

Appendix 1 Acronyms and glossary of terms

Acronyms

ACC	Acceptable Contaminant Concentration
ACR	Acute-to-chronic ratios
AE	Alcohol ethoxylated surfactants
AES	Alcohol ethoxylated sulfate surfactants
AGPS	Australian Government Publishing Service
ANCA	Australian Nature Conservation Agency
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZFA	Australia New Zealand Food Authority
AQUIRE	Aquatic Toxicity Information Retrieval Database
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
ASSAC	Australian Shellfish Sanitation Advisory Committee
ASSCP	Australian Shellfish Sanitation Control Program
ASQAP	Australian Shellfish Quality Assurance Program
ASTM	American Society for Testing and Materials Designation
AUSRIVAS	Australian River Assessment Scheme
AVS	Acid volatile sulfide
BACI	Before– After, Control–Impact
BACIP	Before–After, Control–Impact Paired
BCF	Bioconcentration factor
BEDS	Biological effects database
BOD	Biological oxygen demand
BOM	Biodegradable organic matter
CCL	Cumulative Contaminant Loading Limit
CCME	Canadian Council for Ministers of the Environment
CCREM	Canadian Council for Resource and Environment Ministers
CEC	Cation exchange capacity
CFU	Colony forming units
COAG	Council of Australian Governments
COD	Chemical oxygen demand
CSIRO	Commonwealth Scientific & Industrial Research Organisation
DASET	Department of Arts, Sport, Environment and Territories
DCC	Desirable contaminant concentration
DEST	Department of Environment, Sport and Territories
DISR	Department of Industry, Science and Resources
DO	Dissolved oxygen
DOC	Dissolved organic carbon
DTA	Direct toxicity assessment
DWAF	Department of Water Affairs and Forestry
DUAP	Department of Urban Affairs and Planning

EC	Electrical conductivity
ECLs	Environmental concern levels
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ENSO	El Nino Southern Oscillation
ERIN	Environmental Resource Information Network
eriss	Environmental Research Institute of the Supervising Scientist
ES	Effect size
ESD	Ecologically sustainable development
ESP	Exchangeable sodium percentage
EV	Environmental value
FNARH	First National Assessment of River Health
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Pollution
ICM	Integrated catchment management
ICPMS	Inductively coupled plasma mass spectrometry
IMO	International Maritime Organisation
ISQG	Interim sediment quality guideline
LAS	Linear alkylbenzene sulfonates
LOEC	Lowest observed effect concentration
LWRRDC	Land and Water Resources Research and Development Corporation
MATC	Maximum acceptable toxicant concentration
MBACI	Multiple Before–After, Control–Impact
MBACIP	Multiple Before–After, Control–Impact, Paired
MDBC	Murray Darling Basin Commission
MHSPE	Ministry for Housing, Spatial Planning and the Environment
MPC	Maximum permitted concentration
NATA	National Association of Testing Authorities of Australia
NHMRC	National Health and Medical Research Council
NICNAS	National Industrial Chemicals Notification and Assessment Scheme
NIWA	National Institute of Water and Atmospheric Research
NOAA	US National Oceanic and Atmospheric Administration
NOEC	No observable effect concentration
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NRHP	National River Health Program
NSSP	US National Shellfish Sanitation Program
NSWDWR	NSW Department of Water Resources
NSWEPA	NSW Environmental Protection Authority
NWQMS	National Water Quality Management Strategy
OECD	Organisation for Economic Co-operation and Development
PAR	Photosynthetically available radiation
PCBs	Polychlorinated biphenyls

PQL	Practical quantitation limit
QA/QC	Quality assurance/quality control
RBA	Rapid biological assessment
RIVPACS	Riverine Invertebrate Prediction and Classification System
SACC	State Algal Coordinating Committee
SAR	Sodium adsorption ratio
SCARM	ARMCANZ Standing Committee for Agricultural and Resource Management
SCEP	ANZECC Standing Committee on Environmental Protection
SEM	Simultaneously extracted metals
SoE	State of the Environment
SPM	Suspended particulate matter
TAN	Total ammonia nitrogen
TCM	Total catchment management
TDS	Total dissolved solids
TIE	Toxicity identification & evaluation
TTM	Total toxicity of mixtures
UNESCO	United Nations Education Scientific and Cultural Organization
USEPA	United States Environmental Protection Agency
VEPA	Victoria Environment Protection Authority
WADEP	Western Australian Department of Environmental Protection
WAEPA	WA Environmental Protection Authority
WAWA	WA Water Authority (now split between the Water Corporation Western Australia and Waters and Rivers Commission (WA))
WET	Whole effluent toxicity
WHO	World Health Organization
WQG	Water quality guideline
WWW	World Wide Web

Glossary

Term	Definition
Abalone/paua	<i>Haliotis</i> spp. of shellfish
Abiotic	The non-living components of a system (see biota)
Absorption	In chemistry: Penetration of one substance into the body of another In biology: The act of absorbing (i.e. to take in as fluids or gases through a cell membrane). To take a substance (e.g. water, nutrients) into the body through the skin or mucous membranes or, in plants, through root hairs.
Acceptable Contaminant Concentration (ACC)	The ACC is the maximum concentration (mg/L) of contaminant in irrigation water which can be tolerated for a shorter period of time (20 years) assuming the same maximum annual irrigation loading as DCC
Acclimation	Short-term adaptation of individual organisms to specific environmental conditions
Acid-soluble metal	The concentration of the metal that passes through a 0.45 µm membrane filter after the sample is acidified to pH 1.5–2.0 with nitric acid
Acidic	Having a high hydrogen ion concentration (low pH)
Acid volatile sulfides (AVS)	Sulfides in sediments that liberate hydrogen sulfide on reaction with cold dilute acid (mainly FeS or MnS in sediments)
Acute toxicity	Rapid adverse effect (e.g. death) caused by a substance in a living organism. Can be used to define either the exposure or the response to an exposure (effect).
Acute–chronic ratio	The species mean acute value divided by the chronic value for the same species
Additive toxicity	The toxicity of a mixture of chemicals that is approximately equivalent to that expected from a simple summation of the known toxicities of the individual chemicals present in the mixture (i.e. algebraic summation of effects).
Adsorption	The taking up of one substance at the surface of another
Aeration	Any process where a substance becomes permeated with air or another gas. The term is usually applied to aqueous liquids being brought into intimate contact with air by spraying, bubbling or agitating the liquid.
Aerobic	Of organisms requiring oxygen for respiration or conditions where oxygen is available
Aesthetic	Aspects of, say, a water body, that can be considered beautiful or pleasant to the senses
'Aggressive' carbon dioxide	The amount of dissolved carbon dioxide in excess of that required to stabilise the bicarbonate ion present in water
Algae	Comparatively simple chlorophyll-bearing plants, most of which are aquatic and microscopic in size
Alkalinity	The quantitative capacity of aqueous media to react with hydroxyl ions. The equivalent sum of the bases that are titratable with strong acid. Alkalinity is a capacity factor that represents the acid-neutralising capacity of an aqueous system.
Alkaloids	Nitrogenous organic bases found in plants
Allochthonous	Organic material that is developed or derived outside a particular waterbody
Ambient waters	All surrounding waters, generally of largely natural occurrence

Amphipods	Invertebrates belonging to the order Crustacea
Anaerobic	Conditions where oxygen is lacking; organisms not requiring oxygen for respiration
Analytes	The physical and chemical species (indicators) to be determined
Anion	Negatively charged ion
Anionic	Characteristic behaviour or property of an ion that has a negative charge. Anions move to the anode in electrolysis.
Anode	The electrode where oxidation occurs
Antagonism	A phenomenon in which the effect or toxicity of a mixture of chemicals is less than that which would be expected from a simple summation of the effects or toxicities of the individual chemicals present in the mixture (i.e. algebraic subtraction of effects)
Anthropogenic	Produced or caused by humans
<i>A posteriori</i>	Identifying causes by inductive reasoning based on actual effects, consequences or facts (i.e. from observation, experience or experiment)
<i>A priori</i>	Predicting effects by deductive reasoning based on causes rather than actual observation, experience or experiment
Aquaculture	Commonly termed fish farming, but it broadly refers to the commercial growing of marine (mariculture) or freshwater animals and aquatic plants
Aquatic ecosystem	Any watery environment from small to large, from pond to ocean, in which plants and animals interact with the chemical and physical features of the environment
Aquifer	An underground layer of permeable rock, sand or gravel that absorbs water and allows it free passage through pore spaces
Assessment factors	A unitless number applied to the lowest toxicity figure for a chemical to derive a concentration that should not cause adverse environmental effects; also called 'application factor' or 'safety factor', the size of the AF varies with the type of data (section 8.3.3.2)
Assimilation	The incorporation of absorbed substances into cellular material
Assimilative capacity	The maximum loading rate of a particular pollutant that can be tolerated or processed by the receiving environment without causing significant degradation to the quality of the ecosystem and hence the environmental values it supports
Ataxia	Inability to coordinate voluntary movement
Autochthonous	Organic material that is developed or produced within a particular waterbody
Autotrophy	The nutrition of organisms that produce their own organic constituents from inorganic compounds, using energy from sunlight or oxidation processes (e.g. most plants and some bacteria)
Avoidance threshold	The lowest concentration of a substance that causes a fish to actively move away from the source
Barramundi	<i>Lates calcarifer</i>
Baseline data (studies)	Also called pre-operational data (studies); collected (undertaken) before a development begins
Benthic	Referring to organisms living in or on the sediments of aquatic habitats (lakes, rivers, ponds, etc.)
Benthos	The sum total of organisms living in, or on, the sediments of aquatic habitats

Binding sites	Sites on a substrate where chemical interaction with an indicator (qv) may occur. The interaction may be electrostatic, polar, hydrogen bonding or covalent bonding.
Bioaccumulation	General term describing a process by which chemical substances are accumulated by aquatic organisms from water, either directly or through consumption of food containing the chemicals
Bioassay	A test that exposes living organisms to several levels of a substance that is under investigation, and evaluates the organisms' responses
Bioavailable	The fraction of the total of a chemical in the surrounding environment that can be taken up by organisms. The environment may include water, sediment, soil, suspended particles, and food items.
Biochemical (or biological) oxygen demand	<p>The decrease in oxygen content in mg/L of a sample of water in the dark at a certain temperature over a certain period of time which is brought about by the bacterial breakdown of organic matter</p> <p>Usually the decomposition has proceeded so far after 20 days that no further change occurs. The oxygen demand is measured after 5 days (BOD₅), at which time 70% of the final value has usually been reached.</p>
Bioclogging	Clogging of irrigation infrastructure due to excessive algae or microbial growth
Bioconcentration	A process by which there is a net accumulation of a chemical directly from water into aquatic organisms resulting from simultaneous uptake (e.g. by gill or epithelial tissue) and elimination
Bioconcentration factor (BCF)	<p>A unitless value describing the degree to which a chemical can be concentrated in the tissues of an organism in the aquatic environment</p> <p>At apparent equilibrium during the uptake phase of a bioconcentration test, the BCF is the concentration of a chemical in one or more tissues of the aquatic organisms divided by the average exposure concentration in the test.</p>
Biocorrosion	Corrosion caused by microorganisms through formation of biofilms on the metal surface
Biodiversity (biological diversity)	The variety of life forms, including the plants, animals and micro-organisms, the genes they contain and the ecosystems and ecological processes of which they are a part
Biofilm	Layer of materials created by microorganisms on an underwater surface
Biological assessment	Use and measurement of the biota to monitor and assess the ecological health of an ecosystem
Biological community	An assemblage of organisms characterised by a distinctive combination of species occupying a common environment and interacting with one another
Biomagnification	<p>Result of the processes of bioconcentration and bioaccumulation by which tissue concentrations of bioaccumulated chemicals increase as the chemical passes up through two or more trophic levels</p> <p>The term implies an efficient transfer of chemicals from food to consumer, so that residue concentrations increase systematically from one trophic level to the next.</p>
Biomass	The living weight of a plant or animal population, usually expressed on a unit area basis
Biosolids	Sewage sludge, organic residuals remaining after domestic sewage treatment

Biota	The sum total of the living organisms of any designated area
Biotoxins	A toxin (a poison) which originates from a living thing (a plant, animal, fungi, bacteria, etc.)
Bioturbation	The physical disturbance of sediments by burrowing and other activities of organisms
Bivalve	A mollusc with a hinged double shell
Black bream	<i>Acanthopagrus butcheri</i>
Black tiger prawn	<i>Penaeus monodon</i>
Bloom	An unusually large number of organisms per unit of water, usually algae, made up of one or a few species
Blue mussel	<i>Mytilus edulis</i>
Buffer	A solution containing a weak acid and its conjugate weak base, the pH of which changes only slightly on the addition of acid or alkali
Buffering capacity	A measure of the relative sensitivity of a solution to pH changes on addition of acids or base
°C	Degrees Celsius
Carcinogen	A substance that induces cancer in a living organism
Catchment	The total area draining into a river, reservoir, or other body of water
Cathode	The electrode where reduction occurs
Cation	Positively charged ion
Cation exchange capacity (CEC)	A measure of a soil's ability to retain cations
Cationic	The characteristic behaviour or property of an ion with a positive charge. Cations move to the cathode in electrolysis.
Chelate	The type of co-ordination compound in which a central metal ion is attached by co-ordinate links to two or more non-metal atoms in the same molecule, called ligands
Chemical oxygen demand	The amount of oxygen required to oxidise all organic matter that is susceptible to oxidation by a strong chemical oxidant
Chlorination	1) The process of introducing one or more chlorine atoms into a compound 2) The application of chlorine to water, sewage or industrial wastes for disinfection
Chronic	Lingering or continuing for a long time; often for periods from several weeks to years. Can be used to define either the exposure of an aquatic species or its response to an exposure (effect). Chronic exposure typically includes a biological response of relatively slow progress and long continuance, often affecting a life stage.
Chronic value	The geometric mean of the lower and upper limits obtained from an acceptable chronic test or by analysing chronic data using a regression analysis A lower chronic limit is the highest tested concentration that did not cause an unacceptable amount of adverse effect on any of the specified biological measurements, and below which no tested concentration caused unacceptable effect An upper chronic limit is the lowest tested concentration that did cause an unacceptable amount of adverse effect on one or more biological measurements and above which all tested concentrations also caused such an effect
Cladoceran	Water flea; zooplankton belonging to the fourth order of the Branchiopoda, the Cladocera

Colloid	Material in solution typically 1 nm–100 nm in diameter. Colloidal particles do not settle out of solution through the force of gravity. Organic colloidal matter is considered especially important in the transport of inorganic substances such as P through the soil profile.
Community	An assemblage of organisms characterised by a distinctive combination of species occupying a common environment and interacting with one another
Community composition	All the types of taxa present in a community
Community metabolism	The biological movement of carbon in an ecosystem, involving two processes, production (<i>via</i> photosynthesis) and respiration
Community structure	All the types of taxa present in a community and their relative abundances
Complexation	The formation of a compound by the union of a metal ion with a non-metallic ion or molecule called a ligand or complexing agent
Compliance	Action in accordance with upholding a 'standard' (water quality)
Concentration	The quantifiable amount of chemical in, say, water, food or sediment
Condition indicators or targets	Indicators of the condition or state of the ecosystem. They are normally biological indicators (e.g. species composition, species abundance), but may also be physical or chemical indicators (e.g. dissolved oxygen concentration, temperature, flow duration). These often represent the <i>targets</i> , or <i>water quality objectives</i> , that need to be met in order to actually achieve the desired level of ecosystem protection.
Contaminant	Biological (e.g. bacterial and viral pathogens) and chemical (see Toxicants) introductions capable of producing an adverse response (effect) in a biological system, seriously injuring structure or function or producing death
Control	That part of an experimental procedure which is like the treated part in every respect except that it is not subjected to the test conditions. The control is used as a standard of comparison, to check that the outcome of the experiment is a reflection of the test conditions and not of some unknown factor.
Corrosion	Deterioration of surfaces through erosion processes such as the conversion of metals to oxides and carbonates
Cresylic	Acidic commercial mixture of phenolic materials boiling above the cresol range (greater than 240°C)
Criteria (water quality)	Scientific data evaluated to derive the recommended quality of water for different uses
Crop quality	With regard to inorganic contaminants, increased concentration of contaminant in plant tissue that while not phytotoxic, reduces the economic value of the crop due to increased residues
Cumulative	Resulting from successive additions at different times or in different ways
Cumulative Contaminant Loading Limit (CCL)	The CCL is the maximum contaminant loading in soil defined in gravimetric units (kg/ha); it indicates the cumulative amount of contaminant added, above which site-specific risk assessment is recommended if irrigation and contaminant addition is continued.
Cyanobacteria	A division of photosynthetic bacteria, formerly known as blue-green algae, that can produce strong toxins
Cyanosis	A blueness in the appearance of surficial tissues, generally due to a deficiency of oxygen bound to haemoglobin
Cytotoxic	Having an adverse impact on cells
Decision criteria	Criteria by which decisions will be made as a result of monitoring for potential impacts. (See also effect size, Type I error, Type II error)

Decision framework or decision tree	<p>A series of steps for tailoring guideline trigger values to a specific site or region and for assessing water quality by considering the local or regional environmental factors that will modify the effect of the particular water quality parameter</p> <p>The decision frameworks or trees begin with the simplest steps and finish with the most difficult and expensive.</p>
Depuration	Process that uses a controlled aquatic environment to reduce the level of pathogenic organisms that may be present in live shellfish
Desirable Contaminant Concentration (DCC)	The DCC is the maximum concentration (mg/L) of contaminant in irrigation water which can be tolerated assuming 100 years of irrigation based on stated irrigation loading assumptions
Detection limit	The smallest concentration or amount of a substance that can be reported as present with a specified degree of certainty by definite complete analytical procedures
Detritus	Unconsolidated sediments composed of both inorganic and dead and decaying organic material
Dinoflagellates	Major class of marine algae that move by flagella. They are often red in color, and can produce strong toxins that can kill many fish and other marine organisms.
Direct toxicity assessment (DTA)	The use of toxicity tests to determine the acute and/or chronic toxicity of waste water discharges or total pollutant loads in receiving waters. (Assesses the toxicity of mixtures of chemicals rather than individual chemicals.)
Diuresis	Increased discharge of urine
Diurnal	Daily
Divalent	Having a valence (combining power at atomic level) of two (e.g. calcium, Ca ²⁺)
Dose	The quantifiable amount of a material introduced into an animal
Dysphagia	Difficulty in swallowing
Early detection	Measurable biological, physical or chemical response in relation to a particular stress, prior to significant adverse affects occurring on the system of interest.
Early life-stage test	28-day to 32-day exposures (60-day post-hatch for salmonids) of the early life stages of a species of fish from shortly after fertilisation through embryonic, larval and early juvenile development. Data are obtained on survival and growth.
EC ₅₀ (median effective concentration)	The concentration of material in water that is estimated to be effective in producing some lethal response in 50% of the test organisms. The LC ₅₀ is usually expressed as a time-dependent value (e.g. 24-hour or 96-hour LC ₅₀).
EC _{se}	The electrical conductivity of the soil saturation extract
EC _s	The electrical conductivity of the soil solution at maximum field water content
EC _{1:5}	The electrical conductivity of a 1:5 soil:water extract
Ecological integrity (health)	<p>The 'health' or 'condition' of an ecosystem</p> <p>The ability of an ecosystem to support and maintain key ecological processes and organisms so that their species compositions, diversity and functional organisations are as comparable as possible to those occurring in natural habitats within a region</p>
Ecologically sustainable development	Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends
Ecosystem condition	Current or desired status of health of an ecosystem, as affected by human disturbance
Ecosystem health	In this document synonymous with 'ecological integrity' (qv)

Ecosystem-specific modifying factor	A factor that can influence (mostly reduce) the biological effects caused by a Particular toxicant or stressor
Effect size	The size of impact that would cause concern (or constitute an early warning). Often defined as a level of (ecological) change that is acceptable in comparison to a defined reference.
Effluent	A complex waste material (e.g. liquid industrial discharge or sewage) that may be discharged into the environment
Electrical conductivity	The ability of water or soil solution to conduct an electric current
Encrustation	Accumulation of material on surfaces through chemical or biological processes
End-points	Measured attainment response, typically applied to ecotoxicity or management goals
Endemic, endemism	Confined in occurrence to a local region
Enterococci	Any streptococcal bacteria normally found in the human intestinal tract; usually nonpathogenic
Environmental values	Particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and that require protection from the effects of pollution, waste discharges and deposits. Several environmental values may be designated for a specific waterbody.
Epilimnion	The uppermost layer of water in a lake, characterised by an essentially uniform temperature that is generally warmer than elsewhere in the lake, and by relatively uniform mixing by wind and wave action
Epilithon	Organisms attached to rocks, such as algae and lichens
Epiphyte	A plant that grows on the outside of another plant, using it for support only and not obtaining food from it
ESP	The exchangeable sodium content of a soil expressed as a percentage of the cation exchange capacity
Eukaryotes	An organism characterised by the presence of membrane-bound organelles (see prokaryote)
Euphotic	Of surface waters to a depth of approximately 80–100 m; the lit region that extends virtually from the water surface to the level at which photosynthesis fails to occur because of reduced light penetration
Euryhaline	Describes organisms that are capable of osmo-regulating over a wide range of salinities
Eutrophic	Abundant in nutrients and having high rates of productivity frequently resulting in oxygen depletion below the surface layer of a waterbody
Eutrophication	Enrichment of waters with nutrients, primarily phosphorus, causing abundant aquatic plant growth and often leading to seasonal deficiencies in dissolved oxygen
Evapotranspiration	The combined loss of water from a given area during a specified period of time by evaporation from the soil or water surface and by transpiration from plants
Exchangeable sodium percentage (ESP)	The sodium adsorbed onto clay mineral surfaces as a proportion of the total cation exchange capacity of those surfaces
Exposure	The amount of physical or chemical agent that reaches a target or receptor
Fate	Disposition of a material in various environmental compartments (e.g. soil or sediment, water, air, biota) as a result of transport, transformation and degradation
Field capacity	The greatest amount of water that it is possible for a soil to hold in its pore spaces after excess water has drained away

Flocculation	(1) The process by which suspended colloidal or very fine particles coalesce and agglomerate into well-defined hydrated floccules of sufficient size to settle rapidly (2) The stirring of water after coagulant chemicals have been added to promote the formation of particles that will settle
Flounder	<i>Rhombosolea</i> spp.
Flow-through system	An exposure system for aquatic toxicity tests in which the test material solutions and control water flow into and out of test chambers on a once-through basis either intermittently or continuously
Fluorosis	Chronic poisoning by fluorine
Fouling	Accumulation of material through chemical, physical or biological processes
Free carbon dioxide	The amount of dissolved carbon dioxide in excess of that required to stabilise the bicarbonate ion present in water
Freshwater shrimp	A decapod crustacean, including the genus <i>Macrobrachium</i> spp.
Gastropod	A mollusc of the Class Gastropoda, with a locomotive organ placed ventrally (e.g. snail and limpet)
Gilvin	The coloured component of dissolved organic matter in water. It is composed mainly of humic, fulvic and tannic compounds.
Green shell mussel	<i>Perna canaliculus</i>
Gross alpha (activity)	A measure of the concentration of alpha-particle emitting radionuclides in water. This is determined by standard techniques involving the evaporation of a water sample and measurement of the alpha activity of the residue.
Gross beta (activity)	A measure of the concentration of beta-particle emitting radionuclides in water. This is determined by standard techniques involving the evaporation of a water sample and measurement of the beta activity of the residue.
Groundwater	Water stored underground in rock crevices and in the pores of geologic materials that make up the earth's crust; water that supplies springs and wells
Guideline package	Decision trees that are applied to physical and chemical stressors and/or associated issues for aquatic ecosystems
Guideline trigger values	These are the concentrations (or loads) of the key performance indicators measured for the ecosystem, below which there exists a low risk that adverse biological (ecological) effects will occur. They indicate a risk of impact if exceeded and should 'trigger' some action, either further ecosystem specific investigations or implementation of management/remedial actions.
Guideline (water quality)	Numerical concentration limit or narrative statement recommended to support and maintain a designated water use
Habitat	The place where a population (e.g. human, animal, plant, microorganism) lives and its surroundings, both living and non-living
Half-life	Time required to reduce by one-half the concentration of a material in a medium (e.g. soil or water) or organism (e.g. fish tissue) by transport, degradation, transformation or depuration
Hardness	The concentration of all metallic cations, except those of the alkali metals, present in water. In general, hardness is a measure of the concentration of calcium and magnesium ions in water and is frequently expressed as mg/L calcium carbonate equivalent.
Hazard	The potential or capacity of a known or potential environmental contaminant to cause adverse ecological effects

Helminth	Helminths are worms; the helminths discussed in this document are human and animal parasites
Hepatotoxin	Toxic substances which adversely affect the liver
Heterotrophy	The nutrition of plants and animals that are dependent on organic matter for food
High reliability guideline trigger values	Trigger values that have a higher degree of confidence because they are derived from an adequate set of chronic toxicity data (section 8.3.4) and hence require less extrapolation from the data to protect ecosystems
Humic substances	Organic substances only partially broken down that occur in water mainly in a colloidal state. Humic acids are large-molecule organic acids that dissolve in water.
Hydrogeology	Study of subsurface waters and with related geologic aspects of surface water
Hydrograph	Graphical representation of river or stream discharge or of water-level fluctuations in a well
Hydrolysis	(1) The formation of an acid and a base from a salt by the ionic dissociation of water (2) The decomposition of organic compounds by interaction with water
Hydrophilic	Having an affinity for water, readily absorbs water
Hydrophobic	Having little or no affinity for water, repels or does not absorb water
Hypolimnion	The region of a waterbody that extends from below the thermocline to the bottom of the lake; it is thus removed from much of the surface influence
Hypothesis	Supposition made from known facts as a starting-point for further investigation
Hypoxia	Deficiency of oxygen in tissues or in blood; anoxia
Incipient LC ₅₀	The concentration of a chemical that is lethal to 50% of the test organisms as a result of exposure for periods sufficiently long that acute lethal action has essentially ceased. The asymptote (part of the toxicity curve parallel to the time axis) of the toxicity curve indicates the value of the incipient LC ₅₀ approximately.
Indicator	A parameter that can be used to provide a measure of the quality of water or the condition of an ecosystem
Ingestion	The swallowing or taking in of food material
Inorganic carbon	Generally, simple ions and molecules that contain carbon bonded only to inorganic atoms. Carbonates are the most common group, although the cyanide ion is also considered to be inorganic.
Interstitial	Occurring in interstices or spaces; applied to water and to flora and fauna living between sand grains and soil particles
Invertebrates	Animals lacking a dorsal column of vertebrae or a notochord
<i>In vitro</i>	Outside the intact organism; generally applied to experiments involving biochemical events occurring in tissue fragments or fractions in a laboratory
Ion	An electrically charged atom
Kuruma prawn	<i>Penaeus japonicus</i>
Langelier Saturation Index (SI)	An index based on the tendency of water to deposit or dissolve calcium carbonate. It relates the actual pH of water with the pH at which water is saturated with calcium carbonate (SI = pH - pH _s).
LC ₁₀₀	Lowest concentration of a toxicant that kills all the test organisms

LC ₅₀ (median lethal concentration)	The concentration of material in water that is estimated to be lethal to 50% of the test organisms. The LC ₅₀ is usually expressed as a time-dependent value, e.g. 24-hour or 96-hour LC ₅₀ , the concentration estimated to be lethal to 50% of the test organisms after 24 or 96 hours of exposure.
LD ₅₀ (median lethal dose)	The dose of material that is estimated to be lethal to 50% of the test organisms. Appropriate for use with test animals such as rats, mice and dogs, it is rarely applicable to aquatic organisms because it indicates the quantity of a material introduced directly into the body by injection or ingestion rather than the concentration of the material in water in which aquatic organisms are exposed during toxicity tests.
Leachate	Water that has passed through a soil and that contains soluble material removed from that soil
Leaching	Where referred to in the salinity and sodicity section of Chapter 4, the downward movement of water and solutes below the root zone
Leaching fraction (LF)	The proportion of water applied to the surface of a soil (e.g. as irrigation or rainfall) that drains below the root zone in the soil profile
Lentic	Standing body of water such as a lake or pond
Lethal	Causing death by direct action. Death of aquatic organisms is the cessation of all visible signs of biological activity.
Level of protection	A level of quality desired by stakeholders and implied by the selected management goals and water quality objectives for the water resource
Life-cycle study	A chronic (or full chronic) study in which all the significant life stages of an organism are exposed to a test material. Generally, a life-cycle test involves an entire reproductive cycle of the organism. A partial life-cycle toxicity test includes the part of the life cycle observed to be especially sensitive to chemical exposure.
Ligand	A molecule, ion or atom that is attached to the central atom of a co-ordination compound, a chelate or other complex. May also be called complexing agent.
Liveweight	Weight of the living animal
LOEC (Lowest observed effect concentration)	The lowest concentration of a material used in a toxicity test that has a statistically significant adverse effect on the exposed population of test organisms as compared with the controls. When derived from a life-cycle or partial life-cycle test, it is numerically the same as the upper limit of the MATC.
LOEL (Lowest observed effect level)	The lowest concentration that produces an observable effect in a test species. Below this concentration there are no observed effects in the test species.
Long-term trigger value (LTV)	The maximum concentration of contaminant in irrigation water which can be tolerated assuming 100 years of irrigation, based on key irrigation loading assumptions
Lotic	Flowing waters (e.g. rivers and streams)
Low reliability guideline trigger values	Trigger values that have a low degree of confidence because they are derived from an incomplete data set (section 8.3.4.1). They are derived using either assessment factors or from modelled data using the statistical method. They should only be used as interim indicative working levels.
Macrophyte	A member of the macroscopic plant life of an area, especially of a body of water; large aquatic plant

Management goals	<p>Long-term management objectives that can be used to assess whether the corresponding environmental value is being maintained. They should reflect the desired levels of protection for the aquatic system and any relevant environmental problems.</p> <p>Management goals will mostly be narrative statements focusing management on the relevant water quality objectives.</p>
Marron	<i>Cherax tenuimanus</i>
MATC (Maximum acceptable toxicant concentration)	The maximum concentration of a toxic substance that a receiving water may contain without causing significant harm to its productivity or uses as determined by chronic toxicity tests
Maximum tolerable daily level (MTDL)	The dietary level that when fed for a limited period, will not impair animal performance and should not produce unsafe residues in produce for human consumption
Median	Middle value in a sequence of numbers
Mesotrophic	Water bodies or organisms which are intermediate between nutrient-rich and nutrient-poor
Metabolite	Any product of metabolism
Methylation	The introduction of methyl (CH ₃) groups into organic and inorganic compounds
Methyl mercury	The most common form is the cation CH ₃ Hg ⁺ although (CH ₃) ₂ Hg also occurs. Both are extremely potent toxicants and can lead to secondary poisoning through biomagnification. They are usually formed in anoxic sediments.
Mixing zones	An explicitly defined area around an effluent discharge where effluent concentrations may exceed guideline values and therefore result in certain environmental values not being protected. The size of the mixing zone is site specific.
Moderate reliability guideline trigger values	Trigger values that have a moderate degree of confidence because they are derived from an adequate set of acute toxicity data (section 8.3.4) and hence require more extrapolation than high reliability trigger values, including an acute-to-chronic conversion
Monomeric	A chemical compound comprising single molecules
Morphometry	The form, shape and dimensions of an entity, e.g. waterbody or animal
Multiple lines of evidence	Weight of the evidence based on different types of information from a variety of different sources and studies
Munsell Scale	A means of expressing the colour of a soil by matching it against a colour chart
Necrotic	Localised dying tissue
Neurotoxin	Toxic substances which adversely affect the nervous system
NOEC (No observed effect concentration)	The highest concentration of a toxicant at which no statistically significant effect is observable, compared to the controls; the statistical significance is measured at the 95% confidence level
Not detectable	Below the limit of detection of a specified method of analysis
Nutrient solution	Plant growth medium providing all essential elements for plant growth in the absence of soil or other support media. Also referred to as solution culture.
Octanol:water partition coefficient (P _{OW})	The ratio of a chemical's solubilities in <i>n</i> -octanol and water at equilibrium. The logarithm of P _{OW} is used as an indication of a chemical's propensity for bioconcentration by aquatic organisms.
Off-flavour	Result of the accumulation of certain pollutants such as petroleum hydrocarbons in fish or shellfish to a level that affects the flavour, making the product undesirable for human consumption; also known as tainting

Oligotrophic	Waters with a small supply of nutrients
Organic carbon	Generally carbon which is chemically bonded to other carbon atoms, although methane (one carbon atom only) and its derivatives are considered organic
Organism	Any living animal or plant; anything capable of carrying on life processes
Osmoregulation	The biological process of maintaining the proper salt concentration in body tissues to support life
Osmosis	Diffusion of a solvent through a semi-permeable membrane into a more concentrated solution, tending to equalise the concentrations on both sides of the membrane
Oxidation	The combination of oxygen with a substance, or the removal of hydrogen from it or, more generally, any reaction in which an atom loses electrons
Oxygenation	The process of adding dissolved oxygen to a solution
Pacific oyster	<i>Crassostrea gigas</i>
PAH	Polycyclic aromatic hydrocarbons
Parameter	A measurable or quantifiable characteristic or feature
Partition coefficient	A ratio of the equilibrium concentration of the chemical between a non-polar and polar solvent
Pathogen	An organism capable of eliciting disease symptoms in another organism
Pelagic	Term applied to organisms of the plankton and nekton which inhabit the open water of a sea or lake
Percentile	Division of a frequency distribution into one hundredths
Performance indicators	These are the indicators used to assess the risk that a particular issue will occur (they are used in the guideline packages to compare against the trigger values). They are generally median (or mean) concentrations in the ambient water, and may be stressor and/or condition indicators.
Periphyton	The organisms attached to submerged plants
Pesticide	A substance or mixture of substances used to kill unwanted species of plants or animals
pH	Value that represents the acidity or alkalinity of an aqueous solution. It is defined as the negative logarithm of the hydrogen ion concentration of the solution.
pH (CaCl ₂)	Measurement of soil pH in a 1:2.5 solution of soil:0.01M CaCl ₂ . The CaCl ₂ solution is used because it has an ionic strength similar to that of soil water.
Phenols	Phenol is a benzene ring with one -OH radical replacing hydrogen. Phenols are compounds which contain additional chemical groups bound to this basic structure (each replacing hydrogen).
Photodegradation	Breakdown of a substance by exposure to light; the process whereby ultra-violet radiation in sunlight attacks a chemical bond or link in a chemical structure
Photolysis	The decomposition of a compound into simpler units as a result of the absorption of one or more quanta of radiation
Photosynthesis	The conversion of carbon dioxide to carbohydrates in the presence of chlorophyll using light energy
Physico-chemical	Refers to the physical (e.g. temperature, electrical conductivity) and chemical (e.g. concentrations of nitrate, mercury) characteristics of water
Physiology	The study of the functioning of organisms and their parts
Phytoplankton	Small (often microscopic) aquatic plants suspended in water

Phytotoxicity	Toxicity of contaminants to plants
Pilot program	A field investigation similar in design to a sampling program, but less ambitious in scope. It is used to assess preliminary indicator values, spatial and temporal variability and logistic issues before definitive sampling.
Plankton	Plants (phytoplankton) and animals (zooplankton), usually microscopic, floating in aquatic systems
Pollution	The introduction of unwanted components into waters, air or soil, usually as result of human activity; e.g. hot water in rivers, sewage in the sea, oil on land
Polychlorinated biphenyls	These are highly toxic and persistent compounds derived from the replacement by Cl radicals of numerous H radicals on biphenyl, which consists of two benzene rings joined by a covalent bond, with the elimination of two H radicals (C ₁₂ H ₁₀).
Potable water	Water suitable, on the basis of both health and aesthetic considerations, for drinking or culinary purposes
Practical Quantitation Limit (PQL)	The Practical Quantitation Limit (PQL) is the lowest level achievable among laboratories within specified limits during routine laboratory operations. The PQL represents a practical and routinely achievable detection level with a relatively good certainty that any reported value is reliable (Clesceri et al. 1998). The PQL is often around 5 times the method detection limit.
Precipitation	(1) The formation of solid particles in a solution; generally, the settling out of small particles (2) The settling-out of water from cloud, in the form of rain, hail, snow, etc.
Primary production	The production of organic matter from inorganic materials
Producers	Organisms that are able to build up their body substance from inorganic materials
Prokaryotes	Organisms characterised by the absence of membrane-bound organelles (opposite to eukaryotes)
Prolarvae	Newly hatched larvae during the first few days when they feed on their supply of embryonic yolk
Protocol	A formally agreed method and procedure for measuring an indicator; it defines the sampling, sample handling procedures and sample analysis
Protozoans	Single-celled, animal-like organisms of the kingdom Protista
Quality assurance (QA)	The implementation of checks on the success of quality control (e.g. replicate samples, analysis of samples of known concentration)
Quality control (QC)	The implementation of procedures to maximise the integrity of monitoring data (e.g. cleaning procedures, contamination avoidance, sample preservation methods)
Rainbow trout	<i>Oncorhynchus mykiss</i>
Radiological	Pertaining to nuclear radiation
Rapid biological assessment	A form of biological assessment, best developed using stream macroinvertebrate communities, that uses standardised, cost-effective protocols to provide rapid sample processing, data analysis, reporting and management response. The results from such assessments are likely to be reliable to detect large impacts but not small or minor impacts.
Recruitment	In these Guidelines, the replenishment or addition of individuals of an animal or plant population through reproduction, dispersion and migration
Red claw	<i>Cherax quadricarinatus</i>

Redox potential	An expression of the oxidising or reducing power of a solution relative to a reference potential. This potential is dependent on the nature of the substances dissolved in the water, as well as on the proportion of their oxidised and reduced components.
Reference condition	An environmental quality or condition that is defined from as many similar systems as possible and used as a benchmark for determining the environmental quality or condition to be achieved and/or maintained in a particular system of equivalent type
Relaying	Transfer of shellfish from restricted areas and conditional approved areas (when closed due to harvesting criteria being exceeded) to approved or conditional approved areas for natural biological cleansing using the ambient environment as a treatment system
Risk	<p>A statistical concept defined as the expected likelihood or probability of undesirable effects resulting from a specified exposure to known or potential environmental concentrations of a material. A material is considered safe if the risks associated with its exposure are judged to be acceptable.</p> <p>Estimates of risk may be expressed in absolute or relative terms. Absolute risk is the excess risk due to exposure. Relative risk is the ratio of the risk in the exposed population to the risk in the unexposed population.</p>
Ryznar (Stability) index	Index relating the pH of water (pH) to the pH of water just saturated with calcium carbonate (pH _s)
Salinity	The presence of soluble salts in or on soils or in water
Sediment	Unconsolidated mineral and organic particulate material that settles to the bottom of aquatic environment
Sediment pore waters	Water that occupies the space between particles in a sediment, as distinct from overlying water which is the water above the sediment layer
Sewage fungus	A thick filamentous growth that develops in water contaminated with sewage. The filamentous material is composed predominately of the bacterium <i>Sphaerotilus natans</i> .
Short-term trigger value (STV)	The maximum concentration of contaminant in irrigation water which can be tolerated for a shorter period of time (20 years) assuming the same maximum annual irrigation loading to soil as for the <i>long-term trigger value</i> (qv)
Silver perch	<i>Bidyanus bidyanus</i>
Simultaneously extracted metals	The sum of the molar concentrations of heavy metals (excluding iron and manganese) that are solubilised with cold dilute acid (usually measured simultaneously with the measurement of AVS).
Snapper	<i>Pagrus auratus</i>
Sodicity	The presence of a high proportion of sodium ions relative to other cations in a soil
Sodium adsorption ratio (SAR)	The concentration of sodium relative to calcium and magnesium in the soil solution
Solution concentration	Concentration of solutes in the soil water phase. The solutes, which may be contaminants, in the soil water are generally regarded as being highly available to organisms.
Sorption	Process whereby contaminants in soils adhere to the inorganic and organic soil particles
Speciation	The intimate chemical environment of the indicator (qv), that is the compound or ion of which it forms a part
Species	A group of organisms that resemble each other to a greater degree than members of other groups and that form a reproductively isolated group that will not produce viable offspring if bred with members of another group

Species richness	The number of species present (generally applied to a sample or community)
SPM — suspended particulate matter	This is insoluble material which resides in the water column, or is dispersed in a sample upon agitation
Stakeholder	A person or group (e.g. an industry, a government jurisdiction, a community group, the public, etc.) who have an interest or concern in something
Standard (water quality)	An objective that is recognised in enforceable environmental control laws of a level of government
Standing crop	The weight of organic material that can be sampled or harvested by normal methods at any one time from a given area
Static system	An exposure system of aquatic toxicity tests in which the test chambers contain solutions of the test material or control water that are not usually changed during the test. Depending upon conditions, a static system may or may not be in equilibrium.
Steady state or dynamic equilibrium	The state at which the competing rates of uptake and elimination of a chemical within an organism or tissue are equal. An apparent steady state is reached when the concentration of a chemical in tissue remains essentially constant during a continuous exposure.
Stressors	The physical, chemical or biological factors that can cause an adverse effect in an aquatic ecosystem as measured by the condition indicators (see Section 3.3.2)
Sub-lethal	Involving a stimulus below the level that causes death
Supersaturation	Refers to a solution containing more solute than equilibrium conditions will allow
Survival time	The time interval between death and the initial exposure of an aquatic organism to a harmful substance
Suspension	A system in which very small particles (solid, semi-solid, or liquid) are more or less uniformly dispersed in a liquid or gaseous medium. If the particles are small enough to pass through filter membranes, the system is termed a colloidal suspension. If the particles are of larger than colloidal dimensions they will tend to precipitate, if heavier than the suspending medium, or to agglomerate and rise to the surface, if lighter.
Sydney rock oyster	<i>Saccostrea commercialis</i>
Synergism	A phenomenon in which the effect or toxicity of a mixture of chemicals is greater than that to be expected from a simple summation of the effects or toxicities of the individual chemicals present in the mixture
Tainting	See 'Off-flavour'
Taxa richness	Number of taxa present
Taxon (Taxa)	Any group of organisms considered to be sufficiently distinct from other such groups to be treated as a separate unit (e.g. species, genera, families)
Taxonomic (group, resolution)	An organism's location in the biological classification system used to identify and group organisms with similar physical, chemical and/or structural composition.
Teratogen	An agent that increases the incidence of congenital malformations
Thermodynamic equilibrium	Property of a system which is in mechanical, chemical and thermal equilibrium
Thermotolerant coliform	Also known as faecal coliforms. In tropical and sub-tropical areas, thermotolerant coliforms may on some occasions include microorganisms of environmental rather than faecal origin.

Threshold concentration	A concentration above which some effect (or response) will be produced and below which it will not
Tolerance	The ability of an organism to withstand adverse or other environmental conditions for an indefinitely long exposure without dying
Total dissolved solids (TDS)	A measure of the inorganic salts (and organic compounds) dissolved in water
Total metal	The concentration of a metal in an unfiltered sample that is digested in strong nitric acid
Toxicant	A chemical capable of producing an adverse response (effect) in a biological system at concentrations that might be encountered in the environment, seriously injuring structure or function or producing death. Examples include pesticides, heavy metals and biotoxins (i.e. domoic acid, ciguatoxin and saxitoxins).
Toxicity	The inherent potential or capacity of a material to cause adverse effects in a living organism
Toxicity identification and evaluation (TIE)	Toxicity characterisation procedures involving use of selective chemical manipulations or separations and analyses coupled with toxicity testing to identify specific classes of chemicals and ultimately individual chemicals that are responsible for the toxicity observed in a particular sample
Toxicity test	The means by which the toxicity of a chemical or other test material is determined. A toxicity test is used to measure the degree of response produced by exposure to a specific level of stimulus (or concentration of chemical).
Trigger values	These are the concentrations (or loads) of the key performance indicators measured for the ecosystem, below which there exists a low risk that adverse biological (ecological) effects will occur. They indicate a risk of impact if exceeded and should 'trigger' some action, either further ecosystem specific investigations or implementation of management/remedial actions.
Trochus	<i>Trochus niloticus</i>
True colour	The colour of water resulting from substances that are totally in solution; not to be mistaken for apparent colour resulting from colloidal or suspended matter
Turbulence	Unorganised movement in liquids and gases resulting from eddy formation
Type I error	Probability of concluding that an impact has occurred when, in fact, an impact has not occurred
Type II error	Probability of concluding that an impact has not occurred when, in fact, an impact has occurred
Univariate	Statistical analysis concerned with data collected on one dimension of the same organism
Uptake	A process by which materials are absorbed and incorporated into a living organism
Value judgements	A decision involving basic issues of fairness, reasonableness, justice, or morality
Volatile	Having a low boiling or subliming pressure (a high vapour pressure)
Water quality criteria	Scientific data evaluated to derive the recommended quality of water for various uses
Water quality guideline	See 'Guideline (water quality)'
Water quality objective	A numerical concentration limit or narrative statement that has been established to support and protect the designated uses of water at a specified site. It is based on scientific criteria or water quality guidelines but may be modified by other inputs such as social or political constraints.

Watertable	The level of groundwater; the upper surface of the zone of saturation for underground water.
Whiting	<i>Sillago</i> spp. of marine fish
Whole effluent toxicity testing	The use of toxicity tests to determine the acute and/or chronic toxicity of effluents
Xenobiotic	A foreign chemical or material not produced in nature and not normally considered a constituent of a specified biological system. This term is usually applied to manufactured chemicals.
Yabby	<i>Cherax destructor</i>
Zooplankton	The animal portion of the plankton

Appendix 2 The National Water Quality Management Strategy

The Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) are working together to develop a National Water Quality Management Strategy (NWQMS).

The guiding principles for the Strategy are set out in *National Water Quality Management Strategy: Policies and Principles — A Reference Document* (NWQMS Paper 2, ANZECC & ARMCANZ, 1994) which emphasises the importance of:

- ecologically sustainable development
- integrated (or total) catchment management
- best management practices, including the use of acceptable modern technology, and waste minimisation and utilisation
- the role of economic measures, including user pays and polluter pays.

The process of implementing the National Water Quality Management Strategy involves the community working in concert with government in setting and achieving local environmental values, which are designed to maintain good water quality and to progressively improve poor water quality. It involves development of a plan for each catchment and aquifer, which takes account of all existing and proposed activities and developments, and which contains the agreed environmental values and feasible management options.

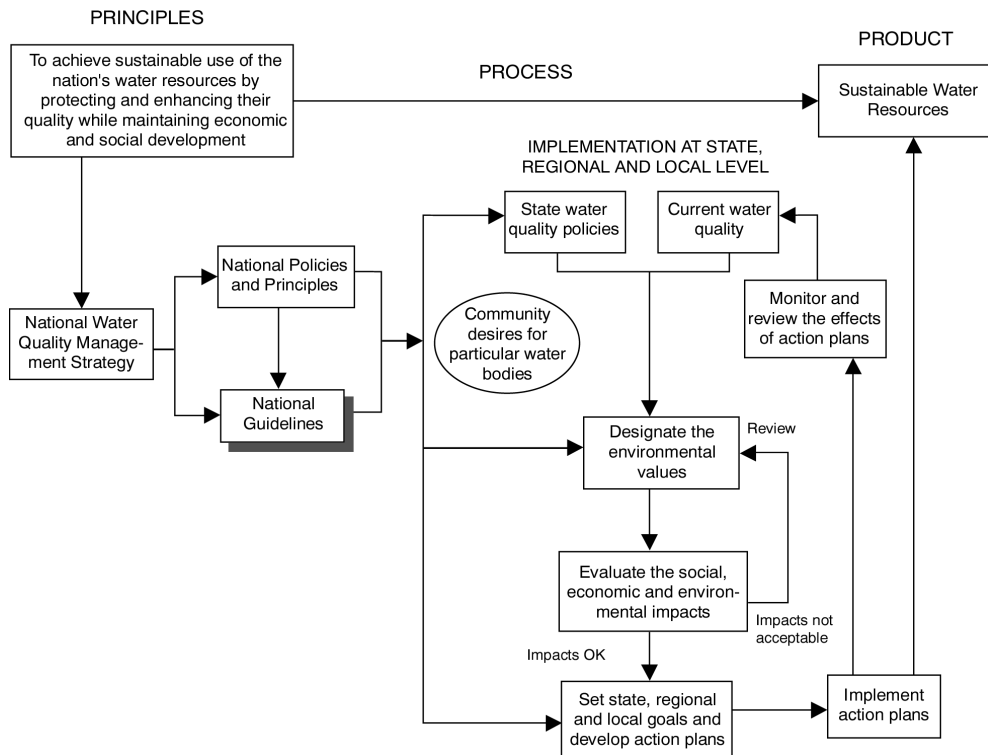


Figure A1 National Water Quality Management Strategy

Documents of the National Water Quality Management Strategy

Paper No. Title

Policies and Process for Water Quality Management

- 1 *Water Quality Management — An Outline of the Policies*
- 2 *Policies and Principles — A Reference Document*
- 3 *Implementation Guidelines*

Water Quality Benchmarks

- 4 *Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters*
- 5 *Australian Drinking Water Guidelines — Summary*
- 6 *Australian Drinking Water Guidelines*
- 7 *Australian Guidelines for Water Quality Monitoring and Reporting*

Groundwater Management

- 8 *Guidelines for Groundwater Protection*

Guidelines for Diffuse and Point Sources*

- 9 *Rural Land Uses and Water Quality*
- 10 *Guidelines for Urban Stormwater Management*
- 11 *Guidelines for Sewerage Systems — Effluent Management*
- 12 *Guidelines for Sewerage Systems — Acceptance of Trade Waste (Industrial Waste)*
- 13 *Guidelines for Sewerage Systems — Sludge (Biosolids) Management*
- 14 *Guidelines for Sewerage Systems — Use of Reclaimed Water*
- 15 *Guidelines for Sewerage Systems — Sewerage System Overflows*
- 16a *Effluent Management Guidelines for Dairy Sheds*
- 16b *Effluent Management Guidelines for Dairy Processing Plants*
- 17 *Effluent Management Guidelines for Intensive Piggeries*
- 18 *Effluent Management Guidelines for Aqueous Wool Scouring and Carbonising*
- 19 *Effluent Management Guidelines for Tanning and Related Industries in Australia*
- 20 *Effluent Management Guidelines for Australian Wineries and Distilleries*

* The guidelines for diffuse and point sources are national guidelines which aim to ensure high levels of environmental protection that are broadly consistent across Australia.

Appendix 3 Recent water quality documents of the NZ Ministry for the Environment

- *Flow Guidelines for Instream Values* (NZ Ministry for the Environment 1995)
- *New Zealand Drinking Water Guidelines* (NZ Ministry of Health 1995).
- *Water Quality Guidelines No. 1: Biological Growths* (NZ Ministry for the Environment 1992)
- *Water Quality Guidelines No. 2: Colour and Clarity* (NZ Ministry for the Environment 1994)
- *Periphyton Guidelines* (NZ Ministry for the Environment, in press)
- *Recreational Water Quality Guidelines* (NZ Ministry for the Environment 1999)
- *Monitoring the Trophic Status of New Zealand's Lakes* (NZ Ministry for the Environment, in press)
- *Managing Waterways on Farms* (NZ Ministry for the Environment, in press)
- *A discussion on reasonable mixing in water quality management, Resource Management Ideas No. 10* (NZ Ministry for the Environment 1994)
- *Reducing the Impacts of Agricultural Runoff on Water Quality: A discussion of policy approaches* (NZ Ministry for the Environment 1997)

Appendix 4 Development of the revised guidelines

This Appendix outlines the revision process for the Guidelines, and the various instrumentalities involved.

The revision program

In March 1993 the ANZECC Standing Committee on Environmental Protection (SCEP) made a decision to review the *Australian Water Quality Guidelines for Fresh and Marine Waters*, periodically, with the following two primary objectives:

- to incorporate current scientific, international and national information which is appropriate to Australian and New Zealand conditions; and
- to produce a document that is sufficiently clear and understandable for the relevant authorities to use for consultation.

The Environmental Research Institute of the Supervising Scientist (*eriss*) was given the responsibility for managing the review of the Guidelines on behalf of ANZECC.

The review strategy was endorsed by the ANZECC SCEP at its meeting on 15 May 1996 which involved key government and non-government groups in recognition of the need for an open and transparent process with broad community consultation. As part of the strategy, a project committee was established and given very broad representation to oversee and facilitate the process. Membership included state environment agencies, a number of agencies and representatives of the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ), and representatives of the National Health and Medical Research Council (NHMRC), the National Farmers Federation, the Australian Seafood Industry Council, and peak conservation organisations (full membership listed below).

The outcomes from a preliminary workshop, together with the issues raised in early public submissions on the Guidelines, were used to assist in identifying and defining the scope of the tasks necessary for reviewing the 1992 report. Expert groups from Australia and New Zealand were then commissioned to review the technical aspects of the report and a draft of the revised guidelines was compiled by *eriss*.

After consideration by the project committee, the draft document was referred firstly to the ARMCANZ/ANZECC Contact Group (listed below), and then to the ARMCANZ subcommittee — the Sustainable Land & Water Resource Management Committee (SLWRMC) — for feedback and subsequent endorsement prior to its release. The Guidelines were released for a three-month public comment period in July 1999 by the Australian Commonwealth Minister for the Environment & Heritage, without the endorsement of SCEP and the ARMCANZ Standing Committee for Agricultural and Resource Management (SCARM).

eriss received and collated 96 public submissions. On the basis of these comments, the Guidelines were redrafted in close consultation with the Contact Group and its working parties (listed below). The revised Guidelines were endorsed by the Contact Group in May 2000 and by SCEP in June 2000, with the final document then referred to ANZECC who approved the Guidelines for publication under the National Water Quality Management Strategy in July 2000.

The Project Committee

Name	Organisation	Name	Organisation
Graeme Batley	ARMCANZ — CSIRO Energy Technology	Kevin McAlpine (Secretary)	Com. Environmental Research Institute of the Supervising Scientist
John Chapman	NSW Environmental Protection Authority — Centre for Ecotoxicology	Bill Maher	University of Canberra
John Cugley	SA Department of Environment and Natural Resources	Scott Markich	Australian Nuclear Science and Technology Organisation
Lisa Dixon	Victorian Environmental Protection Authority	Greg Miller	peak conservation organisations
Barry Hart	Monash University — Water Studies Centre	Andrew Moss	Queensland Department of Environment
Chris Humphrey	Com. Environmental Research Institute of the Supervising Scientist	Barry Noller	Northern Territory Department of Mines and Energy
Heather Hunter	Queensland Department of Natural Resources	Eric Pyle	New Zealand Ministry for the Environment
Arthur Johnston (Chairman)	Com. Environmental Research Institute of the Supervising Scientist	Nigel Scullion	Australian Seafood Industry Council
Warren Jones	Tasmanian Department of Environment and Land Management	Graham Skyring	ARMCANZ — Skyring Environment Enterprises
David Klessa	Com. Environmental Research Institute of the Supervising Scientist	Victor Talbot	WA Department of Environmental Protection
Mike Lawton	Northern Territory Department of Land Planning and Environment	Alan Thomas	Com. Environment Protection Group
Chris leGras	Com. Environmental Research Institute of the Supervising Scientist	Pam Waudby	National Farmers Federation
Richard Lugg	National Health and Medical Research Council	Rosalyn Vulcano	Northern Territory Power and Water Authority

Contributing members of the Contact Group and/or proxies (period 1996–2000)

Name	Organisation	Name	Organisation
Paul Bainton & Alan Thomas	Com. Environment Australia, Environment Protection Group	Rachel Gregson, Ross Dalton, Dennis Alyliffe, David Lambert, Stephen Clark	Agriculture, Fisheries and Forestry — Australia
Barbara Richardson & Carolyn Davies	NSW Environment Protection Authority	Bruce Cooper	New South Wales Department of Land and Water Conservation
Chris Bell	Victorian Environment Protection Authority	Anne Woolley & Peter Thompson	Queensland Department of Natural Resources
John Cugley	SA Environment Protection Authority	Peter Scott	Melbourne Water Corporation
Stephen Fisher (EPA) & Ian Eskdale (DE)	Queensland Environment Protection Agency & Queensland Department of Environment	Alan Maus & Barry Sanders	Water Corporation of Western Australia
Victor Talbot	Western Australian Department of Environmental Protection	Michael Lawton	Northern Territory Department of Lands, Planning & Environment
Greg Dowson & Warren Jones	Tasmanian Department of Environment and Land Management	Robert Neil	Environment ACT
Bob Zuur & Eric Pyle	New Zealand Ministry of the Environment	Philip Callan	National Health and Medical Research Council

Working Parties to the Contact Group

1. Aquaculture: David Cunliffe, Pauline Semple, Victor Talbot, Rob Cordover, Christine Cowie, Kerry Jackson and Michelle Burford
2. Agriculture: Liz Rogers, Greg Dowson, Karen Benn and Karina Watkins
3. Physico-chemical stressors: Klaus Koop, Greg Dowson, John Cugley, Peter Scott, Andrew Moss and Bob Humphries
4. Toxicants and sediments: Peter Thompson, Bob Humphries, John Cugley, Bruce Cooper, Munro Mortimer, Victor Talbot, Karina Watkins and Gus Fabris

Appendix 5 Basis of the proposed guidelines for recreational water quality and aesthetics in Australia

The draft World Health Organization (WHO) *Guidelines for Safe Recreational-water Environments: Coastal and Fresh-waters* (WHO 1998), in referring to the different types of recreational usage of water, give the following examples:

- no contact, where enjoyment is of aesthetic beauty of the water environment;
- limited contact, e.g. boating, rowing, fishing;
- meaningful direct contact that involves a negligible risk of swallowing water, e.g. wading;
- extensive direct contact with full body immersion and a meaningful risk of swallowing water, e.g. swimming.

The WHO *Health-based Monitoring of Recreational Waters: The Feasibility of a New Approach (The 'Annapolis' Protocol)* (WHO 1999) considers the adequacy and effectiveness of present approaches to the monitoring and assessment of recreational water, particularly where the monitoring is linked to the effective management of microbiological hazards in coastal and freshwater areas.

A number of types of hazards that can be encountered in recreational water are dealt with in the WHO Guidelines; they include:

- poisoning and toxicoses, including stings of poisonous and venomous animals, ingestion or inhalation of, or contact with, chemically contaminated water or blooms of toxic cyanobacteria or dinoflagellates;
- physiological effects, including chilling, thermal shock;
- exposure to pathogenic bacteria, viruses, fungi or parasites;
- aesthetic quality including visual clarity, colour, odour, surface scum.

The WHO Guidelines also include guidance on assessment and control measures, public health advice and intervention requirements when guideline values are exceeded.

References

- WHO 1998. Guidelines for safe recreational-water environments: Coastal and fresh-waters. Draft for Consultation, EOS/DRAFT/98.14, World Health Organization, Geneva.
- WHO 1999. Health-based monitoring of recreational waters: The feasibility of a new approach (The 'Annapolis Protocol'), WHO/SDEW/WSH/99.1, World Health Organization, Geneva.

