

Using the ANZECC Guidelines

and Water Quality Objectives in NSW

Steps in decision-making for a healthy waterway



The Australian and New Zealand Environment Conservation Council (ANZECC) published the revised *Australian and New Zealand guidelines for fresh and marine water quality* in 2000.

These guidelines, which are usually called the 'ANZECC guidelines' and are available on the internet at www.deh.gov.au/water/quality/nwqms, provide government and the community – especially regulators, industry, consultants, community groups and catchment and water managers – with a framework for conserving ambient water quality in our rivers, lakes, estuaries and marine waters.

The ANZECC guidelines document is a large one, containing detailed scientific information and instructions for a vast array of water-quality issues. However once the basic approach of the guidelines is understood, they become much easier to use. It is the aim of this booklet to explain the principles behind the ANZECC guidelines.

The guidelines form the central technical reference of the National Water Quality Management Strategy, which the federal and all state and territory governments have adopted for managing water quality.

This booklet is designed for technical practitioners applying the ANZECC guidelines in New South Wales.

1. The core concept: managing water quality for environmental values

'Environmental values' are those values or uses of water that the community believes are important for a healthy ecosystem – for public benefit, welfare, safety or health. These include, but are not limited to, protection of aquatic ecosystems, drinking water, primary and secondary recreation, visual amenity, and agricultural water for irrigation, livestock and growing aquatic foods.

It is important that Aboriginal cultural values are also taken into account to ensure that decisions that affect waterways protect these values and support intercultural understanding. The ANZECC guidelines recognise Aboriginal cultural values but do not provide specific criteria for management.

The ANZECC guidelines provide a framework for assessing water quality, based on whether the physical, chemical and biological characteristics of a waterway support these community environmental values. In effect, the guidelines help to define the water quality needed to protect these values.

The environmental values (and uses) of water apply to waterways such as natural rivers, creeks, lagoons, wetlands, lakes, groundwater, and estuarine and marine waters. The quality of artificial waterways such as reservoirs, where the waters are valued by the community for aquatic ecosystems or human uses, are also addressed by the guidelines, but enclosed and piped waters are excluded.

For each environmental value, the guidelines identify particular water quality characteristics or 'indicators' that are used to assess whether the condition of the water supports that value. The presence of faecal coliforms, for example, is used as an

indicator for recreational and drinking water quality, because this directly puts those uses at risk, but it is not an indicator for the protection of aquatic ecosystems.

The ANZECC guidelines are a powerful tool that allows ambient water quality management to be an important element in decision-making for environment protection, land-use planning and natural resource management.

2. NSW Water Quality Objectives

For each catchment in NSW, the state government has endorsed the community's environmental values for water, known as 'Water Quality Objectives' (WQOs). These were adopted following extensive consultation with the community in 1998. A similar process produced the Marine Water Quality Objectives for NSW oceanic waters, agreed to by the NSW Government in 2005.

Environmental values and uses protected by WQOs



Aquatic ecosystems



Aquatic foods (cook before eating)



Drinking water at point of supply



Homestead water supply



Irrigation water supply



Livestock water supply



Primary contact recreation



Secondary contact recreation



Visual amenity

The NSW WQOs are the environmental values and long-term goals for consideration when assessing and managing the likely impact of activities on waterways. **They are not intended to be applied directly as regulatory criteria, limits or conditions** but are one factor to be considered by industry, the community, planning authorities or regulators when making decisions affecting the future of a waterway.

The environmental values expressed as WQOs provide goals that help in the selection of the most appropriate management options. The guiding principles are that:

- where the environmental values are being achieved in a waterway, they should be protected, and
- where the environmental values are not being achieved in a waterway, all activities should work towards their achievement over time.

3. Protection levels

The ANZECC guidelines acknowledge that different levels of protection may be appropriate for different water bodies. The guidelines specify three levels of protection, from stringent to flexible, corresponding to whether the condition of the particular ecosystem is:

- of high conservation value
- slightly to moderately disturbed, or
- highly disturbed.

The policy in NSW is that the level of protection applied to most waterways is the one suggested for 'slightly to moderately disturbed' ecosystems. However, waterways that mainly flow through relatively undisturbed national parks, World Heritage areas or wetlands of outstanding ecological significance are designated as being of 'high conservation value'.

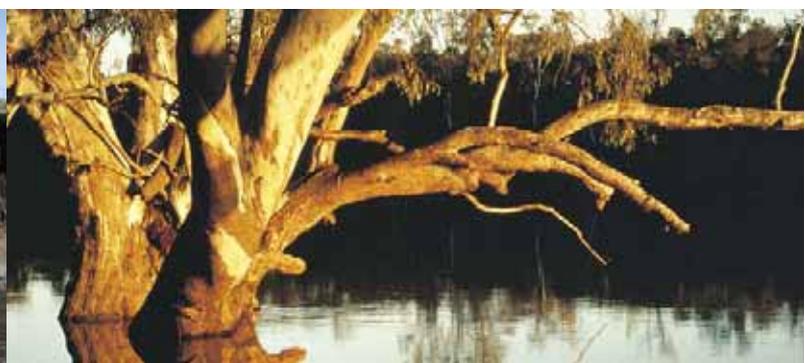
In a highly disturbed waterway, a reduced level of protection may be appropriate as a pragmatic short-term goal, with the aim of eventually restoring it to the status of a 'slightly to moderately disturbed'. However, it is not acceptable to allow poor environmental management or water pollution, simply because a waterway is currently degraded.

4. Waterway issues and level of risk

The ANZECC guidelines advocate an 'issues-based' approach to assessing ambient water quality, rather than the application of rigid numerical criteria with no appreciation of the context. This means that the guidelines focus on:

- the environmental values we are seeking to achieve or maintain
- the outcomes being sought
- the ecological and environmental processes that drive any water quality problem.

For each environmental value of water, the ANZECC guidelines outline common 'issues' (or pressures) that may be a problem and provide 'packaged' solutions on how to deal with them. These common issues in waterways include such problems as algal blooms and salinity.



Examples of 'guideline packages' for common issues



Algal blooms are a key issue in protecting the environmental value 'aquatic ecosystems'. While nutrient levels (especially phosphorus) are a factor driving algal blooms, other conditions may also play a part. These could include thermal stratification of the water body, flow characteristics and light (as determined by turbidity or water clarity). In addition, nutrient levels themselves may be influenced more by total load than concentration. The risk of blooms can also be affected by the condition of the river ecosystem and riparian vegetation. So a singular focus on nutrient concentrations in a waterway might not prevent the problem.



Salinity is a key issue in protecting the environmental value 'irrigation water supply'. However, the suitability of water of a given salinity for irrigation depends on many factors including the crop and soil types, pre-existing salinity, and type of irrigation. Broader catchment conditions, such as water-table levels and the cumulative impacts of irrigation on surface- and ground-water quality, may also play a part. While the numerical salinity criteria can be used as a preliminary guide, the ANZECC guidelines provide steps to effectively address other aspects of the issue.

Applying the risk-based approach

Complementing this focus on problem issues in water quality management, the ANZECC guidelines also advocate a 'risk-based' approach. This means that any investigation into the cause of a water-quality problem reflects the level of risk associated with it. A more comprehensive assessment is required where there is a higher likelihood or greater consequence of an issue or activity having a negative impact on environmental values.

The risk will vary depending on the nature and location of a development or activity, whether it is being carried out in a satisfactory manner, and the sensitivity of the local waterway. The judgement of the level of risk will need to be made on a case-by-case basis with most activities falling somewhere in between the following examples of very low and very high risk.

- A council decides that the risk to environmental values from a dwelling extension in an existing residential area is likely to be low, provided the applicant proposes reasonable stormwater management. As a result, the council decides that a comprehensive assessment of the development's impact is unnecessary.

- A proposal for a major mining or industrial facility could potentially impact significantly on environmental values, unless the facility is designed and constructed with a reasonable level of performance in water management. The assessment of this type of development should comprehensively consider the likely impact on indicators for environmental values and how practical measures can be taken to maintain or restore those values in the waterway.

5. Indicators

For each issue or pressure, the ANZECC guidelines have set key 'indicators' to measure whether the community's desired environmental values are at risk. As an example, for the environmental value 'protecting aquatic ecosystems', the guidelines provide biological, physical and chemical indicators. For a summary of the key indicators for the NSW WQOs, visit the 'WQOs explained' page of the Department of Environment and Conservation's website at www.environment.nsw.gov.au/ieo.

Choosing the right indicators is critical and should be based on the key issues in the local waterway and the main pollutants that might be generated by the activity(ies) under consideration. The ANZECC guidelines provide 'trigger values' for a wide range of indicators, but only those relevant to the issue being faced need to be considered. For example, an assessment might focus on those indicators relevant to stresses in the catchment, or on those that are known risks from the activity or development under investigation.

Examples of environmental values, issues and indicators from the ANZECC 2000 guidelines

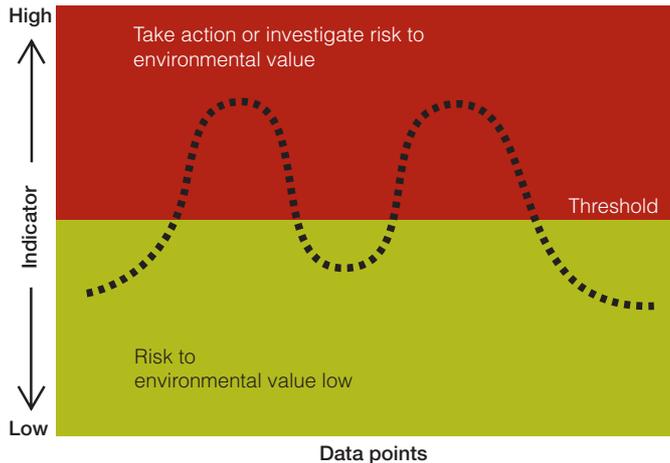
Environmental value	Issue	Indicators
 aquatic ecosystems	nuisance aquatic weeds (eutrophication) lack of dissolved oxygen	total phosphorus; total nitrogen; chlorophyll a dissolved oxygen
 primary contact recreation (swimming and other primary contact with water)	human health	faecal coliforms; enterococci; protozoans; algae and blue-green algae
 irrigation water supply	soil structure degradation and loss of plant vigour through salinity	salinity (measured as electrical conductivity)



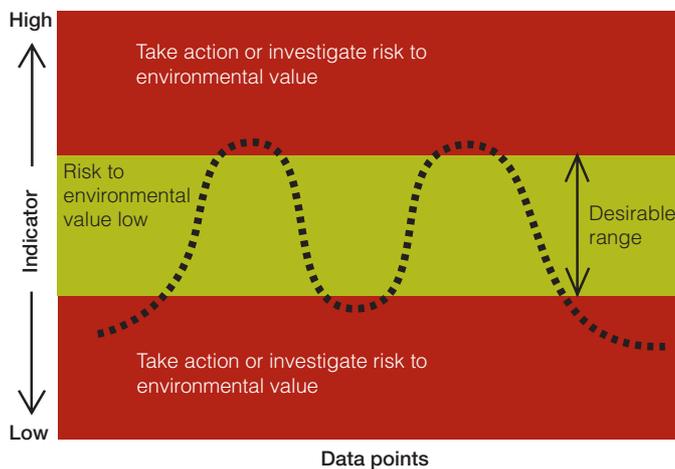
6. Trigger values

Trigger values are fundamental to using the ANZECC guidelines. The trigger values for different indicators of water quality may be given as **a threshold value** or as **a range of desirable values**.

Trigger values are conservative assessment levels, not 'pass/fail' compliance criteria. Local conditions vary naturally between waterways and it may be necessary to tailor trigger values to local conditions or 'local guideline levels'. The guidelines provide a process for refining the trigger values and these protocols should always be followed.



Trigger value with a threshold



Trigger value with a range

Where an indicator is **below the threshold value** or **within the desirable range** for its trigger value in a particular waterway, the risk to the protection of the environmental value is low.

Where an indicator is **higher than the threshold value** or **outside the desirable range** for its trigger value in a particular waterway, there may be a risk that the environmental value will not be protected. This may 'trigger' either:

- immediate action to address the likely causes of the value not being met, or
- further investigation to determine whether the trigger value is too conservative for local conditions, or the local conditions influence the ambient levels and toxicity of the contaminant of concern.

In practice, it will often be most cost effective (and precautionary) to take immediate action to address the causes of exceeding a trigger value, and maintain or restore the environmental values.

Alternatives to trigger values

In some cases, for more complex water issues, the water quality that supports the environmental values may be expressed as:

- a target load, such as for salinity or nutrients
- a descriptive statement, for example 'oil and petrochemicals should not be noticeable as a visible film on the water nor should they be detectable by odour', or
- an index of ecosystem health. For example, in some coastal lakes, the proportion of lake covered by a certain type of filamentous algae may indicate the chance of a blue-green algal bloom developing.

Major components of the ANZECC guidelines

The ANZECC guidelines consist of three volumes:

- Volume 1 (Chapters 1–7) contains the body of the guidelines with chapters on aquatic ecosystems, primary industries, recreational water, drinking water, and monitoring and assessment. It specifies the trigger values for the protection of aquatic ecosystems and the numerical criteria for protection of other environmental values such as drinking water and recreation.
- Volume 2 (Chapter 8) provides further guidance on protecting aquatic ecosystems, and describes water quality issues, modifying factors, decision trees, toxicant profiles and biological assessment.
- Volume 3 (Chapter 9) provides further guidance on water quality for primary industries.



Further information

Where to find the trigger values in the ANZECC guidelines

Values	Table number
 Aquatic ecosystems: physical and chemical stressors	3.3.1, 3.3.2 and 3.3.3
 Aquatic ecosystems: sediment quality guidelines	3.5.1
 Aquatic ecosystems: toxicants	3.4.1
    Drinking water quality	Not applicable*
 Irrigation water supply	All tables in section 4.2
 Livestock water supply	All tables in section 4.3
   Recreational water quality	5.2.2 [†] , 5.2.3 [†] , 5.2.4 [†]

* The ANZECC guidelines chapter on drinking water refers to the 1996 Australian drinking water quality guidelines, which were replaced in 2004 by guidelines available at www.nhmrc.gov.au/publications/_files/awgfull.pdf.

† The National Health and Medical Research Council released new guidelines for recreational water quality in 2005. These have not as yet been adopted for use in NSW.

In some cases the trigger values will not be appropriate and it will be necessary to:

- investigate further to tailor trigger values to local conditions (Table 3.4.2 for toxicants)
- refer to the process for more complex waterway issues, such as nuisance aquatic plant growth (pages 3.3-22 to 3.3-28), or
- refer to the tables relating aquatic ecosystem issues to biological indicators (Table 3.2.2) and physico-chemical indicators (Table 3.3.1).

References

Department of Environment and Conservation NSW 2004, *Investing in our catchments: water quality and its role in river health*, Sydney.

Department of Environment and Conservation NSW 2006, *Local planning for healthy waterways using the NSW Water Quality Objectives*, Sydney.

Information Web address

Water Quality Objectives www.environment.nsw.gov.au/ieo

ANZECC guidelines www.deh.gov.au/water/quality/nwqms

Australian drinking water quality guidelines www.nhmrc.gov.au/publications/_files/awgfull.pdf

Australian guidelines for managing risks in recreational water www.nhmrc.gov.au, and follow the links

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