term assessment of how suitable a site is for swimming. Monitored sites include ocean beaches, estuarine areas including Brunswick River, Simpsons Creek, Shaws Bay, North Creek and Evans River, and swimming sites in Lake Ainsworth.

In 2020–2021, 68% of swimming sites in the North Coast region were graded as Good or Very Good. These sites were suitable for swimming for most or almost all of the time. While this is a decline from the previous year, it reflects the very wet summer conditions and addition of four new swimming sites monitored by Byron Shire Council under the Beachwatch Partnership Program, with the lake/lagoon and estuarine swimming locations more susceptible to impacts from wet weather conditions.

North Coast region summary 2020–2021

Main Beach (Byron Bay), Photo: Jack Herington/ Byron Shire Council

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 New South Wales 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 (two to four 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 North Coast region by Byron Shire Council from 2009 to 2013 and since 2020, Ballina Shire Council since 2002, and Richmond Valley Council since 2006.

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

During 2020–2021, 22 swimming sites were monitored including ocean beaches, estuarine areas in Brunswick River, Simpsons Creek, Shaws Bay, North Creek and Evans River, and swimming sites in Lake Ainsworth.

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 2020–2021 are based on water quality data collected over the last two to four years. Rainfall over this period has been diverse:

- 2017–2018: variable rainfall with prolonged dry periods and mostly wet summer with significant rainfall events
- 2018–2019: rainfall was average to below average, except for a wet spring and isolated rain events
- 2019–2020: average to below average rainfall except for the wettest summer on record
- 2020–2021: rainfall was average to below average except for a very wet summer.

See the section on **How to read this report** on page 44 for an explanation of the graphs, tables and Beach Suitability Grades.

Rainfall on the North Coast was close to the long-term monthly averages for winter 2020. Notably, heavy rain fell in late July 2020, with Evans Head and Ballina recording 168 mm and 165 mm respectively from 24–27 July.

Monthly rainfall totals during spring on the North Coast were average to below average.

In mid-December and late February heavy rain fell, causing flooding and coastal erosion in the Northern Rivers region. Summer rainfall totals were well above average, with Evans Head recording its highest summer rainfall total on record of 828 mm from December 2020 to February 2021 and highest December rainfall total on record of 416 mm. Ballina received more than double the long-term monthly average rainfall for December with 382 mm.

Above average rainfall fell during March and April 2021. Ballina recorded it highest March rainfall since 1994, with 433 mm.

Algal blooms

Blue-green algal bloom present in the water
Photo: Rachael Jenner/ Ballina Shire Council

Water NSW reported several occurrences of freshwater blue-green algal blooms, *Dolichospermum circinale* impacting Lake Ainsworth in October and November 2020, and during February and March 2021. Water NSW also issued a caution alert for marine algae, *Alexandrium* sp. at South Ballina Beach in October 2020.

While freshwater and marine algae occur naturally, there were times of heightened risk to recreational users due to rapid increases in abundance causing blooms.

The appearance of **algae** is sometimes mistaken for **sewage contamination** due to a strong odour and thick green scum or discolouration in the water caused by the blooms.

Algae advisories were issued on the Ballina Council and Water NSW websites, as well as onsite signage during blooms.

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 North Coast region

Swimming site	Site type	Beach Suitability Grade	Change
Byron Shire Council			
Torakina Beach*	Estuarine	P^	–
Simpsons Creek*	Estuarine	P^	–
Main Beach (Bryon Bay)*	Ocean beach	VG^	–
Tallow Beach (Suffolk Park)*	Ocean beach	VG^	–
Ballina Shire Council			
Seven Mile Beach	Ocean beach	VG	●
Lake Ainsworth North	Lake/Lagoon	P	●
Lake Ainsworth East	Lake/Lagoon	G	●
Lake Ainsworth South	Lake/Lagoon	G	●
Lake Ainsworth West	Lake/Lagoon	P	●
Shelly Beach	Ocean beach	VG	▲
Lighthouse Beach	Ocean beach	VG	●
Shaws Bay North	Estuarine	P	▼
Shaws Bay East	Estuarine	G	●
Shaws Bay East Arm	Estuarine	G	●
Shaws Bay East Beach	Estuarine	G	●
Shaws Bay West	Estuarine	P	▼
The Serpentine	Estuarine	G	●
Richmond Valley Council			
Airforce Beach	Ocean beach	G	▼
Main Beach	Ocean beach	G	▼
Shark Bay	Ocean beach	VG	●
Evans River	Estuarine	P	●
Elm Street Bridge North (Evans River)	Estuarine	G	●

Beach Suitability Grade					Change		
VG	G	F	P	VP	↑	●	↓
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.

Byron Shire Council

50%
swimming sites graded Good or Very Good

Four swimming sites were monitored by Byron Shire Council. Samples were collected weekly between December and April and sampling and laboratory analysis was fully funded by the council.

Overall results

Two of the four swimming sites were graded as Very Good in 2020–2021. Monitoring at these sites commenced in December 2020. Byron Shire Council previously monitored these swimming sites from 2009 to 2013.

Percentage of sites graded as Very Good or Good:

- 2020–2021: 50%.

See the section on **How to read this report** on page 44 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Main Beach (Byron Bay) and Tallow Beach (Suffolk Park).

These sites had excellent water quality and were suitable for swimming almost all of the time.

Site types in Byron Shire Council

Swimming sites monitored in the Byron region include ocean beaches and estuarine areas in the Brunswick River and Simpsons Creek, with each site type having a different response to rainfall-related impacts.

Estuarine swimming sites generally did not perform as well as ocean beaches, due to lower levels of flushing increasing the time needed to disperse and dilute pollution inputs, taking longer to recover from stormwater events.

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

Ocean beaches

Beach Suitability Grades for Byron Shire Council ocean beaches

The two ocean beaches were graded as Very Good in 2020–2021: Main Beach (Byron Bay) and Tallow Beach (Suffolk Park). These beaches had excellent water quality and were suitable for swimming almost all of the time.

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

Estuarine beaches

Beach Suitability Grades for Byron Shire Council estuarine beaches

Torakina Beach, located within the entrance of the Brunswick River, and Simpsons Creek were graded as Poor in 2020–2021. Elevated bacteria levels were recorded at these sites during dry and wet weather conditions. These sites may be impacted by several potential sources of faecal contamination including stormwater and upstream sources in the Brunswick River and Simpsons Creek.

While these results are provisional due to limited bacterial data, swimming is not recommended at these sites during and for up to three days after rainfall, or if there are signs of stormwater pollution such as discoloured water or floating debris.

Management

Patrolled ocean beach
Photo: Beachwatch/EES, DPIE

Byron Shire Council

With funding and technical assistance provided through the NSW Coastal and Estuary Grants Program, Byron Shire Council is currently preparing two coastal management programs (CMPs) for the Shire's coastal zone.

Council has adopted a scoping study (Stage 1) as part of a CMP for the northern Byron Shire beaches. The project location encompasses beaches of the Byron Bay Embayment, Brunswick Heads Beach and South Golden Beach in the north. Council is also preparing a scoping study (Stage 1) as part of a CMP for the southern Byron Shire coastline (Seven Mile Beach to Cape Byron), including Tallow Creek and Belongil Creek estuaries. A scoping study for the Brunswick River Estuary is also proposed as a future priority. The CMP will detail a plan of action for council and others to address coastal hazard risks, habitat preservation, maintain or improve recreational amenity and future resilience.

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.

Under the previous *Coastal Protection Act 1979*, councils developed a **Coastal Zone Management Plan** (CZMP) to address coastal issues. Councils can continue to implement priority actions from certified CZMPs with funding assistance from the NSW Government's Coastal and Estuary Grants Program until 2021.

Torakina Beach, Photo: Jack Herington/ Byron Shire Council

Additional investigations to improve coastal protection structures are also underway through the Main Beach Shoreline Project.

Urban development in the town centre and other low lying areas has resulted in increased flooding throughout the Shire. The Belongil Creek Floodplain Risk Management Plan and North Byron Floodplain Risk Management Study and Plan have been implemented by council to deliver sustainable, long-term flood management, assess hazards, reduce risk and improve water quality objectives.

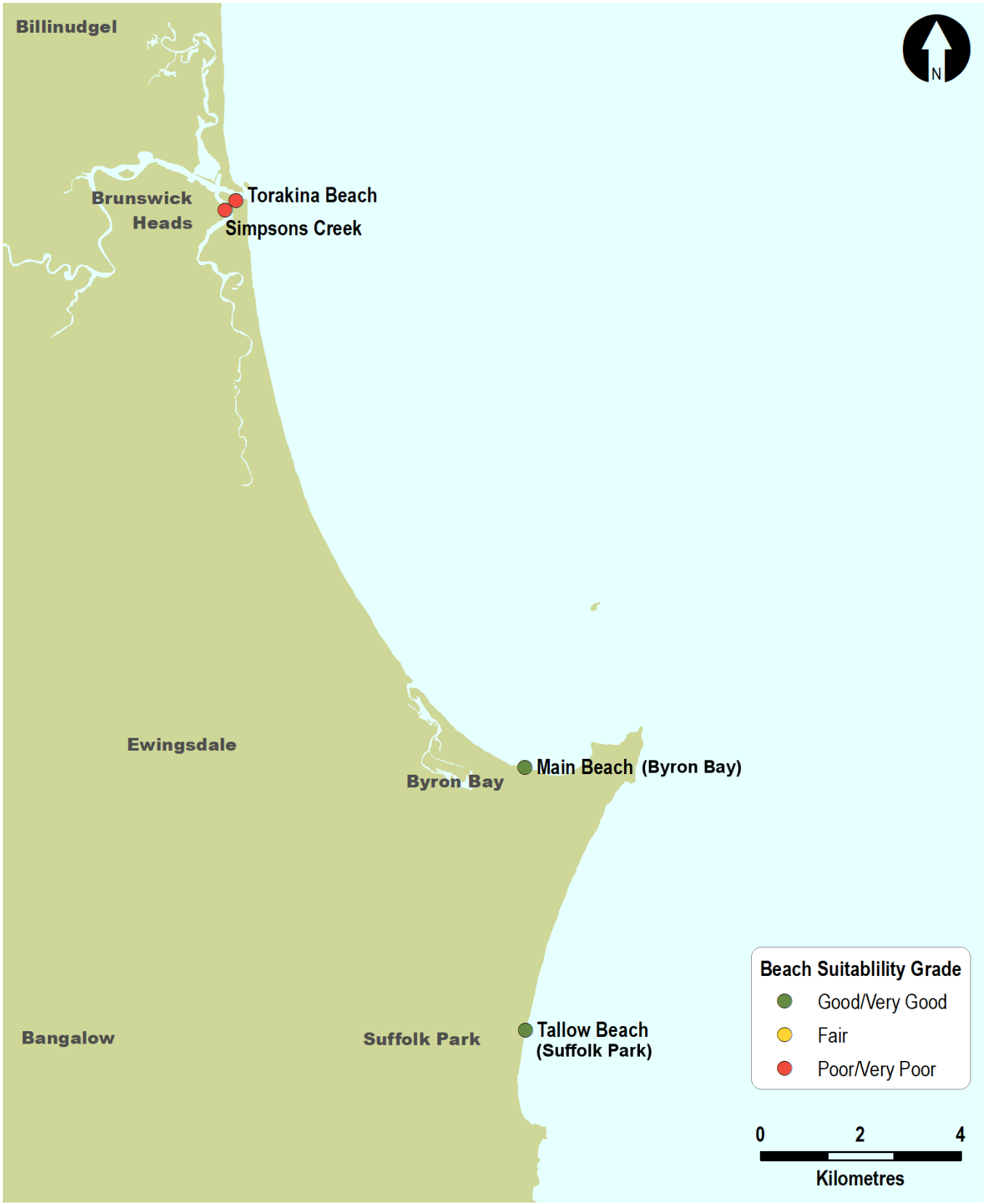
Byron Bay's southern estuary, Tallow Creek is a highly sensitive ICOLL (intermittently closed and open lakes and lagoons) and sacred place for the Arakwal People. In response to a fish kill event in 2019, council, together with the Arakwal Board (BOBBAC), NPWS, DPIE and DPI Fisheries/Marine Parks, amended the approach for entrance management activities at Tallow Creek. The new approach focuses on lowering the sand berm at the creek mouth once it reaches 2.2 m and during a rainfall event, so the creek can open naturally. Encouraging an ICOLL to open naturally due to rainfall rather than mechanical intervention is considered better entrance management in New South Wales and may decrease the risk of a fish kill.

Byron Shire has over 3000 on-site sewage management systems (OSMS) installed to manage wastewater in non-reticulated areas. Many of these systems are in ecologically sensitive areas close to waterways. Council's On-site Sewage Management Strategy and Routine Inspection program was implemented in 2001 and continues to improve wastewater management and water quality outcomes throughout the Shire. The strategy is due to be revised in 2021–2022.

Council provides free farming and agricultural landholder consultation with an Agricultural Extension Officer. The new project, which is partly funded by the federal government's National Landcare Program, aims to increase awareness, knowledge and skills of land management best practice. The program acknowledges the value and knowledge of existing farmers, while also providing workshops on topics such as chemical and pest management, restoring riparian zones and improving soil health, all of which have a direct impact on improving water quality in our creeks, rivers, estuaries and oceans.

The local community are passionate about protecting waterways and are actively involved in various volunteer protection programs, including Bringing Back the Bruns.

Council remains vigilant on responding to reports of pollution and takes compliance action when necessary.



Sampling sites and Beach Suitability Grades in Byron Shire Council

Torakina Beach

Beach grade: P

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

Torakina Beach is a small sandy beach next to the southern break wall of Brunswick River at Brunswick Heads.

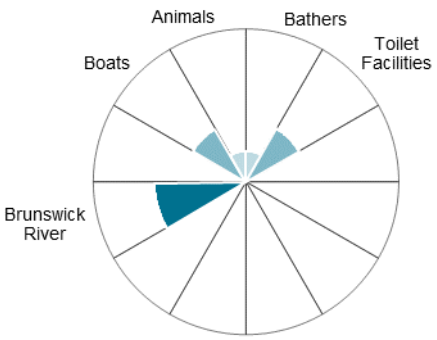
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from upstream sources in the Brunswick River.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after little or no rain.

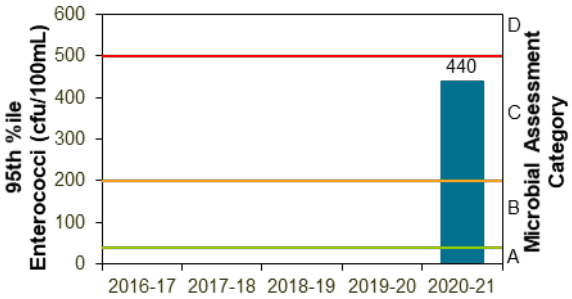
The site was monitored from 2009 until 2013, and since 2020.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Dec 2020 to Apr 2021	80%	15	–

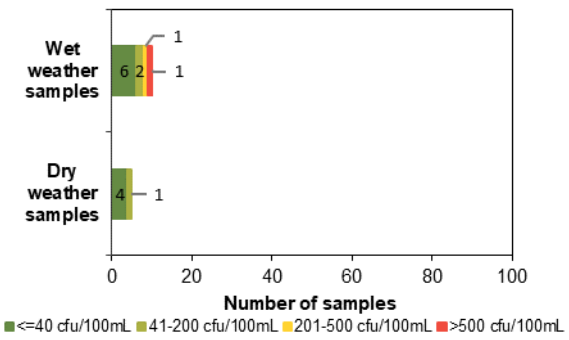
Sanitary inspection: Moderate



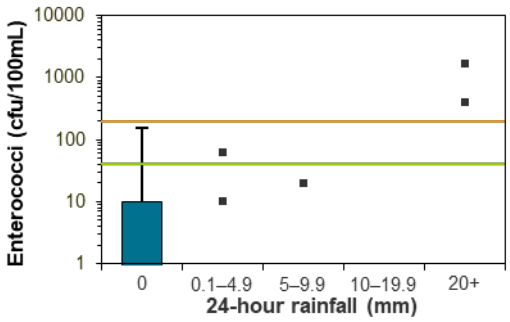
Microbial Assessment Category: C



Dry and wet weather water quality

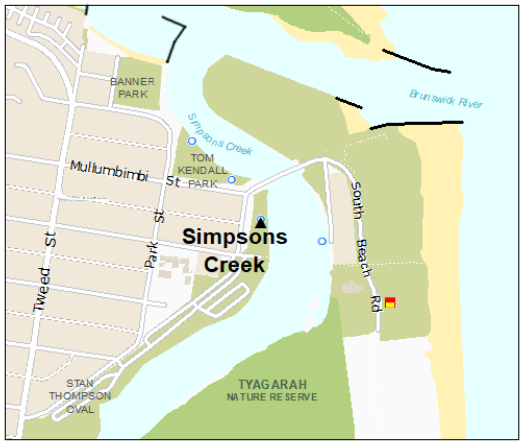


Water quality in response to rainfall



Simpsons Creek

Beach grade: P



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

Simpsons Creek is located adjacent to the Terrace Park in Brunswick Heads. The creek is a tributary of the Brunswick River.

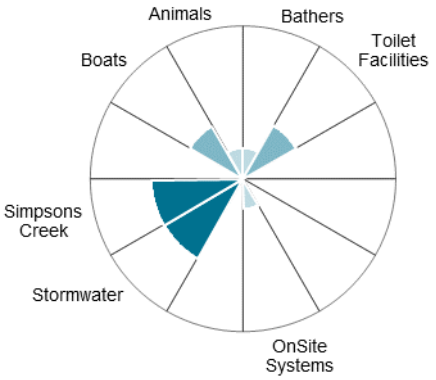
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from upstream sources within Simpsons Creek.

Enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit after no rain.

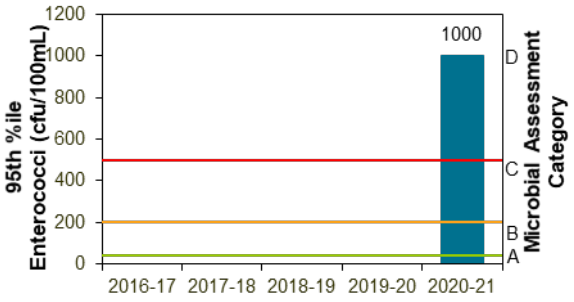
The site was monitored from 2009 until 2013, and since 2020.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Dec 2020 to Apr 2021	40%	15	–

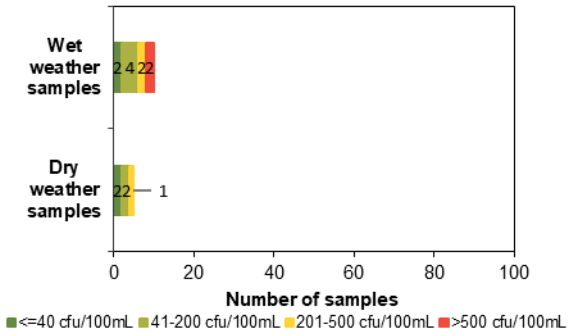
Sanitary inspection: Moderate



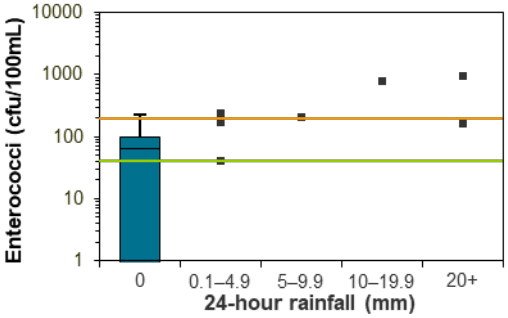
Microbial Assessment Category: D



Dry and wet weather water quality



Water quality in response to rainfall



Main Beach (Byron Bay)

Beach grade: VG

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

Main Beach is a popular long sandy beach in Byron Bay and is patrolled during the summer season.

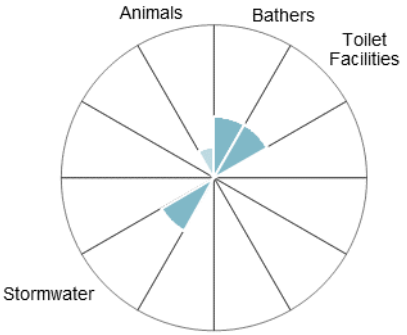
The Beach Suitability Grade of Very Good indicates microbial water quality is suitable for swimming almost all of the time, with few potential sources of faecal contamination.

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

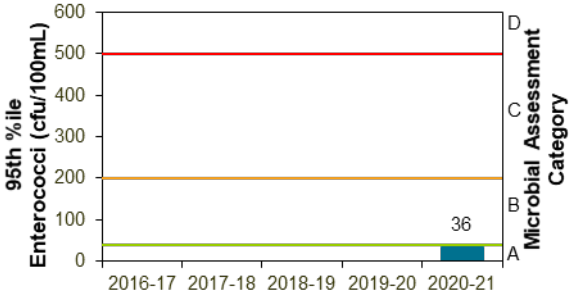
The site was monitored from 2009 until 2013, and since 2020.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Dec 2020 to Apr 2021	80%	17	–

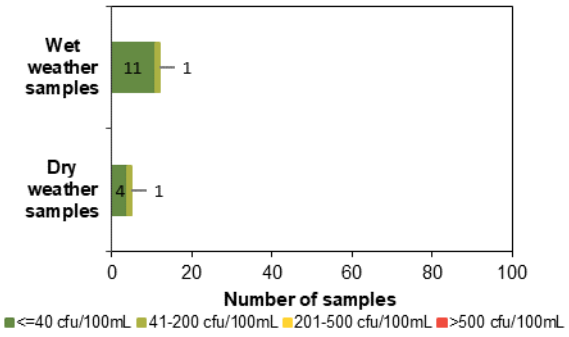
Sanitary inspection: Low



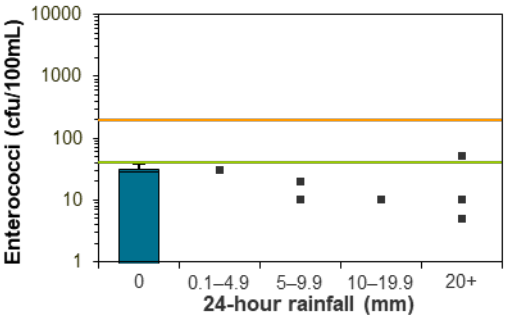
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Tallow Beach (Suffolk Park)

Beach grade: VG

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

Tallow Beach (Suffolk Park) is located toward the southern end of a 6.5 kilometre stretch of beach between Cape Bryon and Broken Head, and is patrolled during the summer season.

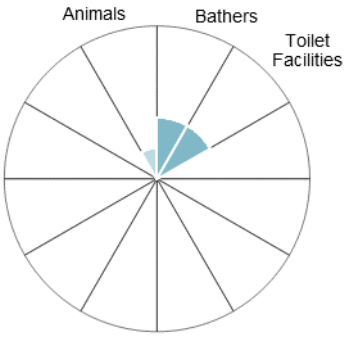
The Beach Suitability Grade of Very Good indicates microbial water quality is suitable for swimming almost all of the time, with few potential sources of faecal contamination.

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

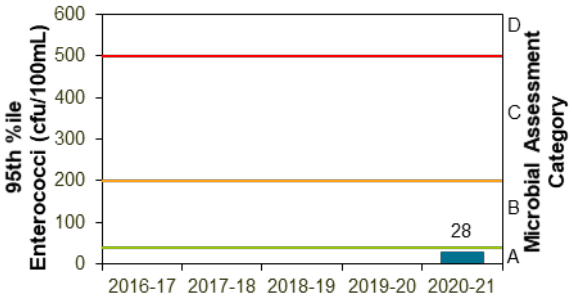
The site was monitored from 2009 until 2013, and since 2020.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Dec 2020 to Apr 2021	100%	17	–

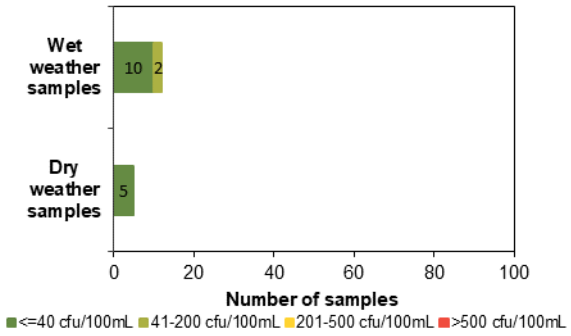
Sanitary inspection: Low



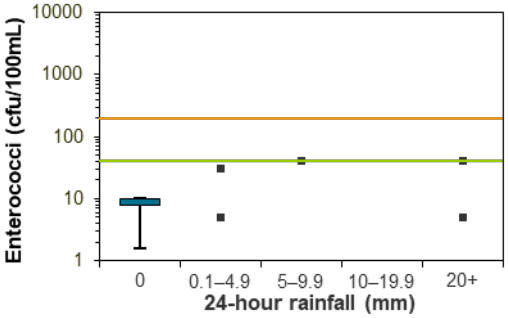
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Ballina Shire Council

69%
swimming sites graded Good or Very Good

Overall results

Nine of the 13 swimming sites were graded as Very Good or Good in 2020–2021, a decline in performance from the previous year.

Percentage of sites graded as Very Good or Good:

- 2020–2021: 69%
- 2019–2020: 85%
- 2018–2019: 77%
- 2017–2018: 77%.

See the section on **How to read this report** on page 44 for an explanation of the graphs, tables and Beach Suitability Grades.

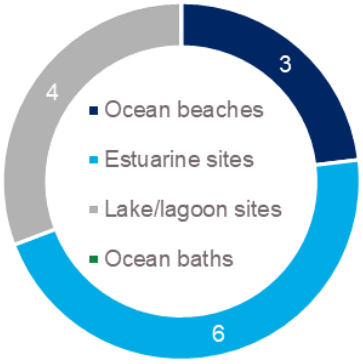
Thirteen swimming sites were monitored by Ballina Shire Council. Samples were collected weekly between November and March and sampling and laboratory analysis was fully funded by the council.

Best beaches

Seven Mile Beach, Shelly Beach and Lighthouse Beach.

These sites had excellent water quality and were suitable for swimming almost all of the time.

Swimming sites monitored in the Ballina region include ocean beaches, estuarine areas in Shaws Bay and North Creek and lake/lagoon swimming sites in Lake Ainsworth, with each site type having a different response to rainfall-related impacts.



Site types in Ballina Shire Council

Estuarine and lake/lagoon swimming sites generally did not perform as well as ocean beaches, due to lower levels of flushing increasing the time needed to disperse and dilute pollution inputs, taking longer to recover from stormwater events.

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

Ocean beaches

Beach Suitability Grades for Ballina Shire Council ocean beaches

Seven Mile Beach, Shelly Beach and Lighthouse Beach were graded as Very Good in 2020–2021. These beaches had excellent water quality and were suitable for swimming almost all of the time.

While Seven Mile Beach and Lighthouse Beach have continued to be graded as Very Good as in previous years, Shelly Beach was upgraded from Good in the previous year due to improved microbial water quality.

Estuarine beaches

Beach Suitability Grades for Ballina Shire Council estuarine beaches

Four of the six estuarine swimming locations were graded as Good in 2020–2021: Shaws Bay East, Shaws Bay East Arm, Shaws Bay East Beach and The Serpentine. Water quality at these sites was frequently suitable for swimming in dry weather, with 95% or greater of dry weather samples within the safe swimming limit.

Shaws Bay North and Shaws Bay West were downgraded to Poor in 2020–2021 from Good in the previous year. While these sites were mostly suitable for swimming during dry weather, elevated bacterial levels were regularly recorded following light rainfall.

The estuarine swimming locations occasionally recorded elevated enterococci levels after light rainfall and more often after heavy rainfall. Water quality at these sites can be impacted by upstream sources and can take longer to recover due to lower levels of flushing.

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

Lake/lagoon swimming sites

Beach Suitability Grades for Ballina Shire Council lake/lagoon swimming sites

Lake Ainsworth East and Lake Ainsworth South continued to be graded as Good in 2020–2021. These sites were mostly suitable for swimming during dry weather, with 86% and 95% of dry weather samples within the safe swimming limit respectively. Elevated enterococci levels were regularly recorded at these sites after heavy rainfall.

Lake Ainsworth North and Lake Ainsworth West were graded as Poor, a result consistent with the previous year. Elevated bacteria levels were recorded at these lake swimming sites during dry and wet weather conditions. Despite the poor grades, between 71% and 73% of dry weather samples were within the safe swimming limit. These sites may be impacted by a number of significant potential sources of faecal contamination, including stormwater, and have low levels of flushing. Since 2019, council has been investigating the source of microbial contamination with additional samples collected for faecal sterol analysis at sites within Lake Ainsworth. Preliminary results have found that the main contributors to elevated bacteria levels are from avian (bird) sources.

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

Management

Ballina Shire Council

Patrolled ocean beach
Photo: Beachwatch/EES, DPIE

Ballina Shire Council finalised the Lake Ainsworth CMP in late 2020 and it was the first CMP to be certified in New South Wales, in February 2021. The CMP has received $250,000 through the Crown Reserves improvement fund to assist with foreshore stabilisation, erosion repair, refining access points for swimmers and enhancing habitat around the lake. This work complements previous work done removing a road alongside the lake, providing further swimming and recreational opportunities in and around the lake. The program also includes further measures to address the water quality issues at the popular swimming spot over the next 10 years.

Council has also finished Stage 1 of a CMP for North Creek and has attracted $273,333 from the NSW Government's Coasts and Estuaries Grants Program to undertake hydrological and water quality studies that were identified as gaps to be addressed under Stage 2 of the CMP. Council has also recently been awarded funding to begin a CMP focusing on coastal hazards along the Ballina coastline and for the lower part of the Richmond River and North Creek estuaries.

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.

Under the previous *Coastal Protection Act 1979*, councils developed a **Coastal Zone Management Plan** (CZMP) to address coastal issues. Councils can continue to implement priority actions from certified CZMPs with funding assistance from the NSW Government's Coastal and Estuary Grants Program until 2021.

The CMPs provide a mechanism to publicly identify, manage and fund coastal improvement and rehabilitation works. These programs are essential in providing sustainability for council's coastal areas and can contribute significantly to water quality improvement and swimmer safety.

On behalf of all local governments within the Richmond River catchment including Ballina Shire Council, Rous County Council has convened a working group to transition the certified Richmond River CZMP to a CMP. The CZMP implemented a number of actions including consideration of governance within the catchment, riparian planting along creeks and the river, upgrading the water quality monitoring equipment and program, amongst other work. Councils have worked both collaboratively and individually on these projects. Stage 1 of the CMP process (scoping study) began in March 2021 and is due for completion by early 2022. There are likely to be several actions identified within the Richmond River CMP that will continue the work identified in the Richmond River CZMP. It is anticipated the implementation of these actions will lead to a gradual improvement in water quality in the Richmond River, and subsequently improvements to the associated recreational swimming sites and beaches.

Over the next year, council will begin work on transitioning the Shaws Bay CZMP to a CMP, which will allow Shaws Bay to be managed under the new coastal management framework. Council has implemented all identified works within the Shaws Bay CZMP. The improvements have included dredging within the bay, significant construction works to stabilise bank erosion, development of a formal carpark, construction of a shared pathway along with shower and picnic facilities and the upgrade of stormwater infrastructure. Beach nourishment or sand replacement to access points within the bay has also been undertaken along with the implementation of a boardwalk style path that meanders within remnant vegetation and allows for saltmarsh to establish in an ecological zone.

The foreshore improvement and dredging works in Shaws Bay aim to address long-term sedimentation issues and assist tidal circulation and flushing to improve water quality within the bay. The works have created improved swimming and recreational areas within Shaws Bay.

Ballina Shire Council recently completed the $1.8 million Lake Ainsworth Precinct project. The project included construction of sealed roadways including the recently upgraded and sealed access road to Camp Drewe and Seven Mile Beach, improved water sensitive stormwater design features, new access pathways and landscaping on the eastern, southern and western foreshores of the lake. The project enhancements have improved the public amenity

and are aimed at positively affecting water quality by improving erosion control, upgrades to stormwater management, landscaping, grassed areas, bank rehabilitation, erosion control and impervious parking areas.

Council has also prohibited dogs on the eastern side of Lake Ainsworth to maintain and preserve the environmental health and amenity of the sensitive ecological location by reducing the amount of dog faeces within the vicinity of the lake.

In 2019, Ballina Shire Council collected additional samples from several locations within Lake Ainsworth. The samples have been tested for faecal sterols to identify if elevated enterococci counts are from human or animal sources. Preliminary results from the sampling identified that human faecal compounds were not detected in the samples and that avian (bird) faecal matter is the main contributor. It is thought that Beachwatch samples collected at the lake may be significantly influenced by waterbird faecal matter rather than bathers.

Lake Ainsworth is occasionally affected by blue-green algal blooms. During October to May the lake is constantly sampled and when sampling indicates an algal bloom, council places precautionary signage at the lake advising users that the area may be affected by algal blooms. The signage is only displayed when algal levels are elevated and necessary in accordance with Water NSW algae guidelines.

Lighthouse Beach
Photo: Tom McAully Rix/ Ballina Shire Council

Council has implemented and maintains modern wastewater treatment works located at West Ballina and Lennox Head. The treatment works provide recycled wastewater via dual reticulation to properties in Lennox Head, Skennars Head, East Ballina and Cumbalum. Ballina's wastewater treatment plant is also currently supplying bulk recycled water for irrigation purposes to sports fields, Ballina Racecourse and the Ballina Golf Course. The treatment and use of recycled water greatly reduces the release of treated wastewater to the environment.

Council has also recently completed significant sewage pumping station upgrades that include emergency storage tanks to pump stations located at Shelly Beach and The Serpentine. The emergency storage tanks will reduce the possibility of accidental release of untreated sewage into the local waterways by capturing unforeseen surcharges or spills in the event of power outage, pump or mains failure.

Despite this, occasional sewage overflows or spills can also result in pollution entering watercourses and beaches. Although uncommon, if contamination is suspected at a swimming site, warnings are displayed advising the area is unsuitable for swimming. Warnings remain in place until testing indicates the water quality is again suitable for

swimming. Media releases are issued and council's website is updated during periods of heavy rain and minor flooding to advise which swimming sites are likely to be contaminated and impacted by stormwater runoff.

Council has developed and implements an onsite sewage management (OSSM) strategy and guidelines. The OSSM strategy and guidelines aim to ensure OSSM systems are effectively managed, and there are no adverse effects to public and environmental health in the design, installation and maintenance of these systems.

Sampling sites and Beach Suitability Grades in Ballina Shire Council

Seven Mile Beach

Beach grade: VG

Seven Mile Beach extends for over eight kilometres and is patrolled over the summer period.

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

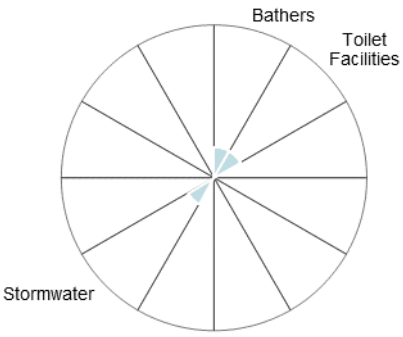
Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after 20 mm or more of rain.

The site has been monitored since 2002.

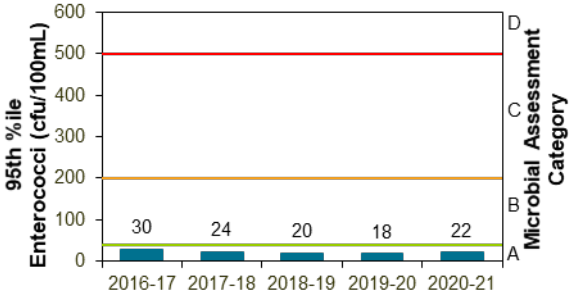
See ‘How to read this report’ for key to map.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2016 to Mar 2021	98%	97	Stable

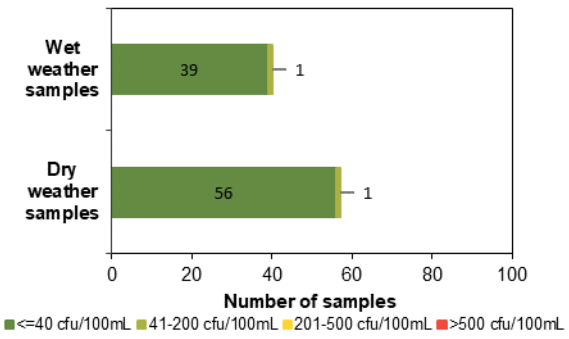
Sanitary inspection: Low



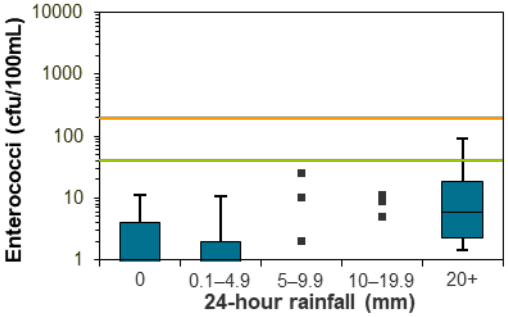
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth North

Beach grade: P

See ‘How to read this report’ for key to map.

Lake Ainsworth North is located at the northern end of Lake Ainsworth, near a pontoon.

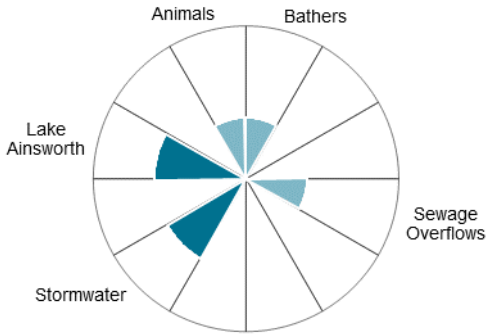
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from stormwater and elsewhere within the lake.

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

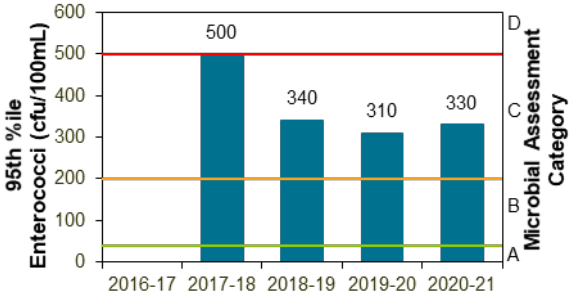
The site has been monitored since 2016.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Aug 2017 to Mar 2021	71%	100	Stable

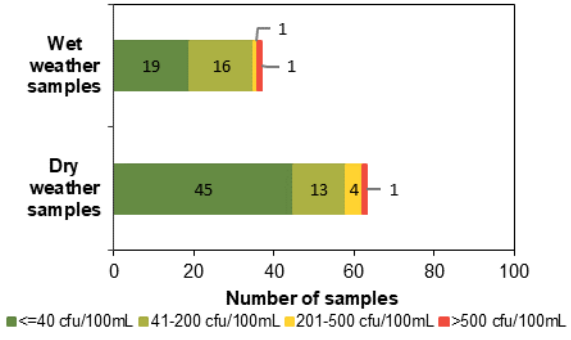
Sanitary inspection: Moderate



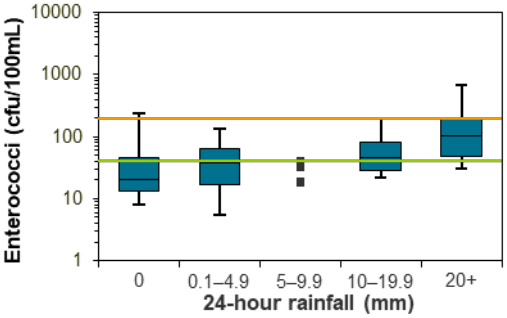
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth East

Beach grade: G

See ‘How to read this report’ for key to map.

Lake Ainsworth East is located on the eastern shore of Lake Ainsworth, a coastal freshwater lake.

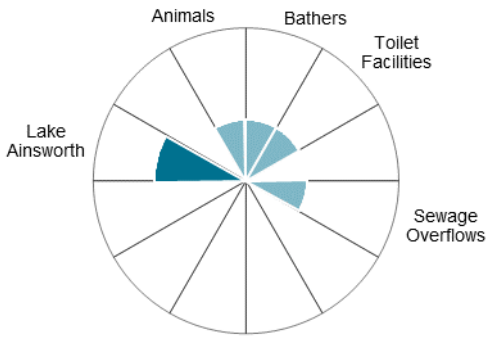
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including from elsewhere within the lake.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after little or no rain, and regularly after 20 mm or more.

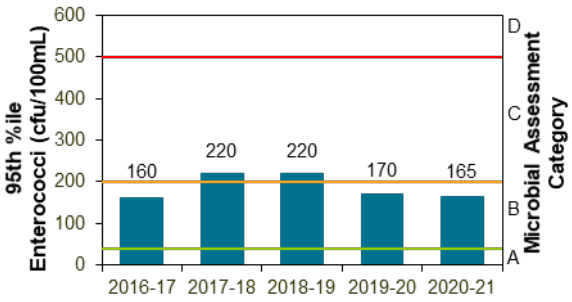
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Aug 2017 to Mar 2021	86%	100	Stable

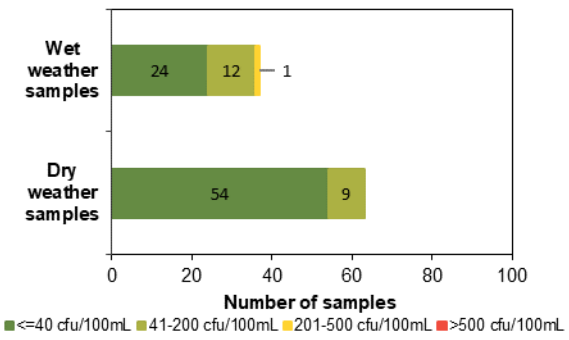
Sanitary inspection: Moderate



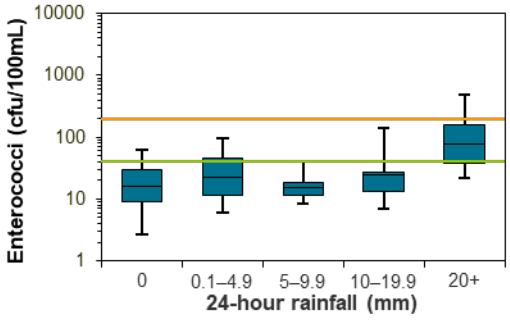
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth South

Beach grade: G

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

Lake Ainsworth South is located on the southern shore of Lake Ainsworth, a coastal freshwater lake.

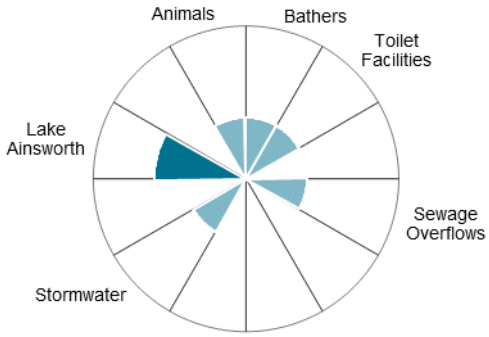
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including from elsewhere within the lake.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after little rain, and frequently after 20 mm or more.

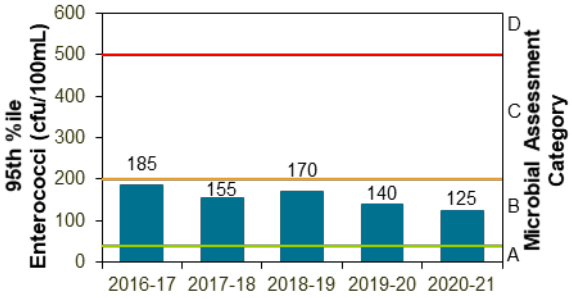
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Aug 2017 to Mar 2021	95%	100	Stable

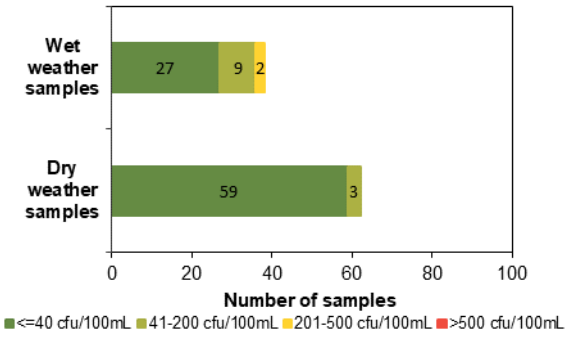
Sanitary inspection: Moderate



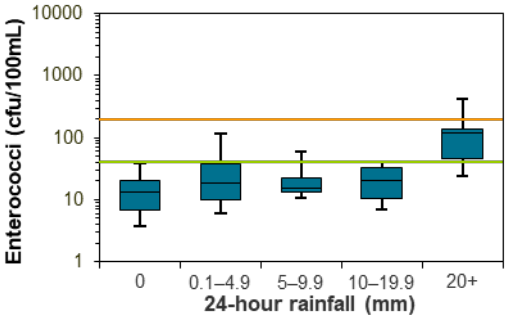
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth West

Beach grade: P

See ‘How to read this report’ for key to map.

Lake Ainsworth West is located on the western shore of Lake Ainsworth, a coastal freshwater lake.

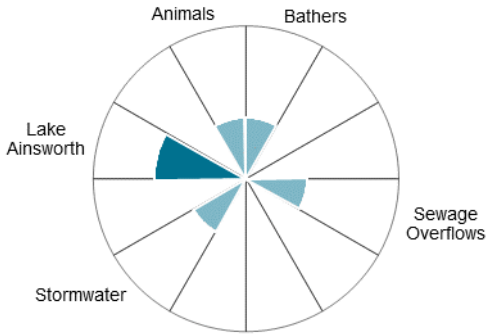
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and often during dry weather conditions, with potential faecal contamination from elsewhere within the lake.

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

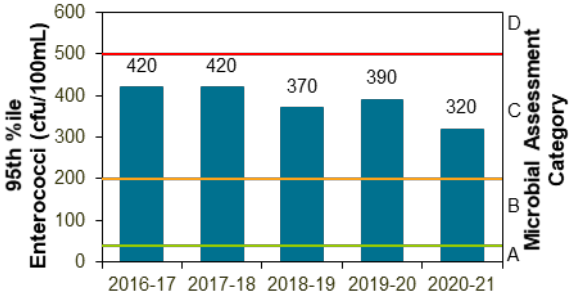
The site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Aug 2017 to Mar 2021	73%	100	Stable

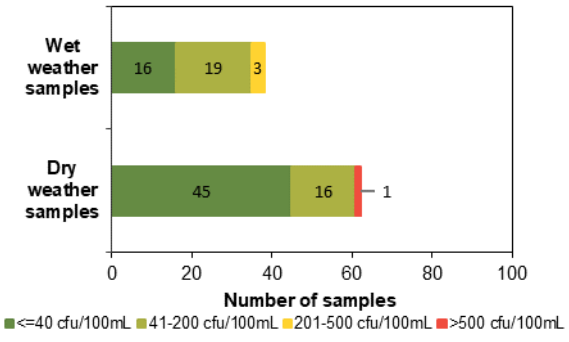
Sanitary inspection: Moderate



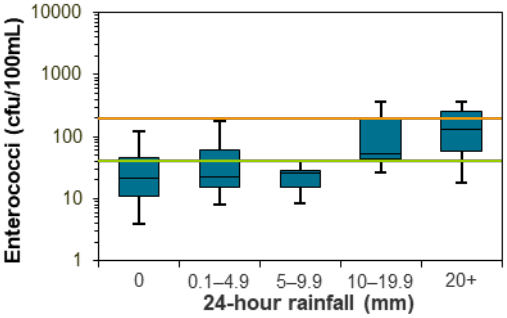
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Shelly Beach

Beach grade: VG

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

Shelly Beach is a 700 metre long beach located between Black Head and Richmond River Lighthouse, and is patrolled during holiday periods.

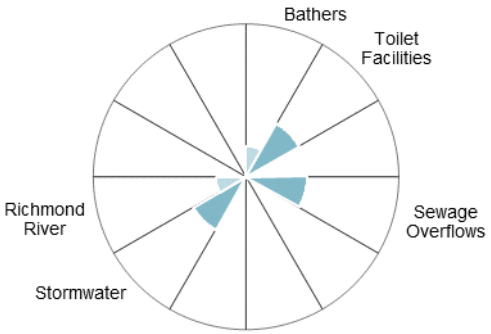
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of significant faecal contamination.

Enterococci levels increased slightly with increasing rainfall, but usually remained below the safe swimming limit across all rainfall categories.

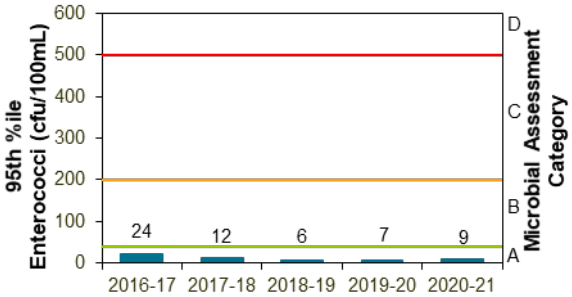
The site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2016 to Mar 2021	98%	97	Improved

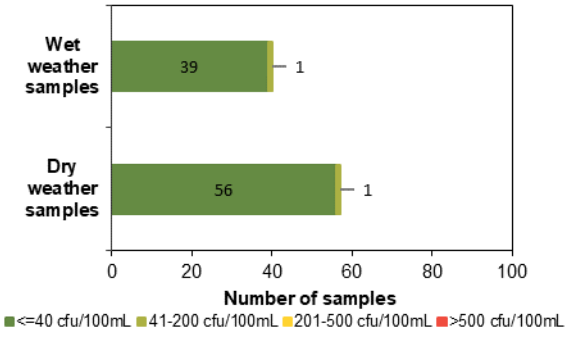
Sanitary inspection: Low



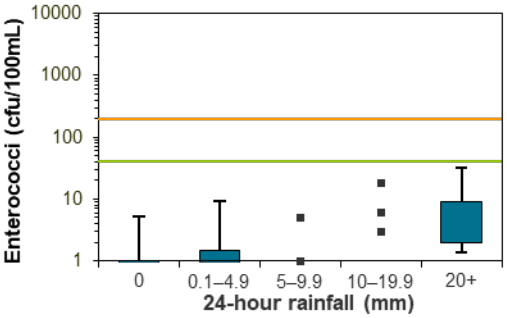
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Lighthouse Beach

Beach grade: VG

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

Lighthouse Beach is situated north of the sea wall at the mouth of the Richmond River and is patrolled during holiday periods.

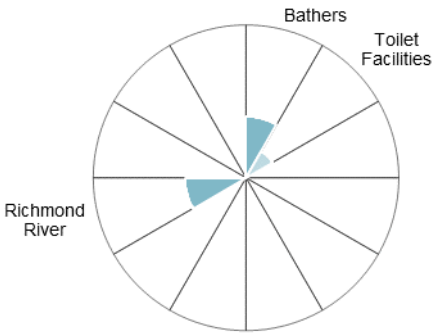
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, but usually remained below the safe swimming limit across all rainfall categories.

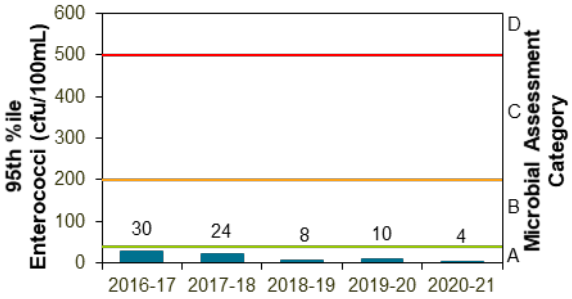
The site was monitored in 2002 until 2003, and since 2009.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2016 to Mar 2021	98%	97	Stable

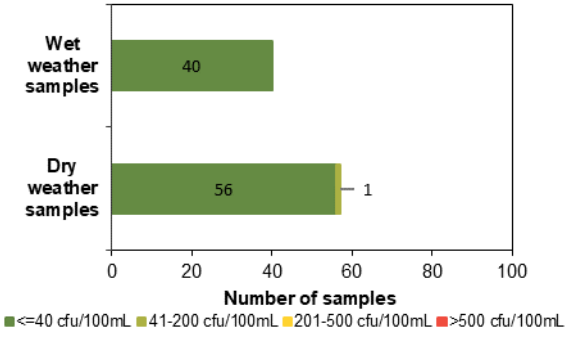
Sanitary inspection: Low



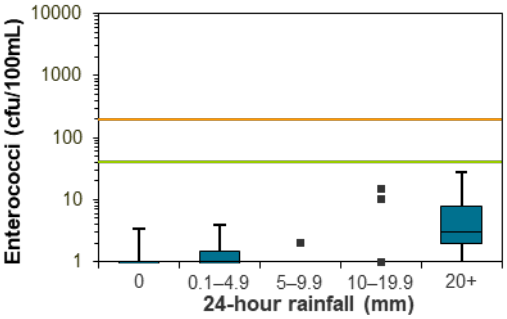
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Shaws Bay North

Beach grade: P

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

Shaws Bay North is located on the northern side of Shaws Bay, an inlet near the mouth of the Richmond River.

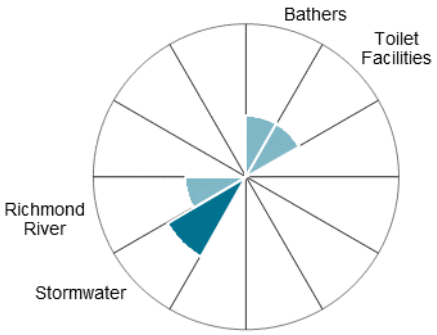
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and often during dry weather conditions, with potential faecal contamination from elsewhere within the lake.

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

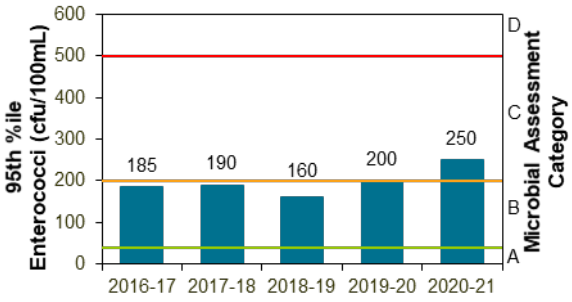
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Mar 2017 to Mar 2021	89%	100	Declined

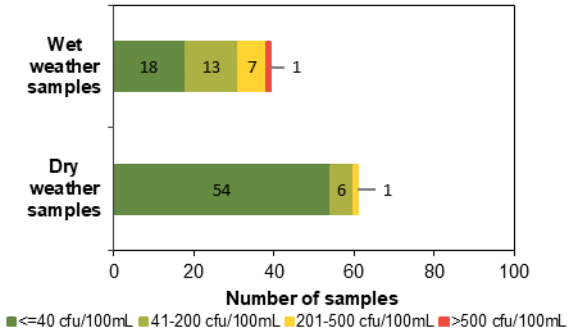
Sanitary inspection: Moderate



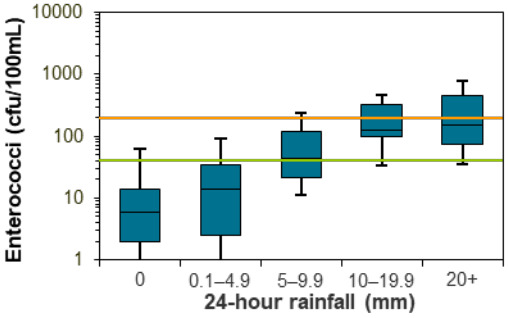
Microbial Assessment Category: C



Dry and wet weather water quality

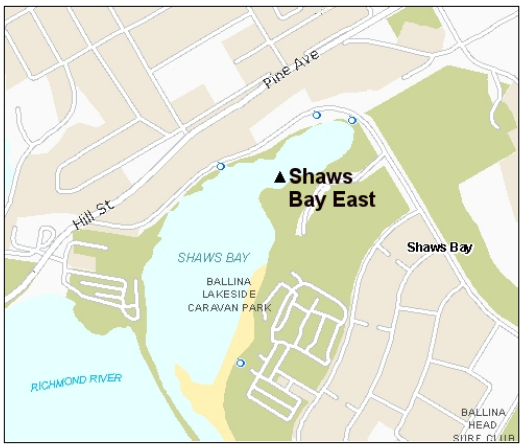


Water quality in response to rainfall



Shaws Bay East

Beach grade: G



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

Shaws Bay East is located on the eastern side of Shaws Bay, an inlet near the mouth of the Richmond River.

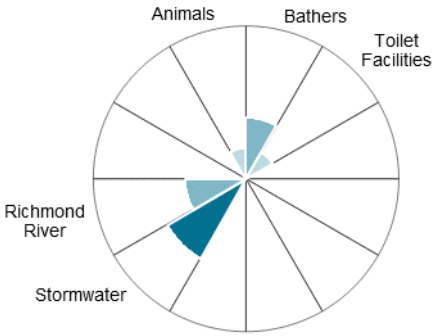
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

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

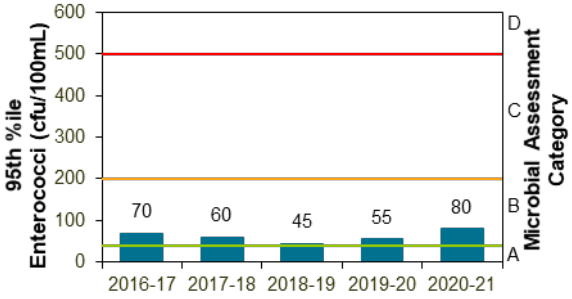
The site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Apr 2017 to Mar 2021	95%	100	Stable

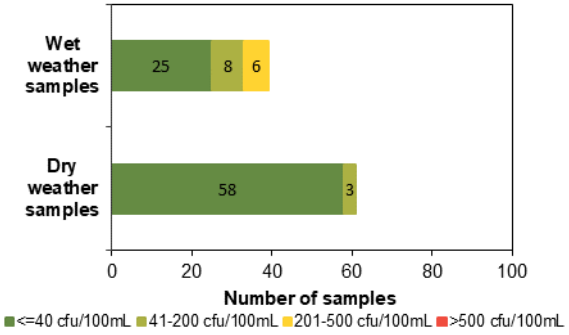
Sanitary inspection: Moderate



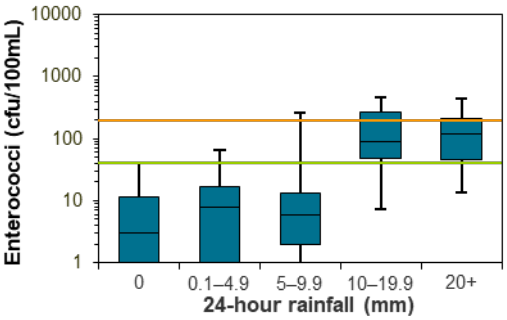
Microbial Assessment Category: B



Dry and wet weather water quality

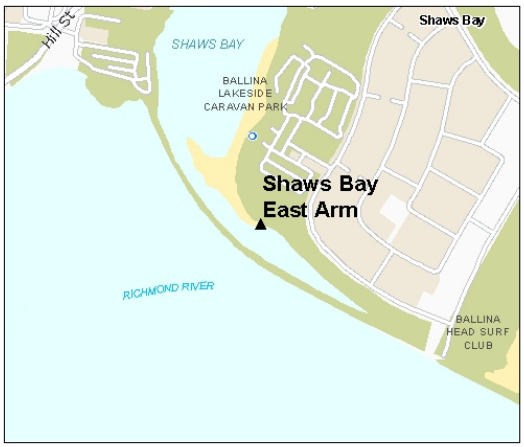


Water quality in response to rainfall



Shaws Bay East Arm

Beach grade: G



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

Shaws Bay East Arm is a sandy beach located on the southern side of Shaws Bay, an inlet near the mouth of the Richmond River.

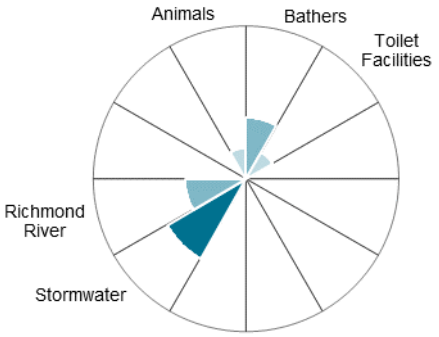
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but can be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after little or no rain, and regularly after 20 mm or more.

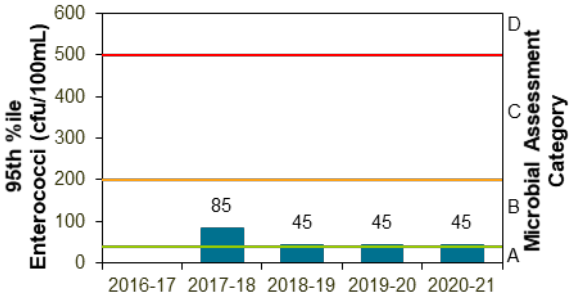
The site has been monitored since 2014.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	May 2017 to Mar 2021	97%	100	Stable

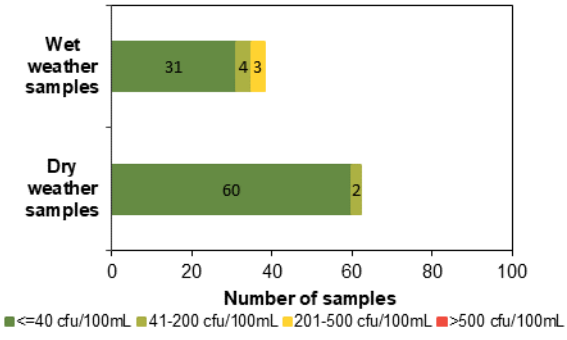
Sanitary inspection: Moderate



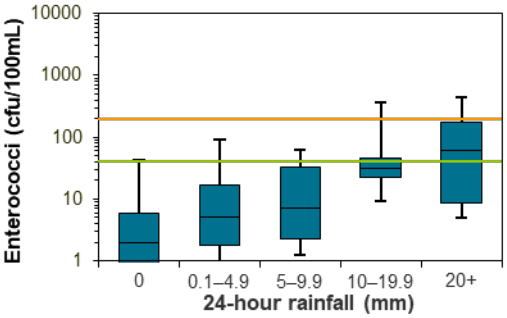
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Shaws Bay East Beach

Beach grade: G

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

Shaws Bay East Beach is a sandy beach located on the eastern side of Shaws Bay, an inlet near the mouth of the Richmond River.

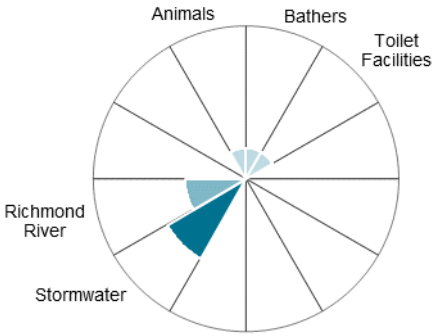
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but can be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after light rain, and regularly after 5 mm or more.

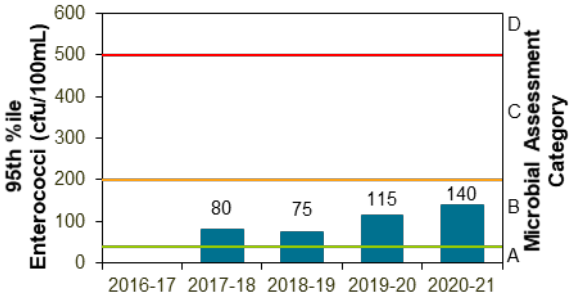
The site has been monitored since 2014.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Mar 2017 to Mar 2021	100%	100	Stable

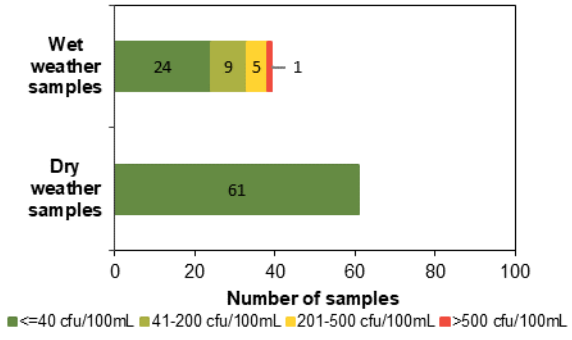
Sanitary inspection: Moderate



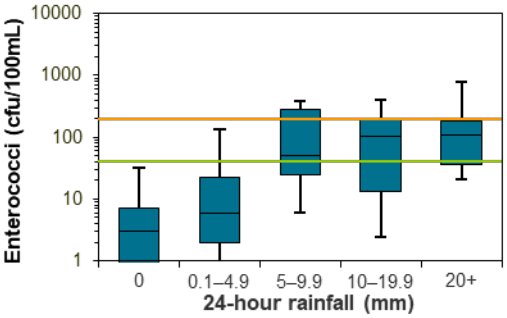
Microbial Assessment Category: B



Dry and wet weather water quality

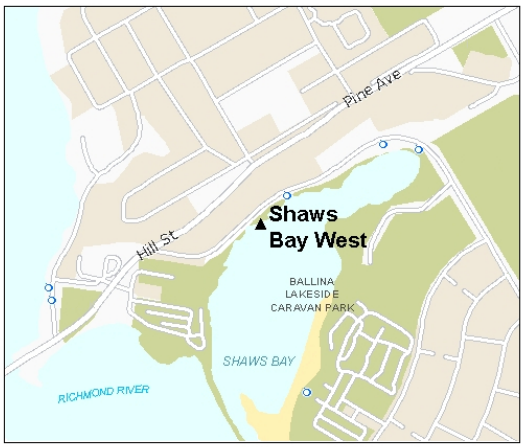


Water quality in response to rainfall



Shaws Bay West

Beach grade: P



See ‘How to read this report’ for key to map.

Shaws Bay West is located on the western side of Shaws Bay, an inlet near the mouth of the Richmond River.

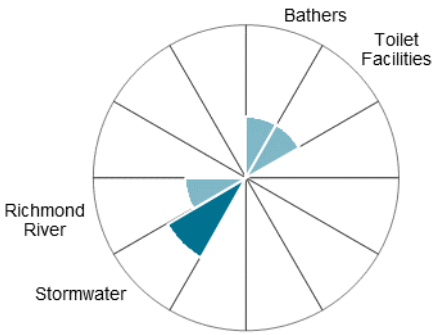
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from stormwater and elsewhere within the lake.

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

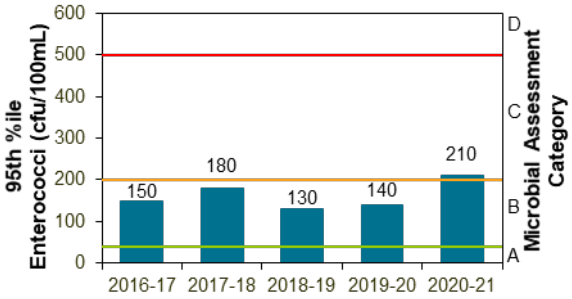
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Jun 2017 to Mar 2021	87%	100	Declined

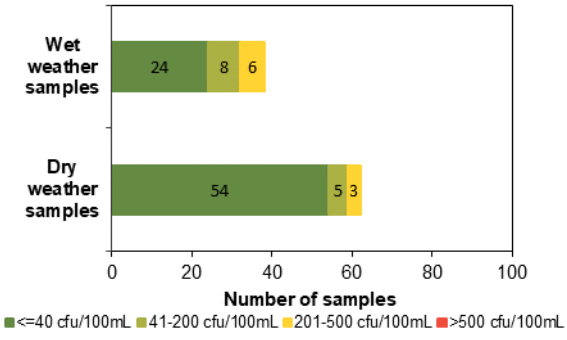
Sanitary inspection: Moderate



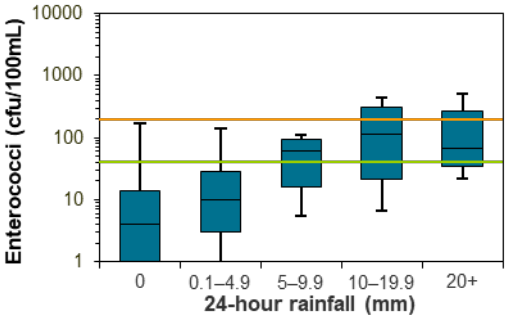
Microbial Assessment Category: C



Dry and wet weather water quality

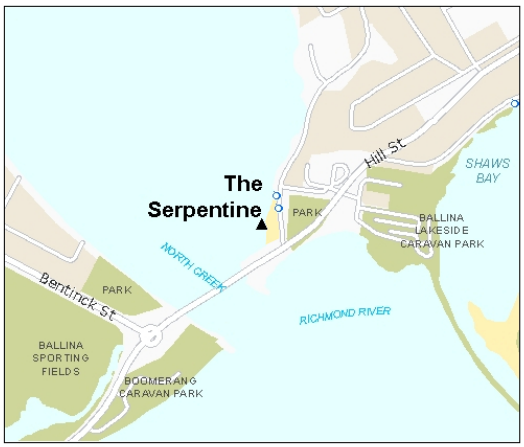


Water quality in response to rainfall



The Serpentine

Beach grade: G



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

The Serpentine is adjacent to Missingham Bridge in North Creek, a tributary of the Richmond River.

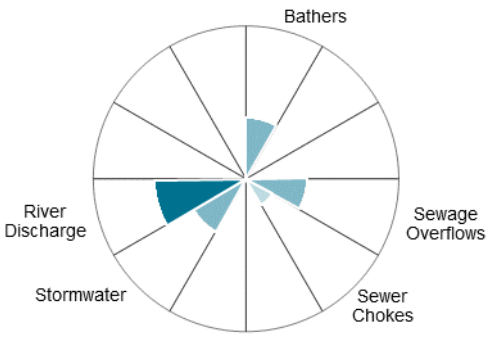
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including upstream river sources.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after light rain, and regularly after 20 mm or more.

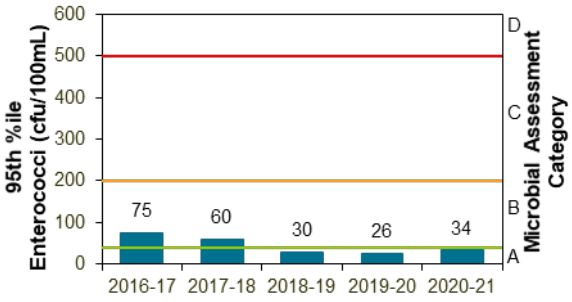
This site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	May 2016 to Mar 2021	98%	97	Stable

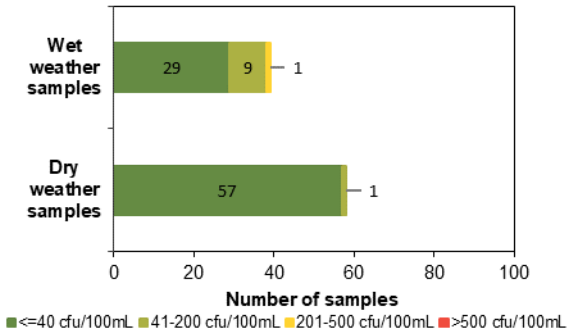
Sanitary inspection: Moderate



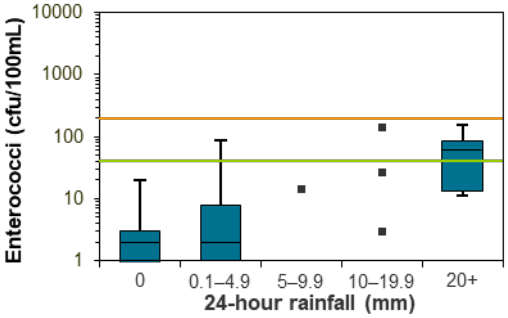
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Richmond Valley Council

80%
swimming sites graded Good or Very Good

Overall results

Four of the five swimming sites were graded as Very Good or Good in 2020–2021. This result is a similar performance to the previous year.

Percentage of sites graded as Very Good or Good:

- 2020–2021: 80%
- 2019–2020: 80%
- 2018–2019: 80%
- 2017–2018: 80%.

See the section on **How to read this report** on page 44 for an explanation of the graphs, tables and Beach Suitability Grades.

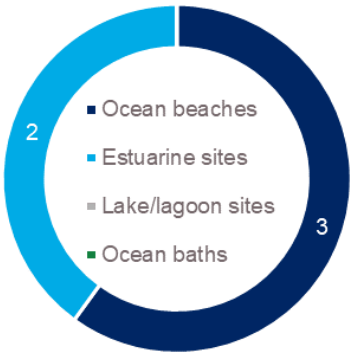
Five swimming sites were monitored by Richmond Valley Council. All sampling and laboratory analysis was fully funded by the council.

The three ocean beaches and Elm Street Bridge North were sampled weekly from October to March. Evans River is sampled weekly throughout the year.

Best beaches

Shark Bay.

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



Site types in Richmond Valley Council

Swimming sites monitored in the Richmond Valley Council region include ocean beaches and estuarine areas in Evans River, with each site type having a different response to rainfall-related impacts.

Estuarine swimming sites generally did not perform as well as ocean beaches, due to lower levels of flushing to disperse and dilute pollution inputs, taking longer to recover from stormwater events.

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

Ocean beaches

Beach Suitability Grades for Richmond Valley Council ocean beaches

Shark Bay continued to be graded as Very Good in 2020–2021. Water quality at this beach has been consistently excellent for many years and is suitable for swimming almost all of the time.

Airforce Beach and Main Beach were graded as Good, downgraded from Very Good in the previous year due to a decline in microbial water quality. While water quality at these beaches was suitable for swimming most of the time, elevated results were often recorded following heavy rainfall.

Estuarine beaches

Beach Suitability Grades for Richmond Valley Council estuarine beaches

Elm Street Bridge North in the Evans River continued to be graded as Good in 2020–2021, a similar result to previous years. Water quality was mostly suitable for swimming during dry weather, with 88% of samples within the safe swimming limit. Elevated enterococci levels were mostly recorded following rainfall.

Evans River, located downstream of Elm Street Bridge North, was graded as Poor in 2020–2021, consistent with previous years. Microbial water quality at this site has continued to decline over the last five years. Elevated bacterial levels were recorded in dry weather and were regularly elevated during and following moderate to heavy rainfall. Despite this, water quality was sometimes suitable for swimming during dry weather, with 55% of dry weather samples within the safe swimming limit. Discharge from a nearby large stormwater drain is also likely to impact water quality at this site when flowing. Further investigation is required to show the scale and extent of the problem, and the source of microbial contamination.

Management

Richmond Valley Council

Patrolled ocean beach
Photo: Beachwatch/EES, DPIE

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.

Under the previous *Coastal Protection Act 1979*, councils developed a **Coastal Zone Management Plan** (CZMP) to address coastal issues. Councils can continue to implement priority actions from certified CZMPs with funding assistance from the NSW Government's Coastal and Estuary Grants Program until 2021.

On behalf of all local governments within the Richmond River catchment, including Richmond Valley Council, Rous County Council has convened a working group to transition the certified Richmond River CZMP to a CMP. The Evans River was included as a sub-catchment within the process for the purpose of improving river health outcomes. The CZMP implemented a number of actions including consideration of governance within the catchment, riparian planting along creeks and the river, upgrading the water quality monitoring equipment and program, amongst other work. Councils have worked both collaboratively and individually on these projects. Stage 1 of the CMP process (scoping study) began in March 2021 and is due for completion by early 2022. There are likely to be several actions identified within the Richmond River CMP that will continue the work identified in the Richmond River CZMP.

A number of Marine Estate Management Strategy (MEMS) projects have also been implemented within the catchment as the Richmond Valley was identified as a pilot project location for farm planning, riparian revegetation and a road sealing program. This work has complemented that undertaken by farmers, recreational fishers and councils. Over time, it is anticipated the implementation of these actions will lead to gradual improved water quality in the Richmond River, and subsequently improvements to the associated recreational swimming sites and beaches.

Richmond Valley Council is responsible for four wastewater treatment plants (WWTPs). These are located at Casino, Coraki, Evans Head and Rileys Hill. The plants in Evans Head and Rileys Hill are fitted with UV disinfection. The Evans Head treatment system continues to service the Broadwater area.

There are approximately 3800 onsite sewage management systems throughout the Richmond Valley Council local government area. Council runs a comprehensive audit program of these systems, inspecting approximately 150 each year to ensure they are operating effectively not polluting the environment or creating a health risk. High risk sites with systems close to sensitive receiving environments such as waterways are prioritised. Pre-purchase inspections of these systems are also undertaken upon request from the purchaser/vendor.

Richmond Valley Council has been proactive in the Evans Head area by investigating, educating and in some instances issuing prevention notices regarding poor land-use practices on or near the riverbank, which will help to improve the water

quality of the Evans River and its tributaries. While council has targeted the Evans River as a priority, these programs extend throughout the local government area including the Richmond River catchment.

Main Beach
Photo: Richmond Valley Council

Sampling sites and Beach Suitability Grades in Richmond Valley Council

Airforce Beach

Beach grade: G

See ‘How to read this report’ for key to map.

Airforce Beach is located on a 31 kilometre stretch of beach and is not patrolled by lifeguards.

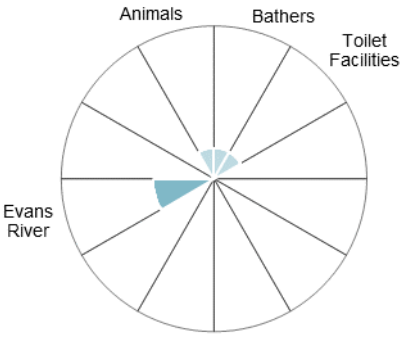
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, from several potential sources of faecal contamination including stormwater.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and often after 20 mm or more of rain.

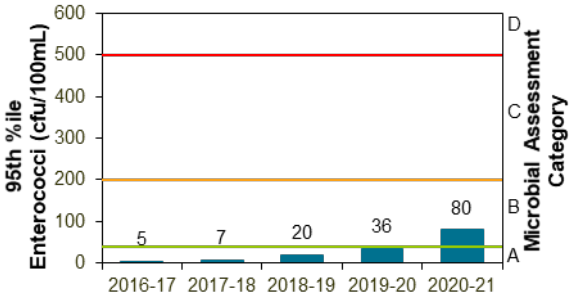
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2017 to Mar 2021	90%	100	Declined

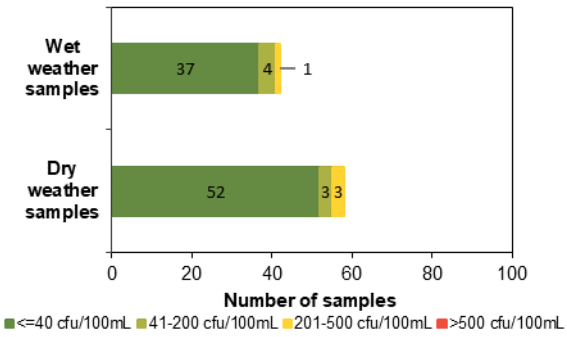
Sanitary inspection: Low



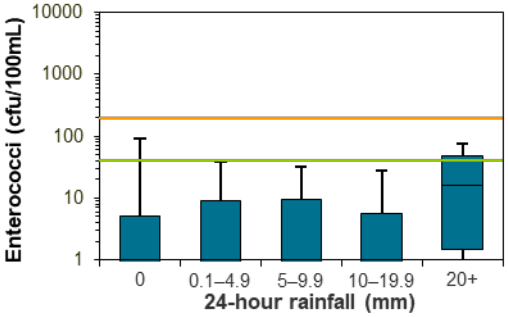
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Main Beach

Beach grade: G

See ‘How to read this report’ for key to map.

Main Beach is located at the southern end of a 31 kilometre stretch of beach and is patrolled during holiday periods.

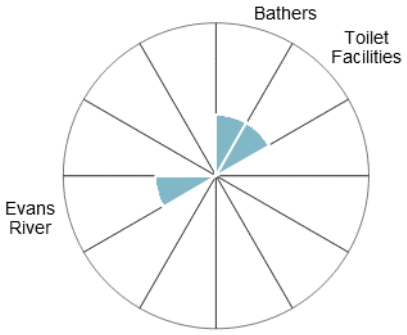
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, from several potential sources of faecal contamination including stormwater.

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

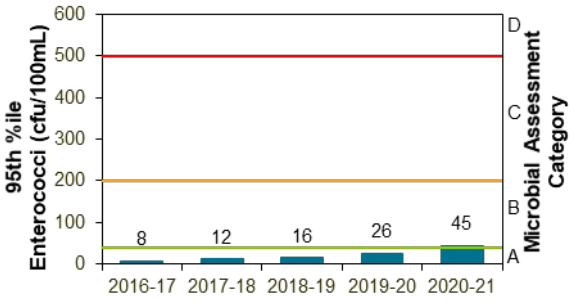
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2017 to Mar 2021	97%	100	Declined

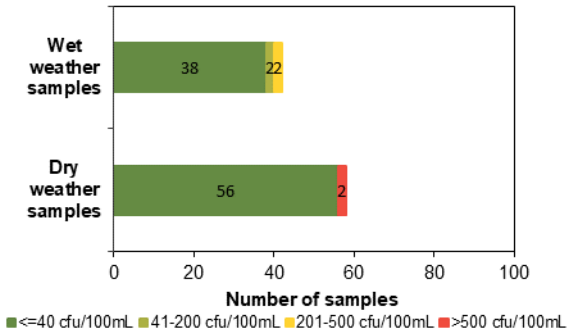
Sanitary inspection: Low



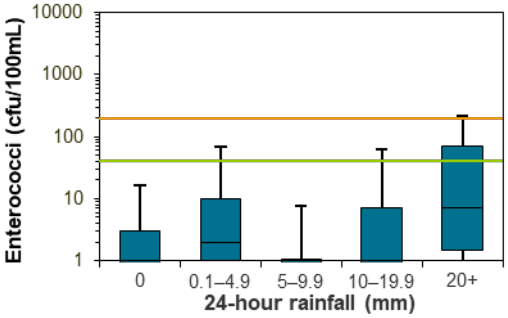
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Shark Bay

Beach grade: VG

See ‘How to read this report’ for key to map.

Shark Bay is a small beach located between the southern entrance wall to the Evans River and the cliffs below Razorback Lookout and is not patrolled by lifeguards.

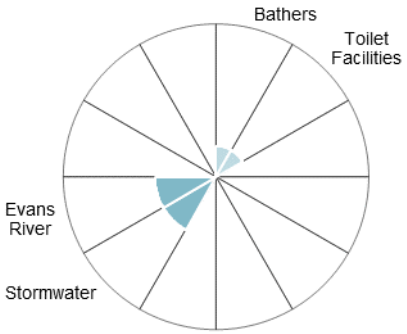
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm or more rainfall.

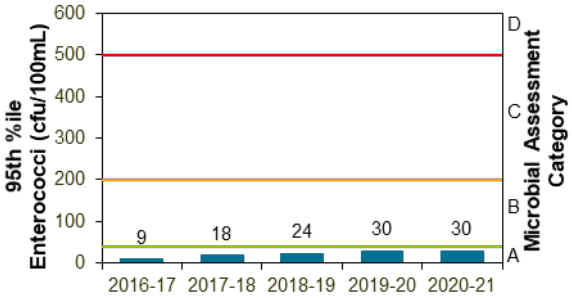
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2017 to Mar 2021	98%	100	Stable

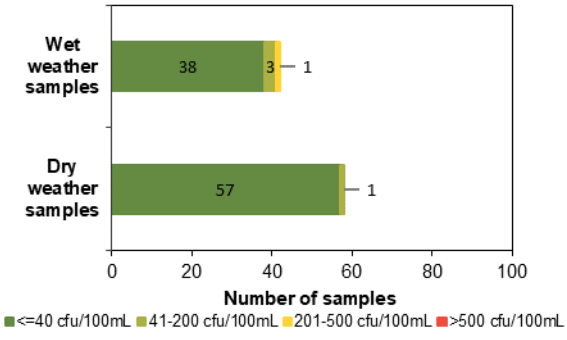
Sanitary inspection: Low



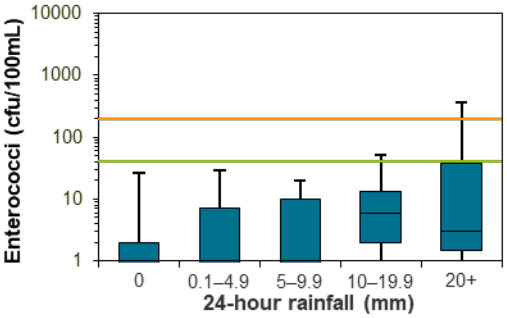
Microbial Assessment Category: A



Dry and wet weather water quality

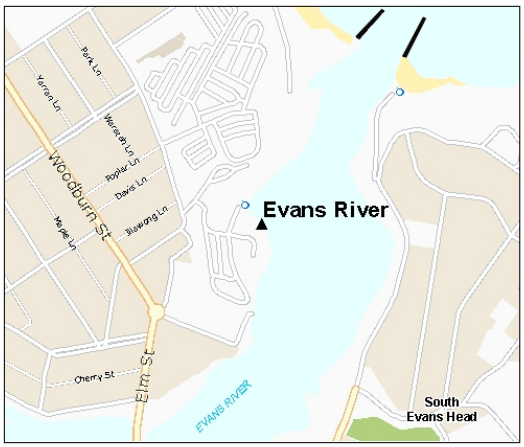


Water quality in response to rainfall



Evans River

Beach grade: P



See ‘How to read this report’ for key to map.

Evans River sampling site is located upstream of the river mouth and near the caravan park.

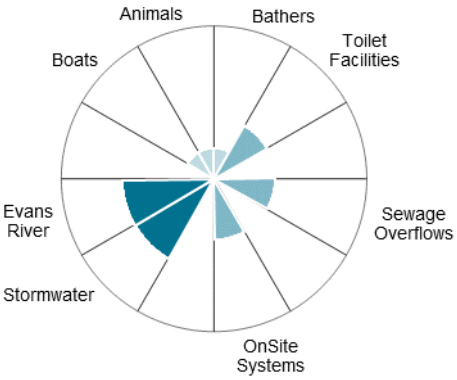
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from upstream river sources and stormwater.

Enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit after no rain, and regularly in response to rain.

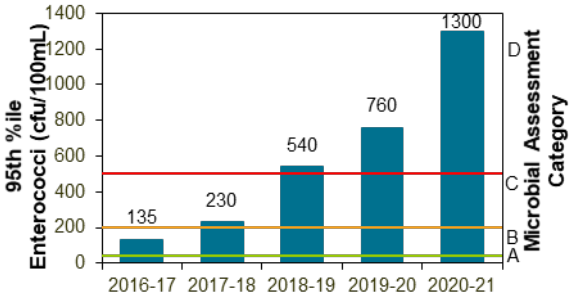
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	May 2019 to Apr 2021	55%	100	Stable

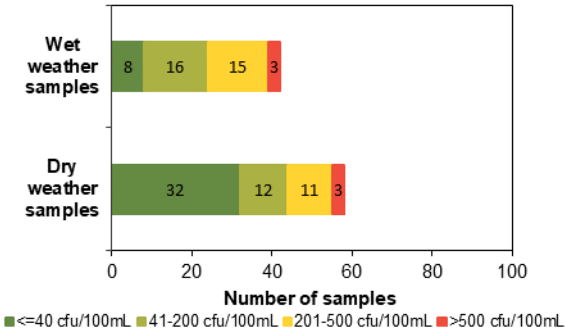
Sanitary inspection: Moderate



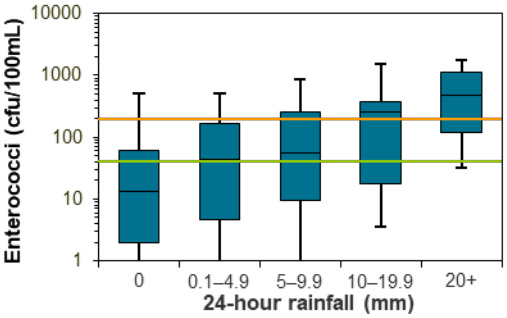
Microbial Assessment Category: D



Dry and wet weather water quality



Water quality in response to rainfall



Elm Street Bridge North (Evans River)

Beach grade: G

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

Elm Street Bridge North (Evans River) is located on the eastern side of Elm Street Bridge in the Evans River.

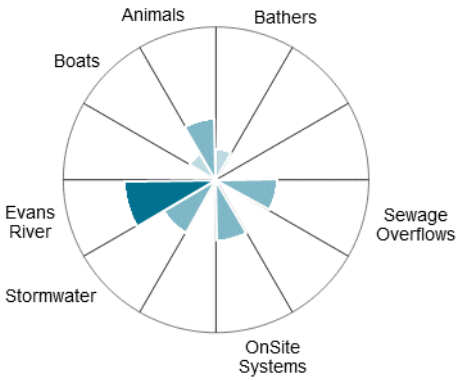
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including upstream river sources.

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

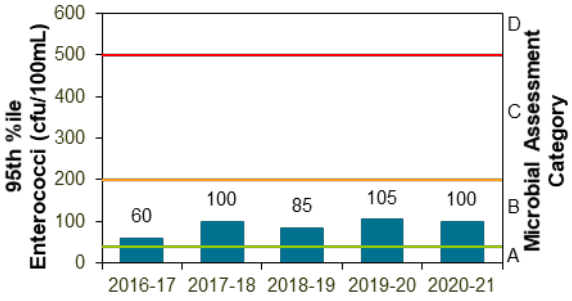
The site has been monitored since 2015.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Oct 2017 to Mar 2021	88%	100	Stable

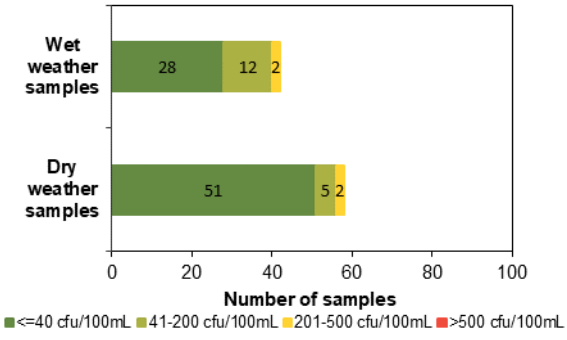
Sanitary inspection: Moderate



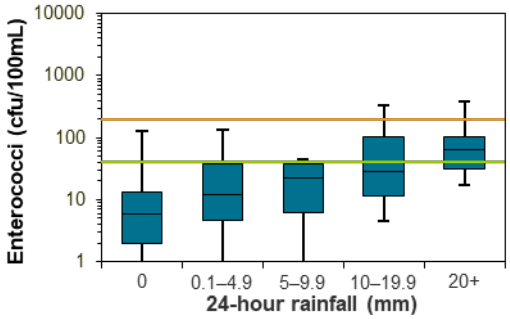
Microbial Assessment Category: B



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 five grades ranging from Very Good to Very Poor:

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

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 three days at estuarine sites

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 three days following rainfall or if there are signs of pollution such as discoloured water or odour or debris in the water

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 three days following rainfall

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*[1] were adopted for use in New South Wales 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[2].

---

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

[2]Department of Health, Western Australia 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, available at ww2.health.wa.gov.au/Articles/A_E/Environmental-waters-publications, accessed on 27/05/21.

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.

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.

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 four 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[1].

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 four 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 New South Wales differs from the European distribution.

[1] 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*, vol.33(3), pp.715–722.

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* [accessed 27/05/21].

Sanitary Inspection Category (SIC)

More information about the **sanitary inspection** process is available on the DPIE webpage:

Sanitary inspection of beaches

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 five categories: Very Low, Low, Moderate, High and Very High.

Stormwater at Coogee Beach
Photo: Beachwatch/EES, DPIE

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

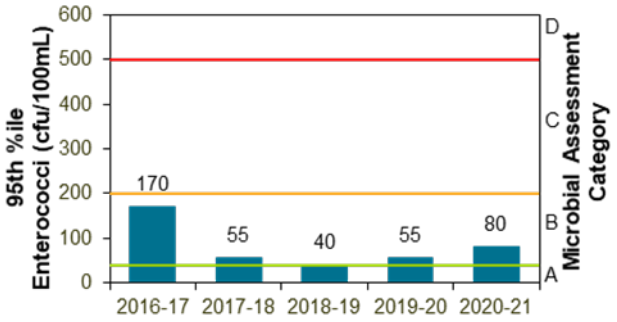
A provisional grade indicates the assessment is based on limited data collected during the assessment period and should not be compared to the beach grade from the previous year.

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

Microbial Assessment Category (MAC) chart

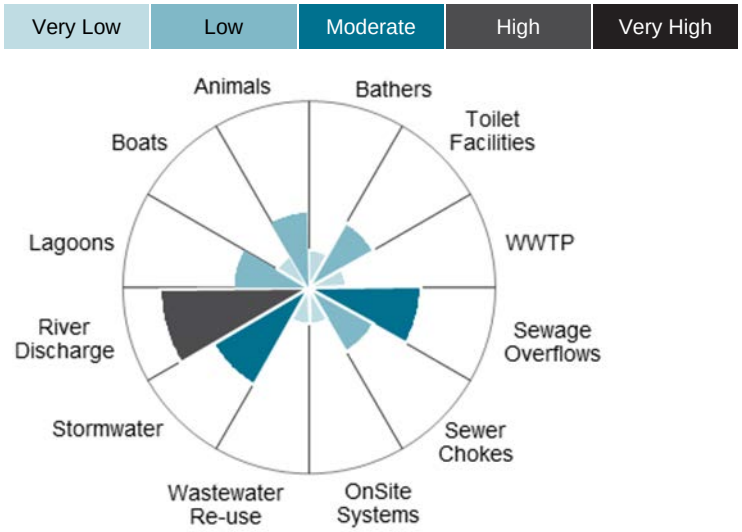
On each beach page, the MACs for the last five years are displayed on a simple bar chart. The MAC for the current year is based on enterococci data collected during the assessment period. The bars are labelled with the 95th percentile value for each year and the thresholds dividing the

A, B, C and D categories are marked in green, amber and red for reference.



Sanitary Inspection Category (SIC) chart

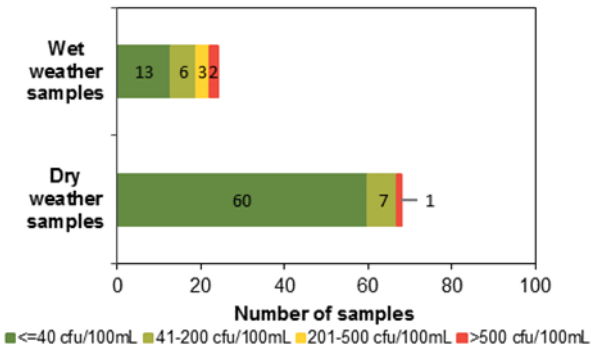
The results of the sanitary inspection for each swimming location are presented in a radar pie chart. The chart shows the likelihood that each identified pollution source will contribute to faecal contamination at a swimming site, as indicated by the size and colour of the segment, ranging from very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

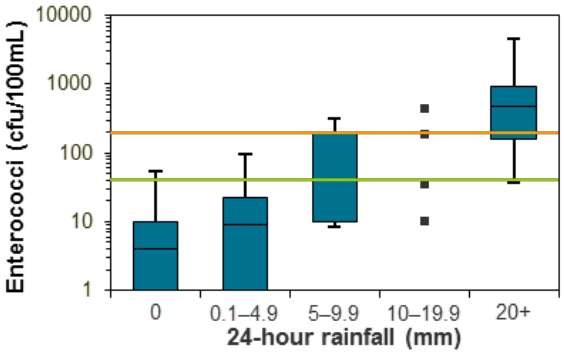
coloured on the graph as dark green, light green, amber and red respectively.



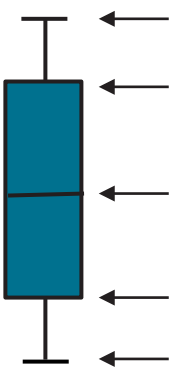
It is expected that swimming sites with lower levels of flushing will show some elevated bacterial results in dry weather samples (no rainfall in the previous 24 hours) due to the longer time needed to recover from a rainfall event. At some estuarine and lake/lagoon swimming locations the impacts of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



95% of the samples lie below the top whisker

75% of the samples lie below the top of the box

half the samples are on each side of the middle line of the box (median or 50%ile)

25% of the samples lie below the bottom of the box

5% of the samples lie below the bottom whisker.

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 five-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 three 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.