Chapter 1 Introduction

Overview of programs

Twelve councils along the New South Wales coast participated in recreational water quality monitoring and reporting programs during the 2008–2009 summer swimming season in partnership with the (then) Department of Environment and Climate Change's (DECC's) Beachwatch Program. The councils were:

- Ballina Shire Council
- Richmond Valley Council
- Clarence Valley Council
- Coffs Harbour City Council
- Kempsey Shire Council
- Port Stephens Council
- Newcastle City Council
- Wyong Shire Council
- Gosford City Council
- Shoalhaven City Council
- Eurobodalla Shire Council
- Bega Valley Shire Council.

Monitoring and reporting activities over the 2008–2009 summer swimming season were fully funded by each council. DECC provided assistance with quality assurance, data management and reporting.

Table 1 summarises the Beachwatch Partnership Programs (BPPs) undertaken during summer 2008–2009.

A total of 143 swimming locations were monitored, including ocean beaches, freshwater lakes, tidal pools, bays, rivers, lagoons, harbour sites and estuarine sites.

Owing to the resource-intensive nature of recreational water quality monitoring, some councils focused their resources on collection of samples during the busiest months of the summer season. This approach was supported by DECC.

Monitoring was conducted to assess compliance with swimming water quality guidelines. Where possible, an assessment of the impact of rainfall on recreational water quality was also made.

Table 1: Summary of Beachwatch Partnership Programs

Council	Period of monitoring	Number of sites				
		Ocean Beaches	Tidal/Rock Pools	Freshwater River/Creek /Lake	Estuarine River/ Lake/Lagoon	Total
Ballina	Nov 08 – Feb 09	2	0	3	4	9
Richmond Valley	Oct 08 – Apr 09	3	0	0	1	4
Clarence Valley	Oct 08 – Mar 09	0	0	6	4	10
Coffs Harbour	Nov 08 – Feb 09	6	1	0	0	7
Kempsey	Oct 08 – Apr 09	5	0	4	1	10
Port Stephens	Oct 08 – Apr 09	1	2	0	4	7
Newcastle	Oct 08 – Apr 09	0	4	0	0	4
Wyong	Oct 08 – Apr 09	17	0	3	9	29
Gosford	Oct 08 – Apr 09	10	5	0	7	22
Shoalhaven	Dec 08 – Feb 09	10	0	0	0	10
Eurobodalla	Oct 08 – Apr 09	10	1	0	0	11
Bega	Nov 08 – Feb 09	9	2	0	9	20
Total		**73**	**15**	**16**	**39**	**143**

Report structure

This **Introduction** provides background information on the BPP and its predecessor, the Beachwatch Partnership Pilot Program (BPPP), as well as the water quality indicators and guidelines used to assess beach water quality.

Chapter 2 presents the findings from water quality monitoring in the 12 regional council areas in New South Wales.

Chapter 3 describes the quality assurance (QA) program included in the Beachwatch Partnership Program to ensure that the data collected and presented are accurate and reliable. This includes QA of field sampling and microbiological analysis of beach water samples.

There are three appendixes to this report.

- **Appendix A** gives details of the indicators and guidelines used to assess recreational water quality.
- **Appendix B** provides an overview of the new NHMRC 2008 *Guidelines for Managing Risks in Recreational Waters*. These guidelines were adopted for use in May 2009 and will be used to report recreational water quality beginning summer 2009–2010.
- **Appendix C** lists further reading and information sources. It is intended to point the reader towards other information relating to both bacterial pollution of waterways used for recreation and the human health risks it poses.

Beachwatch Partnership Pilot Program

The BPPP ran between 2002 and 2004 and was funded as part of the New South Wales Government's $11.7-million Coastal Protection Package. The aim of the BPPP was to raise awareness of beach water quality issues, streamline testing along the New South Wales coast and increase community access to beach water quality information.

The three key elements of the BPPP were:

- development of a water quality monitoring and reporting protocol to help councils design and run programs
- funded pilot monitoring and reporting programs to test all aspects of the protocol
- development of a training program to ensure future recreational monitoring and reporting are undertaken in a scientifically rigorous and credible manner.

More information on the BPPP, including access to protocols and reports generated as part of the program, is available from www.environment.nsw.gov.au /beach/BWPilot.htm.

Beachwatch Partnership Program

Councils that participated in the BPPP identified a need for ongoing assistance with data management, community reporting and quality assurance. The Beachwatch Partnership Program (BPP) began in 2004 to provide this assistance to councils.

As part of the BPP:

- coastal councils are contacted before the beginning of each summer swimming season to discuss intended recreational monitoring and reporting programs
- a program review is undertaken by Beachwatch field officers during the summer season; it includes quality assurance of sampling techniques and advice on data management procedures
- the laboratories used by councils are included in a quality assurance program coordinated by Beachwatch
- data are collated and uploaded to the Beachwatch database
- advice on reporting results to the community is provided.

Data availability

The annual BPP State of the Beaches reports are available on the Beachwatch website at www.environment.nsw.gov.au/beach/BPP.htm. Water quality data can also be downloaded from the Beachwatch website www.environment.nsw.gov.au/beachsoeapp/.

Water quality analyses

Two types of indicator bacteria, faecal coliforms and enterococci, were used to

assess recreational water quality in the summer 2008–2009 programs, as recommended by the NHMRC *Australian Guidelines for Recreational Use of Water* (NHMRC 1990). These bacteria indicate the possible presence of waterborne pathogens, organisms that pose significant risks to human health.

Faecal coliforms, also known as thermotolerant coliforms, are strongly associated with faecal waste and are therefore excellent indicators of recent faecal contamination. Faecal coliforms are not reliable indicators of aged faecal contamination owing to their short survival times in marine waters.

Enterococci are a subgroup of faecal streptococci and, in contrast to faecal coliforms, survive for longer periods in seawater. Enterococci are thus good indicators of the presence of recent and aged faecal contamination.

Owing to resource constraints and in some cases laboratory limitations, eight councils chose to analyse samples for only one type of indicator bacteria. Gosford, Newcastle and Bega tested for faecal coliforms only. Clarence Valley, Coffs Harbour, Kempsey, Wyong and Eurobodalla tested for enterococci only.

Recreational water quality guidelines

Recreational water quality guidelines provide an indication of the probability of swimmers developing illnesses derived from the water, but the actual risk depends on many factors. These factors include, in particular, the bacterial indicator to pathogen ratio, which varies with time and is usually unknown.

The NHMRC Australian *Guidelines for Recreational Use of Water* (NHMRC 1990) were used to assess recreational water quality in the BPP.

Under the NHMRC (1990) guidelines, waters are considered to be unsuitable for swimming if, for five samples taken at regular intervals over a month:

- the median faecal coliform density exceeds 150 cfu/100 mL, or
- the second-highest faecal coliform density is equal to or greater than 600 cfu/100 mL, or
- the geometric mean enterococci density exceeds 33 cfu/100 mL.

From summer 2009–2010, recreational water quality will be assessed under the new NHMRC Guidelines for Managing Risks in Recreational Waters (NHMRC 2008). These guidelines are largely based on the World Health Organisation guidelines, published in October 2003 (WHO 2003). The assessment of microbial contamination in recreational waters under the new guidelines is outlined in Appendix B.

Interpretation of results

The findings in this report focus on bacterial results, which are indicators of the possible presence of sewage contamination. Data are interpreted in terms of guideline compliance and response to rainfall.

Guideline compliance assessment

Compliance with NHMRC (1990) swimming water quality guidelines is reported as a pass or a fail for each month. Guideline compliance assessments are useful for comparing sites and looking at temporal trends:

- Beaches that consistently pass the guidelines generally have excellent water quality and are affected by few sources of sewage pollution.
- Beaches that pass the guidelines in most months generally have good water quality but are affected by intermittent sources of pollution, generally related to rainfall.
- Beaches that consistently fail the guidelines have poor water quality and are generally subject to ongoing sewage pollution, for example from sewage treatment plant discharges or leachate from septic tanks, with contamination occurring in both wet and dry weather conditions.

Beach water quality can vary significantly over short periods of time owing to the impact of intermittent sources of pollution, such as those related to wet weather. These

impacts may not be apparent from the guideline compliance results for several years, depending on the prevailing weather conditions. Guideline compliance results therefore tell only part of the story.

Response to rainfall

In order to assess the impact of wet weather-related pollution sources on swimming water quality, bacterial results were compared with daily rainfall measurements through time. Where elevated bacterial results were recorded during or immediately after rainfall, this is noted for each site.

Rainfall data were obtained from the Bureau of Meteorology's gauges in all council areas.

Explanation of maps

Maps have been provided in this report to indicate the locations of beaches, sampling sites, surf clubs, roads, stormwater drains and coastal sewage treatment plants.

The maps also include land-use classifications such as parks and reserves and built-up areas, giving an indication of developed and undeveloped areas in each council region.

Explanation of compliance graphs

Compliance graphs have been generated for each council area to summarise compliance with NHMRC (1990) swimming water quality guidelines at each site. Compliance data are presented as the number of months complying with the guidelines out of the total number of months in which sufficient samples were collected to calculate compliance.

A site is considered to pass only if levels of both faecal coliforms and enterococci meet the guidelines. If either bacterial indicator exceeds the guideline limits, then the site has failed for that month.

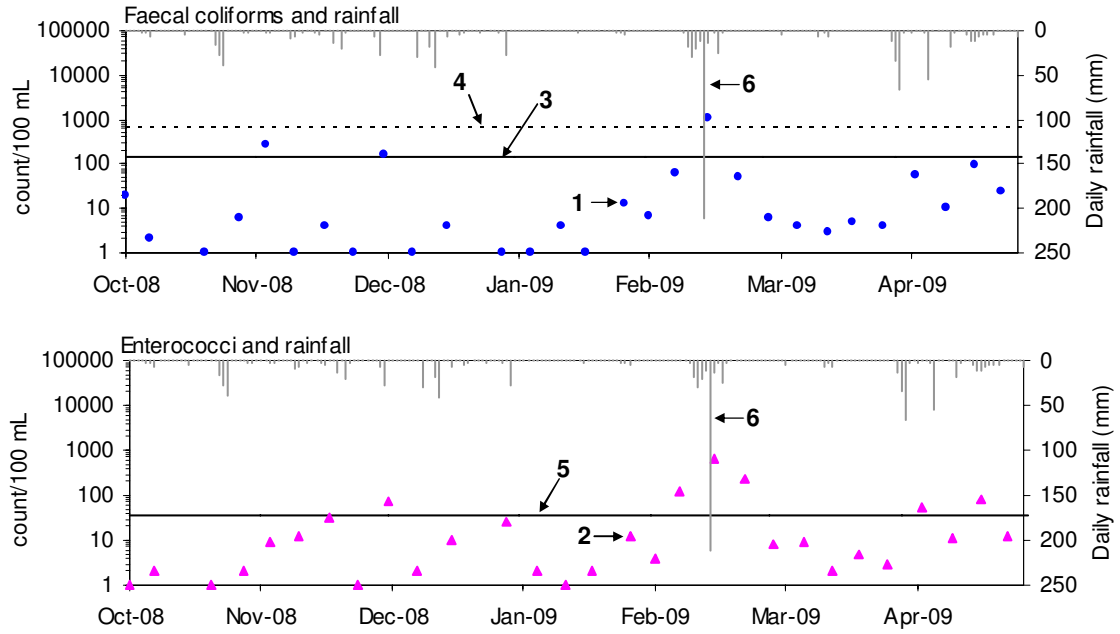
Compliance results for each month for both faecal coliforms and enterococci are presented on the individual beach pages for each site.

Explanation of timeseries graphs

Timeseries graphs have been generated for each site; they show rainfall and water quality results through time over the 2008–2009 summer swimming season (Figure 1).

The NHMRC (1990) guideline limits for faecal coliforms (for the median and second-highest result) and enterococci (for the geometric mean) have been included on the graphs for reference. These guidelines do not relate to individual samples, but they provide useful reference values for assessing data.

Figure 1: Example of timeseries plot



Numbers have been added in bold type to explain the graph. The numbers represent:

1 Individual sample results for faecal coliforms.

2 Individual sample results for enterococci.

3 The recreational water quality assessment criteria that should not be exceeded by the median faecal coliform level from five samples collected within one month.

4 The recreational water quality assessment criteria that should not be exceeded by the second-highest faecal coliform level from five samples collected within one month.

5 The recreational water quality assessment criteria that should not be exceeded by the geometric mean enterococci level from five samples collected within one month.

6 Daily rainfall (mm).