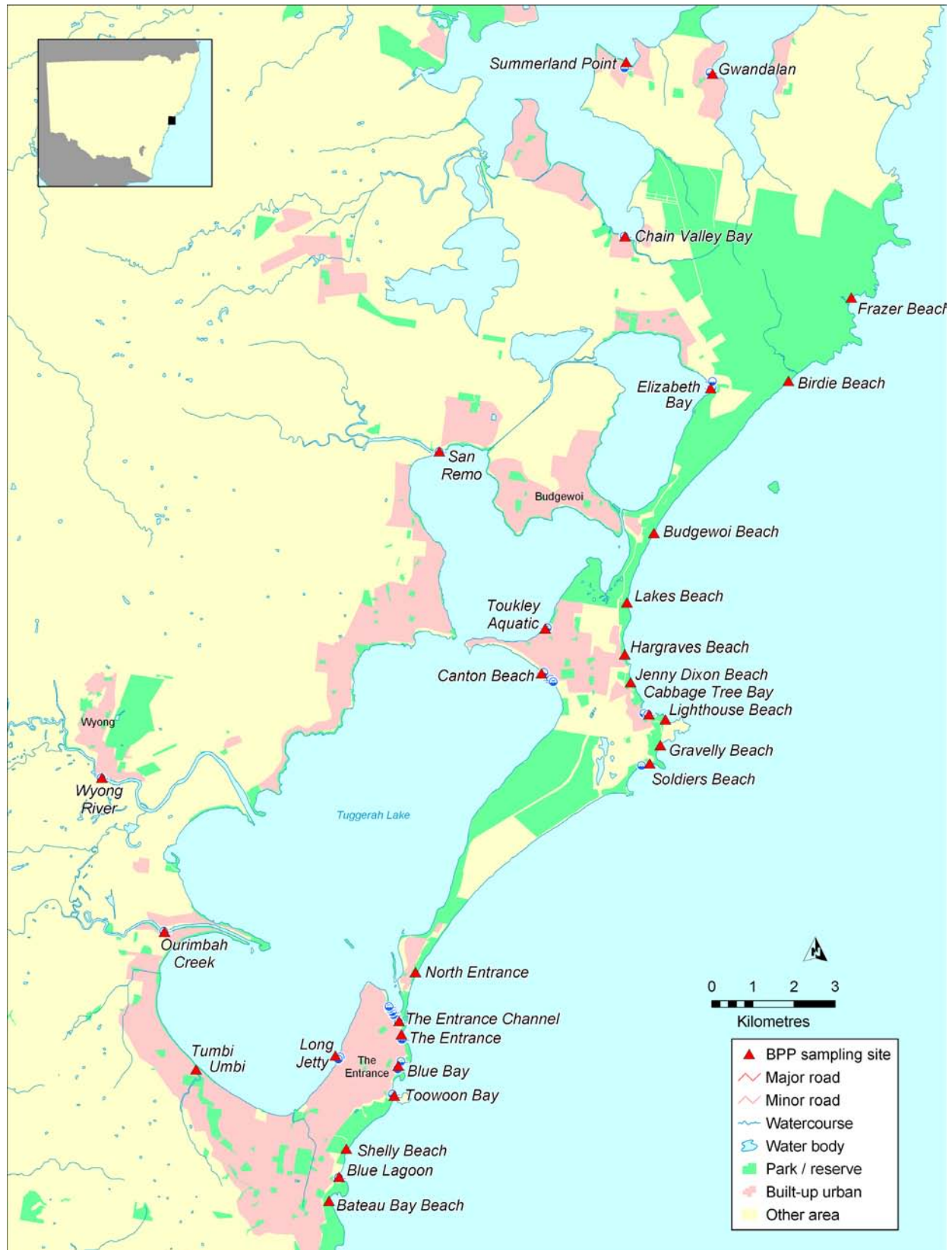


# Wyong Shire Council

**Ocean beaches:** Frazer, Birdie, Budgewoi, Lakes, Hargraves, Jenny Dixon, Cabbage Tree Bay, Lighthouse, Gravelly, Soldiers, North Entrance, The Entrance, Blue Bay, Toowoan Bay, Shelly, Blue Lagoon, Bateau Bay. **River sites:** Wyong River, Ourimbah Creek, Tumbi Umbi Creek.

**Coastal lakes:** Summerland Point, Gwandalan, Chain Valley Bay, Elizabeth Bay, San Remo, Toukley Aquatic, Canton Beach, The Entrance Channel, Long Jetty.



## Local government area description

Wyong Shire Council is located 100 kilometres north of Sydney and covers an area of 827 square kilometres. The Shire extends from Gwandalan in the north to Ourimbah in the south and has a population of approximately 135 900, growing at the rate of 3.9 per cent each year. There is a considerable expansion in planned urban development within the shire.

The council area encompasses numerous ocean beaches, the southern extent of Lake Macquarie, Tuggerah Lakes and the Wyong River.

Wyong Shire is characterised by towns and villages separated by extensive areas of natural vegetation, with the three most predominant land uses being urban development, agriculture and forestry. (Wyong Shire Council 2002).

## Program outline

A total of 29 swimming locations were monitored by Wyong Shire Council, including 17 ocean beaches, nine lake sites and three river sites in the Tuggerah Lakes catchment.

Faecal coliform and enterococci samples were collected from all locations over all seven months of the 2007–2008 summer swimming season to assess compliance with NHMRC (1990) swimming water quality guidelines. The required five samples were not collected at Birdie Beach during April 2008 so compliance was unable to be assessed for that month. At sites with only four samples collected in month, the closest sample in time from an adjacent month was ‘borrowed’ to provide the five samples necessary for the compliance calculation.

Monitoring in the Wyong Council area was also conducted in the 2006–2007, 2005–2006, 2004–2005, 2003–2004 and 2002–2003 summer seasons and results have been reported in the State of the Beaches reports for these years (DEC 2004a, 2004b, 2006a and 2006b, DECC 2007).

Wyong Council has erected warning signs at Tumbi Umbi Creek, Ourimbah Creek and a number of other estuarine swimming locations with histories of poor water quality.

## Rainfall

Rainfall data presented in the timeseries plots were obtained from the Bureau of Meteorology’s gauge at Wyong Bowling Club. Where data were missing in the record, data from the Bureau of Meteorology’s gauge at Gosford (Narara Research Station) were used.

## Ocean beaches

### *Guideline compliance*

A high level of compliance with NHMRC (1990) swimming water quality guidelines was recorded at the 17 ocean beaches (Figure 9). All beaches were suitable for swimming in all months of the 2007–2008 summer swimming season.

A very high level of compliance with swimming water quality guidelines has also been reported at the ocean beaches in previous years (DEC 2004b, 2004b, 2006a and 2006b, DECC 2007).

### *Response to rainfall*

Bacterial levels at all beaches were generally low throughout the monitoring period. Although slightly elevated levels of bacteria were measured at most of the ocean beaches on one or two occasions, monitoring did not reveal evidence of sewage contamination (as indicated by faecal coliform and enterococci levels greater than 1000 cfu/100 mL) in either dry or wet weather conditions.

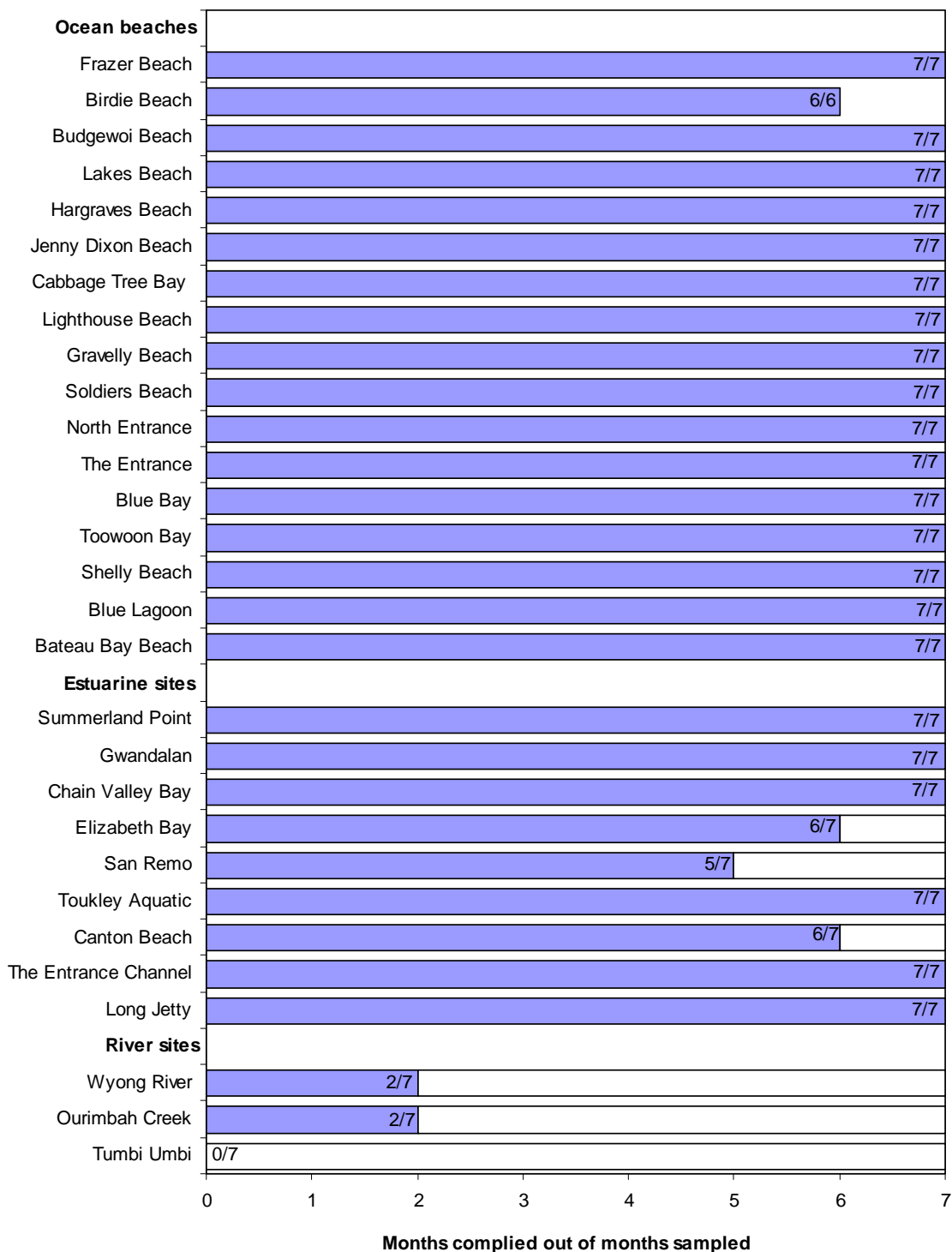
Similar results were obtained during the 2002–2003, 2003–2004, 2004–2005, 2005–2006 and 2006–2007 summer swimming seasons (DEC 2004b, 2004c, 2006a and 2006b, DECC 2007).

## Lake Macquarie

### *Guideline compliance*

The three swimming locations monitored in Lake Macquarie were Summerland Point, Gwandalan and Chain Valley Bay. All three sites passed the NHMRC (1990) swimming water quality guidelines in all seven months of the 2007–2008 summer swimming season (Figure 9).

**Figure 9: Summary of compliance with NHMRC (1990) microbiological guidelines for swimming at Wyong Shire Council swimming sites over the 2007–2008 summer season**



### ***Response to rainfall***

Levels of faecal coliforms and enterococci at Summerland Point, Chain Valley Bay and Gwandalan were generally low throughout the summer season and displayed no clear response to rainfall.

Results from previous monitoring indicate that swimming in Lake Macquarie should be avoided during and after rainfall (DEC 2004b).

### **Lake Munmorah**

#### ***Guideline compliance***

Elizabeth Bay, located in the southeast corner of Lake Munmorah, complied with the NHMRC (1990) swimming water quality guidelines in six of the seven months of the 2007–2008 summer swimming season. The site failed in April 2008 owing to elevated levels of enterococci. This is an improvement from the previous summer season when the site failed the guidelines in November 2006, December 2006 and January 2007 owing to elevated levels of faecal coliforms (DEC 2007).

#### ***Response to rainfall***

Levels of bacteria were generally low throughout the monitoring period, showing little response to rainfall. However, some elevated results were recorded in April following heavy rain.

Results from previous monitoring indicate that high levels of bacteria may be measured at the site in response to heavy rainfall (DEC 2004b).

### **Lake Budgewoi**

#### ***Guideline compliance***

The two swimming locations monitored in Lake Budgewoi were San Remo in the north and Toukley Aquatic in the south.

Toukley Aquatic complied with NHMRC (1990) swimming water quality guidelines in all seven months of the 2007–2008 summer swimming season (Figure 9).

San Remo complied with NHMRC (1990) swimming water quality guidelines in five of the seven months of the 2007–2008 summer swimming season (Figure 7). The site failed the guidelines in February and April 2008 owing to elevated levels of enterococci.

### ***Response to rainfall***

Bacterial levels at Toukley Aquatic showed little response to rainfall, with elevated levels only recorded occasionally in response to heavy rain. Slightly elevated levels of enterococci were recorded throughout the 2007–2008 summer swimming season at San Remo, with no clear response to rainfall.

### **Tuggerah Lake**

#### ***Guideline compliance***

The three swimming locations monitored in Tuggerah Lake were Canton Beach in the north, Long Jetty in the south, and The Entrance Channel.

Long Jetty and The Entrance Channel complied with the NHMRC (1990) swimming water quality guidelines in all seven months of the 2007–2008 summer swimming season (Figure 9). High compliance was also recorded at Canton Beach which complied six of the seven months. The site failed the guidelines in April 2008 owing to elevated levels of enterococci.

#### ***Response to rainfall***

Slightly elevated levels of bacteria were recorded occasionally at all three locations in Tuggerah Lake in response to rainfall during the 2007–2008 summer swimming season.

Previous monitoring has revealed elevated bacterial levels in response to rainfall at these sites (DEC 2004b and 2004c).

### **Tuggerah Lakes catchment**

#### ***Guideline compliance***

The three sites monitored in the Tuggerah Lakes catchment were Wyong River, Ourimbah Creek and Tumby Umbi Creek.

Very low levels of compliance with the NHMRC (1990) swimming water quality guidelines were recorded at all three locations. Ourimbah Creek and Wyong River failed the guidelines in five of the seven months of the 2007–2008 summer swimming season, and Tumby Umbi Creek failed the guidelines in all seven months (Figure 9).

### ***Response to rainfall***

Because of the ongoing high levels of bacteria measured at these sites, swimming should be avoided at these sites at all times.

### ***Further Investigations***

As part of Wyong Shire Council Management Plan a review of data collected from Tuggerah Lake was undertaken. Council tested for evidence of correlation between historic rainfall and bacteria levels. In addition, Council carried out faecal sterol analysis of ten sites to determine potential sources of faecal contamination. These results will drive a modified Beachwatch program for the 2008–2009 season in accordance with the NHMRC (2008) guidelines.

Micro-catchment rainfall data were compared for correlation with faecal coliform and enterococci levels. A few marginal correlations were found across some sites. Current field sampling has demonstrated significant variation across samples at each site. Council is currently testing whether an increase sample size for each site will demonstrate significant correlations against rainfall and enterococci levels.

For the faecal sterol analysis, none of the 120 samples was found to have correlation between enterococci levels and human and/or herbivore sterols. Although numerous samples had elevated enterococci levels, only five samples returned positive results for contamination from a herbivorous source. Only one sample returned positive results for aged human sterols. Potential other sources of elevated enterococci levels include water fowl and dogs, for which faecal sterol ratio methodology is inconclusive.

For further details contact Wyong Shire Council's Regulation and Compliance Section on (02) 4350 5555.

# Frazer Beach

See page 90 for key to map

## Description

Frazer Beach is located within the Munmorah State Recreation Area. The beach is patrolled during the Christmas and Easter school holidays and is frequently used on weekends and holidays for surfing, swimming, fishing and camping.



## Pollution sources

There are few pollution sources at this beach. Outflow from the lagoon may affect water quality in wet weather. Illegal discharge from commercial and recreational boats is also a potential pollution source.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

### Compliance with NHMRC (1990) swimming guidelines at Frazer Beach

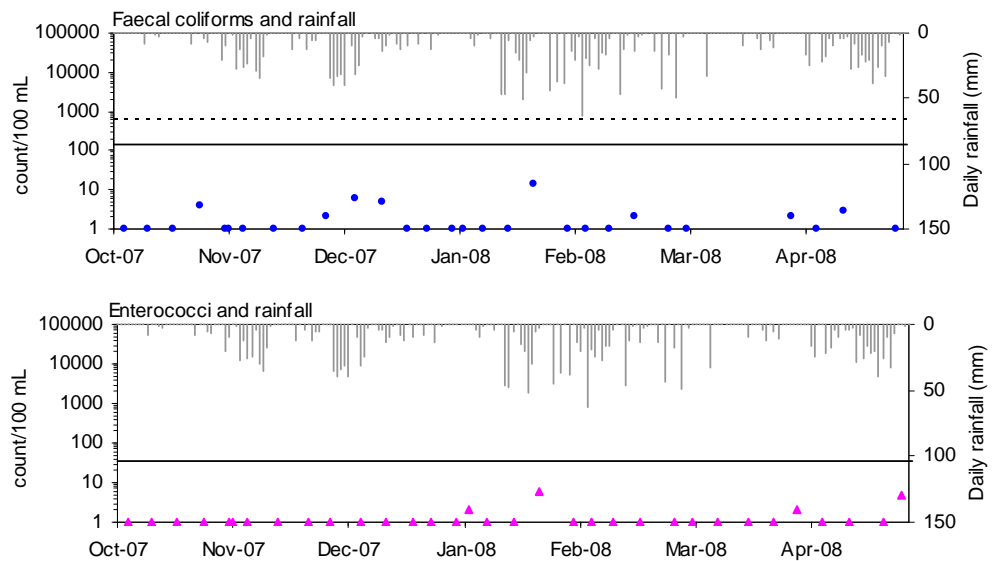
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci remained low throughout the monitoring period, with little response to rainfall.



See page 5 for key to graph

# Birdie Beach

See page 90 for key to map

## Description

Birdie Beach is located within the Munmorah State Recreation Area, at the northern end of an eight kilometre-long beach. The beach is backed by a well vegetated foredune. It is popular during holiday periods and is used for swimming, surfing, fishing and camping.



## Pollution sources

There are few potential pollution sources at this beach. Illegal discharge from commercial and recreational boats may affect water quality.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all six months of the 2007–2008 summer swimming season in which sufficient samples were collected to assess compliance.

### Compliance with NHMRC (1990) swimming guidelines at Birdie Beach

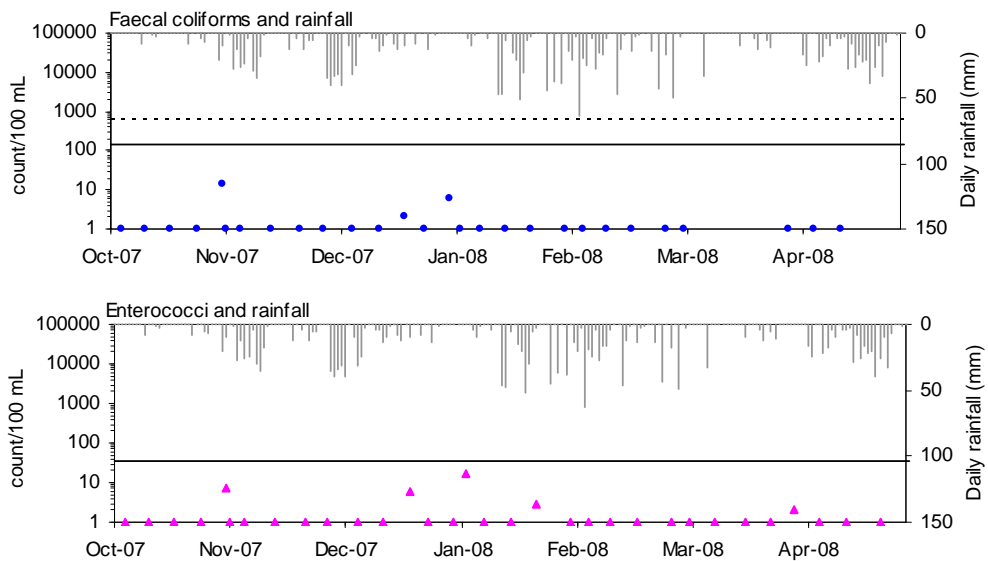
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	**

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci remained low throughout the monitoring period, with little response to rainfall.



See page 5 for key to graph

# Budgewoi Beach

See page 90 for key to map

**Description**

Budgewoi Beach is located in the centre of an eight kilometre-long beach and is backed by a reserve. The beach is frequently used on weekends and during holiday periods.

**Pollution sources**

There are few potential sources of pollution at this beach. Illegal discharge from commercial and recreational boats may affect water quality.

**Compliance**

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



**Compliance with NHMRC (1990) swimming guidelines at Budgewoi Beach**

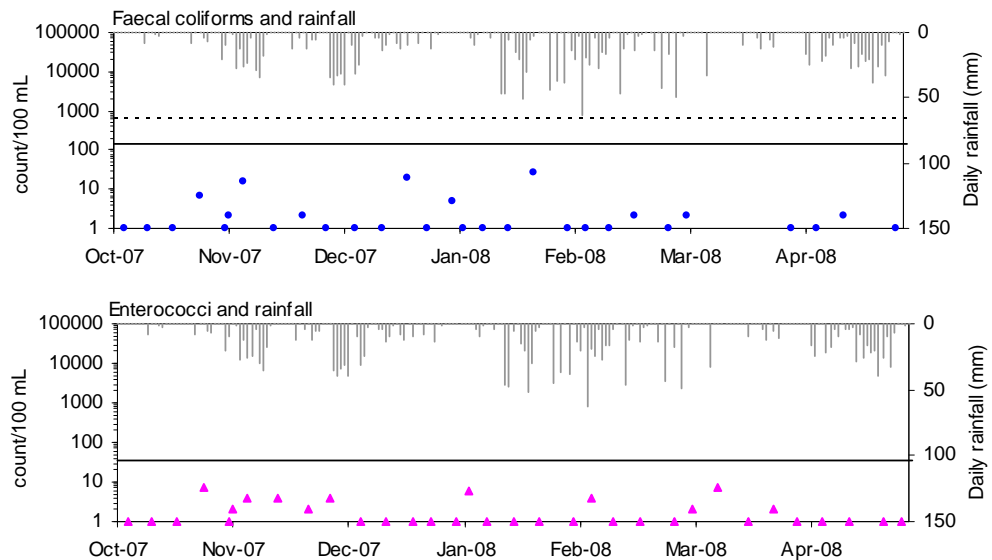
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots**

Levels of faecal coliforms and enterococci remained low throughout the monitoring period, with little response to rainfall.



See page 5 for key to graph

# Lakes Beach

See page 90 for key to map

**Description** Lakes Beach is located at the southern end of an eight kilometre-long beach and is backed by a reserve. The beach is patrolled during peak holiday periods, when large numbers of swimmers and surfers visit the beach.

**Pollution sources** There are few potential pollution sources at this beach.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



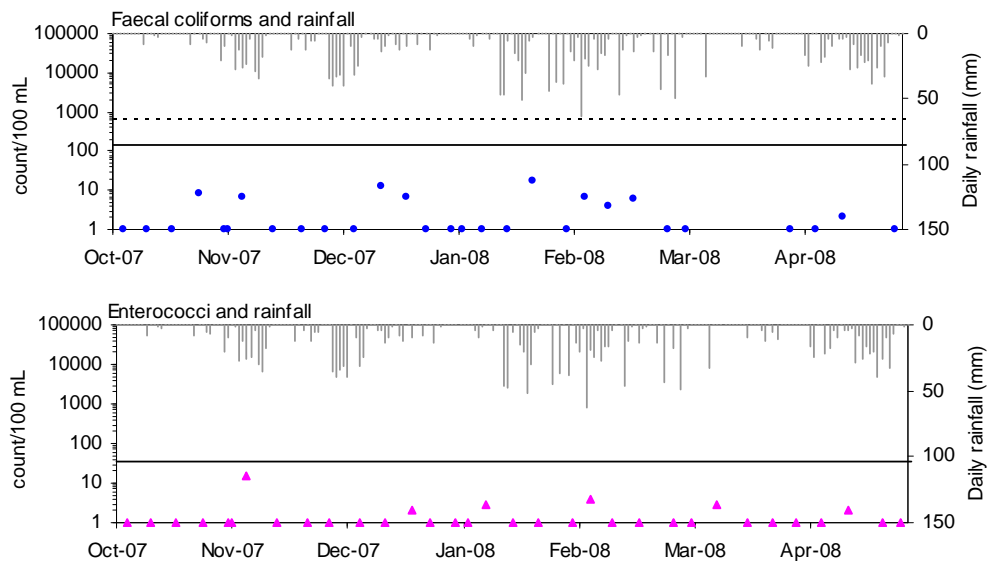
### Compliance with NHMRC (1990) swimming guidelines at Lakes Beach

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms and enterococci were generally low throughout the monitoring period, with little response to rainfall.



See page 5 for key to graph

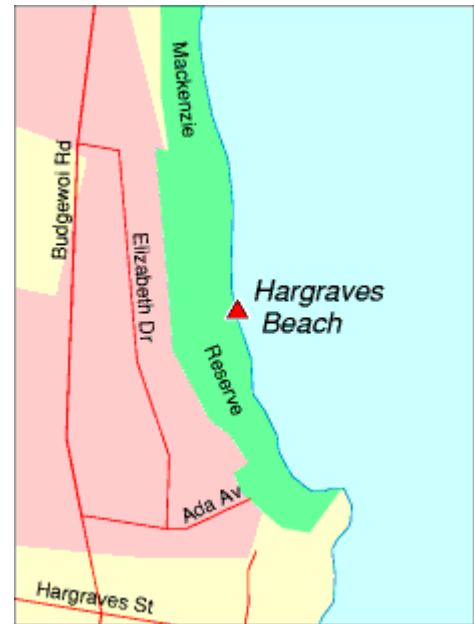
# Hargraves Beach

See page 90 for key to map

**Description** Hargraves Beach is not patrolled and is difficult to access. Despite this, the beach is frequently used on weekends and holidays by the local community. The beach is backed by a reserve.

**Pollution sources** Urban stormwater runoff may affect beach water quality after rainfall.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



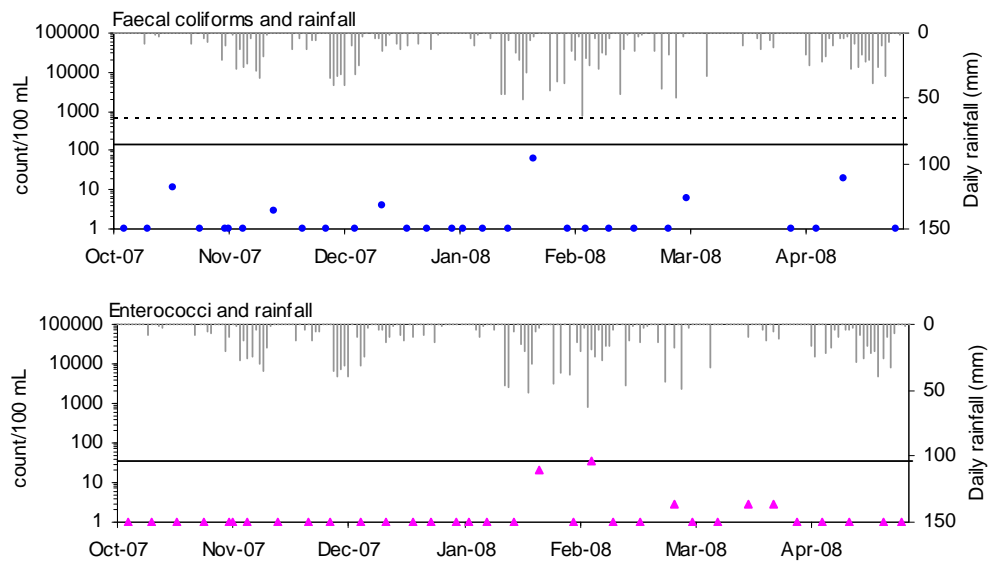
### Compliance with NHMRC (1990) swimming guidelines at Hargraves Beach

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Bacteria levels generally remained very low throughout the monitoring period, with a single slightly elevated enterococci result in response to heavy rainfall in February 2008.



See page 5 for key to graph

# Jenny Dixons Beach

See page 90 for key to map

**Description** Jenny Dixons Beach is approximately 300 metres long and is protected by reefs and Norah Head. The beach is popular with the local community and is frequently used on weekends and holidays. It is backed by an escarpment and residential development.

**Pollution sources** Urban stormwater may affect beach water quality after rainfall.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at Jenny Dixons Beach

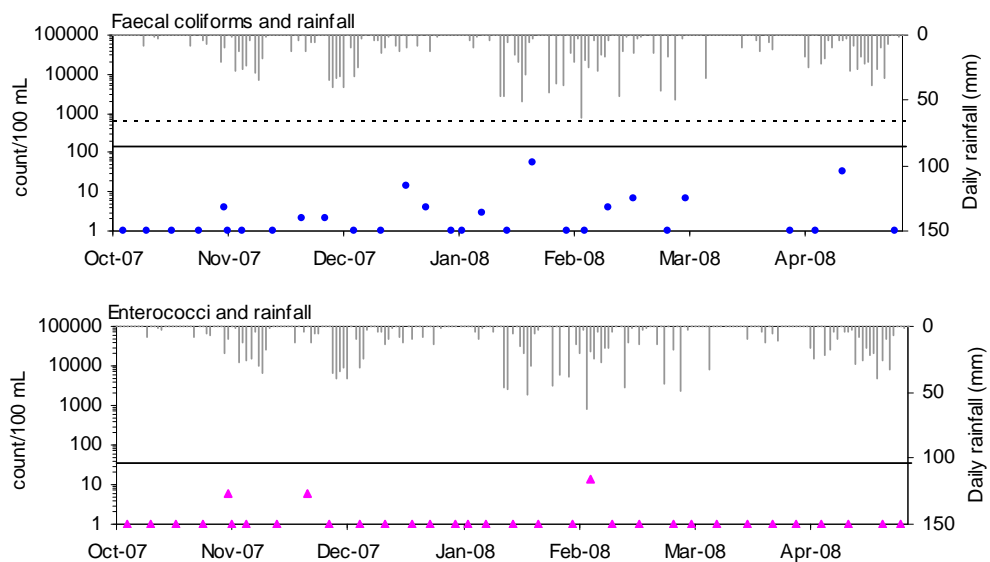
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

### Timeseries plots

Levels of faecal coliforms and enterococci were generally low over the monitoring period, with all results below the guideline limits.



See page 5 for key to graph

# Cabbage Tree Bay

See page 90 for key to map

## Description

Cabbage Tree Bay is located at Norah Head and is backed by a reserve and a steep escarpment. It is not patrolled but is frequently used during the summer months for swimming, snorkeling, diving and fishing. There are also boat launching facilities at the bay.



## Pollution sources

A number of stormwater drains discharge to the bay from the urban area during wet weather. Secondary-treated sewage effluent from the Norah Head Sewage Treatment Plant is discharged via an outfall at Norah Head, to the south of the beach.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

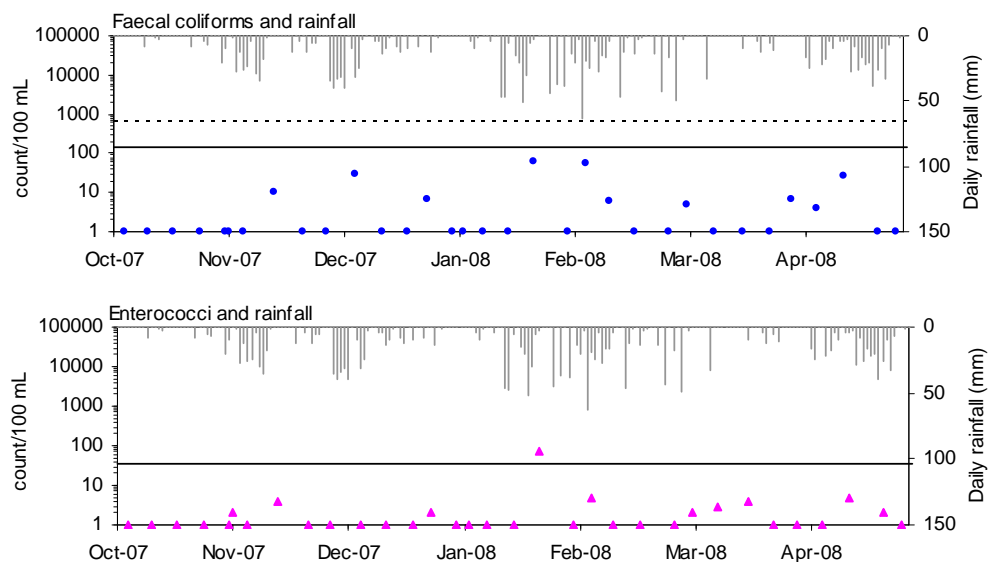
### Compliance with NHMRC (1990) swimming guidelines at Cabbage Tree Bay

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

## Timeseries plots

Bacterial levels were generally low throughout the monitoring period with a single elevated enterococci level recorded on only one occasion in January 2008 following heavy rainfall.



See page 5 for key to graph

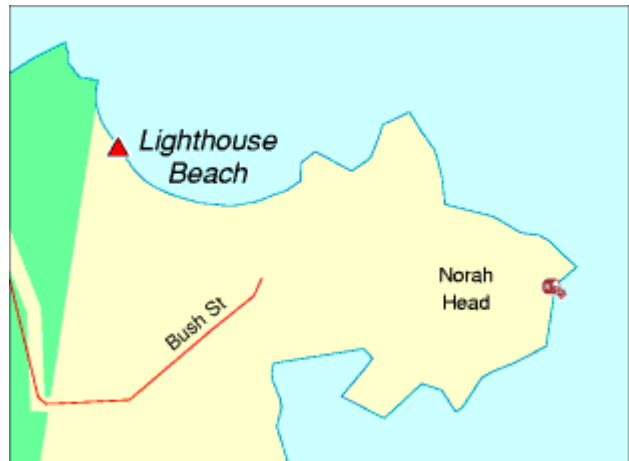
# Lighthouse Beach

See page 90 for key to map

**Description** Lighthouse Beach is situated on Norah Head. It is used mainly for fishing, snorkelling, diving and surfing.

**Pollution sources** Secondary-treated sewage effluent from the Norah Head Sewage Treatment Plant is discharged via an outfall at Norah Head, to the south of the beach.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

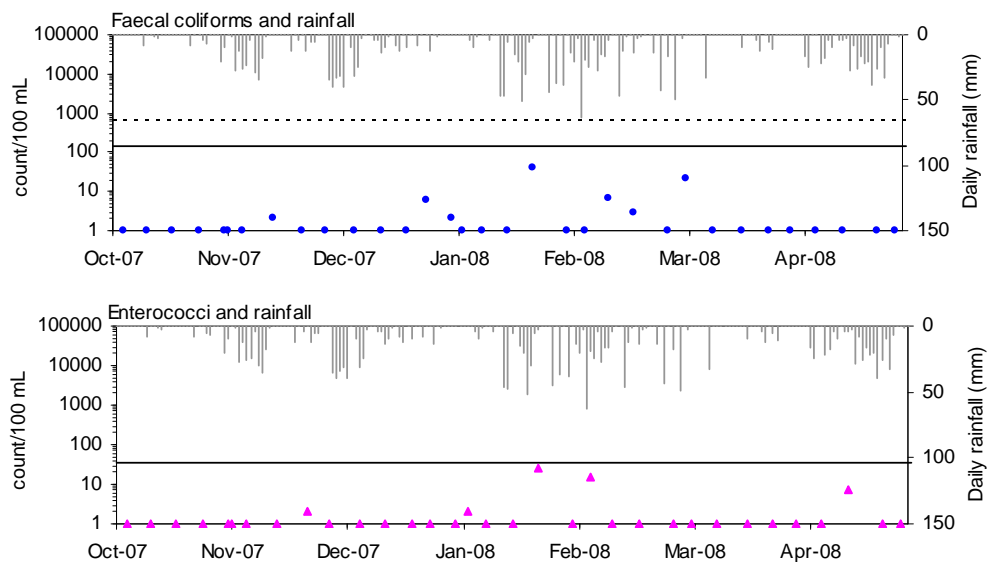


### Compliance with NHMRC (1990) swimming guidelines at Lighthouse Beach

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

**Timeseries plots** Levels of faecal coliforms and enterococci were generally very low throughout the monitoring period.



See page 5 for key to graph

# Gravelly Beach

See page 90 for key to map

## Description

Gravelly Beach is located approximately 500 metres south of Norah Head and is backed by high dunes and vegetation. The beach is protected by wide rock platforms at either end. Access is via Norah Head walking track or the car park located at Soldiers Beach to the south. The area is popular for sightseeing and fishing, with high use by surfers.



## Pollution sources

Secondary-treated sewage effluent from the Norah Head Sewage Treatment Plant is discharged via an outfall at Norah Head, to the north of the beach.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

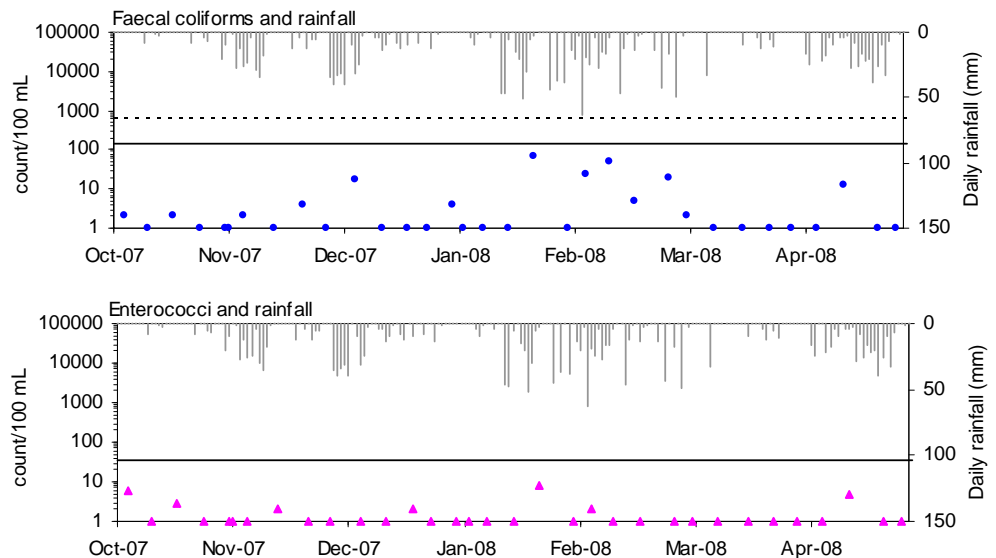
### Compliance with NHMRC (1990) swimming guidelines at Gravelly Beach

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

## Timeseries plots

Levels of faecal coliforms and enterococci were generally low throughout the monitoring period.



See page 5 for key to graph

# Soldiers Beach

See page 90 for key to map

## Description

Soldiers is a patrolled beach that extends south-east from Soldiers Point to Pelican Point. A surf club is located toward the northern end of the beach, with a large car park situated on the Soldiers Point headland. The beach is popular in the summer and is used frequently by surfers throughout the year. A caravan park and residential area are located close by. The beach has high economic importance to the local community.



## Pollution sources

A stormwater outlet flows to the beach just south of the surf club. This drains both urban and natural catchment areas. The beach may also be affected by secondary-treated sewage effluent discharged via an outfall at Norah Head to the north.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

### Compliance with NHMRC (1990) swimming guidelines at Soldiers Beach

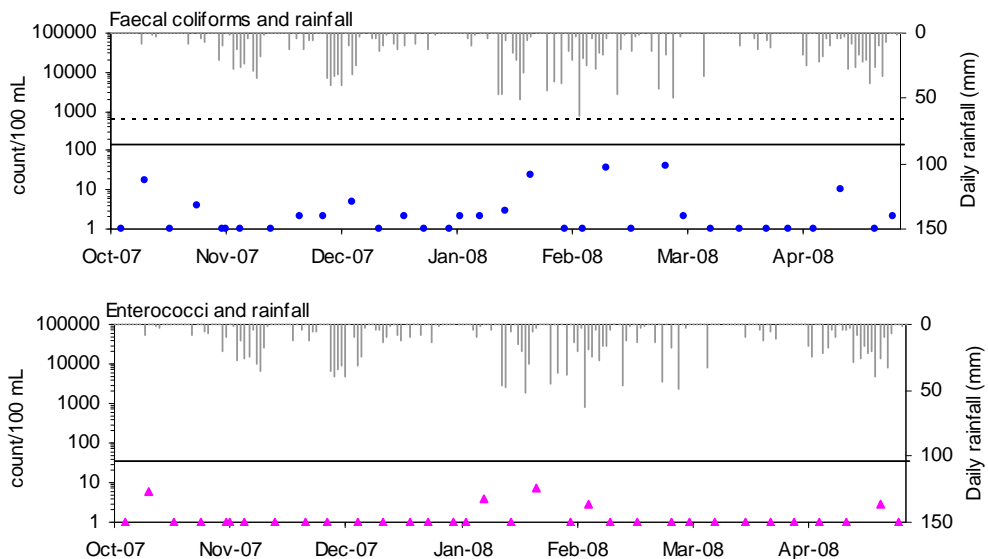
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci were generally low throughout the monitoring period.



See page 5 for key to graph

# North Entrance

See page 90 for key to map

**Description**

North Entrance is located to the north of Tuggerah Lake entrance, at the southern end of Tuggerah Beach. The sampling site is located in front of the surf club which is backed by urban development, with a caravan park nearby. The beach has frequent use and is of high economic importance to the local community.



**Pollution sources**

Beach water quality may be affected by urban stormwater runoff and outflow from Tuggerah Lake.

**Compliance**

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

**Compliance with NHMRC (1990) swimming guidelines at North Entrance**

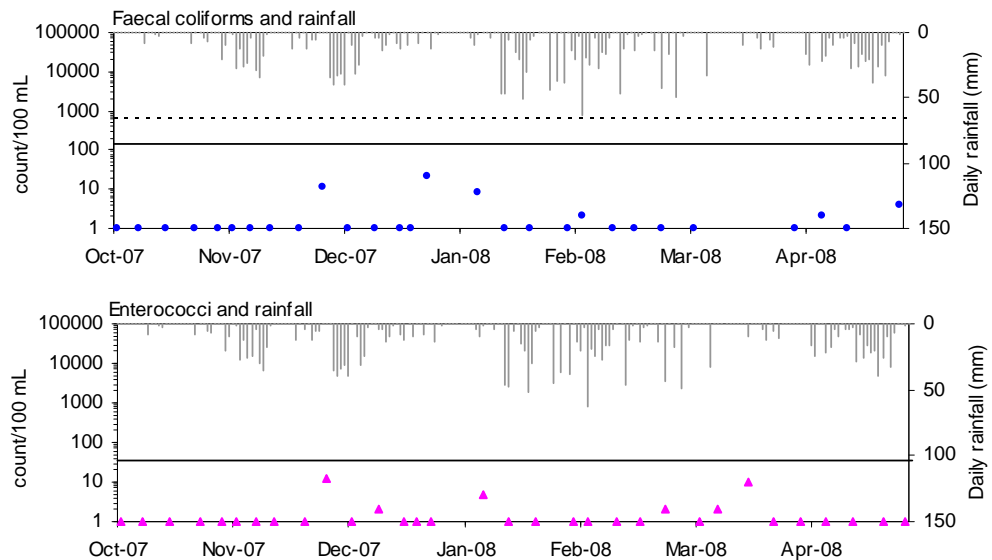
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots**

Levels of faecal coliforms and enterococci were generally very low throughout the monitoring period.



See page 5 for key to graph

# The Entrance

See page 90 for key to map

**Description** The Entrance Beach is approximately 300 metres long and lies immediately south of the entrance to Tuggerah Lake. It is backed by high density residential and holiday apartment development. It is of high economic importance to the local community. The beach is very popular on weekends and during holiday periods.

**Pollution sources** Urban stormwater runoff, outflow from Tuggerah Lake and overflows from a sewage pumping station just south of the surf club may all potentially affect beach water quality.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



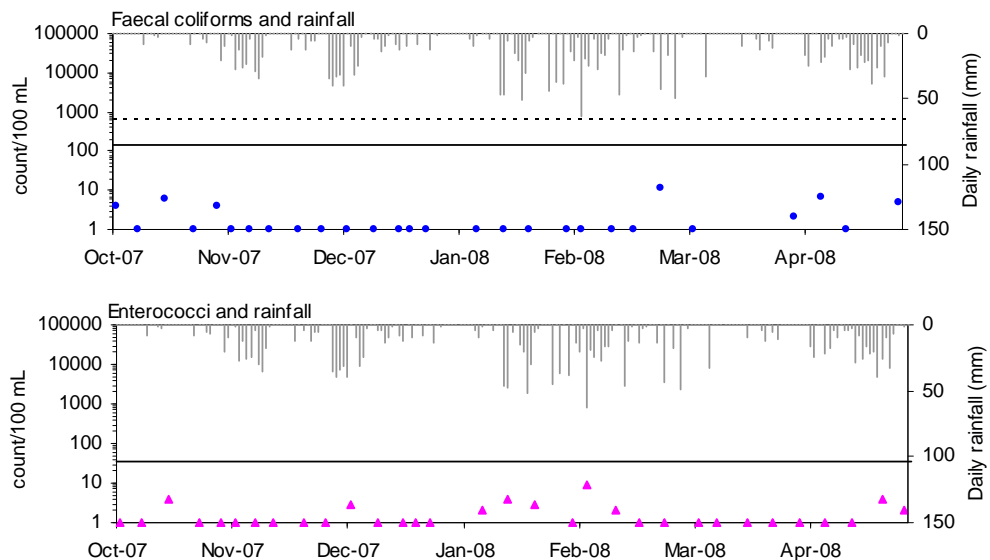
### Compliance with NHMRC (1990) swimming guidelines at The Entrance

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms and enterococci were generally low throughout the monitoring period.



See page 5 for key to graph

# Blue Bay

See page 90 for key to map

## Description

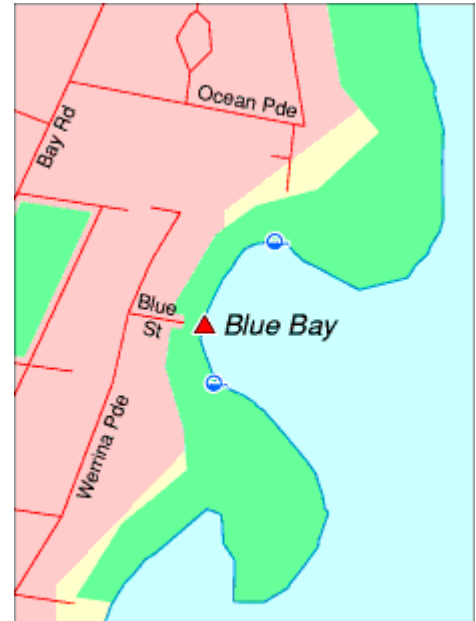
Blue Bay is a calm ocean beach bounded by a wide rock platform to the north and a long sand spit to the south. The beach is backed by residential development. It is used mainly on weekends and public holidays, and is popular with families owing to the prevailing calm water conditions.

## Pollution sources

Beach water quality may be affected by urban stormwater runoff.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at Blue Bay

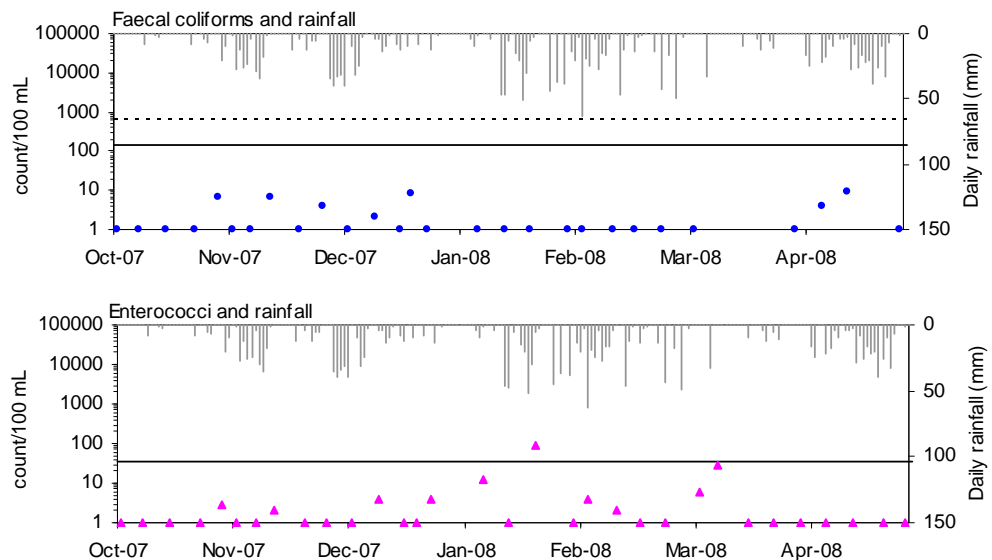
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci remained generally low over the monitoring period, with a single elevated enterococci level recorded on only one occasion.



See page 5 for key to graph

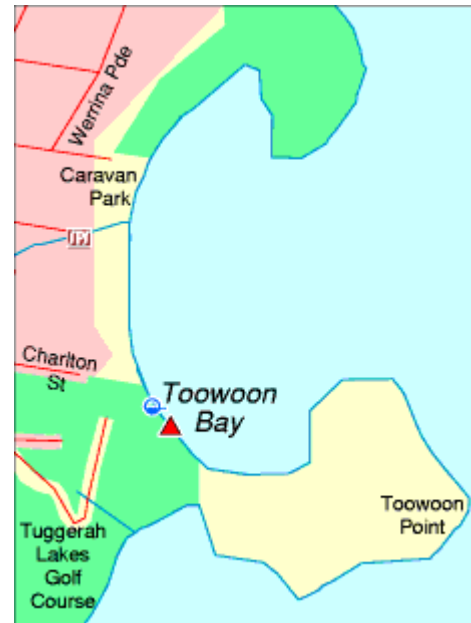
# Toowoan Bay

See page 90 for key to map

**Description** Toowoan Bay is a relatively calm, semi-circular ocean beach that is protected by headlands. Parking, picnic areas, a surf club and a caravan park are located at the southern end of the beach. The beach is very popular for swimming and snorkelling, particularly during the summer holiday period. It has high economic importance to the local community.

**Pollution sources** Urban stormwater runoff and overflows from a sewage pumping station may affect beach water quality.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



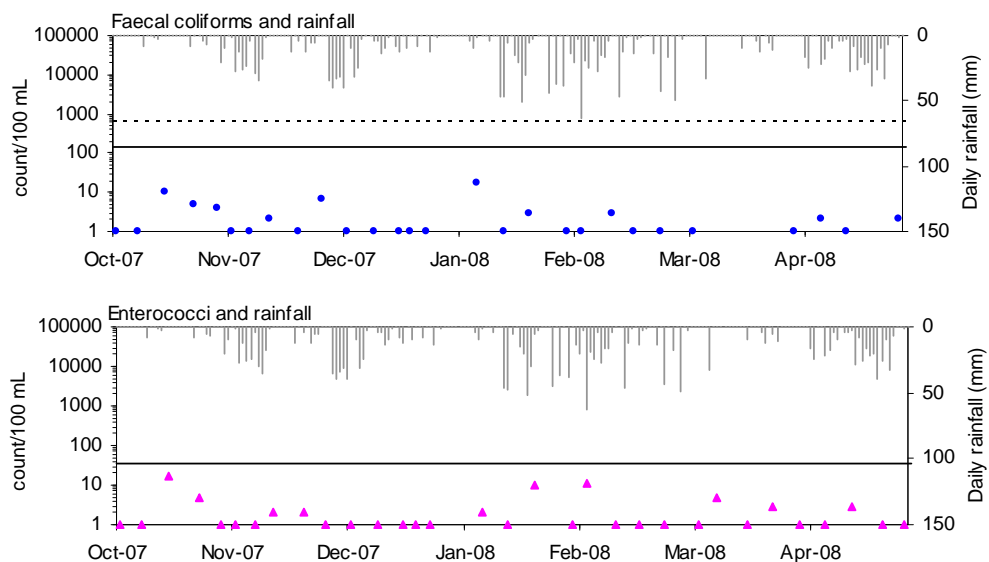
### Compliance with NHMRC (1990) swimming guidelines at Toowoan Bay

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
FC	PASS	PASS	PASS	PASS*	PASS	**	**
ENT	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms and enterococci remained generally low over the monitoring period.



See page 5 for key to graph

# Shelly Beach

See page 90 for key to map

## Description

Shelly Beach is backed by a high foredune and a golf course. A surf club, carpark and caravan park are located at the southern end of the beach. The area is used primarily on weekends and public holidays. It has high economic importance to the local community.

## Pollution sources

Urban stormwater discharged at the southern end of the beach may affect water quality. Treated effluent from the Bateau Bay Sewage Treatment Plant is discharged via an outfall at Wonga Point to the south of the beach.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at Shelly Beach

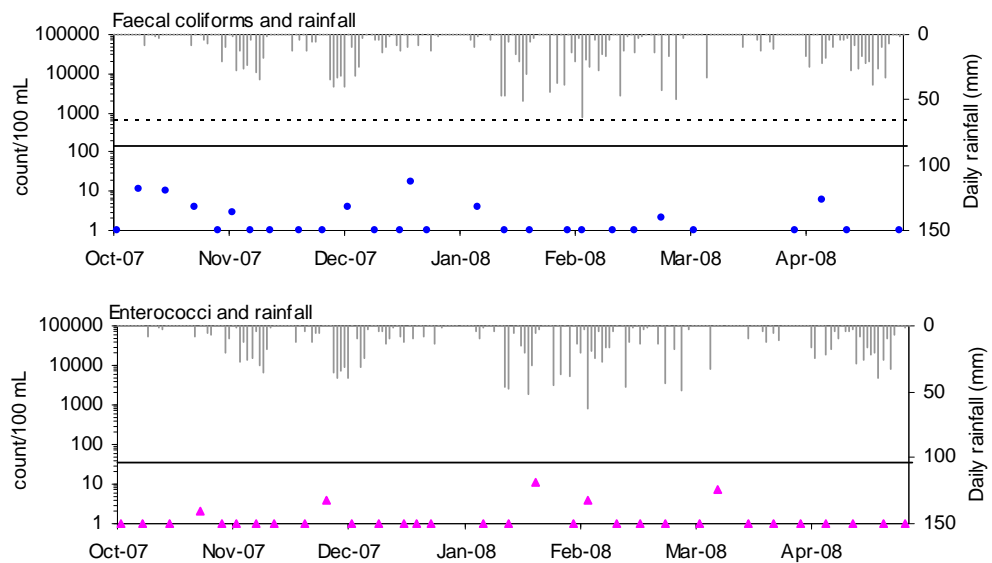
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci were generally low over the monitoring period.



See page 5 for key to graph

# Blue Lagoon

See page 90 for key to map

**Description** Blue Lagoon is a short and calm ocean beach that is protected by a reef approximately 200 metres offshore. It is backed by a caravan park and is popular with tourists to the area. The beach is used extensively on weekends and holiday periods for swimming and snorkelling.

**Pollution sources** Urban stormwater discharged at the southern end of the beach may affect water quality. Treated effluent from the Bateau Bay Sewage Treatment Plant is discharged via an outfall at Wonga Point to the south of the beach.

**Compliance** The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



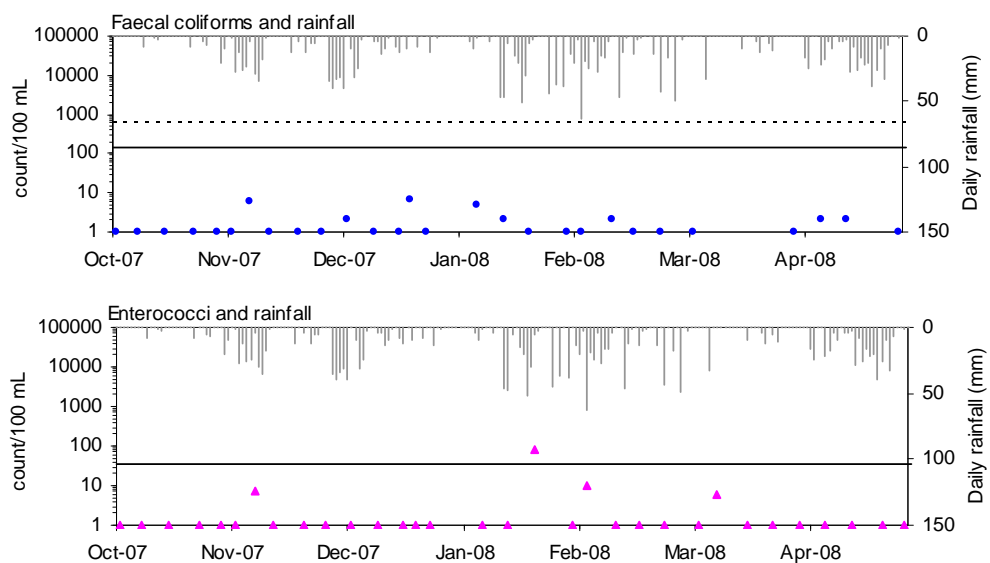
### Compliance with NHMRC (1990) swimming guidelines at Blue Lagoon

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms and enterococci remained generally low over the monitoring period. A single elevated enterococci level was recorded on only one occasion following rainfall.



See page 5 for key to graph

# Bateau Bay Beach

See page 90 for key to map

## Description

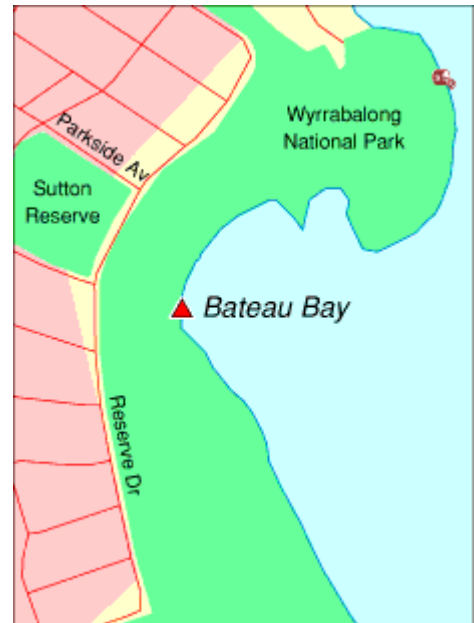
Bateau Bay Beach is approximately 200 metres long and backed by the southern section of Wyrabalong National Park. The beach is not patrolled and is protected by prominent headlands and reefs. It is popular with family groups on weekends and during holiday periods.

## Pollution sources

Urban stormwater may affect beach water quality during wet weather. Treated effluent from the Bateau Bay Sewage Treatment Plant is discharged via an outfall at Wonga Point to the north of the beach.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at Bateau Bay Beach

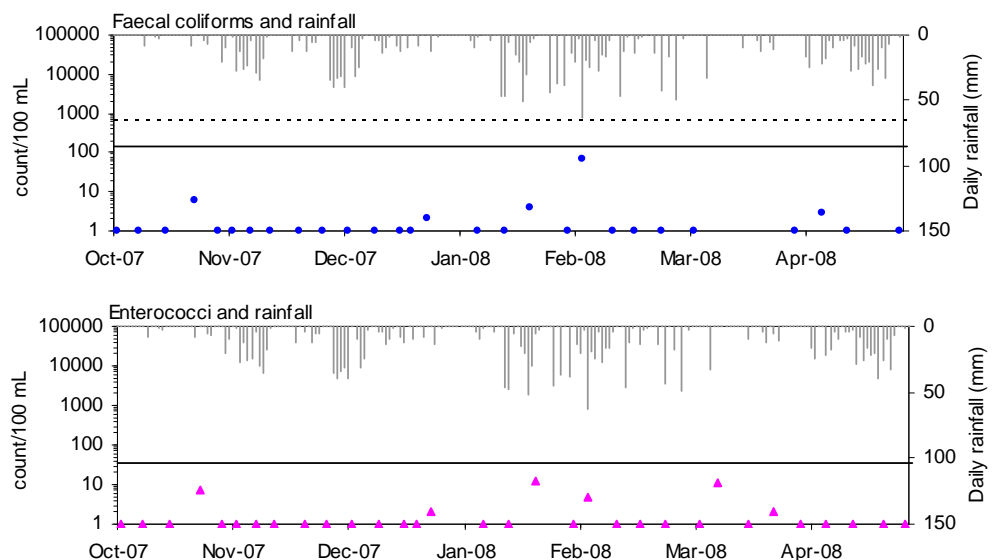
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci remained generally low over the monitoring period.



See page 5 for key to graph

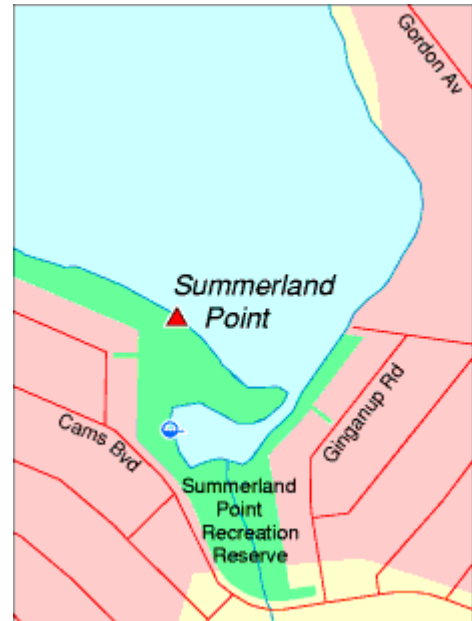
# Summerland Point

See page 90 for key to map

**Description** Summerland Point is a netted swimming enclosure within Lake Macquarie. The sampling site is backed by a small reserve and the residential area of Summerland Point. The site is popular with local children.

**Pollution sources** Several stormwater outlets discharge in the vicinity of the swimming location. A boat pumpout facility on the adjacent wharf and droppings from birdlife are also potential pollution sources.

**Compliance** Summerland Point complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



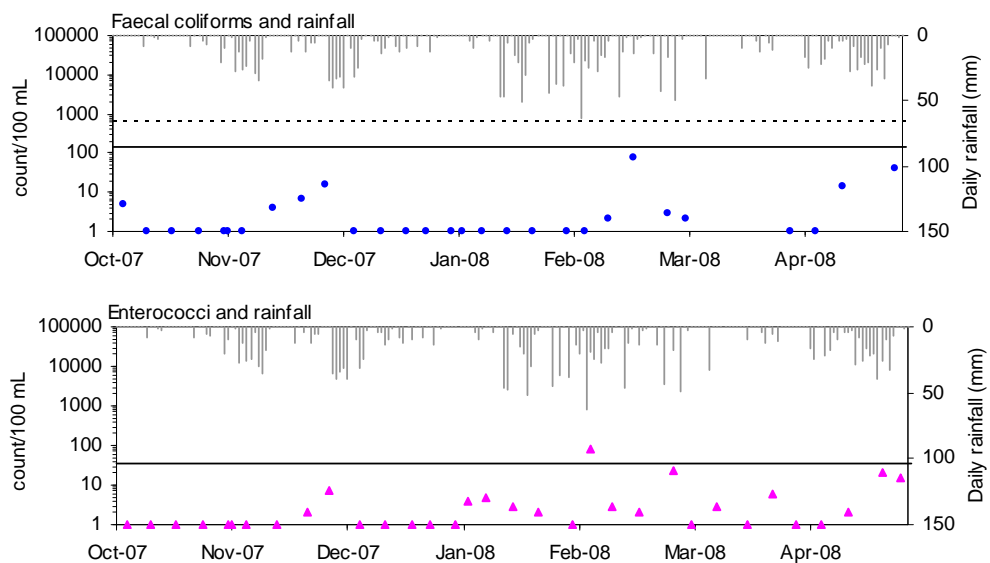
## Compliance with NHMRC (1990) swimming guidelines at Summerland Point

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms and enterococci remained generally low over the monitoring period, with a single elevated enterococci level recorded on only one occasion.



See page 5 for key to graph

# Gwandalan

See page 90 for key to map

## Description

The Gwandalan sampling site is a netted swimming enclosure within Crangan Bay in Lake Macquarie. The site is backed by a small reserve and the township of Gwandalan. The location is popular with local children.

## Pollution sources

Urban stormwater is discharged via an outlet to the north of the swimming area. Waterbirds common to the area may also affect water quality.

## Compliance

Gwandalan complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at Gwandalan

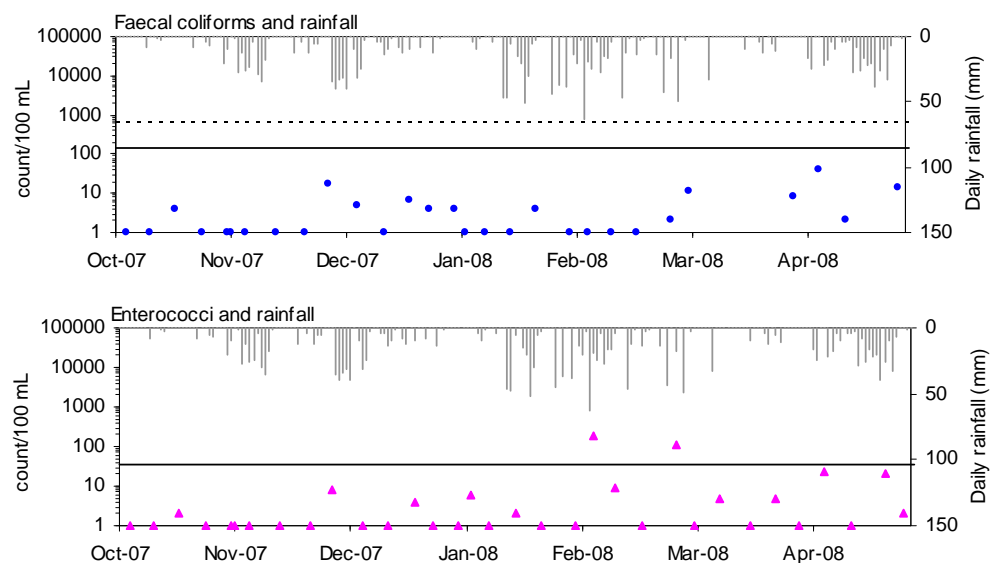
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci were generally low throughout the monitoring period. Elevated enterococci levels were recorded on only two occasions in response to rainfall.



See page 5 for key to graph

# Chain Valley Bay

See page 90 for key to map

**Description** The Chain Valley Bay site is an enclosed swimming area located in the south-east of Lake Macquarie. The site is backed by a small reserve and residential development. The swimming site is popular with local children.



**Pollution sources** Water quality is potentially affected by urban stormwater, outflow from Karignan Creek and overflows from a nearby sewage pumping station. Water birds may also contribute to faecal contamination.

**Compliance** Chain Valley Bay complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

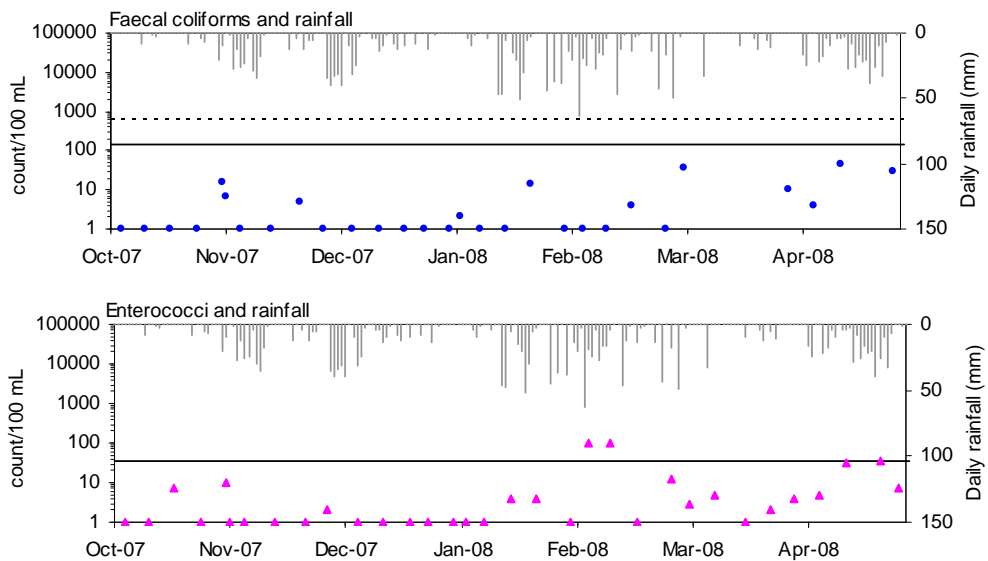
### Compliance with NHMRC (1990) swimming guidelines at Chain Valley Bay

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms and enterococci were generally low throughout the monitoring period. Elevated enterococci levels were recorded on only two occasions in response to rainfall.



See page 5 for key to graph

# Elizabeth Bay

See page 90 for key to map

## Description

Elizabeth Bay is in the north-eastern corner of Lake Munmorah and is backed by Elizabeth Bay Reserve. A creek draining a residential area flows into the bay, and birdlife is common. The area is not a popular swimming location, but local children are known to swim here.

## Pollution sources

Two large stormwater outlets drain into the bay and there is a sewage pumping station located in the reserve. Faecal contamination from waterbirds and creek discharge are further potential sources of contamination.

## Compliance

Elizabeth Bay complied with NHMRC (1990) swimming guidelines in six of the seven months of the 2007–2008 summer swimming season. The site failed the guidelines in April 2008 owing to elevated levels of enterococci.



### Compliance with NHMRC (1990) swimming guidelines at Elizabeth Bay

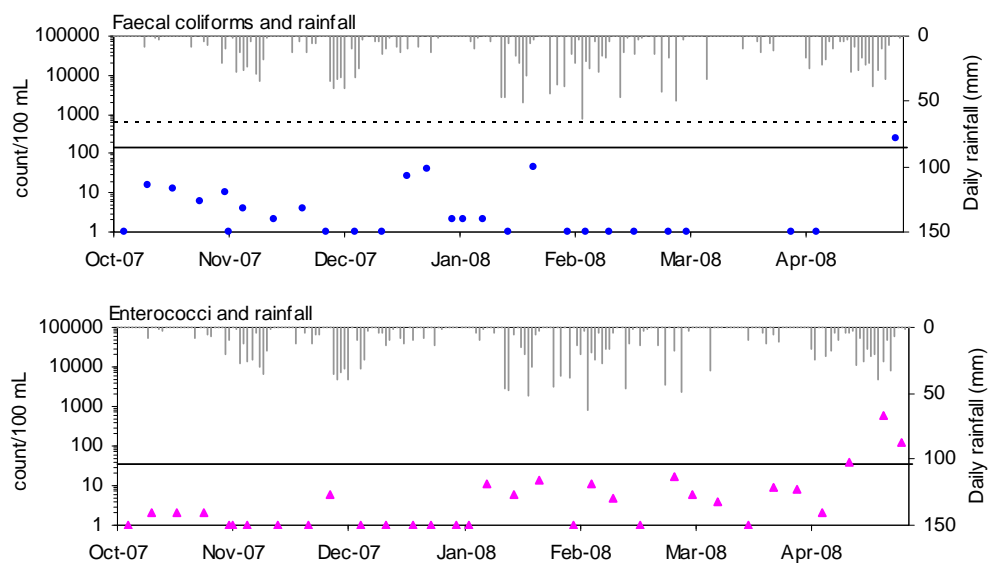
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	FAIL*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of bacteria were generally low during the first six months of the monitoring period. Elevated faecal coliform and enterococci levels were recorded in April 2008 in response to rainfall.



See page 5 for key to graph

# San Remo

See page 90 for key to map

**Description** The San Remo swimming location is situated in Budgewoi Lake, near the mouth of Wallarah Creek. The site is popular with local children.

**Pollution sources** Urban stormwater runoff is discharged via two drains in the immediate vicinity of the swimming site. Outflow from Wallarah Creek may also affect swimming water quality. Bird faeces may be significant source of contamination.



**Compliance** San Remo complied with NHMRC (1990) swimming guidelines in five of the seven months of the 2007–2008 summer swimming season. The site failed the guidelines in March 2008 and April 2008 owing to elevated levels of enterococci.

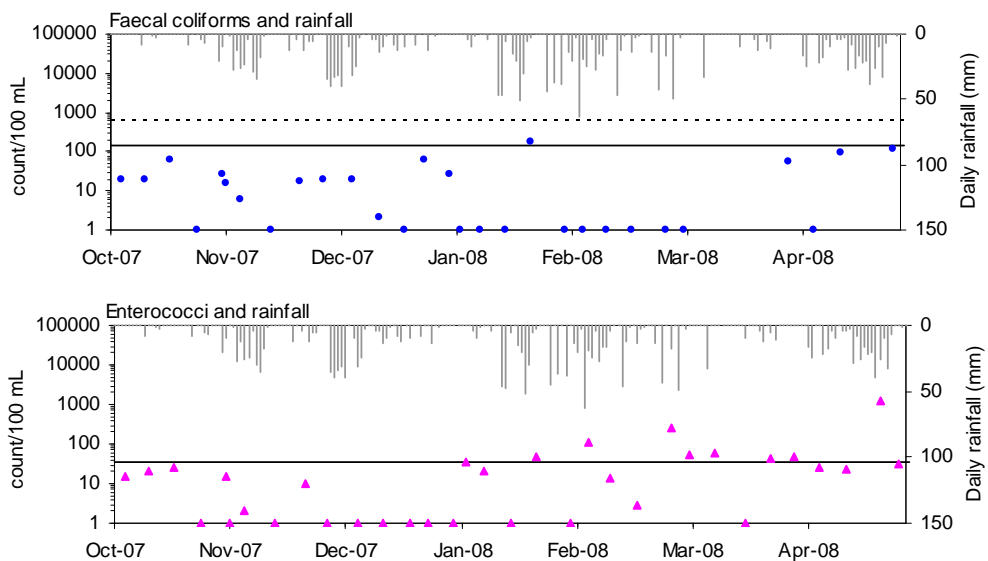
**Compliance with NHMRC (1990) swimming guidelines at San Remo**

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	FAIL	FAIL*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Faecal coliform levels generally remained below the guideline limits throughout the monitoring period. Elevated enterococci levels were recorded more frequently, mostly in response to rainfall in the last four months of the summer season.



See page 5 for key to graph

# Toukley Aquatic

See page 90 for key to map

## Description

Toukley Aquatic is a netted swimming enclosure located in Lake Budgewoi. It is backed by a large urban development. The pool is not a popular swimming location but is occasionally used by children.



## Pollution sources

Urban stormwater runoff may affect swimming water quality in wet weather. Water birds in the area may also contribute to faecal contamination.

## Compliance

Toukley Aquatic complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.

### Compliance with NHMRC (1990) swimming guidelines at Toukley Aquatic

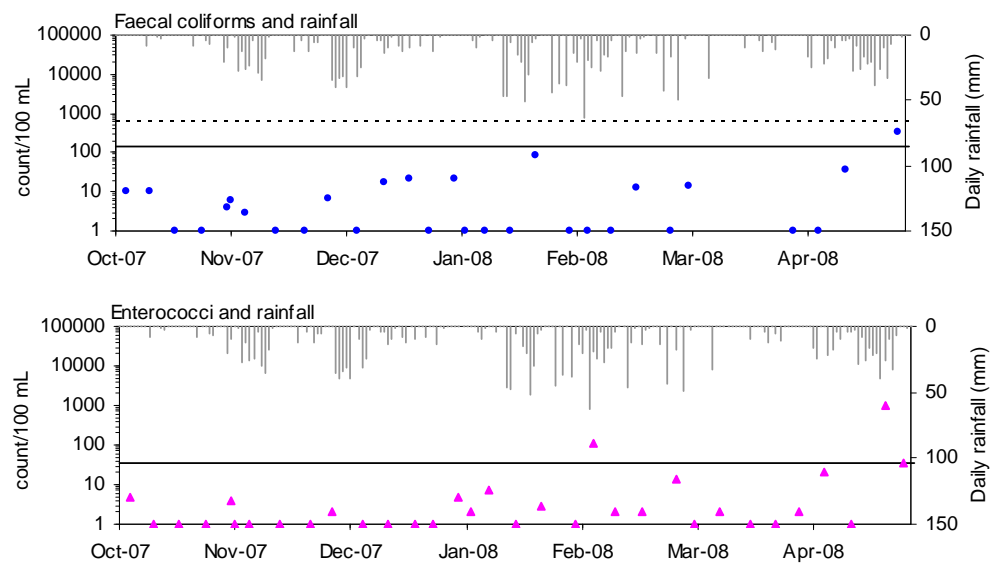
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	PASS*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms were generally low throughout the monitoring period, with only one result exceeding the median guideline limit. Enterococci levels were also generally low, exceeding the geometric mean guideline limit on two occasions in response to rainfall in February and April 2008.

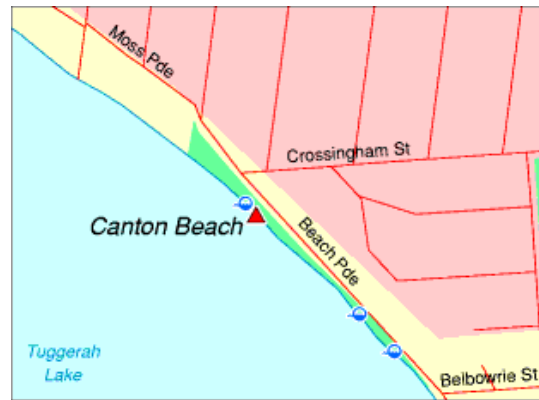


See page 5 for key to graph

# Canton Beach

See page 90 for key to map

**Description** Canton Beach is situated in Tuggerah Lake and is backed by a narrow reserve and picnic area and the town of Toukley. The shallow, calm waters of this beach are popular with children and families during holiday periods. Sailing is popular throughout the year and the beach has high economic importance to the local community.



**Pollution sources** Urban stormwater runoff is discharged to the beach via three drains. The largest drain is located near Crossingham Street. Faecal contamination from birds may also be a significant source of pollution.

**Compliance** Canton Beach complied with NHMRC (1990) swimming guidelines in six of the seven months of the 2007–2008 summer swimming season. The site failed the guidelines in April 2008 owing to elevated levels of enterococci.

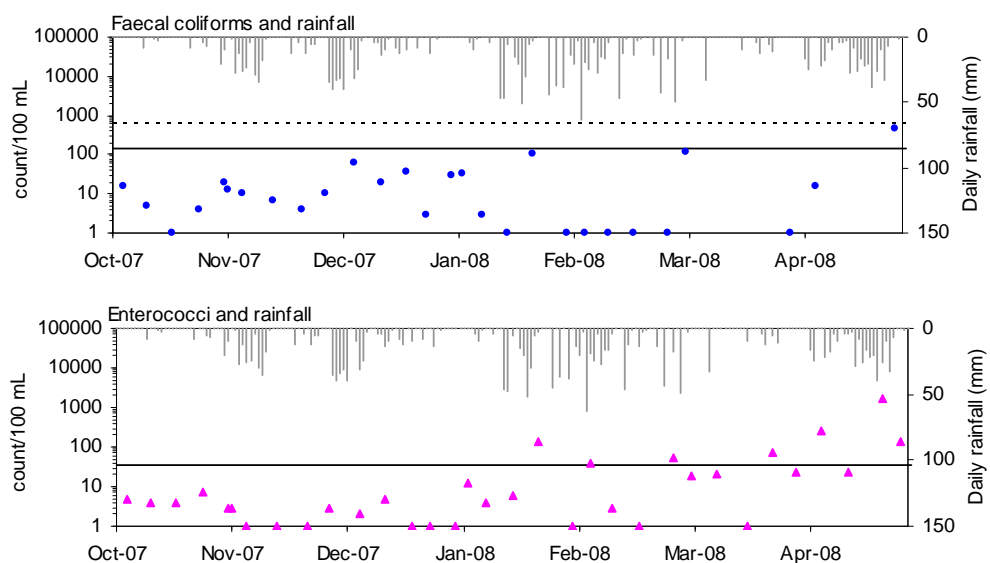
**Compliance with NHMRC (1990) swimming guidelines at Canton Beach**

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS	PASS*	PASS	FAIL*

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** Levels of faecal coliforms generally remained below the guideline limits throughout the monitoring period, with an elevated result recorded on only one occasion during April 2008. Enterococci levels were more frequently elevated, exceeding the guideline limits on several occasions, often in response to rainfall during the last four months of the monitoring period.



See page 5 for key to graph

# The Entrance Channel

See page 90 for key to map

## Description

The Entrance Channel is situated in the mouth of Tuggerah Lake. It is backed by high-density urban, commercial and resort development. The beach is not patrolled but is popular during school holidays. Pelican feeding is a regular attraction near this site.

## Pollution sources

Numerous stormwater drains discharge in the immediate vicinity of the site. The site may also be affected by outflow from Tuggerah Lakes. Droppings from waterbirds, including pelicans, may also have an impact on water quality.

## Compliance

The site complied with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at The Entrance Channel

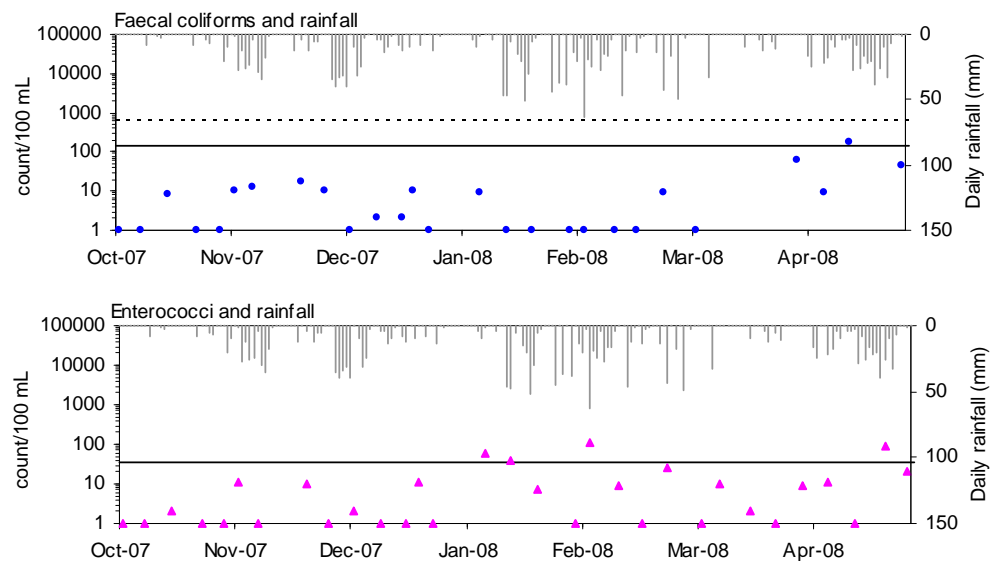
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

Levels of faecal coliforms and enterococci were generally below the guideline limits throughout the monitoring period, exceeding the median and geometric mean guideline limits occasionally in response to rainfall.



See page 5 for key to graph

# Long Jetty

See page 90 for key to map

**Description** Long Jetty is located in Tuggerah Lake and is backed by urban development. Children are the most frequent users of the swimming location.

**Pollution sources** Urban stormwater runoff is discharged in the immediate vicinity of the sampling site.

**Compliance** Long Jetty complied with NHMRC (1990) swimming water quality guidelines in all seven months of the 2007–2008 summer swimming season.



### Compliance with NHMRC (1990) swimming guidelines at Long Jetty

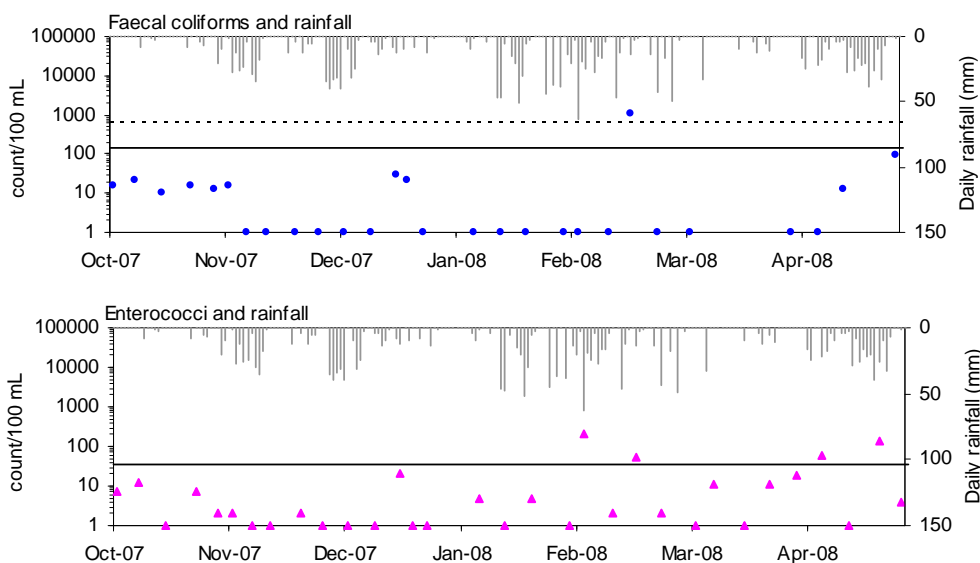
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	PASS	PASS	PASS	PASS*	PASS*	**	**
<b>ENT</b>	PASS	PASS	PASS	PASS*	PASS*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

### Timeseries plots

Levels of bacteria were usually below the guideline limits throughout the monitoring period, with values occasionally exceeding the guideline limits in February and April 2008 in response to rainfall.



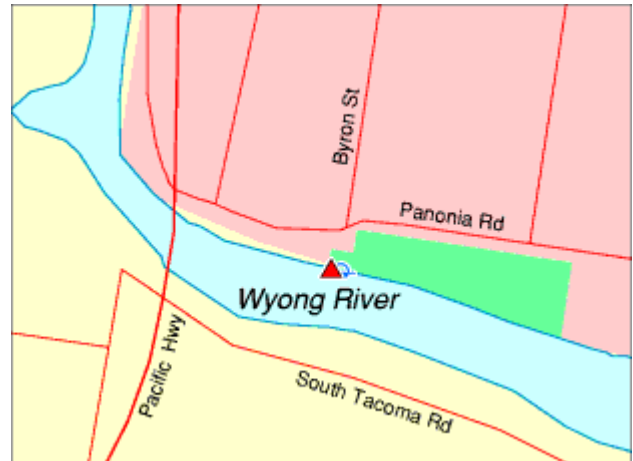
See page 5 for key to graph

# Wyong River

See page 90 for key to map

## Description

The Wyong River sampling site is located to the south of the township of Wyong. This area of the river is predominantly used for recreational boating and fishing.



## Pollution sources

Urban stormwater runoff is discharged in the immediate vicinity of the sampling site. Water quality may also be affected by leachate from onsite wastewater management systems and runoff from rural areas in the upper catchment.

## Compliance

Wyong River failed to comply with the NHMRC (1990) swimming guidelines in five of the seven months of the 2007–2008 summer swimming season owing to elevated levels of both faecal coliforms and enterococci. The site passed the guidelines in March 2008 and April 2008.

### Compliance with NHMRC (1990) swimming guidelines at Wyong River

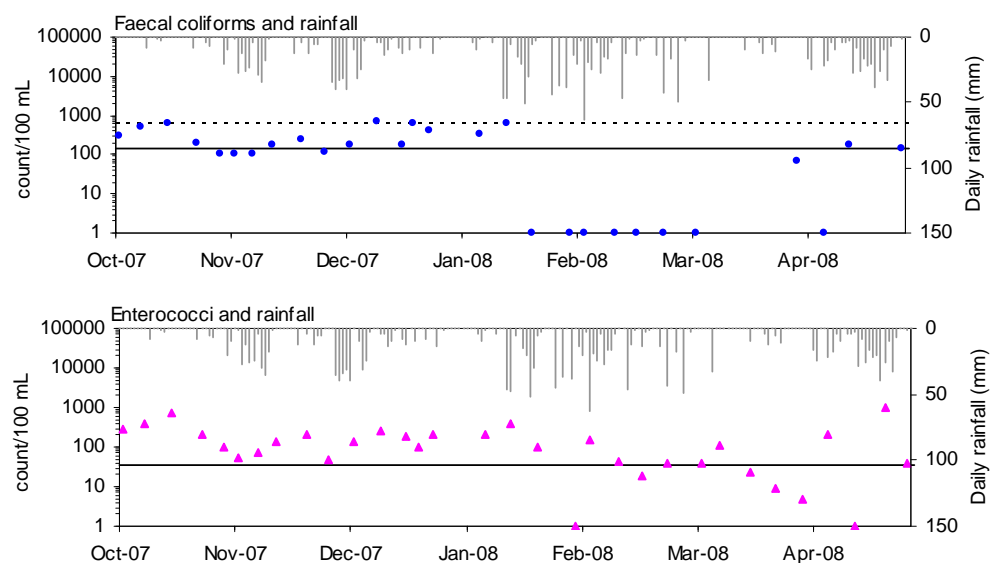
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	FAIL	PASS	FAIL	PASS*	PASS*	**	**
<b>ENT</b>	FAIL	FAIL	FAIL	FAIL*	FAIL*	PASS*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

High levels of faecal coliforms and enterococci were recorded throughout the monitoring period, indicating that the site is affected by faecal contamination in dry and wet weather conditions.



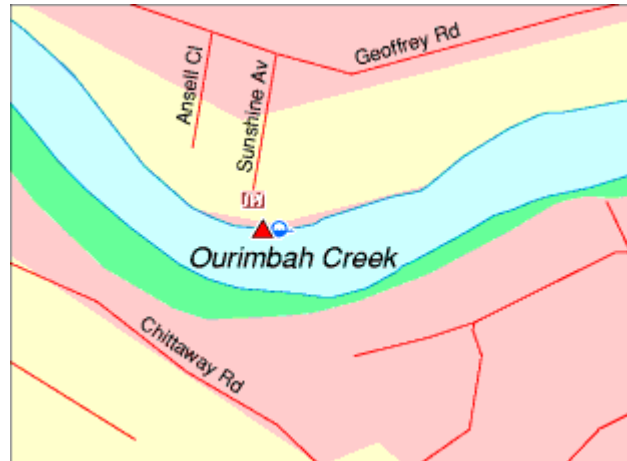
See page 5 for key to graph

# Ourimbah Creek

See page 90 for key to map

**Description** This site is located at Chittaway Point, adjacent to the boat ramp. The area is used for swimming by local children.

**Pollution sources** Urban stormwater runoff is discharged in the immediate vicinity of the swimming site. Leachate from onsite wastewater management systems and rural runoff from the upper catchment may also affect water quality. Faecal contamination from birds is a significant source of pollution.



**Compliance** Ourimbah Creek failed to comply with the NHMRC (1990) swimming guidelines in five of the seven months of the 2007–2008 summer swimming season owing to elevated levels of both faecal coliforms and enterococci. The site passed the guidelines in February 2008 and April 2008.

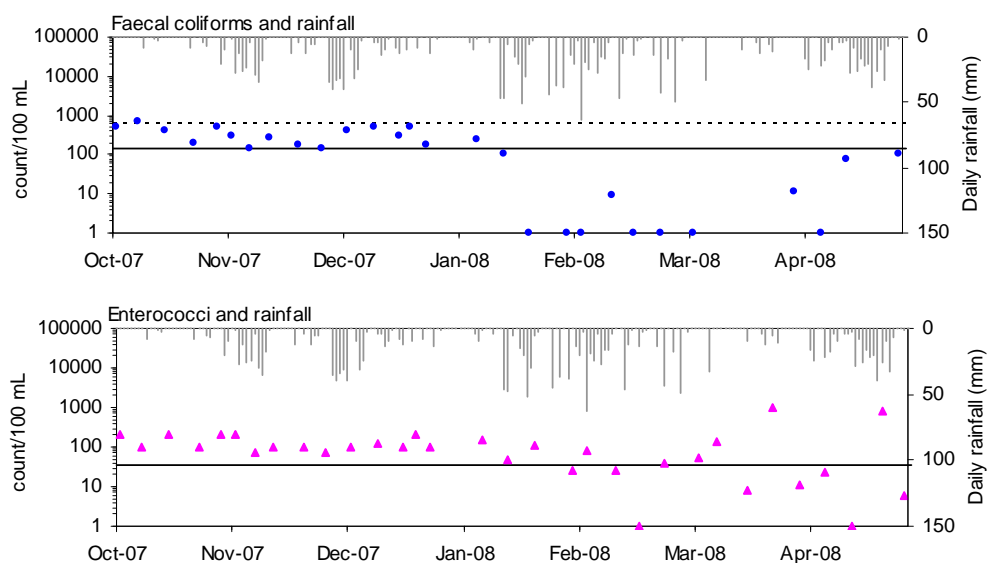
**Compliance with NHMRC (1990) swimming guidelines at Ourimbah Creek**

	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	FAIL	FAIL	FAIL	PASS*	PASS*	**	**
<b>ENT</b>	FAIL	FAIL	FAIL	FAIL*	PASS*	FAIL*	PASS

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

**Timeseries plots** High levels of faecal coliforms and enterococci were recorded throughout the monitoring period, indicating that the site is affected by faecal contamination in dry and wet weather conditions.



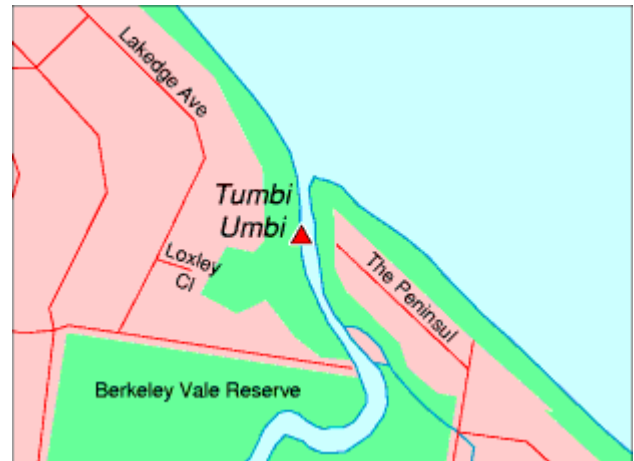
See page 5 for key to graph

# Tumbi Umbi Creek

See page 90 for key to map

## Description

Tumbi Umbi Creek drains into the southern end of Tuggerah Lake. The creek mouth is blocked by a sandbar and, as a result, the creek is poorly flushed. The swimming area is known to be used by local children.



## Pollution sources

Water quality in Tumbi Umbi Creek is affected by urban and industrial stormwater runoff from the lower catchment and by leachate from onsite wastewater management systems and rural runoff from the upper catchment. Faecal contamination from birds is also a significant source of pollution.

## Compliance

Tumbi Umbi Creek failed to comply with NHMRC (1990) swimming guidelines in all seven months of the 2007–2008 summer swimming season. The site failed because of elevated levels of both faecal coliforms and enterococci.

### Compliance with NHMRC (1990) swimming guidelines at Tumbi Umbi Creek

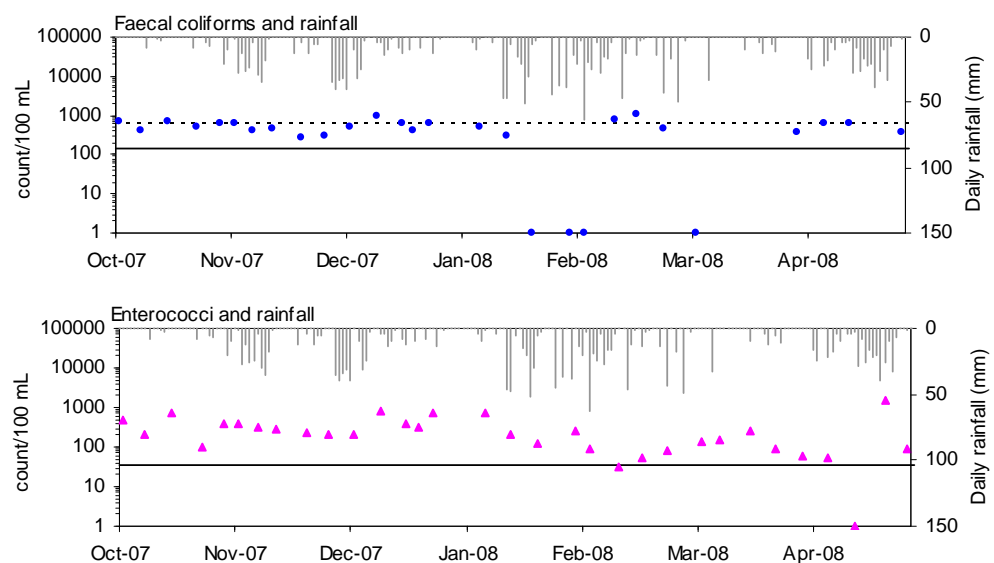
	OCT '07	NOV '07	DEC '07	JAN '08	FEB '08	MAR '08	APR '08
<b>FC</b>	FAIL	FAIL	FAIL	PASS*	FAIL*	**	**
<b>ENT</b>	FAIL	FAIL	FAIL	FAIL*	FAIL*	FAIL*	FAIL

\* Only four samples were collected in this month. An additional data point was borrowed from an adjacent month to calculate compliance.

\*\* Insufficient samples to calculate compliance were collected in this month.

## Timeseries plots

High levels of bacteria were measured throughout the monitoring period, indicating that the site is affected by faecal contamination in dry and wet weather conditions.



See page 5 for key to graph