State of the beaches
2016–2017
South Coast region
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Recreational water quality has been monitored in the South Coast region since 2002 by Shoalhaven City Council, Eurobodalla Shire Council and Bega Valley Shire Council under the Office of Environment and Heritage’s Beachwatch Partnership Program. This report summarises the performance of 35 swimming sites on the south coast of New South Wales, providing a long-term assessment of how suitable a site is for swimming. Monitored sites include ocean beaches, estuarine and lagoon swimming sites, and ocean baths.

In 2016–2017, 100% of swimming sites in the South Coast region were graded as Good or Very Good. These sites were suitable for swimming for most or almost all of the time. This is an excellent result, similar in performance to the previous year even with prolonged wet weather periods and significant storm events.
South Coast region summary 2016–2017

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.

Recreational water quality has been monitored on the South Coast by Shoalhaven Council and Eurobodalla Shire Council since 2002 and by Bega Valley Shire Council since 2004.

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

Rainfall impacts

Rainfall is the major driver of pollution to recreational waters, generating stormwater runoff and triggering 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 2016–2017 are based on water quality data collected over the last two to four years. Rainfall over this period has been diverse, beginning with dry weather conditions, then a very wet year for the coast, and...
then variable rainfall with some heavy rain events, as well as extended dry periods:

- 2013–2014: driest summer in almost 30 years
- 2014–2015: above average rainfall, particularly on the coast
- 2015–2016: variable rainfall with significant wet weather events
- 2016–2017: variable rainfall with persistent dry periods and isolated wet months.

In early June 2016, an east coast low event caused heavy rainfall, flooding, strong winds and coastal erosion on the south coast. A record three-day total of 346mm of rain was recorded at Bega and 264mm of rainfall at Batemans Bay from 4–6 June.

Extended dry weather conditions were experienced from November 2016 to February 2017, with below average rainfall at most coastal areas during these months.

Persistent rain fell throughout March 2017, making it the wettest March on record in many coastal areas. Ulladulla received a total of 374mm of rainfall for the month, more than three times the monthly average. Bega received 216mm of rainfall in March, more than double the March average.

**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 microorganisms) 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 the threat of 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 South Coast region

<table>
<thead>
<tr>
<th>Swimming site</th>
<th>Site type</th>
<th>Beach Suitability Grade</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shoalhaven City Council</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Shoalhaven Heads Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🔻</td>
</tr>
<tr>
<td>Tilbury Cove</td>
<td>Ocean beach</td>
<td>VG</td>
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<tr>
<td>Warrain Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🔻</td>
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<tr>
<td>Collingwood Beach</td>
<td>Ocean beach</td>
<td>VG</td>
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</tr>
<tr>
<td>Cudmirrah Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🔻</td>
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<td>Mollymook Beach</td>
<td>Ocean beach</td>
<td>VG</td>
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<td>Rennies Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🔻</td>
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<td>Racecourse Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🔻</td>
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<td>Bawley Point Beach</td>
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<tr>
<td><strong>Eurobodalla Shire Council</strong></td>
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<td>Cookies Beach</td>
<td>Ocean beach</td>
<td>VG</td>
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<td>Caseys Beach</td>
<td>Ocean beach</td>
<td>VG</td>
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<tr>
<td>Surf Beach</td>
<td>Ocean beach</td>
<td>G</td>
<td>🔻</td>
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<tr>
<td>Malua Bay Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🔻</td>
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<td>🔻</td>
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<td>🔻</td>
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<td>Brou Beach</td>
<td>Ocean beach</td>
<td>VG</td>
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<tr>
<td>Wagonga Inlet</td>
<td>Estuarine</td>
<td>G</td>
<td>🔻</td>
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<td>Narooma Main Beach</td>
<td>Ocean beach</td>
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<td><strong>Bega Valley Shire Council</strong></td>
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<tr>
<td>Camel Rock Beach</td>
<td>Ocean beach</td>
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<td>🟢</td>
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<tr>
<td>Bruce Steer Pool</td>
<td>Estuarine</td>
<td>G</td>
<td>🟢</td>
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<td>Horseshoe Bay</td>
<td>Ocean beach</td>
<td>VG</td>
<td>🟢</td>
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<tr>
<td>Big Blue Pool</td>
<td>Ocean baths</td>
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## Bega Valley Shire Council (continued)

<table>
<thead>
<tr>
<th>Swimming site</th>
<th>Site type</th>
<th>Beach Suitability Grade</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beares Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>Provisional</td>
</tr>
<tr>
<td>Mogareeka Inlet</td>
<td>Lake/Lagoon</td>
<td>G</td>
<td>Provisional</td>
</tr>
<tr>
<td>Tathra Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>Provisional</td>
</tr>
<tr>
<td>Short Point Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>Provisional</td>
</tr>
<tr>
<td>Bar Beach</td>
<td>Estuarine</td>
<td>G</td>
<td>Provisional</td>
</tr>
<tr>
<td>Main Beach (Merimbula)</td>
<td>Ocean beach</td>
<td>VG</td>
<td>Provisional</td>
</tr>
<tr>
<td>Pambula Beach</td>
<td>Ocean beach</td>
<td>VG</td>
<td>Provisional</td>
</tr>
<tr>
<td>Pambula River Mouth</td>
<td>Estuarine</td>
<td>G</td>
<td>Provisional</td>
</tr>
<tr>
<td>Aslings Beach</td>
<td>Ocean beach</td>
<td>G</td>
<td>Provisional</td>
</tr>
<tr>
<td>Cocora Beach</td>
<td>Ocean beach</td>
<td>G</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

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**Legend:**
- **VG** = Very good
- **G** = Good
- **F** = Fair
- **P** = Poor
- **VP** = Very poor
- **↑** = Improved
- **=** = Stable
- **↓** = Declined
Shoalhaven City Council

Overall results

All 10 swimming sites were graded as Very Good in 2016–2017. Excellent results were also recorded in previous years.

Percentage of sites graded as Very Good or Good:
- 2016–2017: 100%
- 2015–2016: 100%
- 2014–2015: 100%
- 2013–2014: 100%.

See the section on How to read this report on page 52 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Shoalhaven Heads Beach, Tilbury Cove, Warrain Beach, Collingwood Beach, Cudmirrah Beach, Mollymook Beach, Rennies Beach, Racecourse Beach, Bawley Point Beach and Merry Beach.

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

Ocean beaches were the only site type monitored in the Shoalhaven region.

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

All 10 ocean beaches were graded as Very Good: Shoalhaven Heads Beach, Tilbury Cove, Warrain Beach, Collingwood Beach, Cudmirrah Beach, Mollymook Beach, Rennies Beach, Racecourse Beach, Bawley Point Beach and Merry Beach. Collingwood Beach and Racecourse Beach were upgraded to Very Good from Good in the previous year. Water quality at these sites was suitable for swimming almost all of the time. They have few potential sources of faecal contamination.

Management

As part of the Northern Shoalhaven Reclaimed Water Management Scheme (REMS), an average of 70% of treated wastewater from the Callala, Huskisson/Vincentia, Culburra/Greenwell Point and St Georges Basin sewage treatment plants (STPs) is recycled onto land, reducing the amount of effluent released to the ocean. Previous discharge of treated effluent to Jervis Bay has been phased out as a result of the scheme. The next stage of REMS is currently under construction and is due for completion in early 2019. This includes major upgrades to Nowra and Bomaderry STPs and connection into the existing REMS distribution network. This will significantly reduce the reclaimed water discharge volumes to Shoalhaven River and almost double the volume available for beneficial re-use through the REMS.

The sewerage network in the Milton–Ulladulla regions has been upgraded. The upgrades include improved disinfection of treated effluent and replacing the previous shoreline outfall with one 350m offshore. In 2008, the Conjola Regional Sewerage Scheme connected nine small villages within the vicinity of Lake Conjola to the reticulated sewerage system, replacing the existing septic systems in these villages. Properties in the Currarong area were connected to reticulated sewerage in December 2009 as part of the Currarong Sewerage Scheme.
Sampling sites and Beach Suitability Grades in Shoalhaven City Council
Shoalhaven Heads Beach

Shoalhaven Heads Beach is located towards the southern end of Seven Mile Beach at Shoalhaven Heads.

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

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

The site was monitored from 2003 to 2004 and since 2006.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>100%</td>
<td>51</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Tilbury Cove

Tilbury Cove is located towards the south-eastern corner of Culburra Beach.

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

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

The site was monitored from 2002 to 2004 and since 2006.

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<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>97%</td>
<td>51</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Warrain Beach

Warrain Beach is located to the south of Penguin Headland. The beach is patrolled over the summer months.

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

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

The site has been monitored since 2007.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>100%</td>
<td>51</td>
<td>Stable</td>
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</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Collingwood Beach

Collingwood Beach is located in Jervis Bay, adjacent to the town of Vincentia. The beach is approximately two kilometres long.

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

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

The site has been monitored since 2006.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>97%</td>
<td>51</td>
<td>Improved</td>
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</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall

See ‘How to read this report’ for key to map
Cudmirrah Beach

Cudmirrah Beach is the main surf beach for the township of Sussex Inlet. The beach is approximately three kilometres long.

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

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

The site was monitored from 2003 to 2004 and since 2006.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>100%</td>
<td>51</td>
<td>Stable</td>
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</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Mollymook Beach is a popular beach that stretches for approximately two kilometres. The beach is patrolled during the warmer months.

The Beach Suitability Grade of Very Good indicates microbial water quality is safe for swimming almost all of the time, with few significant 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 2002 to 2004 and since 2008.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
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<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>100%</td>
<td>51</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Rennies Beach

Rennies Beach is located near the town of Ulladulla. The beach is approximately 600 metres long.

The Beach Suitability Grade of Very Good indicates microbial water quality is considered safe for swimming almost all of the time, with few significant 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 has been monitored since 2006.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
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<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
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</table>

**Sanitary inspection:** Low

**Microbial Assessment Category:** A

**Dry and wet weather water quality**

**Water quality in response to rainfall**
Racecourse Beach

Racecourse Beach is located near the town of Ulladulla. The beach is approximately one kilometre long.

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

Enterococci levels had little response to rainfall but occasionally exceeded the safe swimming limit in response to 10mm of rainfall or more.

The site was monitored from 2002 to 2004 and since 2006.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
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<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>97%</td>
<td>51</td>
<td>Improved</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low  
Microbial Assessment Category: A

Dry and wet weather water quality  
Water quality in response to rainfall
Bawley Point Beach

Bawley Point Beach is approximately 250 metres long and is located on the northern side of Bawley Point.

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

Enterococci levels had little response to rainfall but occasionally exceeded the safe swimming limit in response to 20mm of rainfall or more.

The site has been monitored since 2006.

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**Site**

Ocean beach

**Monitoring period**

Nov 2012 to Feb 2017

**Dry weather samples suitable for swimming**

97%

**Water samples**

51

**Beach grade**

Stable

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**Sanitary inspection:** Low

**Microbial Assessment Category:** A

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**Dry and wet weather water quality**

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**Water quality in response to rainfall**

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Merry Beach

Merry Beach is located south of the town of Kioloa. The beach is approximately 400 metres long and is backed by reserve and caravan park.

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

Enterococci levels had little response to rainfall but occasionally exceeded the safe swimming limit in response to 20mm of rainfall or more.

The site has been monitored since 2006.

<table>
<thead>
<tr>
<th>Site type</th>
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<th>Dry weather samples suitable for swimming</th>
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<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2012 to Feb 2017</td>
<td>97%</td>
<td>51</td>
<td>Stable</td>
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</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall

- Enterococci levels had little response to rainfall but occasionally exceeded the safe swimming limit in response to 20mm of rainfall or more.

- The site has been monitored since 2006.
Overall results

All 11 swimming sites were graded as Very Good or Good in 2016–2017. Excellent results were also recorded in previous years.

Percentage of sites graded as Very Good or Good:
- 2016–2017: 100%
- 2015–2016: 100%
- 2014–2015: 100%
- 2013–2014: 100%.

See the section on How to read this report on page 52 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Cookies Beach, Caseys Beach, Malua Bay Beach, Bengello Beach, Brou Beach and Narooma Main Beach.

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

Swimming sites monitored in the Eurobodalla region include ocean beaches and an estuarine area in Wagonga Inlet, with each site type having a different response to rainfall-related impacts.

In general, estuarine swimming sites do 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 at least one day after heavy rain at ocean beaches, and up to three days in estuarine areas, or if there are signs of stormwater pollution such as discoloured water or floating debris.
Ocean beaches

Six of the 10 ocean beaches were graded Very Good: Cookies Beach, Caseys Beach, Malua Bay Beach, Bengello Beach, Brou Beach and Narooma Main Beach. Bengello Beach and Brou Beach were upgraded to Very Good from Good. Water quality at these sites was suitable for swimming almost all of the time.

Surf Beach, Broulee Beach, Shelley Beach and Tuross Main Beach were graded as Good. The water quality at these sites was suitable for swimming most of the time, occasionally exceeding the safe swimming limit after rain.

Estuarine beaches

Wagonga Inlet was graded as Good. Water quality at this site was suitable for swimming most of the time, with elevated enterococci results occasionally recorded following rainfall. Swimming should be avoided during and for up to three days after rainfall, or if there are signs of pollution such as discoloured water or floating debris.

Management

Eurobodalla Shire Council adopted a revised Integrated Water Cycle Management Strategy (IWCMS) in 2016 which included sewer network modelling for council’s five sewage treatment plants. The modelling evaluated system flows, and predicted overflow locations and frequency to identify locations that would benefit from upgrades, as well as inflow and infiltration reduction measures which will be progressively implemented with scheduled asset upgrades.

The risks to the environment and public health, community opinions, technical considerations and the availability of funding were considered in the prioritisation of village water supply and sewerage schemes. The IWCMS includes the provision of improved water supply and sewerage services to all villages by 2036, depending on community consultation and funding. The construction of a low pressure sewer scheme through the Guerilla Bay and Rosedale areas has been completed and construction of the Bodalla sewage treatment plant and low pressure sewer scheme has commenced and is on track for completion in 2018. Funding has been received for sewering of Potato Point, with design to commence in 2017–2018, and construction completion anticipated in 2019–2020.

Actions have been taken to lessen the impact of stormwater ingress into the sewer system, particularly during wet weather events. These include CCTV inspections and smoke
testing, sewer main relining and replacement, junction sealing, manhole renewals and upgrade of sewer mains and pumping stations. Capacity upgrade works have been completed including the construction of additional detention storage tanks for pumping stations at Denhams Beach and on a tributary to Short Beach Creek. These works have been targeted to reduce the risk of potential sewer overflows during storm events in high-risk locations and increase dry weather storage where deemed inadequate.

Two rising mains along Centenary Drive, Narooma were relocated following damage to the road in June 2016. The relocation will substantially improve the security of the rising mains and reduce risk of pipe failure and subsequent impacts on Wagonga Inlet.

A range of other water quality projects augment council’s Beachwatch program including water quality monitoring in all major estuaries for which Estuary Health Report Cards are produced. Council continues to deliver ongoing community education material on ecosystem health and recreational water quality through its website.
Sampling sites and Beach Suitability Grades in Eurobodalla Shire Council
Cookies Beach

Cookies Beach is located near the town of South Durras. Murramarang National Park lies to the south.

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

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

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>95%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Caseys Beach

Caseys Beach is approximately 800 metres long and is located to the south of Observation Point.

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

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

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>97%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Surf Beach

Surf Beach is a popular beach approximately 350 metres long. The beach is patrolled during the warmer months.

The Beach Suitability Grade of Good indicates microbial water quality is safe 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 across most rainfall categories and regularly after 20mm or more.

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>78%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Malua Bay Beach

Malua Bay Beach is approximately 500 metres long. The beach is patrolled during the warmer months.

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

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

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>98%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Broulee Beach

Broulee Beach extends from Candlagan Creek in the north and to Broulee Island in the south.

The Beach Suitability Grade of Good indicates microbial water quality is safe for swimming most of the time but may be susceptible to pollution from several potential sources of minor faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after light rainfall.

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>96%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Bengello Beach

Bengello Beach extends from Broulee Head to the mouth of the Moruya River. The beach is patrolled during the summer months.

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

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

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>98%</td>
<td>100</td>
<td>Improved</td>
</tr>
</tbody>
</table>

**Sanitary inspection: Low**

**Microbial Assessment Category: A**

**Dry and wet weather water quality**

**Water quality in response to rainfall**
Shelley Beach

Shelley Beach is situated near the mouth of the Moruya River and is backed by Eurobodalla National Park.

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

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after light rainfall.

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>96%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Tuross Main Beach

Tuross Main Beach is located between Tuross Headland to the north and Tuross Lake to the south and is approximately 250 metres long.

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

Enterococci levels showed little response to rainfall, and generally remained below the safe swimming limit across most rainfall categories.

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>97%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Brou Beach

Brou Beach is located to the north of Dalmeny. The beach is approximately 6.5 kilometres long and is backed by Eurobodalla National Park.

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

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

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>98%</td>
<td>100</td>
<td>Improved</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Wagonga Inlet

The swimming site is a netted enclosure at the mouth of Wagonga Inlet. The town of Narooma is located on the southern side of the inlet.

The Beach Suitability Grade of Good indicates microbial water quality is safe for swimming most of the time but may be susceptible to pollution, with potential faecal contamination from upstream sources in Wagonga Inlet.

Enterococci levels showed little response to rainfall, but occasionally exceeded the safe swimming limit in no rain and after 20mm of rainfall.

This site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estuarine</td>
<td>Mar 2013 to Mar 2017</td>
<td>88%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Narooma Main Beach

Narooma Beach is approximately 750 metres long and is patrolled on weekends and holidays during the summer months.

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

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

The site has been monitored since 2002.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Mar 2013 to Mar 2017</td>
<td>100%</td>
<td>100</td>
<td>Stable</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Bega Valley Shire Council

Overall results

All 14 swimming sites were graded as Very Good or Good in 2016–2017. These grades are provisional as the information required for the analysis is incomplete due to limited bacterial data.

Percentage of sites graded as Very Good or Good:

- 2016–2017: 100%.

Proficiency testing for Bega Valley Shire Council laboratory indicates greater confidence can be placed in their results in 2016–2017 than in previous years. As a result, only data collected in 2016–2017 has been included in the assessment to provide greater accuracy in reporting.

See the section on Quality assurance in the Statewide Summary for results of laboratory proficiency testing.

See the section on How to read this report on page 52 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Camel Rock Beach, Horseshoe Bay, Big Blue Pool, Beares Beach, Tathra Beach, Short Point Beach, Main Beach and Pambula Beach.

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

Swimming sites monitored in the Bega Valley region include ocean beaches, estuarine areas in Bermagui River, Merimbula Lake and Pambula River, a lagoon/lake swimming site in Bega River and an ocean baths, with each site type having a different response to rainfall-related impacts.

In general, estuarine and lake/lagoon swimming sites do not perform as well as ocean beaches and ocean baths, due to lower levels of flushing which increase 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 at least one day after heavy rain at ocean beaches, and up to three days in estuarine areas, or if there are signs of stormwater pollution such as discoloured water or floating debris.

**Ocean beaches**

Seven of the nine ocean beaches were graded as Very Good: Camel Rock Beach, Horseshoe Bay, Beares Beach, Tathra Beach, Short Point Beach, Main Beach and Pambula Beach. Water quality at these sites was suitable for swimming almost all of the time.

Aslings Beach and Cocora Beach were graded as Good. Water quality at these sites was suitable for swimming most of the time, with slightly elevated bacteria levels occasionally recorded after rainfall.

**Estuarine beaches**

Bruce Steer Pool, Bar Beach and Pambula River Mouth were graded as Good. Water quality at these sites was suitable for swimming most of the time. Elevated enterococci levels were recorded on a few occasions but were only just above the safe swimming limit. These sites are impacted by river discharge and are not as well-flushed as ocean beaches.

**Lake/lagoon swimming sites**

Mogareeka Inlet was graded as Good. Water quality at this site was suitable for swimming most of the time, with slightly elevated enterococci levels recorded following rain.
Ocean baths

Big Blue Pool was graded as Very Good. Water quality was suitable for swimming almost all of the time. All samples collected during 2016–2017 were within the safe swimming limit during dry and wet weather conditions.

Management

Bega Valley Shire Council is responsible for the stormwater drainage network of 109km in the urban areas. In 2015–2016 council spent $377,000 maintaining the drainage systems, and a further $464,000 on capital works.

Wastewater is collected and treated from 12,900 customers across the shire. Council undertakes a range of activities to minimise the risk of sewer overflows and associated impacts on water quality. These include investigation, planning, operational and asset management activities. In 2017 council is reviewing and updating the sewerage system risk based environmental management plan to better target CCTV inspections, sewer jetting and capital works programs. This work ensures sewerage system infrastructure near beaches and waterways is classified as high risk, and operational and capital works programs are implemented to focus on these areas. The council is committed to reducing the number of sewer chokes and overflows per 1000 connected properties through these measures.

Poorly performing on-site sewage management systems are a known risk to council and this is managed through ongoing inspections and approvals. Sites identified as having critical risk systems are inspected annually.

Environmental studies have concluded the preliminary stages of a proposed ocean outfall pipe project in Merimbula Bay. The proposed $25 million project will pump treated effluent from the Merimbula Sewage Treatment Plant approximately 4km out to sea where the study has found that deep water currents will prevent the effluent washing back to shore. The outfall pipe will significantly reduce pressure on the sewage system which can become inundated at times of heavy rain or increased use during peak tourist season. The outcome will reduce the impact to the local industry and environment which includes a tidal lake, oyster and mussel leases, and Merimbula Bay, a popular tourist spot. Currently the treated effluent is pumped into the bay from a beach-located outlet pipe.
Council has worked with planning consultants to develop masterplans for the Bruce Steer Pool area in Bermagui, Short Point in Merimbula and the Pambula Surf Club.

A review of planned biosolids and treatment process upgrades for council’s sewage treatment plants has been undertaken. Due to the significant capital costs an additional peer review has also been undertaken. It is likely that Tura Beach STP followed by Bermagui STP will be subject to the first upgrades in 2017 and 2018.

Council opened the Bega River mouth to the ocean north of Tathra in February 2017. This was to reduce the river height, as well as the need to flush these systems.
Sampling sites and Beach Suitability Grades in Bega Valley Shire Council
Camel Rock Beach is located to the north of Bermagui and is backed by a reserve.

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

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

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2016 to Feb 2017</td>
<td>100%</td>
<td>12</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Bruce Steer Pool is a netted enclosure located in protected waters near the entrance to Bermagui Harbour.

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

Enterococci levels had little response to rainfall, rarely exceeding the safe swimming limit across all rainfall categories.

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estuarine</td>
<td>Nov 2016 to Feb 2017</td>
<td>100%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Horseshoe Bay (Bermagui)

Horseshoe Bay is approximately 300 metres long and is patrolled during the summer months.

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

Enterococci levels had little response to rainfall, occasionally exceeding the safe swimming limit during dry weather conditions.

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2016 to Feb 2017</td>
<td>91%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
**Big Blue Pool**

Blue Pool is a historic swimming area located on the headland to the south of Horseshoe Bay.

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

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

The site has been monitored since 2004.

---

**Site**

| Ocean baths |

**Monitoring period**

Nov 2016 to Feb 2017

**Dry weather samples suitable for swimming**

100%

**Water samples**

13

**Beach grade**

Provisional

---

**Sanitary inspection:** Low

**Microbial Assessment Category:** A

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**Dry and wet weather water quality**

**Water quality in response to rainfall**

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See ‘How to read this report’ for key to map
Beares Beach is a small, exposed beach located just south of the town of Bermagui.

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

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

The site has been monitored since 2004.

---

**Site type**

Ocean beach

**Monitoring period**

Nov 2016 to Feb 2017

**Dry weather samples suitable for swimming**

100%

**Water samples**

12

**Beach grade**

Provisional

---

**Sanitary inspection:** Low

**Microbial Assessment Category:** A

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**Dry and wet weather water quality**

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**Water quality in response to rainfall**
Mogareeka Inlet

Mogareeka Inlet is on the northern side of the Bega River estuary, about 500 metres upstream of the entrance. The inlet is intermittently open to the ocean.

The Beach Suitability Grade of Good indicates microbial water quality is safe for swimming most of the time but may be susceptible to pollution from several potential sources of faecal contamination including river discharge.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in dry weather conditions.

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake/Lagoon</td>
<td>Nov 2016 to Feb 2017</td>
<td>75%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Tathra Beach

Tathra Beach is a popular beach stretching for approximately five kilometres. The beach is patrolled during the summer months.

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

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

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2016 to Feb 2017</td>
<td>100%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall

See ‘How to read this report’ for key to map
Short Point Beach

Short Point Beach is located between the towns of Merimbula and Tura. It is patrolled during summer holidays.

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

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

The site has been monitored since 2004.

---

**Site type** | Monitoring period | Dry weather samples suitable for swimming | Water samples | Beach grade
--- | --- | --- | --- | ---
Ocean beach | Nov 2016 to Feb 2017 | 100% | 13 | Provisional

---

**Sanitary inspection:** Low

**Microbial Assessment Category:** A

**Dry and wet weather water quality**

**Water quality in response to rainfall**

---

[Graphs and charts showing dry and wet weather water quality and water quality in response to rainfall]
Bar Beach

Bar Beach is located on the northern side of the inlet to Merimbula Lake. The beach is patrolled during the summer holidays.

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

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

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estuarine</td>
<td>Nov 2016 to Feb 2017</td>
<td>100%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Main Beach (Merimbula)  

Merimbula Main Beach is located on the southern side of Merimbula Lake. It is patrolled during the summer holidays.

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

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

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2016 to Feb 2017</td>
<td>100%</td>
<td>12</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: A

Dry and wet weather water quality

Water quality in response to rainfall
Pambula Beach is located to the north of Pambula River and is patrolled during the summer months.

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

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

The site has been monitored since 2004.
Pambula River Mouth

The mouth of Pambula River is a shallow sandy tidal flat. The river is well-flushed.

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

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

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estuarine</td>
<td>Nov 2016 to Feb 2017</td>
<td>89%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Aslings Beach

Aslings Beach is the main surf beach in Eden. The southern end of the beach is patrolled during the summer months.

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

Enterococci levels had little response to rainfall, occasionally exceeding the safe swimming limit after little to no rainfall.

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2016 to Feb 2017</td>
<td>91%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Low

Microbial Assessment Category: B

Dry and wet weather water quality

Water quality in response to rainfall
Cocora Beach is a protected ocean beach in the north of Twofold Bay.

The Beach Suitability Grade of Good indicates microbial water quality is safe for swimming most of the time but may be susceptible to pollution from several potential sources of faecal contamination, including outflow from Cocora Lagoon.

Enterococci levels had little response to rainfall, occasionally exceeding the safe swimming limit after light rain.

The site has been monitored since 2004.

<table>
<thead>
<tr>
<th>Site type</th>
<th>Monitoring period</th>
<th>Dry weather samples suitable for swimming</th>
<th>Water samples</th>
<th>Beach grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean beach</td>
<td>Nov 2016 to Feb 2017</td>
<td>100%</td>
<td>13</td>
<td>Provisional</td>
</tr>
</tbody>
</table>

Sanitary inspection: Moderate

Microbial Assessment Category: A

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 (VG)**

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 (G)**

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 (F)**

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 (P)**

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 (VP)**

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 (2008) 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 (2007).

Enterococci

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

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


Enterococci are measured in colony forming units per 100mL of sample (cfu/100mL).
Beach Suitability Grades are determined by using the following matrix:

<table>
<thead>
<tr>
<th>Sanitary Inspection Category</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>Very Good</td>
<td>Very Good</td>
<td>Follow Up</td>
<td>Follow Up</td>
</tr>
<tr>
<td>Low</td>
<td>Very Good</td>
<td>Good</td>
<td>Follow Up</td>
<td>Follow Up</td>
</tr>
<tr>
<td>Moderate</td>
<td>Good</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>High</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
<td>Very Poor</td>
</tr>
<tr>
<td>Very High</td>
<td>Follow Up</td>
<td>Fair</td>
<td>Poor</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

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 (1999).

**Risk of illness associated with Microbial Assessment Categories**

<table>
<thead>
<tr>
<th>Category</th>
<th>Enterococci (cfu/100ml)</th>
<th>Illness risk*</th>
</tr>
</thead>
</table>
| 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.

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: [ww2.health.wa.gov.au/Articles_/E/Environmental-waters-publications](http://ww2.health.wa.gov.au/Articles_/E/Environmental-waters-publications) under *Forms and templates* [accessed 19/06/17].
Sanitary Inspection Category (SIC)

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 (WWTP), sewage overflows, sewer chokes, onsite systems, wastewater reuse, stormwater, river discharge, lagoons, boats and animals.

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 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.

Where there is a known history or evidence of sewage overflows or sewer chokes in the catchment they are identified as sources of potential faecal contamination, particularly if they are located close to the swimming location. In these instances, the risk posed by stormwater is adjusted accordingly to ensure the overall risk to public health is not overestimated.
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 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. 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/100ml, between 41 and 200 cfu/100ml, between 201 and 500 cfu/100ml and greater than 500 cfu/100ml. 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 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 40cfu/100ml and 200cfu/100ml are indicated with a green and orange line, respectively. The 40cfu/100ml 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 (1cfu/100ml), 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 monitoring 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 monitoring period varies between sites depending on sampling frequency.

Dry weather samples suitable for swimming shows the percentage of water samples with enterococci levels below 40cfu/100ml. 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 1:15,000. Each map shows the location of the sampling site, land use and features such as surf lifesaving clubs. Potential pollution sources such as stormwater drains, sewage pumping stations, wastewater treatment plants, lagoons, rivers and creeks, are shown where accurate data is held.

**Key to maps**

- Sampling site
- Surf lifesaving club
- Wastewater treatment plant
- Storm sewage treatment plant
- Sewage pumping station
- Stormwater drain
- Water
- Baths
- National park
- Other park/reserve
- Built-up area
- Sand
- Land
- Roads
- Rock/cliff/reef
- Baths – netted area
- Breakwater/wharf
References

