

1 Introduction

This document updates the Australian water quality guidelines for fresh and marine waters released in 1992 (ANZECC 1992).

Specifically, this document:

- outlines the important principles, objectives and philosophical basis underpinning the development and application of the guidelines;
- outlines the management framework recommended for applying the water quality guidelines to the natural and semi-natural marine and fresh water resources in Australia and New Zealand;
- provides a summary of the water quality guidelines proposed to protect and manage the environmental values supported by the water resources;
- provides advice on designing and implementing water quality monitoring and assessment programs;
- has been revised using data, relevant literature, and other information available to at least 1996.

A note on the structure and other features of the Guidelines

Readers should note the following features of the Guidelines:

- Given the broad scope of the Guidelines, it has been necessary to load much of the detailed rationale and reference information, including software, onto a CD-ROM, which is in the pocket of the ring-bound folder.
- While many users will be satisfied with use of the default guideline values provided in this volume, others will want to tailor guidelines for local conditions, or may simply seek further reading. To assist users to refine the guidelines in this way or to acquire further information, cross-reference to the support information referred to in point 1 above is provided. These cross-references are indicated in the text by way of superscript letters that link the relevant passage to the corresponding italicised notes in the left hand margin of the page.
- The loose-leaf format of the Guidelines is a feature that will enable discrete subject areas to be revised in future independently of other sections. To assist this, the page numbering is independent for each of the short chapters (e.g. 2–1 to 2–xx) and to the first subsection level of the longer, more complex chapters, i.e. chapters 3, 4 and 7 (this volume), 8 (Volume 2) and 9 (Volume 3) (e.g. pages 3.1–1 to 3.1–xx, 3.2–1 to 3.2–xx etc).
- A glossary of the main terms is provided at the end of this volume to assist readers further in understanding the main issues. Users are encouraged to check the glossary for all key terms because the terminology used by the various jurisdictions throughout Australia and New Zealand is not always consistent with the terminology used in these Guidelines.

These Guidelines should not be used as mandatory standards because there is significant uncertainty associated with the derivation and application of water quality guidelines. For example, data on biological effects are not available for all

^a
Environmental values are defined in Section 2.1.3

local species; there is uncertainty over the behaviour of contaminants in the field; there is uncertainty in water quality measurements. The user should be aware of this uncertainty when determining if an environmental value has been supported or not. However, the Guidelines should provide a framework for recognising and protecting water quality for the full range of existing environmental values.^a The Guidelines also provide risk-based decision frameworks wherever possible, simply to help the user refine guideline trigger values for application at local and/or regional scales.

Box 1.1 Water quality guidelines may be used to trigger action

The guidelines provided in this document are designed to help users assess whether the water quality of a water resource is good enough to allow it to be used for humans, food production or aquatic ecosystems (these uses are termed *environmental values*). If the water quality does not meet the water quality guidelines, the waters may not be safe for those environmental values and management action could be triggered to either more accurately determine whether the water is safe for that use or to remedy the problem.

For some environmental values the guideline number provided may be an adequate guide to quality (e.g. for recreation or drinking). For other specific environmental values the guideline can be just a starting point to trigger an investigation to develop more appropriate guidelines based on the type of water resource and inherent differences in water quality across regions. For water whose environmental value is aquatic ecosystem protection, for example, the investigation should aim to develop and adapt these guidelines to suit the local area or region. This document incorporates protocols and quite detailed advice to assist users in tailoring the water quality guidelines to local conditions. Invariably, the process of refining these guidelines — ‘trigger values’ — to local conditions will result in numbers for toxicants at least, that are less conservative and hence less constraining on surrounding activities.

Box 1.2 Application of the guidelines to groundwater

Groundwater is an essential water resource for many aquatic ecosystems, and for substantial periods it can be the sole source of water to some rivers, streams and wetlands. Groundwater is also very important for primary and secondary industry as well as for domestic drinking water, particularly in low rainfall areas with significant underground aquifers.

Generally these Guidelines should apply to the quality both of surface water and of groundwater since the environmental values which they protect relate to above-ground uses (e.g. irrigation, drinking water, farm animal or fish production and maintenance of aquatic ecosystems). Hence groundwater should be managed in such a way that when it comes to the surface, whether from natural seepages or from bores, it will not cause the established water quality objectives for these waters to be exceeded, nor compromise their designated environmental values. An important exception is for the protection of underground aquatic ecosystems and their novel fauna. Little is known of the lifecycles and environmental requirements of these quite recently-discovered communities, and given their high conservation value, the groundwater upon which they depend should be given the highest level of protection.

As a cautionary note the reader should be aware that different conditions and processes operate in groundwater compared with surface waters and these can affect the fate and transport of many organic chemicals. This may have implications for the application of guidelines and management of groundwater quality.

The present Water Quality Guidelines have been prepared under the auspices of Australia's National Water Quality Management Strategy (NWQMS) and relate to New Zealand's National Agenda for Sustainable Water Management (NASWM). More information on the NWQMS is provided below and in Appendix 2. Guidelines for the management of effluent discharges (including stormwater) and other activities affecting water resources are covered in other NWQMS documents (Appendix 2) and in the documents released by the NZ Ministry for the Environment listed in Appendix 3. All of these guidelines are complementary, and users are encouraged to take a holistic approach to water resource management by integrating these documents with other considerations such as catchment management and habitat related issues.

A 24-page introductory brochure that summarises the main features of the guidelines is also available for users who are seeking a general overview.

1.1 Background

The current Guidelines, including this working volume, arise from a revision of the NWQMS Guidelines published in 1992 (ANZECC 1992). The revision was necessary to:

- incorporate current scientific, national and international information in a clear and understandable format;
- ensure that the Guidelines complement major policy initiatives and directions undertaken at the state and federal levels in the areas of ecologically sustainable development and water resource management;
- promote a more holistic approach to aquatic ecosystem management;
- incorporate more detailed guidance on how to refine national or regional guidelines for site-specific application.

Important input to the review process from Australia and New Zealand has included: public submissions on the 1992 Guidelines and on an earlier draft of the revised document; the most recent local and overseas scientific and resource management documents and information; relevant overseas water quality guideline documents and government submissions.

In keeping with the underlying philosophy of the 1992 Guidelines, the chapters in this document describe how to apply state-of-the-art practices of water resource management and assessment, for the protection of the environmental values. The key changes in direction taken in revising the water quality guidelines are summarised below.

Management strategy

- The management strategy adopted in the 1992 guidelines has been refined so that it provides a greater focus on local environmental conditions, which should allow the water quality guidelines to be tailored to specific sites or regions.

Aquatic ecosystems

- Methods for deriving the physical and chemical water quality guidelines for ecosystem management (now termed 'guideline trigger values') have also been

updated in the light of an increased understanding of ecosystems, and improving technologies.

- There is greater focus on issue-based management of water quality rather than on the management of individual parameters. In practice, this means integrating monitoring programs so that managers measure biological parameters and related physical and chemical parameters, in both water and sediment. Therefore guidelines have been developed for these other indicator types (e.g. biological assessment, sediment quality and environmental flows).

Primary industries

- The Guidelines have amalgamated agriculture, aquaculture and human consumption of aquatic foods into one environmental value called 'Primary Industries'.

Recreation and aesthetics

- At the time of publication of these Guidelines, the material for Australian users on *Guidelines for Recreational Water Quality and Aesthetics* was still under review. Until these Guidelines are revised and endorsed, users should apply the guidelines from the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 1992). In New Zealand, water managers should refer to the Ministry for the Environment publication *Recreational Water Quality Guidelines* (New Zealand Ministry for the Environment 1999).

Drinking water

- The Guidelines refer to the Australian NHMRC and ARMCANZ (1996) *Australian Drinking Water Guidelines* and the New Zealand Ministry of Health (1995) *Drinking-Water Standards for New Zealand*, to avoid duplication and confusion.

Industrial water

- After extensive consultation with representative industrial groups, the current Guidelines provide no specific guidance for industrial water use, because industrial water requirements are so varied (both within and between industries) and sources of water for industry have other coincidental environmental values that tend to drive management of the resource. Industrial water use continues to be a recognised environmental value that has high economic benefit to the community. It must be given adequate consideration during the planning and management of water resources.

Cultural issues

- The current Guidelines recognise that water resources have important cultural and spiritual values, particularly for indigenous peoples. No specific guidance for protection of these values is provided, but consideration must be given to cultural issues in the planning and management of water resources, and as required by existing legislation, regulations and guidelines.

Monitoring and assessment

- The Guidelines discuss the essential elements of water quality monitoring and assessment programs, but with extensive reference to the recent NWQMS Monitoring and Reporting Guidelines (ANZECC & ARMCANZ 2000).

1.2 Guiding principles

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* are primarily based on the philosophy of ecologically sustainable development (ESD). The Australian *National Strategy for Ecologically Sustainable Development* (ESD Steering Committee 1992) defined ESD as:

[development] using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future can be increased. Put more simply, ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems to the benefit of future generations.

The need to comply with ESD principles is being included in statutes throughout Australia, with the commitment to continuous environmental improvement through comprehensive and integrated public policy.

In New Zealand, the Purpose and Principles in the *Resource Management Act (1991)* (RMA) set out the philosophy and approach for water management. The purpose of the RMA is to promote sustainable management, which is broadly equivalent to the ESD philosophy.

The Guidelines are also based on the policies and principles of the Australian National Water Quality Management Strategy which are explained in ANZECC and ARMCANZ (1994). The principles include:

- ecologically sustainable development;
- an integrated approach to water quality management;
- community involvement in water resource management, including establishment of the environmental values and development of management plans;
- government endorsement of the water quality policy objectives.

Four further guiding principles have also been adopted:

- A coordinated and cooperative approach to water quality management is vital and involves all spheres of government, the community, local and indigenous groups and the private sector.
- The high variability and complexity inherent in natural water resources needs to be recognised and taken into account when evaluating water quality or developing management strategies.
- Water resources are special features of the environment and their quality and integrity should be conserved and managed according to the intent of the *Australian National Strategy for Ecologically Sustainable Development*, the *Wetlands Policy of the Commonwealth Government of Australia* and the *National Strategy for the Conservation of Australia's Biological Diversity*.
- Ongoing research into the inter-relationships between ecological processes, water quality and the biota, and the dissemination of these findings in a readily usable form, are essential for effective management of water resources.

1.3 Objectives

The primary objective of the Australian National Water Quality Management Strategy (NWQMS) (ANZECC & ARMCANZ 1994) is based on ecologically sustainable development of water resources. The main objective of the Guidelines for fresh and marine water quality is intended to support this overall objective:

to provide an authoritative guide for setting water quality objectives required to sustain current or likely future environmental values for natural and semi-natural water resources in Australia and New Zealand.

It is recognised that a nationally consistent approach to water quality management is underpinned by the development of high-status guidelines which can provide guidance when issues arise. The adoption of national guidelines provides a shared national objective while allowing flexibility of response to different circumstances at regional and local levels. Where appropriate, state and/or local jurisdictions can use their own legislative and regulatory tools to refine these national water quality guidelines either into their own regional guidelines or into specific water quality objectives.

The Guidelines are intended to provide government, industry, consultants and community groups with a sound set of tools that will enable the assessment and management of ambient water quality in a wide range of water resource types, and according to designated environmental values. They are the recommended limits to acceptable change in water quality that will continue to protect the associated environmental values. They are not mandatory and have no formal legal status (e.g. they are not National Environmental Standards as provided for in Section 43 of the *New Zealand Resource Management Act 1991*). They also do not signify threshold levels of pollution since there is no certainty that significant impacts will occur above these recommended limits, as might be required for prosecution in a court of law. Instead, the guidelines provide certainty that there will be no significant impact on water resource values if the guidelines are achieved.

The management framework, guidelines, protocols and strategies set out here complement other documents produced under the NWQMS umbrella (Appendix 2).