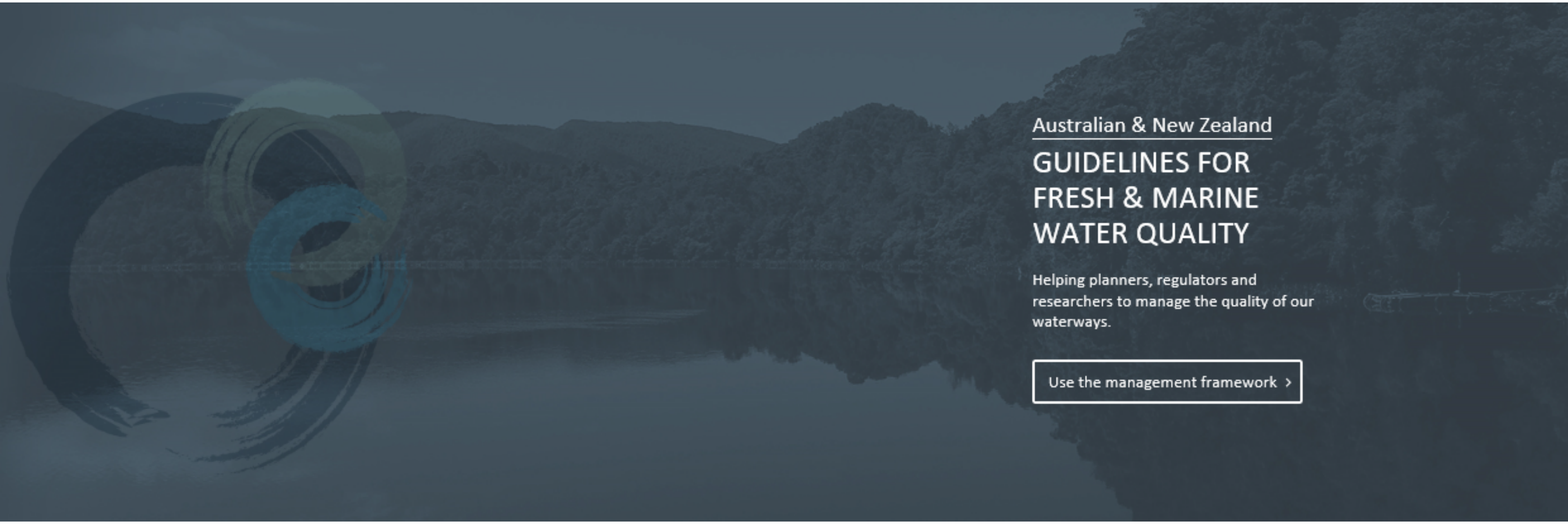


Key features and website preview

Dr Angela Slade, DAWR

Dr Rick van Dam, DoEE

10 April 2018

Contributors

Jurisdictions

Australian Government Initiative

New Zealand Government

NSW Government

State Government Victoria

Northern Territory Government

Government of Western Australia

Government of South Australia

Queensland Government

Tasmanian Government

ACT Government

Organisations

Agresearch, ARRIS, CSIRO, DAWR, ERISS, Golder Associates, Hydrobiology, NIWA, NZ MfE, Natural Resource Assessment, Qld EHP

Presentation outline

1. Introduction – brief history/description of the revision
2. Key features
   - Water quality management framework
   - Weight of evidence
   - Toxicant guideline values
   - Ecoregionalisation
3. Website tour

1. Introduction

History

- After release of ANZECC/ARMCANZ (2000), intention to have ongoing updates did not eventuate
- In 2009, after stakeholder review of NWQMS in 2008, COAG approved the revision of Doc 4 (& Doc 7),

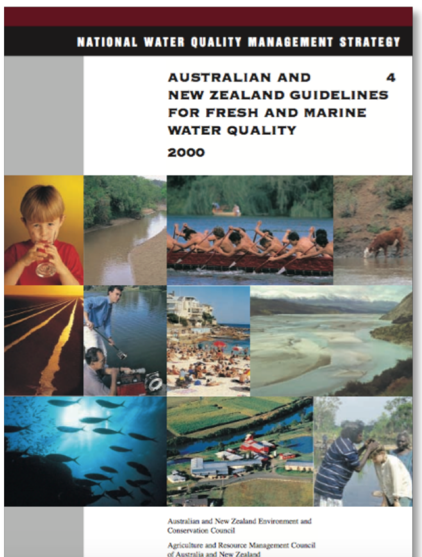
Stage	Timeline
Phase 1 Straightforward, high priority revisions Detailed scoping of major revisions	late 2009 – end 2012
Phase 2 Major revisions Website development	2013 to late 2017
Phase 3 Completion of revisions, ongoing updates/maintenance	mid 2018 (pending approval)

1. Introduction

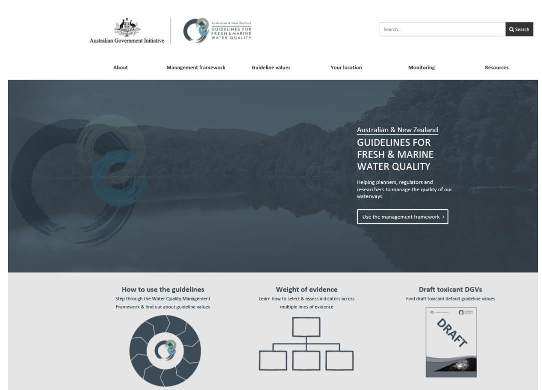
Content

ANZECC/ARMCANZ (2000) Guidelines for Fresh and Marine Water Quality

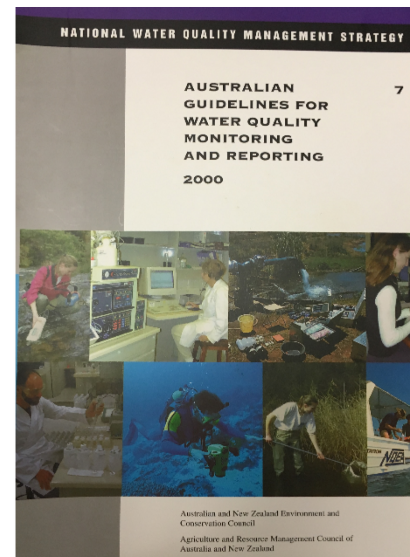
ANZECC/ARMCANZ (2000) Guidelines for Water Quality Monitoring and Reporting



Revised



Revised

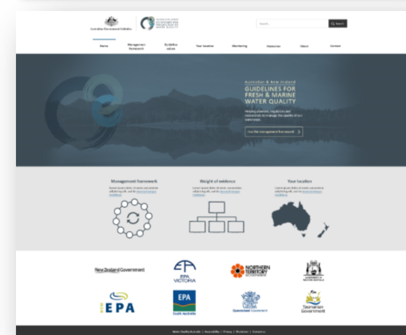


1. Introduction

The major revision projects

1. WQ management framework, WoE and conceptual modelling;
2. Monitoring, assessment and reporting update
3. Primary industries targeted update
4. Toxicant trigger value derivation method; sediment quality g'lines; ecogenomics
5. Ecoregionalisation for Australia (P-C stressors and biological assessment)
6. Ecoregionalisation for NZ (P-C stressors and biological assessment)
7. Priority toxicant guideline value derivation
8. Updating remaining key sections of 2000 Guidelines

9. WQGs website



2. Key features

Overview

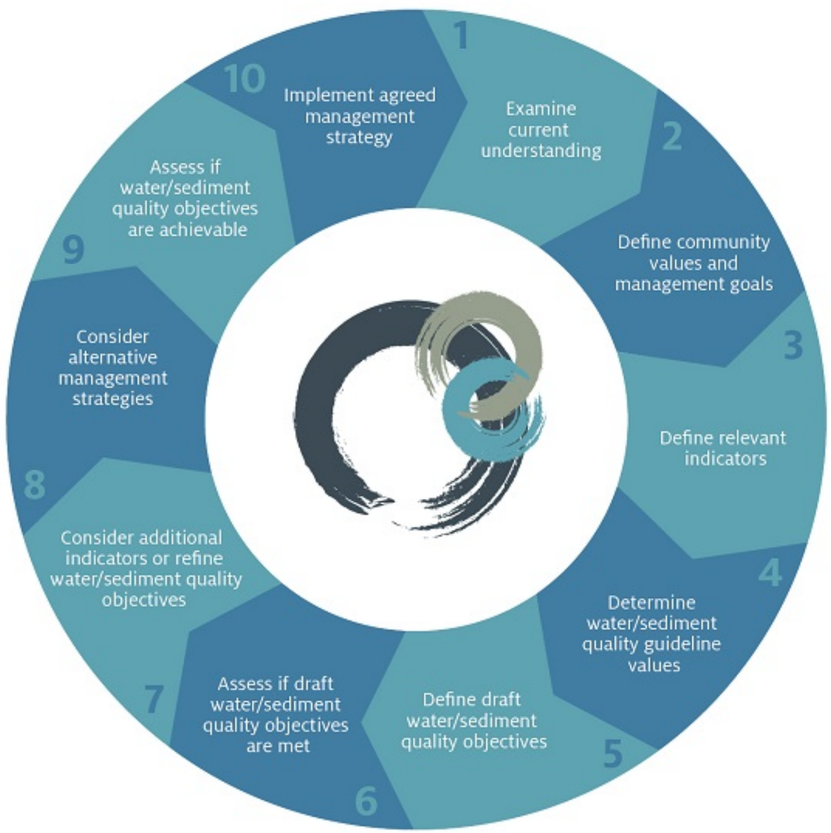
- Web-based delivery
- Improved Water Quality Management Framework and tailored guidance for seven typical uses
- Conceptual modelling
- Weight of evidence
- Toxicants – new derivation method and some updated/new guideline values
- Improved ecoregionalisation
- Guidance and case studies on cultural and spiritual values
- Guidance on sediment quality assessment
- Proper integration of Docs 4 and 7 – clear links between management and monitoring

2. Key features

Water Quality Management Framework

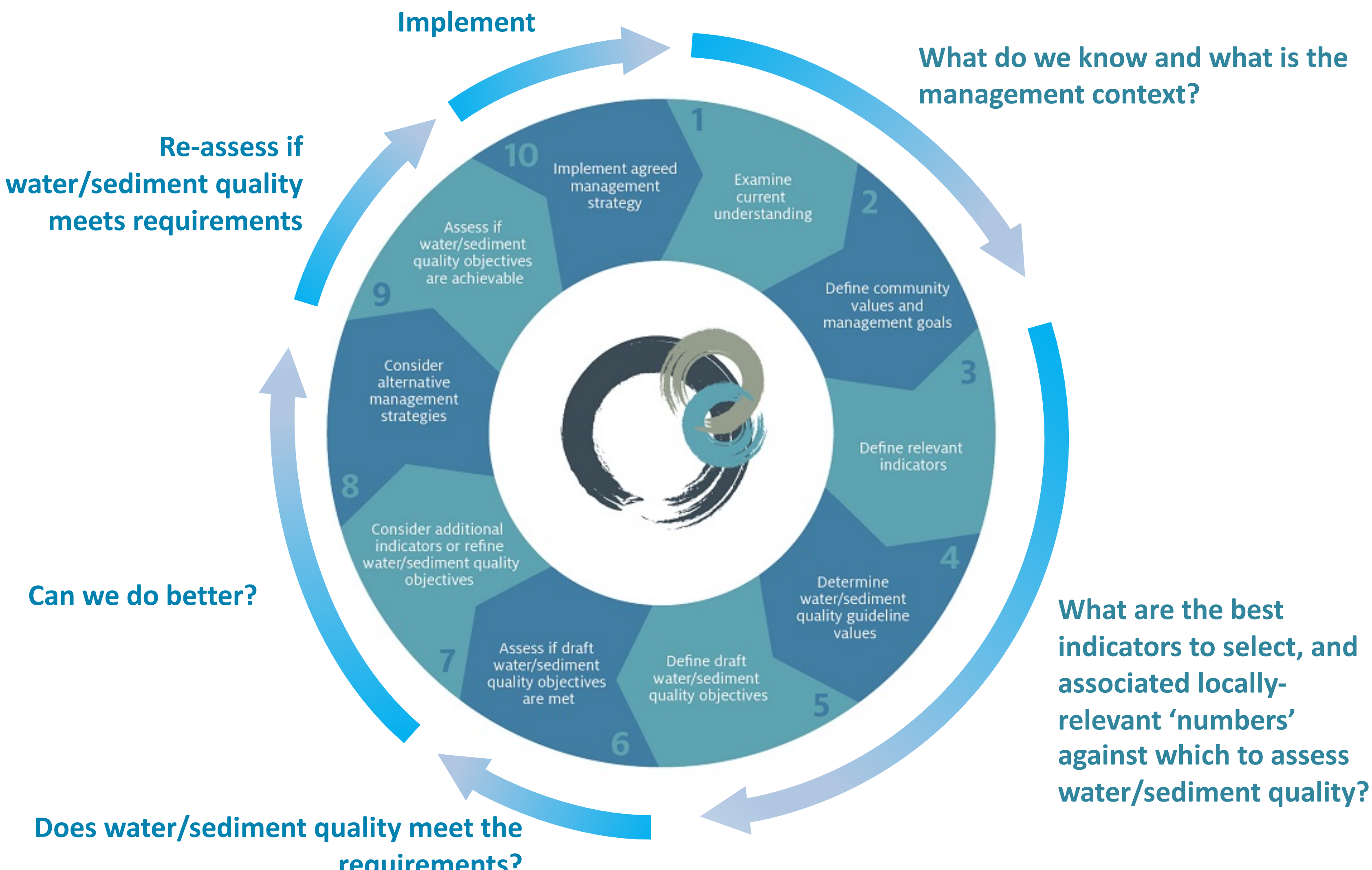
ANZECC/ARMCANZ (2000) WQMF

Revised (2018) WQMF



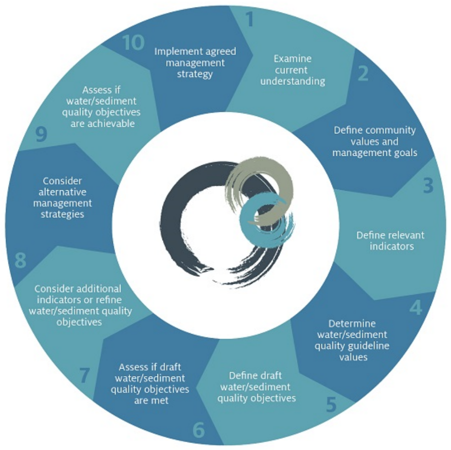
2. Key features

Water Quality Management Framework



2. Key features

Water Quality Management Framework

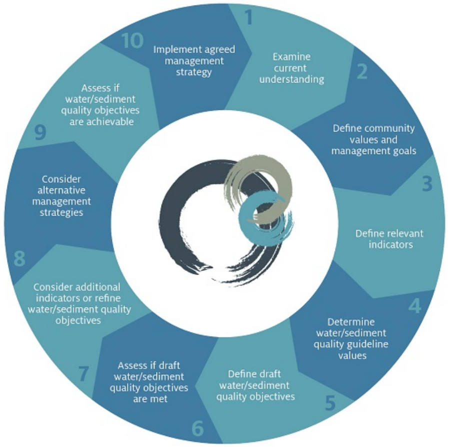


Summary

- Draws in all water quality management activities under one framework
- Depicted as sequential process, but in practice inter-related steps often conducted in parallel
- For individual uses and users of the framework, not all steps always need be undertaken
- Embeds linkages between science, including monitoring, and integrated water planning and management
- Centrepiece of the website – the framework links out to relevant guidance at each step (and vice versa)

2. Key features

Water Quality Management Framework



Seven typical uses

To help users, application of the WQMF is illustrated for seven types of issues:

1. Developing a Water Quality Management Plan
2. Applying for a Development Approval
3. Assessing a Waste Discharge
4. Investigating an unexpected event
5. Assessing a Remediation Study
6. Conducting a baseline study
7. Implementing a broadscale monitoring program

2. Key features

Weight of evidence

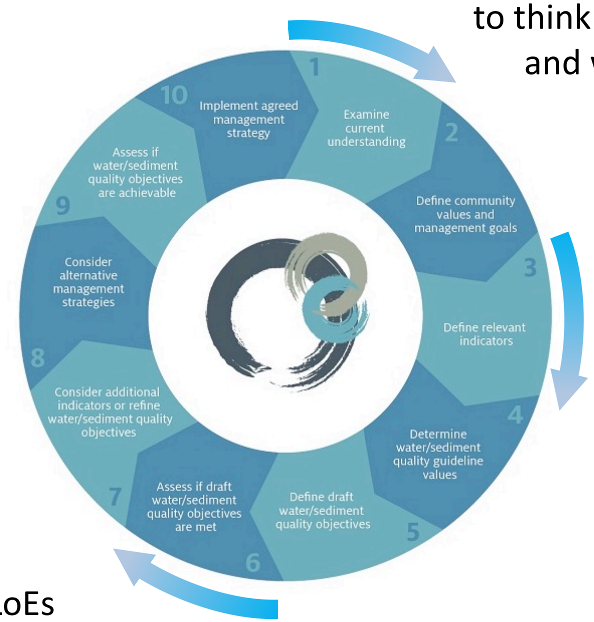
- A process to collect, analyse and evaluate a combination of different (qualitative, semi-quantitative or quantitative) lines of evidence to make an overall assessment of water/sediment quality, to inform management decisions
- *Premise* – assessing water/sediment quality against only a guideline value(s) is often not enough
- Our WoE guidance:
  - Links WoE to a **pressure – stressor – ecosystem receptor (PSER)** causal pathway conceptualisation of water quality issues
  - Emphasises benefits of considering the WoE process at the ***outset*** of the WQ assessment
  - Attempts to make WoE accessible and useful to water quality assessors, so is deliberately simple (and non-quantitative), but allows users to make it as complex as they need it to be

2. Key features

Weight of evidence

➢ Explicitly integrated into the WQMF at:

Step 1 – Formulating the problem in a PSER conceptual model, and starting to think about the issues and what might need to be measured

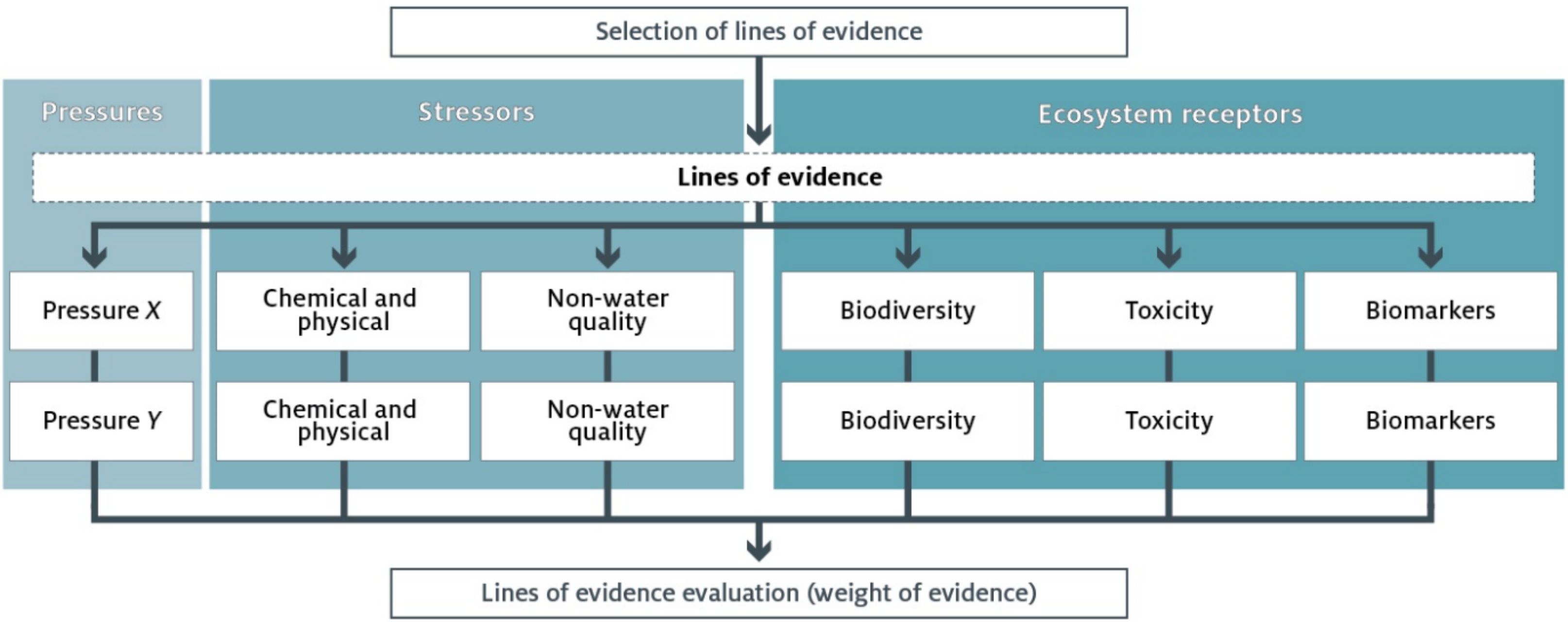


Step 3 – Selecting lines of evidence (LoEs) and associated indicators across the PSER elements

Step 6 – Combining LoEs in a WoE-based evaluation to draw conclusions about ambient water/sediment quality

2. Key features

Weight of evidence



- WoE improves confidence in assessing:
  - **Condition** – *Is it being protected? Is there a change?*
  - **Causality** – *What is causing it?*

2. Key features

Toxicant guideline values

Derivation approaches

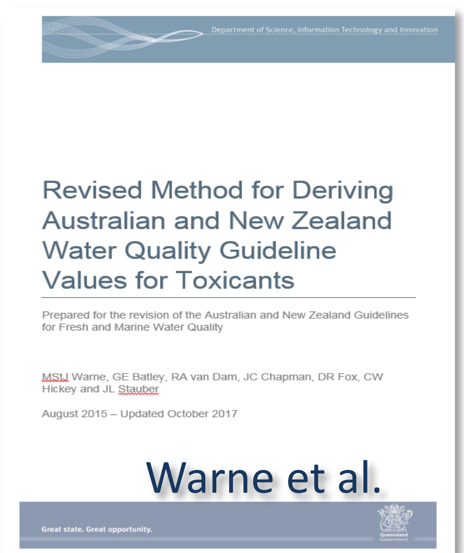
- Guidance provided on how to derive guideline values based on different types of data:
  - Reference data
  - Laboratory effects data
  - Field or semi-field (mesocosm) effects data
  - Multiple lines of evidence
- And how to account for local conditions

2. Key features

Toxicant guideline values

Revised derivation method for default guideline values

- Critical to have a technically robust approach for deriving default and site-specific GVs
- Opportunity to update the ANZECC/ARMCANZ (2000) SSD-based methodology AND use it to derive/revise some DGVs
- Revised/approved in 2015
- Updated in 2017, awaiting approval


Department of Science, Information Technology and Innovation

Revised Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants

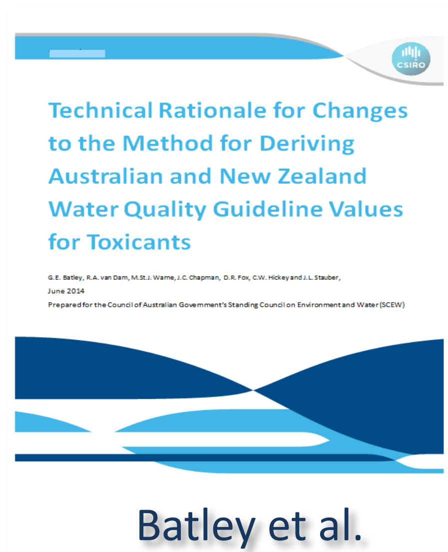
Prepared for the revision of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality

MStJ Warne, GE Batley, RA van Dam, JC Chapman, DR Fox, CW Hickey and JL Stauber

August 2015 – Updated October 2017

Great state. Great opportunity.

Warne et al.


Technical Rationale for Changes to the Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants

G.E. Batley, R.A. van Dam, M.St.J. Warne, J.C. Chapman, D.R. Fox, C.W. Hickey and J.L. Stauber,

June 2014

Prepared for the Council of Australian Government's Standing Council on Environment and Water (SCEW)

Batley et al.

2. Key features

Toxicant guideline values

Revised derivation method – Key aspects

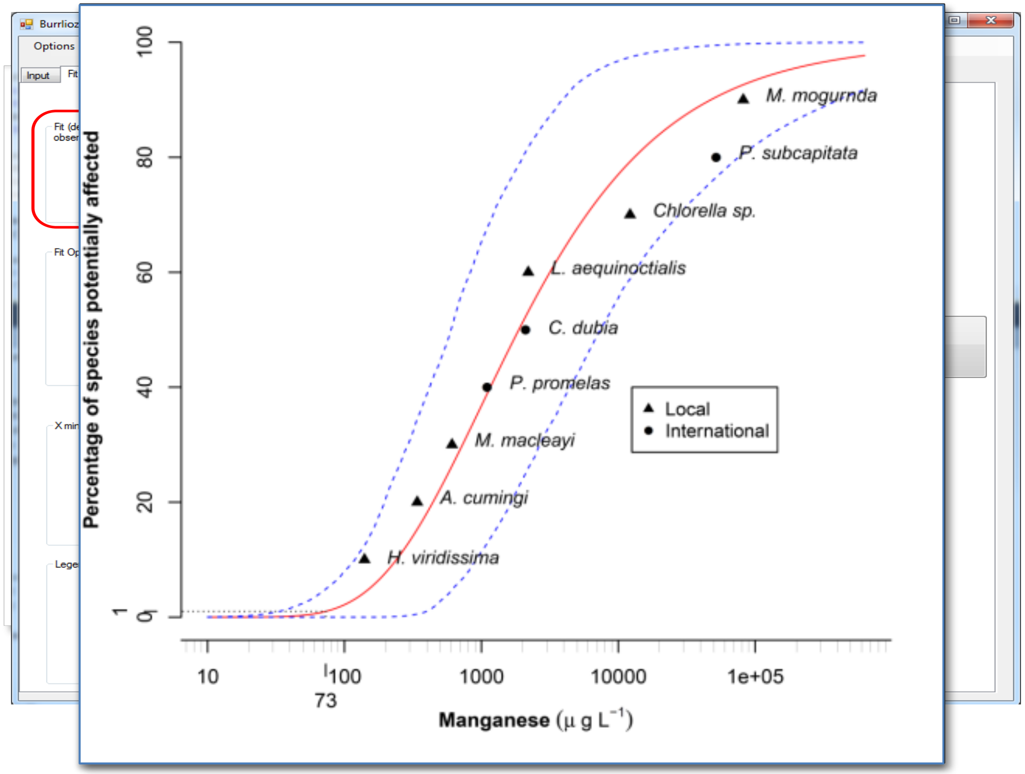
1. Updated classifications for acute and chronic toxicity tests
2. Broadened acceptable sources of data
3. Non-traditional endpoints admissible if ecological relevance can be demonstrated
4. Updated hierarchy of acceptable toxicity estimates
5. Ability to combine chronic and acute (converted to chronic) data
6. More flexibility in decisions – best professional judgment
7. Species sensitivity distribution-fitting – revised approach and software
8. Revised GV Reliability classification

2. Key features

Toxicant guideline values

Revised derivation method – Burrlioz 2.0

- Revised statistical rules
- Calculation of 95% confidence limits (CLs)
- GV and '% species protected' calculators
- Improved graphics functionality
  - Labels and legends
  - Graphics export function
  - Plot 95% CLs
- Produces a Burrlioz analysis report



https://research.csiro.au/software/burrlioz/

2. Key features

Toxicant guideline values

Revised default guideline values (DGVs)

- Selection based on jurisdictional priorities
- Screened, ranked and prioritised → "Top 50" toxicants

Toxicant	Fresh/Marine
Manganese	Marine
Boron	Fresh
Chromium (Cr III)	Fresh
Iron	Fresh
Iron	Marine
Nitrate	Fresh
Chlorine	Marine
Ammonia	Fresh
Fluoride	Fresh
Glyphosate	Fresh

Toxicant	Fresh/Marine
Bisphenol-A	Marine
Bisphenol-A	Fresh
Triclosan	Fresh
PFOS	Fresh
PFOA	Fresh
Dioxins	Fresh
Simazine	Fresh
Simazine	Marine
2,4-D	Fresh
Fipronil	Fresh

Toxicant	Fresh/Marine
MCPA	Fresh
Metsulfuron-methyl	Fresh
Paraquat	Fresh
Picloram	Fresh
Metalochlor	Fresh
Mancozeb	Fresh
Permethrin	Fresh
Sulfometuron	Fresh
α-cypermethrin	Fresh

+ copper and zinc (fresh)

- All DGVs (and supporting info) retrievable using web search tool

2. Key features

Toxicant guideline values

Third party (contributed) guideline values

- Formal process for allowing external parties (e.g. industry, government, research orgs) to contribute GVs where they are a priority to them
- For default GVs, not site-specific GVs
- Must follow the approved GV derivation method
- Formal peer review process
- Details will be available on WQGs website

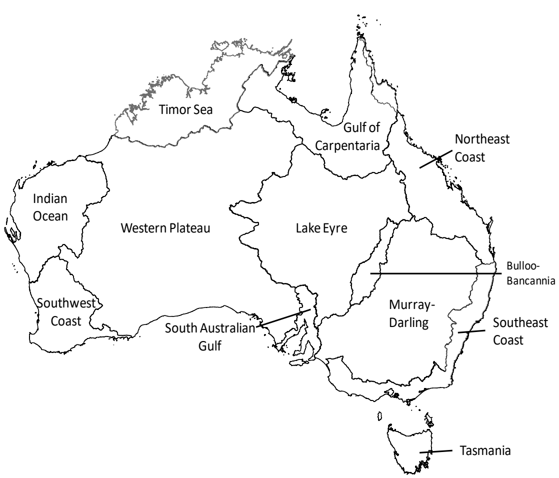
Toxicant	Contributor
Aluminium (marine)	CSIRO
Uranium (fresh)	ERISS
Manganese (fresh)	ERISS
Fluoride (fresh)	NSW Govt
Carbamazepine (fresh)	CSIRO
Diclofenac (fresh)	CSIRO
Fluoxetine (fresh)	CSIRO
Propranolol (fresh)	CSIRO
Hexazinone (fresh/marine)	Qld Govt
Imidacloprid (fresh/marine)	Qld Govt
Atrazine (fresh/marine)	Qld Govt
Diuron (fresh/marine)	Qld Govt
Tebuthiuron (fresh/marine)	Qld Govt
PFOS (marine)	CRC CARE/GHD
PFOA (marine)	CRC CARE/GHD
++	

2. Key features

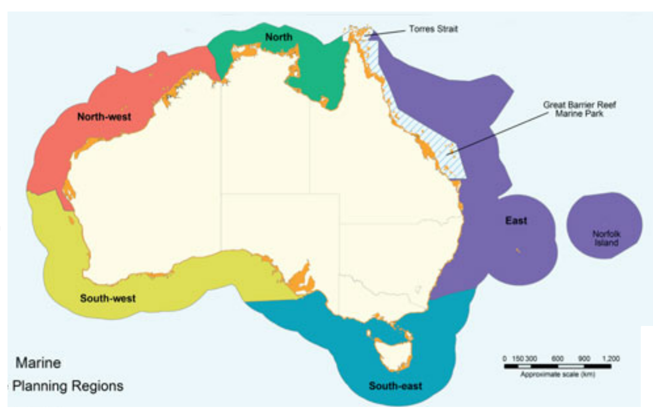
Ecoregionalisation

- Improved water quality (p-c stressor) and biological assessment information and guidance at finer scale resolution
  - For *inland waters*, and where state regional GVs do not exist – Australian Drainage Divisions (AWRC 1976)
  - For *marine waters* of Australia – Marine bioregional planning regions or, where possible, IMCRA meso-scale regions
- Info accessible via web search tool

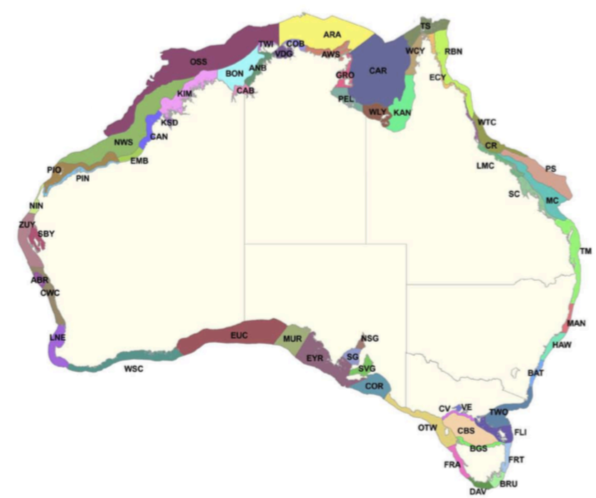
Inland Drainage Divisions



Bioreg planning regions



IMCRA meso-scale regions



3. Website tour

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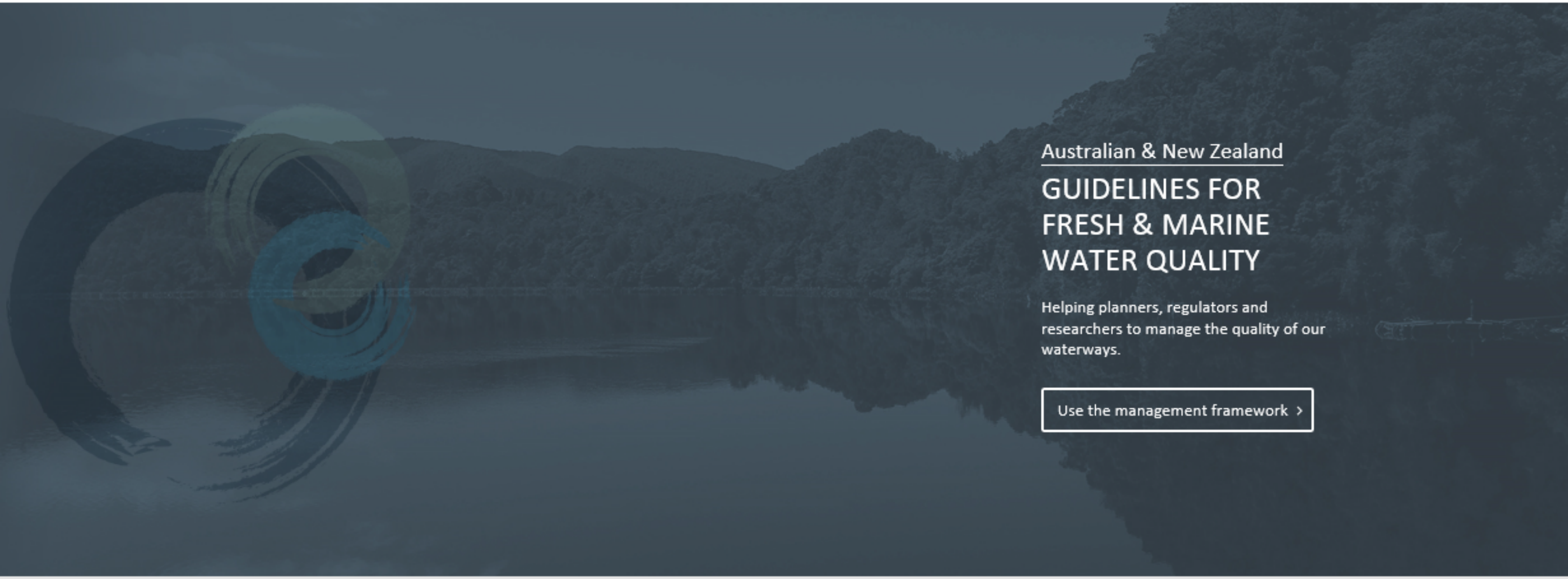


Australian & New Zealand

GUIDELINES FOR FRESH & MARINE WATER QUALITY

Helping planners, regulators and researchers to manage the quality of our waterways.

Use the management framework ›

How to use the guidelines

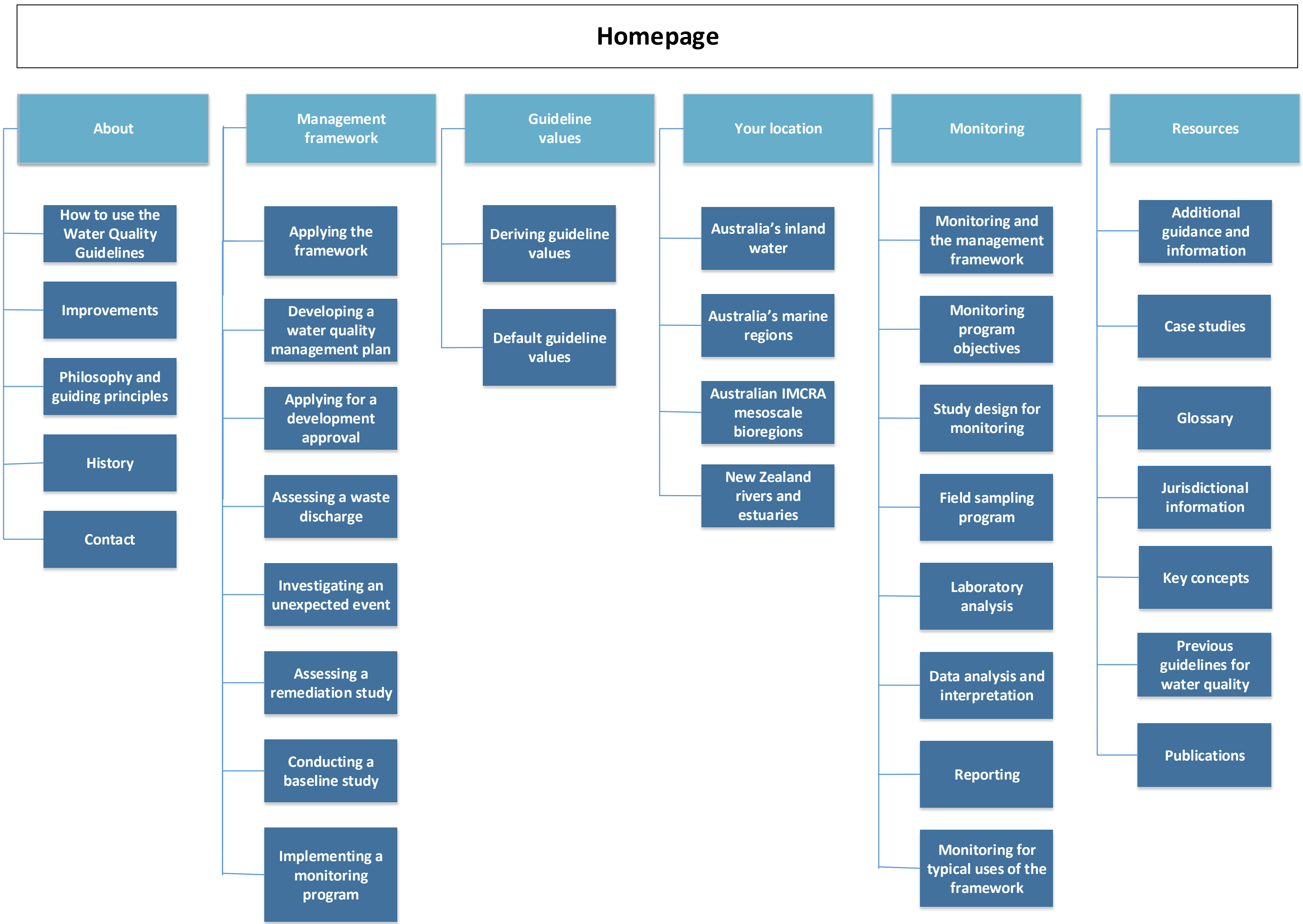
Step through the Water Quality Management Framework & find out about guideline values

Weight of evidence

Learn how to select & assess indicators across multiple lines of evidence

Draft toxicant DGVs

Find draft toxicant default guideline values


Homepage
About
How to use the Water Quality Guidelines
Improvements
Philosophy and guiding principles
History
Contact
Management framework
Applying the framework
Developing a water quality management plan
Applying for a development approval
Assessing a waste discharge
Investigating an unexpected event
Assessing a remediation study
Conducting a baseline study
Implementing a monitoring program
Guideline values
Deriving guideline values
Default guideline values
Your location
Australia's inland water
Australia's marine regions
Australian IMCRA mesoscale bioregions
New Zealand rivers and estuaries
Monitoring
Monitoring and the management framework
Monitoring program objectives
Study design for monitoring
Field sampling program
Laboratory analysis
Data analysis and interpretation
Reporting
Monitoring for typical uses of the framework
Resources
Additional guidance and information
Case studies
Glossary
Jurisdictional information
Key concepts
Previous guidelines for water quality
Publications

Water Quality Guidelines
About
Management framework
Applying the framework
Developing a water quality management plan
Applying for a development approval
Assessing a waste discharge
Investigating an unexpected event
Assessing a remediation study
Conducting a baseline study
Implementing a broadscale monitoring program
Guideline values
Your location
Monitoring
Resources
EDIT LINKS

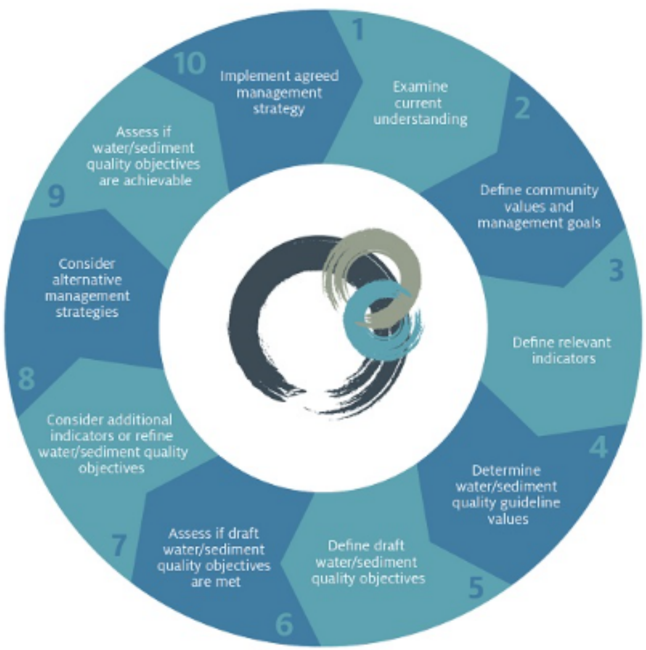
Water Quality Management Framework

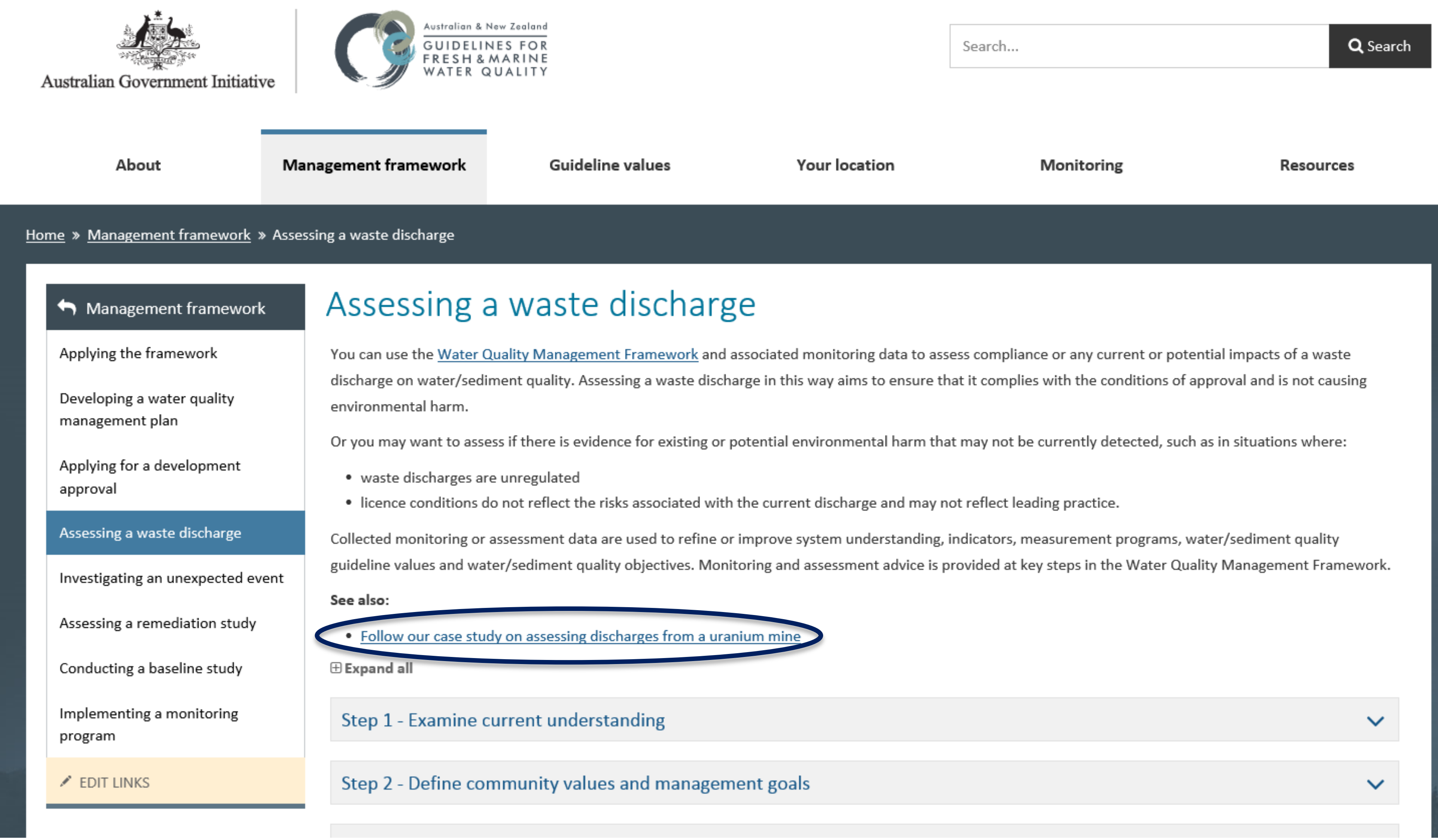
Water quality managers can only develop sustainable management strategies when they have a good scientific understanding of the impact of human activities on their waterways and their community has a collective vision for its waterways.

To protect the community values of waterways, the Water Quality Management Framework logically encompasses key requirements for long-term management strategies:

- good understanding of links between human activity and water/sediment quality
- clearly defined community values or uses, including the setting of unambiguous management goals
- clearly identified and appropriate water/sediment quality objectives
- adoption of cost-effective strategies to achieve water/sediment quality objectives.

10 steps to implement the Water Quality Management Framework





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About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Management framework » Assessing a waste discharge

Management framework

- Applying the framework
- Developing a water quality management plan
- Applying for a development approval
- Assessing a waste discharge
- Investigating an unexpected event
- Assessing a remediation study
- Conducting a baseline study
- Implementing a monitoring program

EDIT LINKS

Assessing a waste discharge

You can use the Water Quality Management Framework and associated monitoring data to assess compliance or any current or potential impacts of a waste discharge on water/sediment quality. Assessing a waste discharge in this way aims to ensure that it complies with the conditions of approval and is not causing environmental harm.

Or you may want to assess if there is evidence for existing or potential environmental harm that may not be currently detected, such as in situations where:

- waste discharges are unregulated
- licence conditions do not reflect the risks associated with the current discharge and may not reflect leading practice.

Collected monitoring or assessment data are used to refine or improve system understanding, indicators, measurement programs, water/sediment quality guideline values and water/sediment quality objectives. Monitoring and assessment advice is provided at key steps in the Water Quality Management Framework.

See also:

- Follow our case study on assessing discharges from a uranium mine

Expand all

Step 1 - Examine current understanding

Step 2 - Define community values and management goals

Case studies

Developing a reef water quality management plan

Assessing discharges from a uranium mine

EDIT LINKS

Assessing discharges from a uranium mine — case study

Water used in mining can adversely affect the quality of the surface water and groundwater surrounding the mine. Assessing water discharges from mines is important to ensure compliance with licence conditions and, ultimately, to ensure environmental protection.

About the site

Ranger mine is located on the 79 km^2 Ranger Project Area 260 km east of Darwin, Northern Territory. The site is surrounded by, but separate from, the World Heritage listed Kakadu National Park.

The Ranger Project Area is part of the Alligator Rivers Region, which includes the catchments of the West, South and East Alligator rivers. It contains high conservation, high ecological value aquatic ecosystems in its surrounding waterways.

Discovered in 1969 and first opened in 1980, the Ranger mine is owned by Energy Resources of Australia Limited, a subsidiary of Rio Tinto. Uranium mined at Ranger provides nuclear power in Asia, Europe and North America. Mine operations have reduced to processing of stockpiled uranium oxide ore since open-cut mining ceased in 2012.

Applying the Water Quality Management Framework

After more than 30 years in operation, the Ranger mine operator and regulators have undertaken many water quality assessments. These assessments represent multiple cycles through the Water Quality Management Framework.

This case study focuses on a more recent issue to assess mine waters with high levels of magnesium sulfate ($MgSO_4$) and their discharge into an adjacent waterway, Magela Creek.

⊞ Expand all

Step 1 - Examine current understanding

Step 2 - Define community values and management goals

Step 3 - Define relevant indicators

Step 4 - Determine water quality guideline values

Step 5 - Define draft water quality objectives

This case study focuses on a more recent issue to assess mine waters with high levels of magnesium sulfate ($MgSO_4$) and their discharge into an adjacent waterway, Magela Creek.

⊟ **Collapse all**

Step 1 - Examine current understanding

Step 2 - Define community values and management goals

Step 3 - Define relevant indicators

Step 4 - Determine water quality guideline values

Step 5 - Define draft water quality objectives

Step 6 - Assess draft water objectives

Step 7 - Consider other indicators or refine water quality objectives

Step 8 - Consider alternative management strategies

Step 9 - Assess whether water quality objectives are achievable and Step 10 — implement agreed management strategy

References

Hogan AC, Trenfield MA, Harford AJ & van Dam RA 2013, Toxicity of magnesium pulses to tropical freshwater species and the development of a duration-based water quality guideline, Environmental Toxicology and Chemistry 32: 1969–1980.

Iles M 2004, '*Water quality objectives for Magela Creek — revised November 2004*', internal report no. 489, Supervising Scientist, Darwin.

O'Connor R, Humphrey C, Dostine P, Lynch C & Spiers A 1995, '*A survey of aquatic macroinvertebrates in lentic waterbodies of Magela and Nourlangie Creek catchments, Alligator Rivers Region, Northern Territory*', internal report no. 225, Supervising Scientist, Darwin.

Step 6 - Assess draft water objectives

Did the monitoring data support the draft water quality objectives?

Depending on the outcome of this assessment, we have different options:

- yes — continue management and monitoring to ensure protection of aquatic species in the waterway.
- no — move to Steps 7 and 8, which can be completed in parallel, in consultation with the regulator.

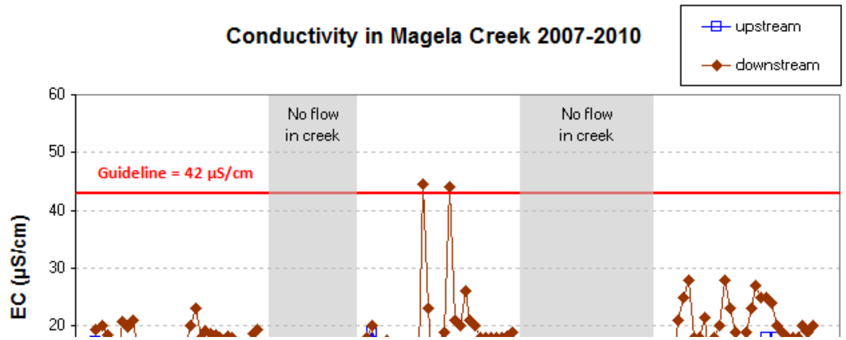
Our monitoring data for various indicators across multiple lines of evidence included:

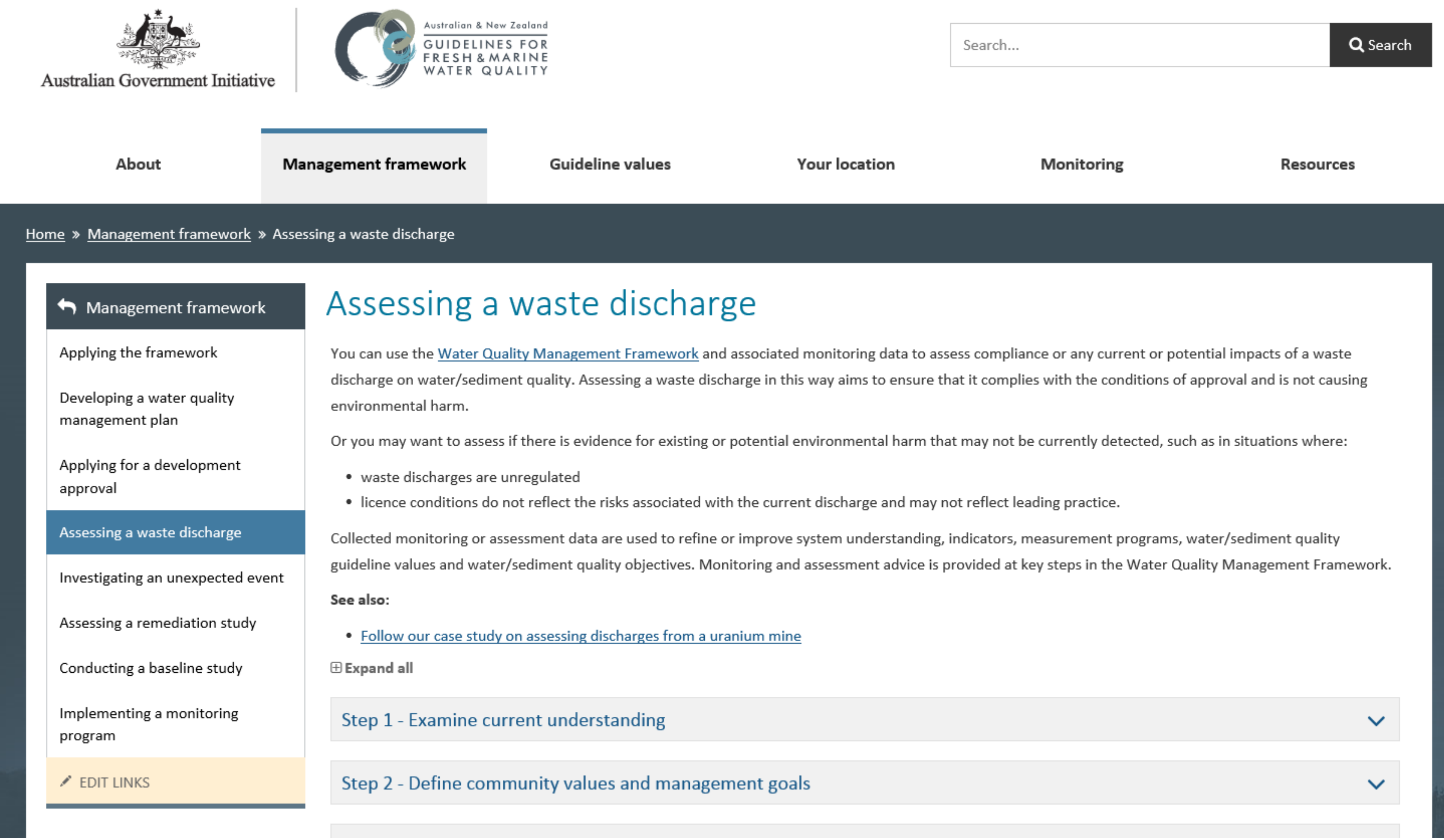
- EC (with corresponding water quality limit)
- in situ monitoring for the freshwater snail
- end-of-wet-season monitoring of stream macroinvertebrate communities.

In the 2007–08 wet season, water quality (measured as EC) was good, with no exceedances of the Mg/EC water quality limit (Figure 2). This was supported by in situ monitoring of the freshwater snail, which showed that downstream egg production was consistent with our upstream baseline (Figure 3). Under this outcome, the approach is to continue management and monitoring (i.e. through moving to Step 10) and keep learning and improving the understanding.

However, the EC monitoring data in the 2008–09 wet season did not support our draft water quality objectives (Figure 2). There were some exceedances of the Mg/EC limit, indicating poorer water quality due to mine water discharges. But in situ toxicity monitoring of the freshwater snail showed no adverse response to this water quality perturbation.

Figure 2 Electrical conductivity (EC) monitoring data for the Magela Creek compliance site used to assess draft water quality objectives, 2007–10. Source: Supervising Scientist 2016





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About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Management framework » Assessing a waste discharge

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- Applying the framework
- Developing a water quality management plan
- Applying for a development approval
- Assessing a waste discharge
- Investigating an unexpected event
- Assessing a remediation study
- Conducting a baseline study
- Implementing a monitoring program

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Assessing a waste discharge

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Or you may want to assess if there is evidence for existing or potential environmental harm that may not be currently detected, such as in situations where:

- waste discharges are unregulated
- licence conditions do not reflect the risks associated with the current discharge and may not reflect leading practice.

Collected monitoring or assessment data are used to refine or improve system understanding, indicators, measurement programs, water/sediment quality guideline values and water/sediment quality objectives. Monitoring and assessment advice is provided at key steps in the Water Quality Management Framework.

See also:

- Follow our case study on assessing discharges from a uranium mine

⊞ **Expand all**

Step 1 - Examine current understanding

Step 2 - Define community values and management goals management plan

Applying for a development approval

Assessing a waste discharge

Investigating an unexpected event

Assessing a remediation study

Conducting a baseline study

Implementing a monitoring program

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Or you may want to assess if there is evidence for existing or potential environmental harm that may not be currently detected, such as in situations where:

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See also:

- Follow our case study on assessing discharges from a uranium mine

⊞ **Expand all**

Step 1 - Examine current understanding

Use current understanding to develop or refine a **conceptual model** of key waterway processes and how the waste discharge could affect local waterways. This will inform your decisions at subsequent steps in the framework.

Typically, the operator of the discharge will undertake this step, possibly in consultation with the regulator and some **stakeholder involvement**.

You will need:

- existing data and literature from the baseline, an environmental impact assessment or a project application for an existing discharge
- site-specific information on the operation and receiving environment (e.g. current water quality and temporal and spatial release characteristics of the discharge, **mixing zones** and regulatory compliance points, water quality and ecology of the receiving environment).

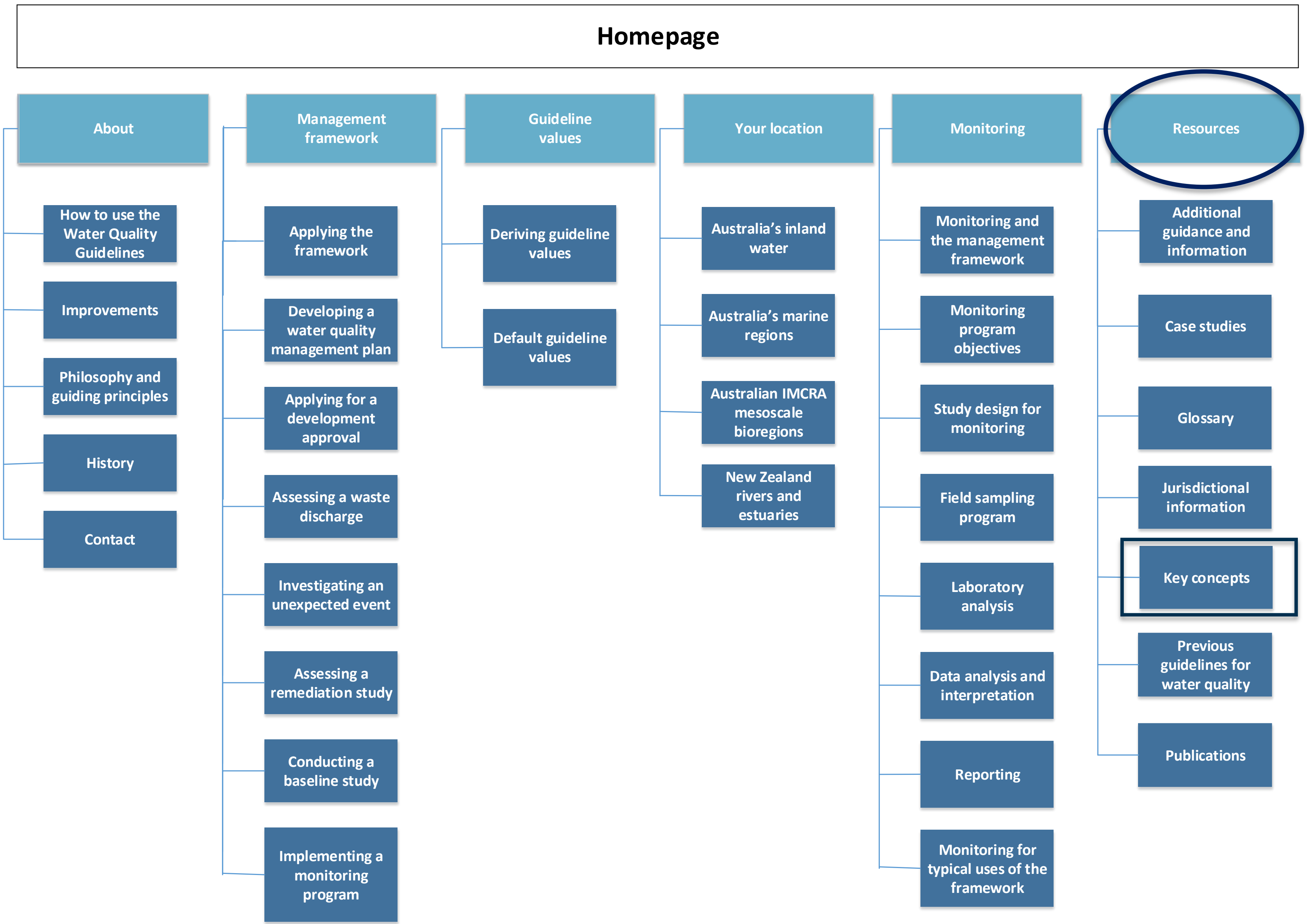
In most cases, you can obtain existing information sources for this process, even for a new discharge. But you may need to collect new baseline data.

As further monitoring data become available, update and refine the current understanding.

Use the conceptual model at Step 3 to identify key indicators for key pressures, stressors and ecosystem receptors selected for the multiple lines-of-evidence process for assessing and managing water/sediment quality. These indicators will be used to assess compliance or water/sediment quality impacts of the waste discharge.

Key concepts:

- Conceptual models
- Mixing zones
- Stakeholder involvement


Homepage
About
How to use the Water Quality Guidelines
Improvements
Philosophy and guiding principles
History
Contact
Management framework
Applying the framework
Developing a water quality management plan
Applying for a development approval
Assessing a waste discharge
Investigating an unexpected event
Assessing a remediation study
Conducting a baseline study
Implementing a monitoring program
Guideline values
Deriving guideline values
Default guideline values
Your location
Australia's inland water
Australia's marine regions
Australian IMCRA mesoscale bioregions
New Zealand rivers and estuaries
Monitoring
Monitoring and the management framework
Monitoring program objectives
Study design for monitoring
Field sampling program
Laboratory analysis
Data analysis and interpretation
Reporting
Monitoring for typical uses of the framework
Resources
Additional guidance and information
Case studies
Glossary
Jurisdictional information
Key concepts
Previous guidelines for water quality
Publications

Australian Government Initiative

Australian & New Zealand GUIDELINES FOR FRESH & MARINE WATER QUALITY

Search... Search

About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Resources » Key concepts » Conceptual models

Key concepts

- Adaptive management
- Community values
- Conceptual models
- Indicators in detail
- Indicator selection
- Level of protection
- Management goals
- Mixing zones
- Predictive models
- Quadruple bottom line

Conceptual models

Natural systems are complex. To understand and manage them, we are often required to make simplifying assumptions. We can do this by portraying the system as a conceptual model.

A conceptual model sets out the collective knowledge, experience and perspectives on the system of interest. The model illustrates your assumptions about how the system functions and what you believe to be the important or dominant processes and their linkages. This includes the factors that are perceived to be driving the changes in the system and the consequences of changes in these factors.

We can use conceptual models to help identify:

- key processes and their interactions
- key pressures and associated stressors acting on the system
- key ecosystem receptors
- cause–effect relationships
- important questions to be addressed
- spatial boundaries
- valid measurement parameters for the processes of concern (what to measure, degree of precision)
- site selection
- temporal and seasonal considerations.

Applying for a development approval

Assessing a waste discharge

Investigating an unexpected event

Assessing a remediation study

Conducting a baseline study

Implementing a monitoring program

EDIT LINKS

Or you may want to assess if there is evidence for existing or potential environmental harm that may not be currently detected, such as in situations where:

- waste discharges are unregulated
- licence conditions do not reflect the risks associated with the current discharge and may not reflect leading practice.

Collected monitoring or assessment data are used to refine or improve system understanding, indicators, measurement programs, water/sediment quality guideline values and water/sediment quality objectives. Monitoring and assessment advice is provided at key steps in the Water Quality Management Framework.

See also:

- Follow our case study on assessing discharges from a uranium mine

⊞ **Expand all**

Step 1 - Examine current understanding

Step 2 - Define community values and management goals

Step 3 - Define relevant indicators

Step 4 - Determine water/sediment quality guideline values

In consultation with the regulator, determine the water/sediment quality **guideline values** for each of the biological, chemical and physical indicators that will provide the desired level of protection (if applicable) for your management goals and the protection of identified community values. (Sometimes the guideline values can be determined by the regulator.)

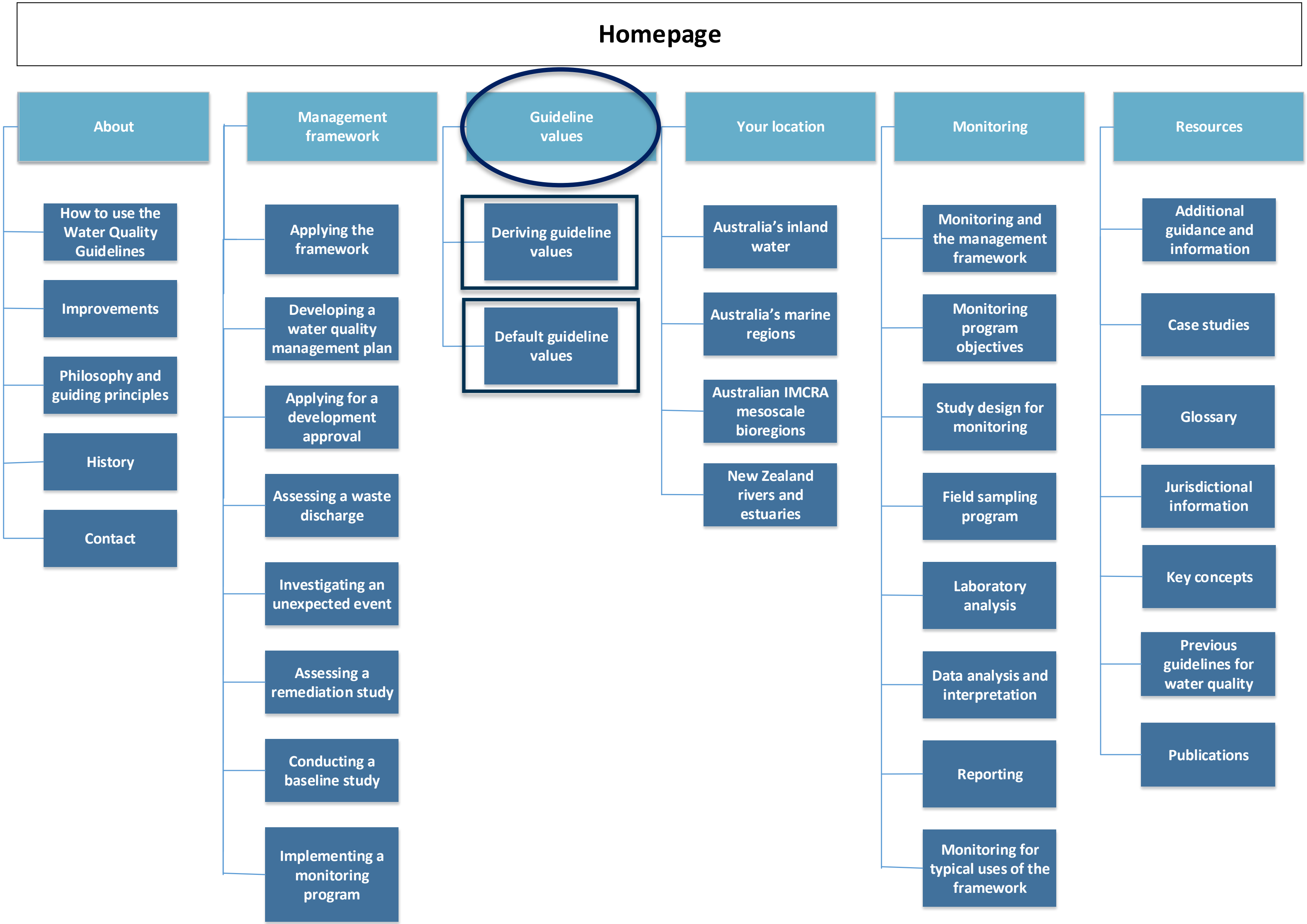
Where possible, derive or use locally relevant (e.g. site-specific, catchment) guideline values based on local monitoring data or biological-effects data. Until these are available, use the default guideline values (DGVs) but be aware that they may not represent your local system.

If possible, establish or continue **monitoring** programs to derive locally relevant guideline values.

Key concepts:

- Guideline values
- Monitoring

Step 5 - Define draft water/sediment quality objectives


Homepage
About
How to use the Water Quality Guidelines
Improvements
Philosophy and guiding principles
History
Contact
Management framework
Applying the framework
Developing a water quality management plan
Applying for a development approval
Assessing a waste discharge
Investigating an unexpected event
Assessing a remediation study
Conducting a baseline study
Implementing a monitoring program
Guideline values
Deriving guideline values
Default guideline values
Your location
Australia's inland water
Australia's marine regions
Australian IMCRA mesoscale bioregions
New Zealand rivers and estuaries
Monitoring
Monitoring and the management framework
Monitoring program objectives
Study design for monitoring
Field sampling program
Laboratory analysis
Data analysis and interpretation
Reporting
Monitoring for typical uses of the framework
Resources
Additional guidance and information
Case studies
Glossary
Jurisdictional information
Key concepts
Previous guidelines for water quality
Publications

About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Guideline values

Water Quality Guidelines

- About
- Management framework
- Guideline values
  - Deriving guideline values
  - Default guideline values
- Your location
- Monitoring
- Resources

EDIT LINKS

Guideline values for water/sediment quality

Water/sediment quality guideline values are used as a general tool to help ensure that certain physical and chemical stressors in waterways do not exceed harmful levels.

We can define a guideline value as a measurable quantity (threshold) or condition of an indicator for a specific community value below or above which we consider to be a low risk of unacceptable effects occurring.

Site-specific guideline values

Ideally, you should use guideline values that are relevant to your to local conditions or situation. We call these 'site-specific guideline values'.

We provide guidance in the Water Quality Guidelines on methods for deriving site-specific guideline values for protecting aquatic ecosystems, which focus on the use of biological field-effects data, laboratory-effects data, reference-site data and the use of multiple lines of evidence.

Find out about:

- Deriving your own guideline values

Default guideline values

If site-specific guideline values are not available, or have been agreed as being unnecessary, we provide or give directions to default guideline values (DGVs) for a range of stressors relevant to different community values, such as aquatic ecosystems, human health and primary industries.

DGVs represent a useful starting point for assessing water quality, and are recommended for generic applications in the absence of more relevant guideline values. DGVs may not be representative of your local conditions or situation but they can, to some extent, be tailored to make them more relevant to local conditions.

We provide DGVs for aquatic ecosystem protection and primary industries, and direct you to DGVs for human health (e.g. drinking water, recreation and aesthetics).

We do not provide DGVs for cultural and spiritual values but these values are considered when setting water/sediment quality objectives (at Step 5 of the Water Quality Management Framework).

Find out about:

- Default guideline values for community values of waterways
- Cultural and spiritual values in water quality planning

Guideline values
Deriving guideline values
Reference-site data
Laboratory-effects data
Field-effects data
Using multiple lines of evidence
Cultural and spiritual values
Default guideline values
EDIT LINKS

Deriving guideline values for water quality

To derive a guideline value requires the collection of data or information on an indicator for a water body, then use of these data to determine concentrations that will protect a particular community value.

Here we describe methods for guideline value derivation related to the protection of aquatic ecosystems — relevant to both default guideline values (DGVs) and site-specific guideline values — and other community values.

Aquatic ecosystem guideline values

Guideline values for aquatic ecosystems can be derived using:

- reference-site data
- laboratory-effects data
- field-effects data
- multiple lines of evidence based on two or more of these data.

These derivation methods are relevant to indicators for all lines of evidence that may require guideline values, namely chemical and physical lines of evidence (physical and chemical stressors, toxicants) and ecosystem receptor lines of evidence (bioaccumulation, biodiversity, toxicity).

For guideline values derived from field and laboratory-effects data, the ecological or biological effects of the stressors are used to define guideline values below which ecologically meaningful changes do not occur.

Referential guideline values define a measurable level of change from a natural reference condition that, although the ecological consequences are unknown, is considered unlikely to result in adverse effects.

For toxicants in waters and sediments, the preferred approaches to deriving guideline values are usually through the use of field and/or laboratory biological-effects (toxicity) data. But this will be dictated by other factors, including the significance or risk of the stressor and the level of protection being assigned to the waterway. For example:

- a stressor assessed to be of low risk to a waterway may not require a guideline value based on field-effects data
- a stressor assessed to be of high risk to a waterway may require a guideline value based on a multiple lines-of-evidence approach using both field and laboratory-effects data
- for waterways of high conservation/ecological value — where any change in water quality from natural background concentrations might be unacceptable — a conservative reference-site approach to deriving guideline values might be preferable.

For physical and chemical (PC) stressors, our preferred approach to derive guideline values is to use local field and/or laboratory-effects data. But these are

Guideline values for water/sediment quality

Water/sediment quality guideline values are used as a general tool to help ensure that certain physical and chemical stressors in waterways do not exceed harmful levels.

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- Deriving your own guideline values

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- Cultural and spiritual values in water quality planning

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Default guideline values

Default guideline values (DGVs) can provide a generic starting point for assessing water quality. We recommend using DGVs for generic applications in the absence of more relevant guideline values (jurisdictional, site specific).

In the Water Quality Guidelines, we provide DGVs and associated guidance for aquatic ecosystem protection and primary industries, and direct you to DGVs for human health (drinking water, recreation and aesthetics).

Ideally, use guideline values with measurements from other lines of evidence in a weight-of-evidence process to determine if water quality represents a risk to a particular community value.

Aquatic ecosystems

Physical and chemical stressors

ANZECC & ARMCANZ (2000) derived physical and chemical (PC) stressor DGVs for large geographic regions that encompassed a broad range of catchments and water types. In the Water Quality Guidelines, we have adopted a more appropriate set of geographic regions.

Find PC stressor DGVs derived from regional reference-site data for your location

Levels of species protection

PC stressor DGVs are provided for different levels of protection, depending on the current or desired ecosystem condition.

- **High conservation/ecological value systems** should have no change from ambient conditions, unless it can be demonstrated that such change will not compromise the maintenance of biological diversity in the system. Where comprehensive biological-effects data are not available, a monitoring program is required to show that values of PC stressors are not changing, using statistically conservative decision criteria as the basis for evaluation.
- **Slightly to moderately disturbed systems** need DGVs based on either 80th or 20th percentiles of minimally impacted reference-site data.
- **Highly disturbed systems** need DGVs for less conservative 90th or 10th percentiles of minimally impacted reference-site data, with a goal of continual improvement.

See also:

- Level of protection — advice on determining an ecosystem condition and associated level of protection and selecting the appropriate PC stressor DGV

Environmental issues

Follow our guidance for PC stressors associated with environmental issues when assessing PC stressors for water quality.

Toxicant default guideline values for water quality in aquatic ecosystems

Throughout the Water Quality Guidelines, we provide context and detailed guidance on how to use default guideline values (DGVs) correctly.

Where possible, DGVs for toxicants have been derived using the species sensitivity distribution (SSD) approach, using methods described in the ANZECC & ARMCANZ (2000) guidelines for DGVs published in 2000 and Warne et al. (2018) for all DGVs published since 2000. Where the SSD approach could not be used, the less preferred assessment-factor approach was used, following the method described in the ANZECC & ARMCANZ (2000) guidelines. Refer to Deriving guideline values for details.

Search results for toxicant default guideline values

Search for toxicant DGVs for the protection of aquatic ecosystems in freshwater and marine water

Your search results will provide the DGVs and information to support them.

Medium — whether the DGV applies to freshwater or marine water.

Reliability classification — DGVs are classified as very high, high, moderate, low, very low or unknown. Classification is mainly based on the number and type (chronic, acute or a mix of both) of data used to derive the guideline value, as well as the fit of the statistical (SSD) model to the data.

We have updated the reliability classification of all DGVs from the ANZECC & ARMCANZ (2000) guidelines to reflect the current classification (refer to Warne et al. 2018).

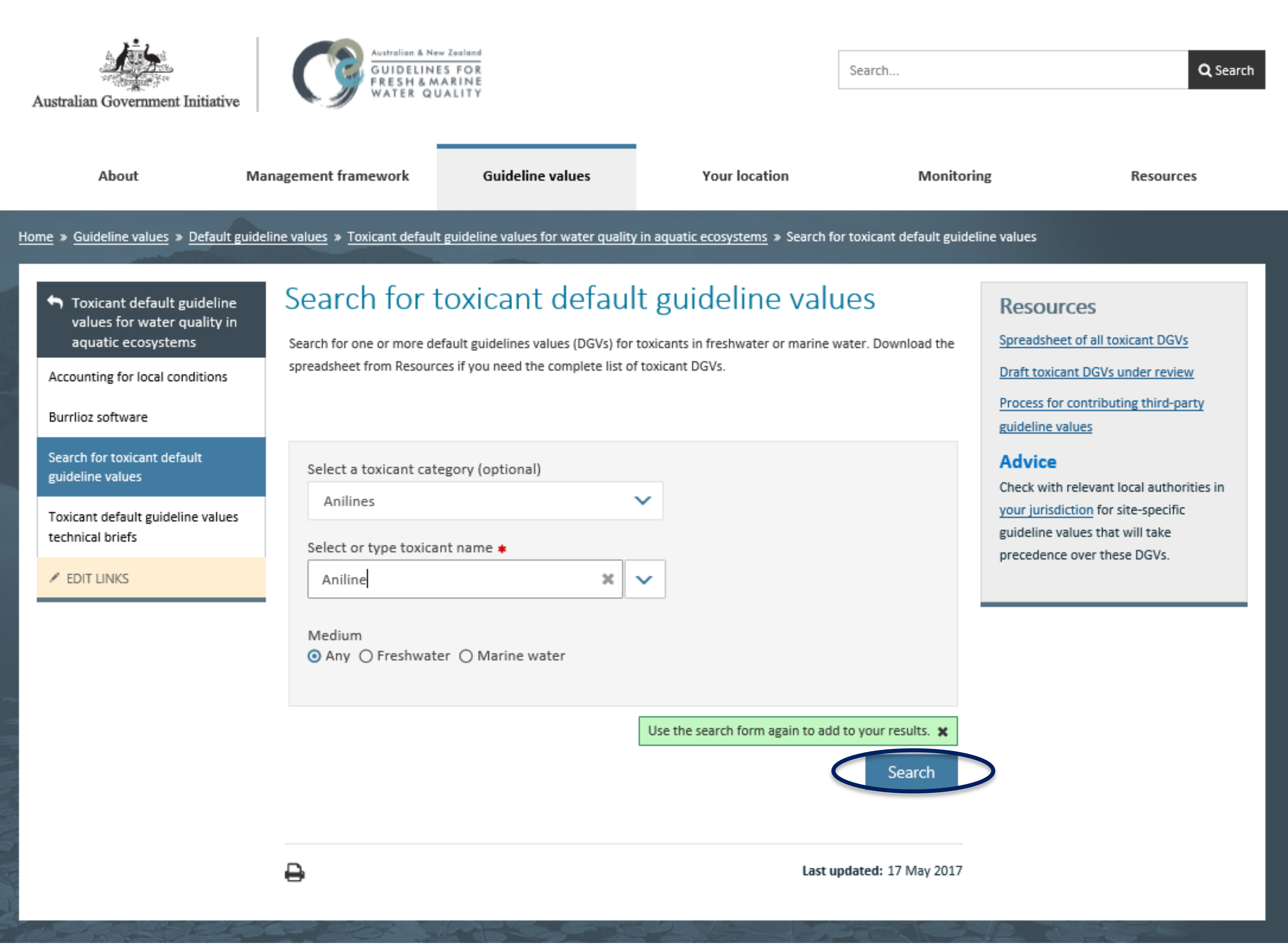
Publication date — year of publication of the DGV.

DGVs for different levels of species protection — where DGVs have been derived using the SSD method, guideline values are provided for 99, 95, 90 and 80% species protection. The DGV that is applicable to your situation depends on the current or desired condition of the ecosystem and the associated level of protection that is assigned. In most cases:

- high ecological/conservation value system — apply 99% species protection DGV
- slightly to moderately disturbed system — apply 95% species protection DGV
- highly disturbed system — apply 90 or 80% species protection DGV.

Guideline values derived using the less preferred assessment-factor method cannot be related to a percentage of species protected; they are assigned an 'unknown' level of species protection. Refer to Level of protection for additional guidance on determining an ecosystem condition and associated level of protection.

Specific comments and **general comments** — for some toxicants, important context or guidance helps you to better understand the DGV and, in some cases, its implementation.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Search...
Search
About
Management framework
Guideline values
Your location
Monitoring
Resources
Home » Guideline values » Default guideline values » Toxicant default guideline values for water quality in aquatic ecosystems » Search for toxicant default guideline values
Toxicant default guideline values for water quality in aquatic ecosystems
Accounting for local conditions
Burrlioz software
Search for toxicant default guideline values
Toxicant default guideline values technical briefs
EDIT LINKS
Search for toxicant default guideline values
Search for one or more default guidelines values (DGVs) for toxicants in freshwater or marine water. Download the spreadsheet from Resources if you need the complete list of toxicant DGVs.
Select a toxicant category (optional)
Anilines
Select or type toxicant name *
Aniline
Medium
Any
Freshwater
Marine water
Use the search form again to add to your results.
Search
Last updated: 17 May 2017
Resources
Spreadsheet of all toxicant DGVs
Draft toxicant DGVs under review
Process for contributing third-party guideline values
Advice
Check with relevant local authorities in your jurisdiction for site-specific guideline values that will take precedence over these DGVs.

Aniline

Medium: **Marine water**
Category: Anilines
Reliability: Unknown
Publish date: 2000

Default guideline values for toxicant

Level of species protection (%)	µg/L	Specific comments
Unknown	8	–

General comments

The reliability of the DGVs has been updated according to the classification in Warne et al. (2017). These DGVs and the information in the corresponding DGVs technical brief for this toxicant should be used in accordance with the detailed guidance provided on the Australian and New Zealand Guidelines for Fresh and Marine Water Quality website.

Read the detail

http://authoring.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/toxicants/aniline-2000

See also

Warne MStJ, Batley GE, van Dam RA, Chapman JC, Fox DR, Hickey CW and Stauber JL. 2015. Revised Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants. Updated May, 2017. Prepared for the Council of Australian Government's Standing Council on Environment and Water (SCEW). Department of Science, Information Technology and Innovation, Brisbane, Queensland. 43 pp.

Toxicant default guideline values technical briefs

Accounting for local conditions

Burrlioz software

Search for toxicant default guideline values

Toxicant default guideline values technical briefs

EDIT LINKS

Aniline in freshwater and marine water

Toxicant default guideline values for protecting aquatic ecosystems

October 2000

Extracted from Section 8.3.7 'Detailed descriptions of chemicals' of the ANZECC & ARMCANZ (2000) guidelines.

The default guideline values (previously known as 'trigger values') and associated information in this technical brief should be used in accordance with the detailed guidance provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Description of chemical

Aniline (CAS 62-53-3) is the simplest aromatic amine, with formula of C6H7N and molecular weight 93.1. It is moderately soluble in water to around 35 g/L to give an alkaline solution with pKa 4.6 and has a low log K_{ow} of 0.90. Its equilibrium with cationic species affects its properties in the environment. The current analytical PQL for aniline is 2 µg/L (NSW EPA 2000). The PQL for 2,4-DCA and 3,4-DCA is 10 µg/L.

The major use of aniline in the production of isocyanates for polyurethane resins, but it is also used for manufacture of dyes and rubber processing chemicals (Nielsen et al. 1993a). It is also a by-product of coke production.

Environmental fate

Aniline partitions readily to water, undergoes rapid photolysis and is readily biodegraded (Nielsen et al. 1993a). The half-life of evaporation of aniline under simulated stream conditions is 24 days (Lyman et al. 1982). It does not readily adsorb to sediments and does not significantly bioaccumulate. It is readily depurated from organisms. It adsorbs more strongly to soil under acidic conditions and in soils with higher organic matter.

Table 8.3.13 Toxicity data for short-term tests conducted for guideline derivation for chlorinated alkenes: (EC50; mg/L; i.e. 1000 x µg/L; TV in µg/L)

CAS No.	Chloroethylene 75-01-4	Dichloroethylene (1,1) 75-35-4*	Trichloroethylene (1,1,2) 79-01-6	Tetrachloroethylene 127-18-4	3-chloropropene 107-05-1	1,3-dichloropropene 26952-23-8
Freshwater						
Fish	–	–	–	5-18.5 (n=3)	20-51 (n=4)	0.24-6.8 (n=4)
Crustaceans	–	–	–	7.5-18 (n=1)	–	0.09-6.2 (n=1)

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About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Guideline values » Default guideline values » Toxicant default guideline values for water quality in aquatic ecosystems » Search for toxicant default guideline values

Toxicant default guideline values for water quality in aquatic ecosystems

- Accounting for local conditions
- Burrlioz software
- Search for toxicant default guideline values
- Toxicant default guideline values technical briefs

EDIT LINKS

Search for toxicant default guideline values

Search for one or more default guidelines values (DGVs) for toxicants in freshwater or marine water. Download the spreadsheet from Resources if you need the complete list of toxicant DGVs.

Select a toxicant category (optional)

Anilines

Select or type toxicant name *

Aniline

Medium

Any Freshwater Marine water

Use the search form again to add to your results.

Search

Last updated: 17 May 2017

Resources

Spreadsheet of all toxicant DGVs

Draft toxicant DGVs under review

Process for contributing third-party guideline values

Advice

Check with relevant local authorities in your jurisdiction for site-specific guideline values that will take precedence over these DGVs.

Toxicant default guideline values for protecting aquatic ecosystems

Publication details

Australian and New Zealand governments, and Australian state and territory governments, 2018

A link to the document on this page will be loaded prior to launching the website.

Master table with all the toxicant default guideline values (DGVs) and associated information. All the information in the table, including the DGVs, should be used in accordance with the detailed guidance provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Downloadable version

Document	Pages	File size
Toxicant Default Guideline Values for Protecting Aquatic Ecosystems, master table XLSX	XX	XX MB

If you have difficulty accessing these files, visit web accessibility for assistance.

Toxicant default guideline values for water quality in aquatic ecosystems

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Search... Search

About | Management framework | Guideline values | Your location | Monitoring | Resources

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Helping planners, regulators and researchers to manage the quality of our waterways.

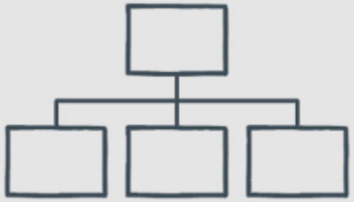
Use the management framework ›

How to use the guidelines

Step through the Water Quality Management Framework & find out about guideline values

Weight of evidence

Learn how to select & assess indicators across multiple lines of evidence



Draft toxicant DGVs

Find draft toxicant default guideline values

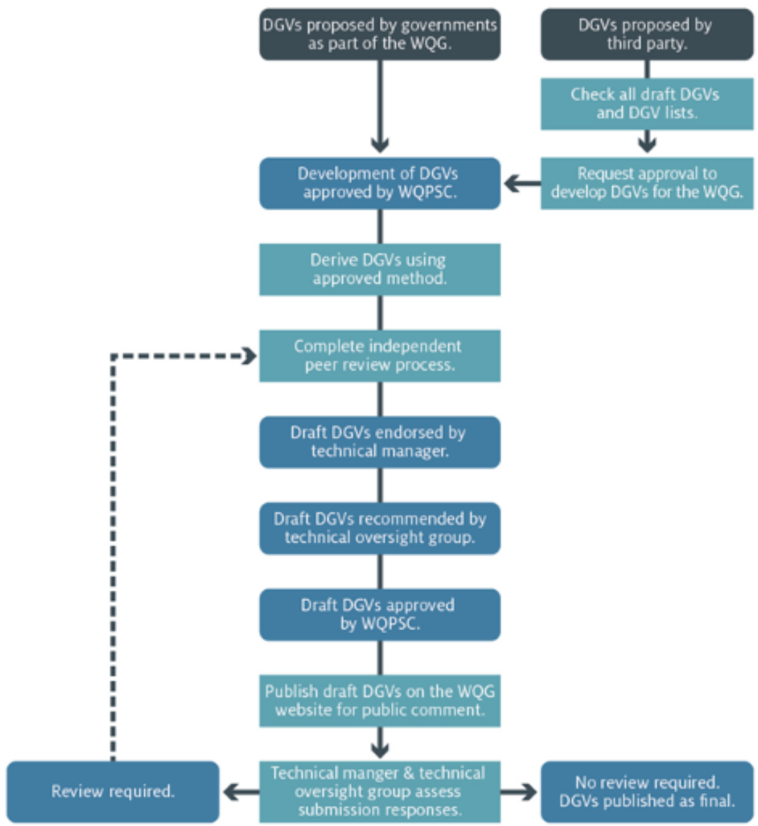
Pathway for toxicant default guideline value publication

The publication of default guideline values (DGVs) on the Water Quality Guidelines website involves a **publication approval process** (refer to Figure 1) that includes initial approval to develop a DGV, development of the DGV and final approval.

All toxicant DGVs published in the Water Quality Guidelines from 2018 onwards, whether funded through the Water Quality Guidelines or contributed by third parties, are subject to a period of public comment.

When draft DGVs have successfully passed through the public comment phase, they will be final, and published on the website as a DGV (refer to Figure 1).

Figure 1 Default guideline value publication approval process



DGVs = Default guideline values, WQG = Water Quality Guidelines, WQPSC = Water Quality Policy Subcommittee

⊞Expand all

DGVs = Default guideline values, WQG = Water Quality Guidelines, WQPSC = Water Quality Policy Subcommittee

⊞ **Expand all**

Draft default guideline values

Proposed default guidelines values

Third party process for proposing default guideline values

⊟Collapse all

Draft default guideline values

Each new or revised toxicant DGV will be published as a draft for public comment (Table 1) for a period of 3 months as a part of our approval process. Until the approval process has been successfully completed, the draft DGV is only draft and should not be used or referred to as an Australian and New Zealand Guidelines for Fresh and Marine Water Quality DGV.

Submit a response

Provide feedback on a draft DGV during its 3-month public comment period by sending us a completed Submission on the draft toxicant DGV.

Table 1 Toxicant DGVs for water and sediment — drafts for public comment

Toxicant	Documents to review	Public comment period closes
Bisphenol-A in freshwater (draft for comment)	• Bisphenol-A technical brief • Bisphenol-A data table • Bisphenol-A quality assessment worksheet	TBA
Iron in freshwater (draft for comment)	• Iron technical brief • Iron data table • Iron quality assessment worksheet	TBA
Triclosan in freshwater (draft for comment)	• Triclosan technical brief • Triclosan data table • Triclosan quality assessment worksheet	TBA

Proposed default guidelines values

Development of draft DGVs involves 3 stages:

- Approved for review process — proposed DGV approved for development and derivation has commenced
- Submitted — proposed DGV developed, including supporting data and information, and submitted for review
- Under consideration — proposed DGV under review, including independent peer review and finalisation based on peer review comments.

Check what is being developed

A number of proposed DGVs have been derived and submitted for consideration to be included in the Water Quality Guidelines as DGVs. These are at different stages of the submission process and are listed in Table 2.

Draft bisphenol-A in freshwater

Publication details

Australian and New Zealand governments, and Australian state and territory governments, 2018

Links to documents on this page will be loaded prior to launching the website.

The draft technical brief, data table and assessment worksheet comprise the package of information associated with the derivation of the draft default guideline values (DGVs) for bisphenol-A in freshwater. Draft DGVs are still in the process of being approved, until the process has been successfully completed, the draft DGV is only draft and should not be used or referred to as an Australian and New Zealand Guidelines for Fresh and Marine Water Quality DGV.

The draft DGVs and guidance in this package should be used in accordance with the detailed guidance provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

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Document	Pages	File size
Draft Bisphenol-A in Freshwater, Draft Toxicant Default Guideline Values for Protecting Aquatic Ecosystems, technical brief PDF	XX	XX MB
Draft Bisphenol-A in Freshwater, Draft Toxicant Default Guideline Values for Protecting Aquatic Ecosystems, technical brief DOCX	XX	XX KB
Draft Bisphenol-A in Freshwater, Draft Toxicant Default Guideline Values for Protecting Aquatic Ecosystems, data table XLSX	1	XX KB

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Search... Search

About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Guideline values » Default guideline values

Guideline values

- Deriving guideline values
- Default guideline values
  - Toxicant default guideline values for water quality in aquatic ecosystems
  - Toxicant default guideline values for sediment quality
  - Water quality for primary industries
  - Pathway for toxicant default guideline value publication

EDIT LINKS

Default guideline values

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Aquatic ecosystems

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Levels of species protection

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See also:

- Level of protection — advice on determining an ecosystem condition and associated level of protection and selecting the appropriate PC stressor DGV

About | Management framework | Guideline values | Your location | Monitoring | Resources

Home » Your location

Water Quality Guidelines

- About
- Management framework
- Guideline values
- Your location
  - Australia's inland waters
  - Australia's marine regions
  - Australian IMCRA mesoscale bioregions
  - New Zealand rivers and estuaries
- Monitoring
- Resources

EDIT LINKS

Your location

We have identified and mapped broad spatial patterns based on biological and physical attributes in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality. This expands on the ecoregionalisation approach first introduced in the ANZECC & ARMCANZ (2000) guidelines.

Ecoregional water quality guidance for Australia and New Zealand

The Water Quality Guidelines provide physical and chemical (PC) stressor default guideline values (DGVs) for many ecoregions of Australia and New Zealand.

We provide specific advice for Australia about the jurisdictional setting, features and ecology of natural and semi-natural aquatic ecosystems in each region, indicators that may be used for biological assessment, and design considerations for conducting a monitoring and assessment program.

Find out about:

- Australia's inland waters
- Australia's marine regions
- Australia's marine IMCRA mesoscale bioregions
- New Zealand's freshwater and estuarine waters.

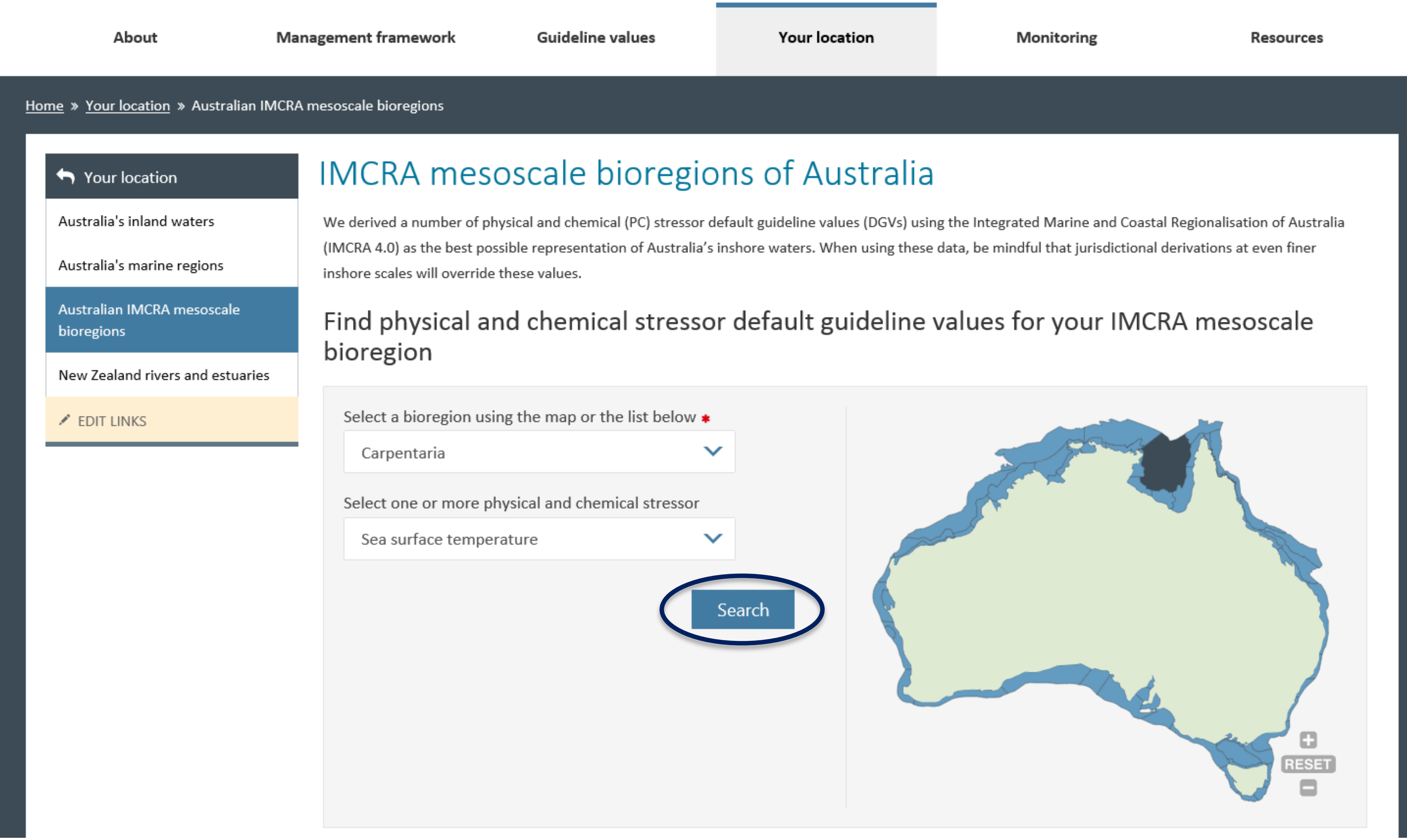
Improvement on previous ecoregionalisation

The ecoregional schema in the Water Quality Guidelines is a considerable enhancement over the approach in the ANZECC & ARMCANZ (2000) guidelines:

- each type of regionalisation or ecosystem based on greater environmental (climatic–physiographic) similarity
- many more regions
- more regional PC stressor DGVs
- more biological assessment models for inland streams (e.g. AUSRIVAS, or Australian River Assessment Scheme)
- useful template for providing guidance on regional-specific management context, biological assessments and general monitoring advice.

Localised guideline values for PC stressors

Many jurisdictions have derived their own guideline values for PC stressors at a catchment, basin or physiographic level since the ANZECC & ARMCANZ (2000) guidelines. We provide links to such jurisdictional information.


About
Management framework
Guideline values
Your location
Monitoring
Resources
Home » Your location » Australian IMCRA mesoscale bioregions
Your location
Australia's inland waters
Australia's marine regions
Australian IMCRA mesoscale bioregions
New Zealand rivers and estuaries
EDIT LINKS
IMCRA mesoscale bioregions of Australia
We derived a number of physical and chemical (PC) stressor default guideline values (DGVs) using the Integrated Marine and Coastal Regionalisation of Australia (IMCRA 4.0) as the best possible representation of Australia's inshore waters. When using these data, be mindful that jurisdictional derivations at even finer inshore scales will override these values.
Find physical and chemical stressor default guideline values for your IMCRA mesoscale bioregion
Select a bioregion using the map or the list below *
Carpentaria
Select one or more physical and chemical stressor
Sea surface temperature
Search
RESET

Search results

IMCRA mesoscale bioregions (Australia) default guideline values (DGVs) for physical and chemical (PC) stressors.

Back to search

Carpentaria

Your search returned 1 result

> Sea surface temperature

Sea surface temperature

Medium: Marine water

IMCRA mesoscale bioregion: Carpentaria

Publish date: 2018

Default guideline values for physical and chemical stressor, surface water for 4 seasons

Percentile	Summer (°C)	Autumn (°C)	Winter (°C)	Spring (°C)
80th	31.2	29.9	26.7	29.1
20th	29.1	27.6	24.6	26

General comments

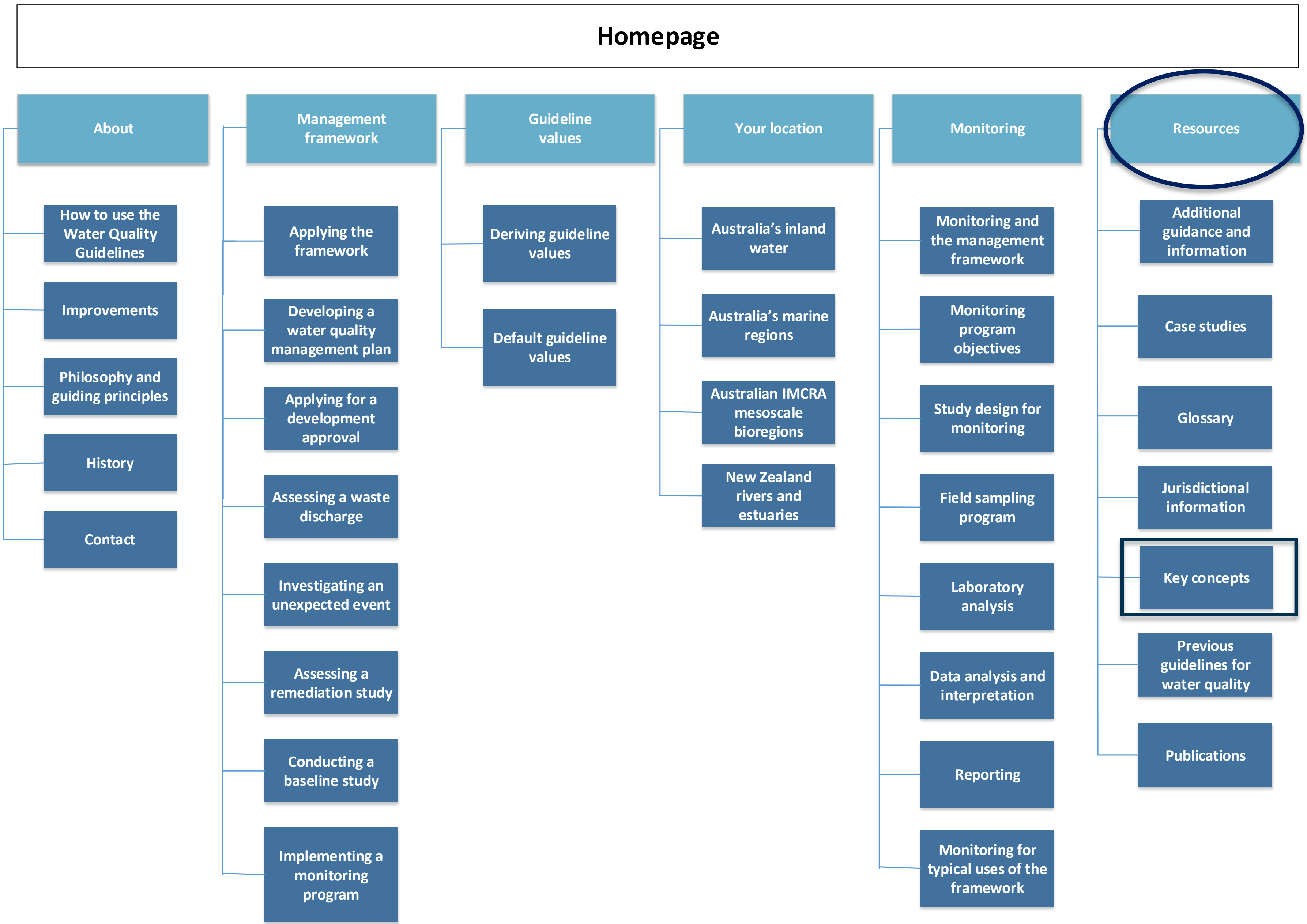
The surface water is an average of the top 20 m. The overall confidence score for each DGV is in the sea surface temperature physical and chemical stressor percentiles data table. Additional percentiles and associated information are also in the data table. The physical and chemical stressor guideline value derivation methodology is available in Resources. Relevant jurisdictional guideline values should be used in preference to these DGVs. These DGVs should be used in accordance with the detailed guidance provided on the Australian and New Zealand Guidelines for Fresh and Marine Water Quality website.

Read the detail

/anz-guidelines/Documents/Physical and chemical stressor default guideline value derivation methodology for IMCRA mesoscale bioregions.pdf

See also

/anz-guidelines/Documents/Sea surface temperature physical and chemical stressor percentiles data table.xls


Homepage
About
How to use the Water Quality Guidelines
Improvements
Philosophy and guiding principles
History
Contact
Management framework
Applying the framework
Developing a water quality management plan
Applying for a development approval
Assessing a waste discharge
Investigating an unexpected event
Assessing a remediation study
Conducting a baseline study
Implementing a monitoring program
Guideline values
Deriving guideline values
Default guideline values
Your location
Australia's inland water
Australia's marine regions
Australian IMCRA mesoscale bioregions
New Zealand rivers and estuaries
Monitoring
Monitoring and the management framework
Monitoring program objectives
Study design for monitoring
Field sampling program
Laboratory analysis
Data analysis and interpretation
Reporting
Monitoring for typical uses of the framework
Resources
Additional guidance and information
Case studies
Glossary
Jurisdictional information
Key concepts
Previous guidelines for water quality
Publications

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Key concepts

To help users better understand how to complete steps in the Water Quality Management Framework, we have defined the critical key concepts b
management of water quality in natural and semi-natural surface waters.

Find out about:

- Adaptive management
- Community values
- Conceptual models
- Guideline values
- Indicator selection
- Indicators in detail
- Level of protection
- Management goals
- Mixing zones
- Monitoring
- Predictive models
- Quadruple bottom line
- Stakeholder involvement
- Water quality objectives
- Weight of evidence (including multiple lines of evidence)

See also:

- Water Quality Management Framework.

Weight of evidence

Weight of evidence describes the process to collect, analyse and evaluate a combination of different qualitative, semi-quantitative or quantitative lines of evidence to make an overall assessment of water/sediment quality and its associated management. It is the central platform for water/sediment quality assessments in the Water Quality Guidelines.

Applying a weight-of-evidence process incorporates judgements about the quality, quantity, relevance and congruence of the data contained in the different lines of evidence.

The Water Quality Guidelines recommends measuring indicators from multiple lines of evidence across the **pressure–stressor–ecosystem receptor (PSER) causal pathway**. This will give greater weight (or certainty) to your assessment conclusions — and subsequent management decisions to meet the water/sediment quality objective — than basing your evaluation on a single line of evidence.

Our approach for weight of evidence:

- harmonises with existing pressure–state–response (PSR) management models that include indicator sets selected across the cause-and-effect pathway
- encompasses a broad set of line of evidence indicators, including those with interpretative and diagnostic value (e.g. toxicity, biomarkers), as well as non –water quality related stressors
- integrates into the Water Quality Management Framework at 3 key steps
- adapts to many typical uses of the Water Quality Management Framework.

Strengthening conclusions from water/sediment quality assessments

Methods and technical guidance for reaching the correct or valid conclusion in water/sediment quality assessments, together with management frameworks that support such evaluations, have steadily improved since the 'integrated water quality assessment' concept in the ANZECC & ARMCANZ (2000) guidelines.

Our methodology to incorporate weight of evidence in water/sediment quality assessments is consistent with recent moves internationally (e.g. USEPA 2016).

Integrated environmental assessment models reduce risk of making poor decisions

Government jurisdictions in Australia and New Zealand are developing environmental indicator sets according to issues and the key elements of the conceptual contaminant pathway that depict causal links.

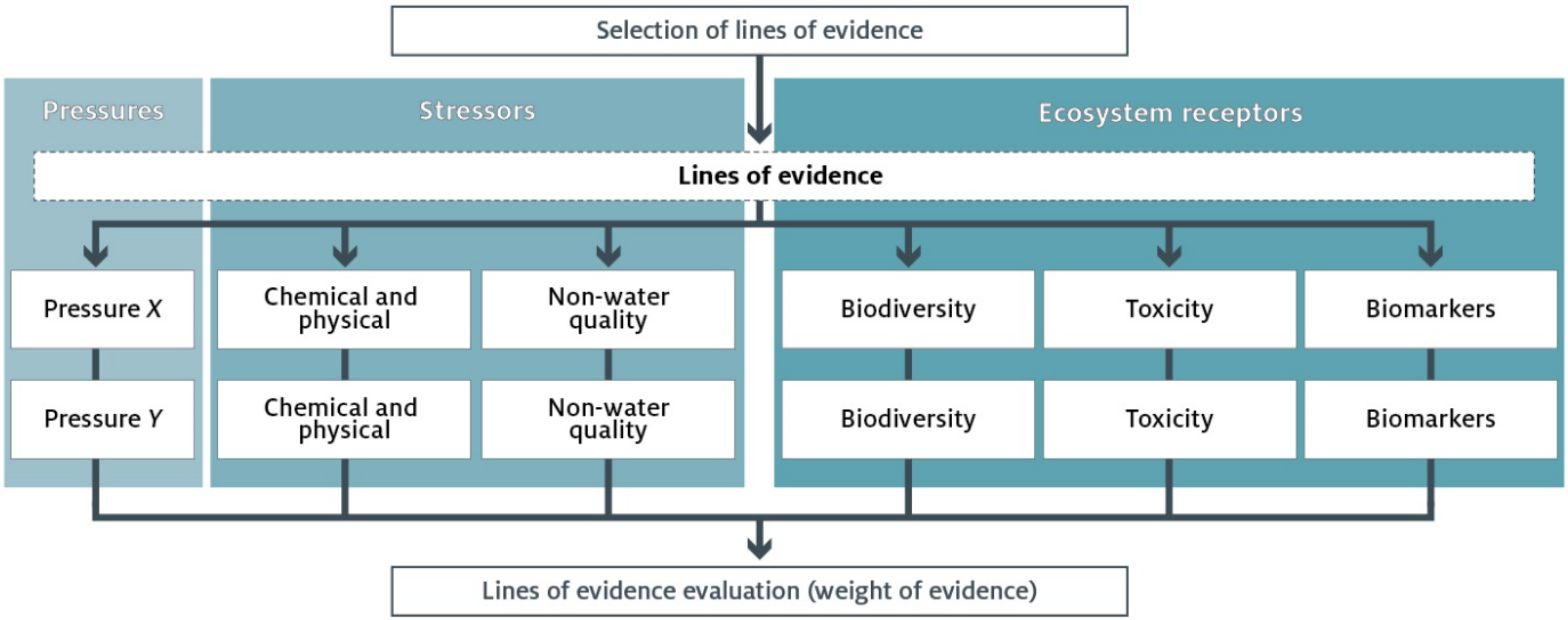
We have adapted the PSR conceptual model used by the Queensland Government (DNRM 2013) and applied it to water/sediment quality assessments in the Water Quality Guidelines; a minor refinement is replacement of 'response' (R) with 'ecosystem receptor' (ER).

Adoption of the PSER model, with information from lines of evidence drawn from and integrated across each of the pressures, stressors and receptors, reduces the risk of making a wrong decision regarding the cause-and-effect linkages for a particular issue.

Defining components in the process

The strongest conclusions arising from a water/sediment quality assessment will be met when lines of evidence are selected from the PSER causal pathway (Figure 1).

Figure 1 Weight-of-evidence process across the pressure–stressor–ecosystem receptor (PSER) causal pathway



Pressures

Pressures are external activities that affect water quality. The consideration of pressure lines of evidence, such as land-based activities, are www.waterquality.gov.au/anz-guidelines

Australian Government
Department of Agriculture
and Water Resources

Website under construction

Water Quality Australia website is under construction, please check again soon...

Visit www.agriculture.gov.au, for urgent enquries call **1800 900 090**