

SOUTH AFRICAN WATER QUALITY GUIDELINES FOR COASTAL MARINE WATERS

Volume 2:

Guidelines for Recreational Use

Summary



environmental affairs

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1. INTRODUCTION

The South African Water Quality Guidelines for Coastal Marine Waters (Edition 1) was first published by the Department of Water Affairs and Forestry (DWAF) in 1995. In order to ensure that coastal water quality is effectively managed in the interest of the public. The Department of Environmental Affairs has taken the initiative to review and update these Guidelines pertaining to recreational use. This document contains a summary of the revised guidelines for coastal waters in South Africa. The Guidelines are aimed at assisting local authorities and stakeholders to better assess and manage the suitability of recreational waters.



In preparing the revised Guideline, the approach followed was to conduct an international review of similar guidelines from a selection of countries and organizations that are considered to be the global leaders in water quality. Organisations and countries include the World Health Organization, the Blue Flag, USA, Australia, and New Zealand.

Based on the outcome of the international assessment, target values for the selected water quality indicators, as well as implementation practices were identified and adopted for the South African situation. It is envisaged that in the long term, the target values will be refined as new scientific information on local conditions becomes available.

2. RECREATIONAL USE

Recreational use is made of South Africa's coastal marine waters along the full 3 000 km of coastline. Thousands of tourists visit the popular bathing beaches, especially during the peak holiday seasons. Along the west and south coast of South Africa this usually occurs during the warmer summer months, while it is practised all year round along the subtropical east coast regions.

Recreational use of coastal marine waters varies from bathing to mere enjoyment of its scenic aspects and can be divided into two major categories:



- Contact recreation¹
- Non-contact recreation.



i. Contact recreation

This category is characterised by the fact that body contact, ingestion of water and inhalation of aerosols are likely to occur throughout the activity. Activities where such contact will be frequent include swimming, diving (scuba and snorkelling), water skiing, surfing, paddle skiing and wind surfing. Contact recreation can also include activities like boating, sailing, canoeing, wading, angling and parasailing, where the user may come into contact

with the water, inhale aerosols or swallow water, albeit to a lesser extent than other activities listed above.

Contact recreation occurs all along the entire South African coastline, particularly at coastal cities and holiday towns. More tolerable water temperature is the main reason for the greater density of users along the south and east coast compared to the west coast.

The age group that participates in these activities spans a wide range, from infants to elderly people. The health status of these individuals may also vary. For example individuals may be able to swim despite bad health, while individuals taking part in the more strenuous sports such as wind surfing and skiing, are usually fit and healthy.

ii. Non-contact recreation



Non-contact recreation involves all recreational activities taking place in the vicinity of coastal marine waters, but which do not involve direct contact with the water, such as sightseeing, picnicking, walking, horse riding, hiking, camping, etc. These activities occur all along the South African coastline, particularly at coastal cities and holiday towns, including all coastal areas where coastal development and tourism are important activities.

¹ Previously (DWAF, 1995) a distinction has been made between direct contact recreation (swimming, diving (scuba and snorkelling), water skiing, surfing, paddle skiing and wind surfing) and secondary contact recreation (e.g. boating, sailing, canoeing, wading, angling and parasailing) based on the extent of contact with water. Practically this distinction was not really applied, it is therefore proposed that this distinction be revised

Typical problems associated with non-contact recreation are largely related to unpleasant aesthetics, e.g. bad odours, discolouration of water and presence of objectionable matter.

3. OBJECTIVE OF THE REVISED GUIDELINES

The primary objectives of the revised Guidelines are to ensure that South African recreational waters are kept fit to protect the public health.

4. RECOMMENDED TARGET

In order to ensure that coastal waters are suitable for recreational use, a range of recommended targets for specific properties of coastal waters or indicators have been identified. In the South African situation the Department of Environmental Affairs has selected the following indicators for the assessment of coastal water quality:

- Objectionable matter
- Physico-chemical
- Micro-biological

The South African Guidelines have recommended that for the above indicators, the following targets should be met:

4.1. *Objectionable matter*

INDICATOR	RECOMMENDED TARGET
Matter	<p><i>Water should not contain litter, floating particulate matter, debris, oil, grease, wax, scum, foam or any similar floating materials and residues from land-based sources in concentrations that may cause nuisance.</i></p> <p><i>Water should not contain materials from non-natural land-based sources which will settle to form objectionable deposits.</i></p> <p><i>Water should not contain submerged objects and other subsurface hazards which arise from non-natural origins and which would be a danger, cause nuisance or interfere with any designated/recognized use.</i></p> <p><i>Water should not contain substances producing objectionable colour, odour, taste, or turbidity.</i></p>

4.2. Physico-chemical indicators

INDICATOR	RECOMMENDED TARGET
<i>Ph</i>	<i>pH of water should be within the range 5.0–9.0, assuming that the buffering capacity of the water is low near the extremes of the pH limits.</i>
<i>Temperature</i>	<i>For prolonged exposure, temperatures should be in the range 15–35°C</i>

4.3. Microbiological indicators

This indicator is used to identify the risk to public health from possible disease-causing bacteria, viruses and protozoa in the coastal waters. In the South African Guidelines the microbiological indicators identified as most suitable for assessment of water quality are Enterococci and E.Coli. The following table classifies water quality into various categories using the concentration of these indicators in coastal waters and its corresponding percentage of risk to gastrointestinal illness. The Sufficient or Fair category is considered the minimum acceptable risk for South Africa.

CATEGORY	ESTIMATED RISK PER EXPOSURE	ENTEROCOCCI (Count per 100ml)	<i>E. coli</i> (Count per 100ml)
<i>Excellent</i>	<i>2.9% gastrointestinal (GI) illness risk</i>	<i>≤ 100 (95 percentile)</i>	<i>≤ 250 (95 percentile)</i>
<i>Good</i>	<i>5% GI illness risk</i>	<i>≤ 200 (95percentile)</i>	<i>≤ 500 (95 percentile)</i>
<i>Sufficient or Fair (minimum requirement)</i>	<i>8.5% GI illness risk</i>	<i>≤ 185 (90 percentile)</i>	<i>≤ 500 (90 percentile)</i>
<i>Poor (unacceptable)</i>	<i>>8.5% GI illness risk</i>	<i>> 185 (90 percentile)</i>	<i>> 500 (90 percentile)</i>

In tropical areas an additional microbiological indicator - *Clostridium perfringens*, a spore-forming obligate anaerobe may need to be included. The target value recommended for *C. perfringens* is:

INDICATOR	RECOMMENDED TARGET
<i>C. perfringens</i>	Geometric mean ≤ 5 counts per 100 ml

With reference to **toxic substances** (chemical compounds), it is proposed that South Africa's drinking water quality guidelines (e.g. SANS, 2005) be consulted to make preliminary risk assessments in areas where these substances are expected to be present at levels that pose a risk to human health as long as care is taken in the application. Drinking water quality targets relate, in most cases, to lifetime exposure following consumption of 2 litres of drinking water per day. For recreational water contact, an intake of 200 ml per day - 100 ml per recreational session with two sessions per day - may often be reasonably assumed. It should be noted that this approach may, however, not be appropriate to substances of which the effects are related to direct contact with water, e.g. skin irritations.

The increasing presence of chlorine, used by local authorities to treat/disinfect wastewater effluent or wastewater spills, has been highlighted as a concern. It is therefore recommended that managers responsible for monitoring of beach water quality, specifically observe for the presence of chlorine contamination (e.g. as an item on the monitoring log sheet). Where contamination is suspected, appropriate monitoring must be carried out by reputable scientists to establish potential health risks.

With regard to toxins from **harmful algal blooms**, no specific target values are prescribed, but when the presence of such harmful algal proliferation occurs, appropriate monitoring must be carried out by reputable scientists to establish potential health risks.

5. MONITORING PROTOCOLS

The previous version of the South African Guidelines did not provide local authorities and other stakeholders with recommendations on the most suitable manner in which to conduct monitoring of coastal waters. This was identified as a major weakness as there was no clear national consensus on monitoring procedures. The new Guideline addresses this gap by prescribing a set procedure for monitoring.

Monitoring protocols described here primarily focuses on *microbiological data* as part of long-term monitoring programmes to assess water quality of recreational waters in the coastal marine environment (observations on *aesthetic quality* of recreational waters are recorded during microbiological sampling). With regard to *physico-chemical* parameters and *toxic substances*, regular monitoring is not required. However, where toxic contamination occurs or is suspected, and a health risk is identified or presumed, appropriate monitoring must be carried out by reputable scientists and/or analytical laboratories to enable timely identification of health risks. Adequate management measures, including information to the public, must be taken immediately to prevent exposure.

To ensure that all related information is captured during sampling (e.g. information necessary for interpretation of microbiological data, recording of aesthetic conditions and potential presence of toxic substances) a sampling log sheet should be completed at each sampling point on every sampling occasion.

Microbiological samples should be collected during all periods when coastal waters are used for contact recreation. A systematic random-sampling regime is recommended. Samples should be collected as a minimum, every two weeks during daylight, regardless of the weather although there may be exceptions if conditions present a health and safety hazard, in which case samples should be collected as soon after the programmed time as possible. In support of such a random-sampling regime, a monitoring calendar should be drawn up for each year. The specific sampling location at a recreation area should be selected on the basis of information gathered during the sanitary inspection. The location/s should be representative of the water quality throughout the whole contact recreation area. The sampling depth should be 15 to 30 cm below the surface where the depth of the water is approximately 0.5 metres. Samples should be collected on the seaward side of a recently broken wave, taking care not to collect backwashing water.

Samples for the analyses of both intestinal enterococci and *E. coli* must be collected. In sub-tropical areas, it may also be necessary to collect samples for the analysis of *C. perfringens* to assist with interpretation of microbiological indicator results. Seawater samples collected from *E. coli* analyses must be analysed on the same day of sampling – preferably within 6-8 hours after sampling - due to the rapid die-off of this microbiological parameter in water with a high salt content. Seawater samples collected for intestinal enterococci and *C. perfringens* analyses must be analysed within 24 hours of sampling. A reputable (preferably an ISO 17025 accredited) laboratory must undertake microbiological analyses, using recognised analytical methods prescribed by the South African Bureau of Standards (SABS) or any equivalent methods provided in *Standard Methods for the Examination of Water and Wastewater*. If a laboratory is not accredited it should participate in a national inter-laboratory proficiency scheme (e.g. National Laboratory)

Association). Samples from any area should be tested by the same method and preferably the same laboratory in order to provide reliable long-term data sets. A list of available methods is provided in the Table 5.1 of the main document. For South Africa, the non-parametric method (i.e. using data ranking) is used for the calculation of percentile values for microbiological parameters. The Hazen method is the preferred procedure although the Excel spreadsheet method can also be applied where users do not have access to a suitable Hazen template.

6. IMPLEMENTATION FRAMEWORK

Often enough water quality monitoring is carried out in an *ad hoc* and unsystematic manner. Therefore, in addition to the development of coastal water quality targets, the department has developed further guidance by developing and prescribing an implementation framework to ensure that coastal water quality is effectively managed.

Based on international best practice the implementation framework for assessing the quality of recreational waters should ideally comprise:

- A classification system for recreational waters; and
- An operational management system (for day-to-day management).

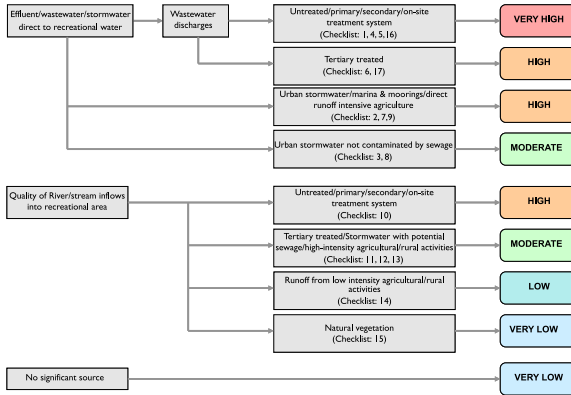
6.1. Classification System for Recreational Waters:

The classification system for recreational waters is primarily based on a combination of:

- a) A sanitary inspection; and
- b) A microbiological quality assessment (based on microbiological indicator counts).

Classification is achieved by first conducting a sanitary inspection. The Guidelines provide more information regarding how to conduct a sanitary inspection and prescribes a checklist (Appendix D) to assist.

Results from the sanitary inspection are rated as follows:



The microbiological assessment is based on an evaluation of microbiological indicator data, collected over a fixed period of time, typically five years. Microbiological quality is graded into four possible categories:

GRADE	INTESTINAL ENTEROCOCCI (counts per 100 ml)	<i>E. coli</i> (counts per 100 ml)
Excellent	≤ 100 (95 percentile)	≤ 250 (95 percentile)
Good	≤ 200 (95 percentile)	≤ 500 (95 percentile)
Sufficient/Fair	≤ 185 (90 percentile)	≤ 500 (90 percentile)
Poor	> 185 (90 percentile)	> 500 (90 percentile)

The Classification of recreational waters is based on a combination of the Sanitary Inspection Category and Microbiological Quality Assessment Category, as indicated below

		MICROBIOLOGICAL QUALITY ASSESSMENT CATEGORY				
		Excellent	Good	Sufficient	Poor	Exceptional circumstances
SANITARY INSPECTION CATEGORY	Very Low	Very good	Very good	Follow-up ¹	Follow-up ¹	
	Low	Very good	Good	Fair	Follow-up ¹	
	Moderate	Good ¹	Good	Fair	Poor	
	High	Good ²	Fair ²	Poor	Very Poor	
	Very High	Follow-up ²	Fair ²	Poor	Very Poor	
	Exceptional circumstances	Action required				

1 Implies non-sewage sources of faecal indicators (e.g. livestock), and this should be verified.

2 Indicates possible discontinuous/sporadic contamination (often driven by events such as rainfall). This is most commonly associated with Combined Sewer Overflow presence. These results should be investigated further and initial follow-up should include verification of the sanitary inspection category and ensuring samples recorded include “event” periods. Confirm analytical results. Review possible analytical errors.

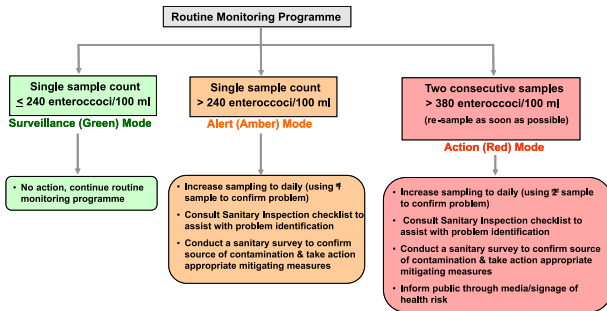
3 Exceptional circumstances relate to known periods of higher risk, such as during an outbreak with a pathogen that may be waterborne, sewer rupture in the recreational water catchment, etc. Under such circumstances, the classification matrix may not fairly represent risk/safety and a grading would not apply until the episode has abated.

The sanitary inspection should be conducted at least annually. However, when there is reason to believe that the sanitary inspection category may have changed markedly within a year, the inspection should be repeated and the revised category should be applied in the classification process.

The microbiological quality assessment should be based on microbiological data over a running 12 month period, considered most appropriate for the South African situation where the microbiological quality of recreational waters can change markedly over short period. This approach allows for a more real-time classification process (e.g. monthly rather than yearly), recognising such variability.

6.2. Proposed Operational Management System:

A proposed operational management process for South Africa is illustrated below:



It is recognised that, in the short-term, capacity constraints may prevent local authorities from effectively establishing such operational management systems at all recreational beaches. However, these systems are crucial for effective management of recreational waters and local authorities should be encouraged to incorporate the implementation thereof in their medium- to long-term strategic plans.

During the interim period (2-3 years during which the interim guidelines will be pilot tested) local authorities are encouraged to implement the proposed operational management system at selected recreational areas in order to test its applicability to the South African situation. In particular, the single value targets need to be confirmed.



The following additional information is provided in the Guideline and is available in request.

APPENDIX A	HISTORICAL OVERVIEW OF SOUTH AFRICAN GUIDELINE
APPENDIX B	INTERNATIONAL REVIEW OF WATER QUALITY GUIDELINE FOR RECREATIONAL USE OF COASTAL MARINE WATERS
APPENDIX C	BACKGROUND INFORMATION ON WATER QUALITY
APPENDIX D	PROPOSED SANITARY INSPECTION CHECKLIST
APPENDIX E	EXAMPLE: SAMPLING LOG SHEET

Department of Environmental Affairs
Directorate: Coastal Pollution Management
P.O. Box 52126
Victoria & Alfred Waterfront
8002
Tel: +27 21 819 2452
Fax: + 27 21 819 2445
Email: marinepollution@environment.gov.za
www.environment.gov.za