Australian Government
Department of the Environment and Heritage

National Chemical Reference Guide – Standards in the Australian Environment

Supporting Information

EPHC
Environment Protection and Heritage Council

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SECTION 1
Introductory Information for Web-site

Chemicals in the environment

Our world is made up of chemicals – those that occur naturally and those that people make for a huge range of purposes. The environment and the people that live in it can be exposed to such chemicals. Determining if these chemicals are at levels harmful to organisms (including humans) in the environment is the key to sustaining these environments into the future. In order to determine if chemical levels in the environment are below harmful levels, considerable research is conducted to determine the fate and effect of these chemicals in air, water, soil and biota. This information is analysed to derive safe concentration values that should be achieved in order to protect ecosystems and human health.

Searching for guidelines and standards

To date, there is no one document integrating the various guidelines and standards for chemical management in Australia. Various guideline documents do exist for different environmental matrices (e.g. air, soil or water), though these are diverse and in many cases region specific. This is reinforced by findings of the National Chemicals Taskforce, which in March 2003 submitted a scoping paper identifying the lack of a readily accessible guide to existing environmental guidelines and standards as a useful precursor to moving toward a nationally consistent approach to chemical management. For this reason, this comprehensive 'Reference Guide' has been compiled to act as a resource for governments, industry and the public with an interest in managing chemicals in the environment. This web-site and associated database provides for the first time in Australia a collation of all national documents for chemicals in our environment. This encompasses five media including air, water, soil, sediment and biota. Documents used to compile this listing include those used to protect ecosystems and the humans that interact with or consume products from these ecosystems.

How are 'safe' levels for chemicals in the environment determined?

Levels of chemicals in the environment perceived to be safe are typically derived from the effects that particular chemicals have on various species inhabiting these environments and/or humans that interact with these environments. Information for the development of a safe level for a chemical in our environment is generally acquired from available literature on the following aspects:

- Relevant toxicological data on plants and animals
- Physical and chemical properties
- Sources and pathways for entering the environment
- Environmental concentrations
- Fate and behaviour
- Potential for bioaccumulation
- Existing standards and guidelines
- Production and uses.

How do you use these levels?

In general, two terms are used to characterise safe levels of chemicals in the environment, namely Guidelines and Standards. Each term, although often highly related, have very different standings and applications in society. ***Guidelines*** are non-legally enforceable limits that provide support to managers for assessment, monitoring and/or remediation of environments. ***Standards,*** however, are legally enforceable numerical limits or narrative statements often specified in permits, approvals, regulations, legislation and/or orders. It is up to State government agencies in Australia to decide whether guidelines are enforceable or not, however the Commonwealth has provided a range of 'guideline' and 'standard' documents to ensure relative uniformity across the nation.

Setting values for chemicals in such a large and diverse country as Australia is quite a challenge and in many cases unrealistic due to the large variations in climate, geology and social conditions as well as existing quality of environments encountered throughout the country. **Subsequently national guidelines should be viewed locally as a point of reference with which to determine the status of individual situations**. It is considered that when setting levels for chemicals in local environments, these values should be accompanied by effective community consultation and transparent decision making in order to reach best results. It should **not** be assumed that degradation of the existing environment to any prescribed value is acceptable. Similarly, modifications of guidelines to site-specific objectives should **not** be made on the basis of ecosystem characteristics that have arisen as a direct result of previous human activities.

The use of guidelines for site-specific environmental objectives requires an understanding of the chemical, physical, and biological characteristics of the environment and an understanding of the behaviour of a substance once it is introduced into the environment. Factors affecting the application of the guidelines include:

- The general characteristics of the environment
- The effect of local environmental conditions
- Processes influencing the concentration of chemicals in the environment
- Mixtures of chemicals having greater toxicity than the added individual toxicities
- Factors that modify toxicity to organisms.

Reference to guideline documents will provide information on how to adapt values to specific conditions. Should an environment display signs of degradation despite guideline values being met, it is recommended to contact the agency that has set the guidelines so that the issue can be addressed when guideline values are reviewed.

What information has been used in this Reference Guide?

This reference guide is built around information obtained from national documents on guidelines and standards for chemicals in the ambient environment. This encompasses five environmental media including air, biota, soil & groundwater, sediment and water. Documents used to compile this listing include:

AIR

1. National Environment Protection Measure (Ambient Air NEPM and Air Toxics NEPM)

National Environment Protection Measures (NEPMs) outline agreed national objectives for protecting or managing particular aspects of the environment. The Ambient Air Quality NEPM sets uniform standards for a set of agreed criteria air pollutants in ambient air (ambient air does not include indoor air) that affect human health. The Air Toxics NEPM establishes a national framework for monitoring and reporting ambient air toxics. The Measure is primarily concerned with the collection of data on ambient levels of formaldehyde, toluene, xylene, benzene and polycyclic aromatic hydrocarbons at locations where elevated levels are expected to occur and there is a likelihood that significant population exposure could occur. Online versions of these documents can be found at the following addresses:

http://www.ephc.gov.au/nepms/air/air_nepm_downloads.html
http://www.ephc.gov.au/nepms/air/air_toxics.html

2. Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales

This document lists the methods to be used and provides guidance for the modelling and assessment of air pollutants from stationary sources in New South Wales for statutory purposes. The document covers:

- Impact assessment criteria for criteria pollutants, hydrogen fluoride, deposited dust and total suspended particulate (TSP) matter
- Ground-level concentration (glc) criteria for individual odorous and toxic air pollutants
- Glc criteria for hydrogen sulphide
- Odour performance criteria for complex mixtures of odours
- Impact assessment methodology based on dispersion modelling
- The procedure for developing site-specific emission limits.

This document contains guidance for estimating the air quality impacts of a much larger set of potential air pollutants than the Air NEPMs.

Note: This is a State government document and has not been through the national approval process and is not applicable in all jurisdictions. An online version of this document can be found at the following address:

http://www.epa.nsw.gov.au/air/amsaap/index.htm

BIOTA

1. Australian New Zealand Food Standards Code (ANZFSC)

Note: These standards have not been included in the database. Please refer to the online document.

The Australian New Zealand Food Standards Code (ANZFSC) is a collection of individual food standards, and deals with standards that apply to all foods, standards affecting particular classes of foods and food hygiene issues in Australia. ANZFSC Standards for contaminants and natural toxicants sets out the maximum levels (MLs) of specified metal and non-metal contaminants and natural toxicants in nominated foods. Unless expressly provided elsewhere in the ANZFSC, the provisions of the Code apply to food products sold or prepared for sale in Australia and/or New Zealand, and/or imported into Australia and/or New Zealand. An online version of this document can be found at the following address:

http://www.foodstandards.gov.au/foodstandardscode/

2. National Residue Survey Annual Report 2002-2003

The National Residue Survey (NRS) was established for the purpose of monitoring and reporting the level of contaminants in food, inputs to production and or the environment. Monitoring for residues, as undertaken by the NRS, helps audit the use of currently registered agricultural and veterinary chemicals in Australia. At present the chemicals that may be detected include: antimicrobial agents (disease control); anthelmintics

(parasite control); hormonal growth promotants; fungicides; insecticides and acaricides; fumigants (e.g. grain protectants); and herbicides used to control weeks in crops. The NRS monitors residue levels against maximum residue limits (MRLs) listed in the ANZFSC. However, where the Australian Pesticides & Veterinary Medicines Authority (APVMA) has established an MRL that has not yet been adopted into the ANZFSC, this fact is taken into consideration by the NRS when interpreting the significance of any results that do not have limits expressed by the ANZFSC. An online version of this document can be found at the following address:

http://www.affa.gov.au/content/publications.cfm?Category=National%20Residue%20Survey&ObjectID=D0E6FEB2-6B1F-4D25-805BCF00E6111CC3

SOIL & GROUNDWATER

1. EPHC/NEPC Assessment of Site Contamination National Environment Protection Measure – NEPM 2000

National Environment Protection Measures (NEPMs) outline agreed national objectives for protecting or managing particular aspects of the environment. The NEPM for assessment of contaminated sites contains two schedules, Schedule A and Schedule B. Schedule A describes the site assessment process that indicates which general guidelines within the NEPM are applied to each level of site investigation. Schedule B identifies 10 individual guidelines for the assessment of contaminated sites, including ***soil and groundwater***. The objective of the site assessment is to determine whether site contamination poses an actual or potential risk to human health and/or the environment of sufficient magnitude to warrant remediation. Within the Soil Investigation Levels, there are six different Health Investigation Levels (HILs) values (A-F), each representing a different human exposure setting, e.g. residential with substantial vegetable garden. Ecological Investigation Levels (EILs), however, are ecologically-based guidelines at a regional level that are yet to be developed. The EILs will consider regional data on flora, fauna, soils, climate etc. related to the protection of ecological values, and referred to as Regional EILs (REILs). Where these levels are exceeded, a remediation strategy can be implemented if sufficient information is available, if not, a detailed site investigation is required. Such investigation determines whether a risk assessment is needed to determine action, if not required a decision can be made regarding whether remediation is needed. An online version of this document can be found at the following address:

http://www.ephc.gov.au/nepms/cs/con_sites.html

WATER (Including Sediment)

1. Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000

These guidelines are designed to help users assess whether the water quality of a water resource is good enough to allow it to be used for humans, food production or aquatic ecosystems (these uses are termed environmental values). If the water quality does not meet the water quality guidelines, the water may not be safe for those environmental values and management action could be triggered to either more accurately determine whether the water is safe for a particular use or, if not, to remedy the problem. These Guidelines include chemicals within ***sediments***, and ***water*** considered for primary industry, human health (recreational and aesthetic) and water within aquatic ecosystems. They are not meant to be applied directly to recycled water quality, contaminant levels in discharges from industry, mixing zones, or stormwater quality, unless stormwater systems are regarded as having conservation value. These Guidelines should not be used as mandatory standards. An online version of this document can be found at the following address:

http://www.deh.gov.au/water/quality/nwqms/index.html#quality

2. NHMRC Australian Drinking Water Guidelines 1996

The National Health and Medical Research Council (NHMRC) Australian Drinking Water Guidelines (ADWG) are the primary reference on drinking water quality in Australia and provide necessary guidance for the provision of a safe and high quality drinking water supply that protects public health and meets the needs and expectations of consumers. They are concerned with the safety of water from a health point of view and with its aesthetic quality. The guidelines are applicable to any water intended for drinking (except bottled or packaged water, and ice) irrespective of its source (municipal supplies, rainwater tanks, bores, point-of-use treatment devices etc.) or where it is used (the home, restaurants, camping areas, shops etc.). Exceeding a guideline value should be a signal to investigate the cause and, if appropriate, to take remedial

action. If the characteristic is health-related, the relevant health authority should be consulted. An online version of this document can be found at the following address:

http://www.health.gov.au/nhmrc/publications/synopses/eh19syn.htm

Note: Other documents exist outlining guidelines and standards for chemicals in the environment, including a wide range of documents produced by international agencies. The agencies that have derived these values are likely to have used differing risk assessment and value setting methodologies and these differences should be appraised before applying them within Australia. It is recommended that guidelines presented above should be consulted first when assessing chemical concentrations in the Australian environment.

SECTION 2
Guideline and Standard Documents used

2.1 Air Quality

Ambient Air Quality National Environment Protection Measure - Air NEPM and Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales	
Air Quality	• **Ambient** • **Human Health** • **Impact of point sources**

2.1.1 Overview of Guideline Documents

National Environment Protection Measures (NEPMs) outline agreed national objectives for protecting or managing particular aspects of the environment. NEPMs are broad framework-setting statutory instruments defined in the National Environment Protection Council Act. Hence, NEPMs are similar to environmental protection policies. In June 1998 the National Environment Protection Council (NEPC) agreed to make the ***Ambient Air Quality NEPM*** which sets uniform standards for a set of agreed criteria air pollutants in ambient air (ambient air does not include indoor air) that affect human health. An amendment to this was included later to cover $PM_{2.5}$. Most recently (April 2004) the NEPC agreed to an ***Air Toxic NEPM*** covering five air toxics.

The Air Toxics NEPM establishes a national framework for monitoring and reporting ambient air toxics. The Measure is primarily concerned with the collection of data on ambient levels of formaldehyde, toluene, xylene, benzene and polycyclic aromatic hydrocarbons at locations where elevated levels are expected to occur and there is a likelihood that significant population exposure could occur. The goals of the measure are to: improve the information about ambient air toxics in the Australian environment; assist in the future development of national standards; and protect human health. The Measure requires that monitoring efforts be focused at locations where there is a risk of people being exposed to significantly elevated concentrations of air toxics.

In addition to the NEPM, the NSW Department of Environment and Conservation (DEC) (formerly the NSW Environment Protection Authority) has issued a guideline for the Assessment of Air Pollutants in NSW (NSW EPA, 2001). This document contains guidance for estimating the air quality impacts of a much larger set of potential air pollutants. The primary purpose of the NSW DEC impact assessment criteria document is to determine whether or not emissions from premises achieve environmental outcomes. The impact assessment criteria, however, are not to be used as limit conditions in environment protection licenses and compliance with impact assessment criteria cannot be readily determined with regulatory purposes.

2.1.2 Scope of chemicals evaluated

- Volatile organic chemicals (NEPM, NSW EPA)
- Sulphur dioxide (SO_2)
- Photochemical oxidants
- Lead and other metals
- Carbon monoxide (CO)
- Hydrogen fluoride (HF)
- Hydrogen sulphide (H_2S)
- Odorous pollutants
- Polycyclic aromatic hydrocarbons (NEPM).

2.1.3 Development and derivation of guidelines

An ***air quality guideline*** is a numerical concentration limit or narrative statement recommended to support and maintains designated air quality standards. These may consist of any combination of goals, standards, protocols and guidelines (for details on the definition see the NEPC web-site). The NEPMs have been based primarily on a health risk assessment or in the case of the Air toxic NEPM the Monitoring Investigation Levels have been derived from human exposure studies or adopted from overseas standards or guidelines provided they were rigorously assessed. The standards aim to represent a high degree of consensus among health professionals but also reflect what is realistically achievable over a 10 year period.

The NSW DEC guidelines are used as a general tool for assessing air quality and are the key to determining air quality objectives that protect and support designated receptors (environment & humans). Air quality parameters can be divided into odours and pollutants, reactive chemicals and relatively persistent chemicals that have direct toxic effects.

2.1.4 Application of guideline values

The NEPMs have been developed to support and maintain air quality management in the different jurisdictions. To demonstrate that air quality is being maintained at the desired level a monitoring network was established. A 'peak sites' or 'upper boundary sites' approach is used which is based on a worst-case scenario. The protocol specifies the requirements for each State and Territory Government monitoring network which include:

1. A monitoring plan and how it applies to participating jurisdictions
2. Methods of measuring and assessing concentrations
3. Averaging period, maximum concentration and allowable exceedences
4. Accreditation requirements for the analysis
5. Selection criteria and number of monitoring stations per State and Territory Government
6. Evaluation and reporting criteria.

2.1.5 Status of document

The Air Toxics NEPM includes Monitoring Investigations Levels to assist in the interpretation of monitoring data. The Monitoring Investigation Levels are based on the protection of human health.

The Monitoring Investigation Levels are not compliance standards, and do not apply as design criteria or emission limits for individual point sources. They apply to assess the results of monitoring of air toxics in areas where cumulative sources, which may include industry or motor vehicles, contribute to elevated levels of the air toxics included in the NEPM.

In relation to the Air Toxics, the NEPM requires Commonwealth and State and Territory Governments to report on:

- Their assessment of locations where significantly elevated levels are likely to occur
- The extent and results of all monitoring that is undertaken
- The causes of any high levels
- Any actions taken to reduce ambient levels of air toxics.

This information will be reported annually and made publicly available via the National Environment Protection Council Service Corporation.

2.2 Biota

Australian New Zealand Food Standards Code (ANZFSC) and National Residue Survey	
Transitional Standards	For Infant formula products, Health Claims, Country of Origin Labelling Requirements, Labelling of Pollen and Royal Jelly, Warning Statement for Condensed Milk, Modified Milk and Skim Milk, Special purposes Foods, caffeine in artificial drinks.
Standards for labelling and other Information Requirements	-
Standards for substances added to food	Including vitamins and minerals, processing aids, miscellaneous additives and identity and purity.
Standards for Foods Requiring Pre-Market Clearance	Including novel foods, Food produced using gene technology, Irradiation of Food, Microbiological and Processing Requirements and Microbiological Limits for Food.
Standards for Processing Requirements	For a range of specific food items standardising the definition of products, qualification of food terms, requirements for food production, compositional and labelling requirements, processing requirements, requirements relating to the sale of food products, cooking instructions, packaging, regulation of sale, protection of geographical indications, recognising specific requirements.
Food product standards	-
Food safety standards	Including interpretation and application, Food Safety Requirements, Food Safety Programs, Food Safety Practices and General Requirements, Food Premises and Equipment.
Primary production standards	Including wine production standards.

The ***Australian New Zealand Food Standards Code* (ANZFSC)*** is a collection of individual food standards, and deals with standards that apply to all foods, standards affecting particular classes of foods and food hygiene issues in Australia. The ***National Residue Survey (NRS)*** was established for the purpose of monitoring and reporting the level of contaminants in food, inputs to production and or the environment.

***Note: These standards have not been included in the database. Please refer to the online document.**

2.2.1 Overview of Guideline Documents

The Australia New Zealand food standards system is a cooperative arrangement between Australia, New Zealand and the Australian States and mainland Territories to develop and implement uniform food standards. The ANZFSC sets standards for *chemical residues and contaminants* in food and defines a range of other standards regarding food production, processing, sales and food safety.

The NRS was established under the National Residue Survey Administration Act 1992. The NRS outlines the general purpose of residue monitoring as to:

- Provide an estimate of the occurrence of residues in products (using systems based on sampling and statistical probability)
- Confirm (or otherwise) that residues in products are within limits
- Alert responsible government authorities and industry when limits are exceeded so that corrective action can be taken.

2.2.2 Scope of chemicals evaluated

ANZFSC standards for contaminants and natural toxicants sets out the maximum levels (MLs) of the following specified metal and non-metal contaminants and natural toxicants in nominated foods:

Metal contaminants	• Arsenic • Cadmium • Lead • Mercury
Non-metal contaminants	• Acrylonitrile • Aflatoxin • Amnesic Shellfish poisons • 3-chloro-1,2-propanediol • Diarrhetic shellfish poisons • 1,3-dichloro-2-propanol • Ergot • Methanol • Neurotoxic shellfish poisons • Paralytic shellfish poisons • Phomopsins • Polychlorinated biphenyls • Vinyl chloride
Natural Toxicants	• Agaric acid • Aolin • Berberine • Coumarin • Hydrocyanic acid • Hypericine • Pulegone • Quassine • Quinine • Safrole • Santonin • Sparteine • Thujones • Erucic acid • Lupin alkaloids

Monitoring for residues, as undertaken by the NRS, helps audit the use of currently registered agvet chemicals in Australia. At present the chemicals that may be detected include:

- Antimicrobial agents used to control microbial diseases in animals
- Anthelmintics used to control internal parasites in animals
- Hormonal growth promotants used as veterinary medicines or to improve growth in livestock
- Fungicides used to control fungal diseases in plants and plant products
- Insecticides and acaricides used to control insect an mite pests in crops, to protect grain, and to control external parasites on animals
- Fumigants used as grain protectants, and to sterilise soil, storage sheds, animal houses and bee hives
- Herbicides used to control weeks in crops.

Other sources of residues include those from the unintended exposure of plants and animals to chemicals that were previously registered for use in Australia, but are no longer registered. These chemicals such as most organochlorine pesticides can persist in soil. Livestock can accidentally ingest or come into contact with such chemicals and become contaminated.

2.2.3 Development and derivation of guidelines

Food standards are developed or varied by the Australia New Zealand Food Authority, either by application from any agency or body or by a proposal of its own initiative. When assessing a food regulatory measure matter, the Authority is required to take into account:

- Any submissions received from the public in response to public notices
- Three statutory objectives listed in order of priority:
  - The protection of public health and safety
  - The provision of adequate information relating to food to enable consumers to make informed choices
  - The prevention of misleading or deceptive conduct.
- Other factors set out in the Act are:
  - The need for standards to be based on risk analysis using the best available scientific evidence
  - The promotion of consistency between domestic and international food standards
  - The desirability of an efficient and internationally competitive food industry
  - The promotion of fair trading in food.
- Relevant New Zealand standards
- Any other relevant matters.

Standards or variations to standards developed by the Authority are recommended for adoption to a council of Health Ministers known as the Australia New Zealand Food Standards Council (ANZFSC). This Council is the decision-making body about food standards.

MRLs are set for all agvet chemicals registered for use in Australia. The Australian Pesticides and Veterinary Medicines Authority (APVMA), formerly the National Registration Authority for Agricultural and Veterinary Chemicals (NRA), has a major role in this process. MRLs are established by the APVMA at levels that are not likely to be exceeded if agvet chemicals are used in accordance with on-label directions, and have been shown by dietary exposure assessment not to pose a hazard to human health. All MRLs proposed by the APVMA for food, agricultural commodities and animal feed are published in the APVMA MRL Standard. MRLs for food commodities are then considered by Food Standards Australia New Zealand (FSANZ), formerly ANZFA, and if endorsed by the Australia and New Zealand Food Regulation Ministerial Council (ANZFRMC), are adopted into the ANZFSC.

ANZFSC Standards for contaminants and natural toxicants sets out the maximum levels (MLs) of specified metal and non-metal contaminants and natural toxicants in nominated foods. As a general principle, regardless of whether or not a ML exists, the levels of contaminants and natural toxicants in all foods should be kept As Low As Reasonably Achievable (the ALARA principle). A ML has been established only where it serves an effective risk management function and only for those foods which provide a significant contribution to the total dietary exposure.

Food not listed in this Standard may contain low levels of contaminants or natural toxicants. However, MLs have not been assigned to these foods because they present a low public health risk. The general provisions of the Food Acts relating to the availability of safe foods apply to all foods. MLs have been set at levels that are consistent with public health and safety and which are reasonably achievable from sound production and natural resource management practices. Consideration has also been given to Australia's and New Zealand's international trade obligations under the World Trade Organization's Sanitary and Phytosanitary Agreement and Technical Barrier to Trade Agreement.

In order to assist both enforcement agencies and industry to maintain contaminant levels at the lowest achievable levels, Generally Expected Levels (GELs) have been established to complement the use of MLs. GELs, while not legally enforceable, provide a benchmark against which to measure contaminant levels in foods.

The prescribed formula for the purposes of this Standard is:

$$ML1 = \left(\frac{MLA \times TotalA}{Total} \right) + \left(\frac{MLB \times TotalB}{Total} \right) + \left(CF \times \left[\frac{TotalA - TotalB}{Total} \right] \right)$$

where:

- ML1 = ML which applies to the contaminant or natural toxicant in the mixed food
- MLA = ML for contaminant or natural toxicant in food A
- MLB = ML for contaminant or natural toxicant in food B
- Total = total weight of mixed food
- Total A = total weight of food A
- Total B = total weight of food B
- CF = Background calculation factor, where in the case of:
    a) Lead, CF = 0.01 mg/kg
    b) Cadmium, CF = 0.005 mg/kg
    c) Other contaminants, CF = 0.

The levels for cadmium and lead are set at the limit of quantification (LOQ) and it is acknowledged that the LOQ may change with time as analytical techniques become more sensitive. The Standard will be reviewed periodically in respect to this issue.

ANZFSC Maximum Residue Limits lists the maximum permissible limits for agricultural and veterinary chemical residues present in food. If a maximum residue or extraneous residue for an agricultural or veterinary chemical in a food is not listed, there must be no detectable residues of that agricultural or veterinary chemical in that food. With respect to the limits for pesticides in drinking water the Standard refers to limits set in Chapter 3 of the Australian Drinking Water guidelines (1996) NHMRC – ARMCANZ (National Health and Medical Research Council – Agriculture and Resource Management Council of Australia and New Zealand).

Under the NRS, residues are classified as being present if their concentration is greater than the limit of reporting (LOR) established for NRS purposes. The NRS typically sets the LOR at 10-20 % of the Australian maximum residue limit (MRL), extraneous residue limit (ERL) or maximum level (ML) as set by ANZFSC. The NRS monitors residue levels against MRLs listed in the ANZFSC. However, where the APVMA has established an MRL that has not yet been adopted into the ANZFSC, this fact is taken into consideration by the NRS when interpreting the significance of any results that fall between the existing and proposed MRL.

The NRS highlights that MLs are set only where they serve effective risk management functions and only for foods that provide a significant contribution to dietary exposure to a particular contaminant. MLs are set at levels that are consistent with the protection of public health and safety and are reasonably achievable from sound production and natural resource management practices.

Chemical-commodity combinations for the NRS are selected on the basis of risk profiles. Those combinations of highest risk are identified for inclusion in NRS residue monitoring activities. In developing risk profiles, the main factors considered are:

- International and/or domestic perceptions of the chemical-commodity combination as a possible public health hazard
- The likelihood of residues occurring in the product (potential for misuse, persistence in the crop, animal or environment, extent of use and use patterns)
- The extent and results of previous monitoring for the chemical-commodity combination
- The Australian Standards for residues and market access requirements of trading partners
- Factors such as the availability of suitable sampling and analytical methods.

2.2.4 Application of guideline values

Unless expressly provided elsewhere in the ANZFSC, the provisions of the Code apply to food products sold or prepared for sale in Australia and/or New Zealand, and/or imported into Australia and/or New Zealand.

The ANZFSC specifies that where no MRL or ERL has been set for a particular agvet chemical residue in a particular food, there must be no detectable level of that residue present and, therefore, any detectable residue is unacceptable. By contrast, where no ML has been set for a particular environmental contaminant in a food, food producers are expected to keep the level of contaminants as low as reasonably achievable, but it is accepted that a low level of contamination may be unavoidable.

When a residue is detected during the NRS in a sample that is above an Australian Standard or defined residue action level (RAL), the laboratory immediately notifies the NRS, which then informs the relevant State or Territory government authority. Staff from the State or Territory government authority then trace the sample back to its property of origin. Subsequent action depends on the chemical and commodity and is specified by State or Territory government authority legislation. Action varies from simple advice in the case of a minor problem, to quarantining of the property or prosecution where serious contamination has occurred.

2.2.5 Status of document

The Australia New Zealand Food Standard System is implemented by food legislation in each State and Territory and in New Zealand, and by the Australia New Zealand Food Authority Act 1991 (the ANZFA Act) of the Commonwealth of Australia. The ANZFA Act establishes the mechanisms for the development of joint food regulatory measures (a food standard code of practice) and creates the Food Standards Australia New Zealand as the agency responsible for the development and maintenance of a joint Australia New Zealand Food Standards Code. No set timeframes are in place to review standard values; this is an ongoing process influenced by new scientific findings and applications from industry. Any changes to the standards are published as amendments.

Responsibility for enforcing and policing food standards rests with the State and Territory governments in Australia and the New Zealand government in New Zealand. Each government has one or more agencies responsible for food surveillance with their health administration charged with the task of ensuring the requirements of the Food Standards Code are met.

Food standards have the force of law. It is an offence in New Zealand, and a criminal offence in Australia to supply food that does not comply with relevant food standards.

The Australia New Zealand Food Standards Code is adopted as the required standards for food produced in New Zealand and the States, Territories and Commonwealth of Australia in relation to food sold and/or imported into both countries under the following Acts:

- Food Act 1981 (New Zealand)
- Health Act 1981 (Western Australia)
- Food Act 1992 (Australian Capital Territory)
- Food Act 1981 (Queensland)
- Food Act 1989 (New South Wales)
- Food Act 1998 (Tasmania)
- Food Act 1986 (Northern Territory)
- Food Act 1984 (Victoria)
- Food Act 1985 (South Australia)
- Imported Food Control Act 1992 (Commonwealth).

Traceback of residues found in NRS samples that exceed Australian Standards is the responsibility of the State or Territory government authority from which the sample originates. The NRS is notified of traceback results.

2.3 Soil and Groundwater

EPHC/NEPC Assessment of Site Contamination National Environment Protection Measure – NEPM 2000	
Soil	• Residential with garden • Residential with substantial garden including poultry • Residential with substantial garden excluding poultry • Residential with minimal soil access • Parks • Commercial/Industrial
Groundwater	• Aquatic ecosystems • Drinking water • Agriculture (Including Irrigation and Livestock)

Guidelines for:

- **Investigation Levels for Soil and Groundwater**
- **Data Collection, Sample Design and Reporting**
- **Laboratory Analysis**
- **Health Risk Assessment Methodology**
- **Ecological Risk Assessment**
- **Risk Based Assessment of Groundwater Contamination**
- **Health-Based Investigation Levels**
- **Exposure Scenarios**
- **Community Consultation and Risk Communication**
- **Protection of Health**
- **Competencies and Acceptance of Environmental Auditors.**

2.3.1 Overview of Guideline Document

The Environment Protection and Heritage Council (EPHC) incorporate the National Environment Protection Council (NEPC), and the associated statutory functions. The primary function of the NEPC is to produce National Environment Protection Measures (NEPMs), broad framework-setting statutory instruments used for protecting or managing particular aspects of the environment. The purpose of the NEPMs are to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, contaminated land auditors, land owners, developers and industry. NEPMs may consist of any combination of goals, standards, protocols, and guidelines.

The NEPM for assessment of contaminated sites contains two schedules, Schedule A and Schedule B. Schedule A describes the site assessment process that indicates which general guidelines within the NEPM are applied to each level of site investigation. Schedule B identifies 10 individual guidelines for the assessment of contaminated sites, including soil and groundwater. Guidelines can be used in a number of ways, as part of the NEPM, the preferred approach to achieving or maintaining an environmental standard. As guidelines are not mandatory they allow State and Territory governments to experiment with other approaches or for small State and Territory governments to take a lower cost but in their terms, equally effective route. Of the 10 guidelines within the NEPM for the Assessment of Contaminated Sites, only Schedules B (1) and B (7A) contain guideline values whereby contaminant levels can be compared to Investigation Levels (ILs).

The objective of the site assessment is to determine whether site contamination poses an actual or potential risk to human health and/or the environment of sufficient magnitude to warrant remediation. In achieving this objective a balance, optimising the current or intended use of the site and the need to adequately protect human health, is sought.

2.3.2 Scope of Chemicals Evaluated

Soil	• Metals and Metalloids • Organics • Other (Boron, Cyanide, Phosphorus, Sulfur, Sulfate)
Groundwater	• Metals and Metalloids • Organics • Other (Calcium, Chlorine, Cyanide, Fluoride, Nitrate-N, Nitrite-N) • Aesthetic Parameters

2.3.3 Development and Derivation of Guidelines

2.3.3.1 Soil

A variety of terms have been used to describe soil criteria. In the NEPM (Assessment of Site Contamination) Schedule 7A (Soil) the principal terms used are ***Investigation Levels*** and ***Response Levels***.

An ***Investigation Level*** is the concentration of a contaminant above which further appropriate investigation and evaluation will be required. (ANZEEC/NHMRC, 1992).

A ***Response Level*** is the concentration of a contaminant at a specific site based on a site assessment for which some form of response is required to provide an adequate margin of safety to protect public health and/or the environment.

Investigation Levels are either referred to as Health-based (HILs) or Ecologically-based (EILs). The derivation of the HILs are based on the health risk assessment methodology, which involves deriving and evaluating toxicity data in animals and humans and setting what are referred to as tolerable intake (TI) levels for individual contaminants. Tolerable intake, irrespective of the various expressions it has adopted, is an estimate of the intake of a substance that will not cause appreciable health risk. Often an uncertainty factor is built into the TI value to account for quality and relevance of the available data, adding a level of conservatism where necessary. The routes of exposure are also considered when determining TI values, as is an estimate of the background exposure to the given contaminant. An equation is then used to determine the concentration of a particular contaminant in the soil matrix required to trigger investigation based on the TI value for that contaminant, where exposed to humans (exposure parameters such as ingestion are based on child or adult model). Another important parameter considered when determining the exposure of a contaminant to humans is its bioavailability (BA) to humans from the soil matrix. BA is defined as the proportion of a substance available to the animals' blood from the gastrointestinal tract. Within the Soil Investigation Levels, there are six different HIL values (A-F), each representing a different human exposure setting, e.g. residential with substantial vegetable garden. EILs, however, are ecologically-based guidelines at a regional level that are yet to be developed. The EILs will consider regional data on flora, fauna, soils, climate etc. related to the protection of ecological values, and referred to as Regional EILs (REILs). In the interim, generic EILs are set for urban land use, which are based on considerations of phytotoxicity and soil survey data from capital cities.

2.3.3.2 Groundwater

Schedule B (6) of the Assessment of Contaminated Site NEPM details the recommended framework for the assessment of groundwater contamination, based on the ANZECC Australian Water Quality Guidelines (1992) and the NHMRC/ARMCANZ Australian Drinking Water Guidelines (1996). The NEPC proposes the guideline values provided in these documents define acceptable water quality for the settings outlined in the NEPM for groundwater (i.e. aquatic ecosystems, drinking water and agricultural use). Hence, when assessing groundwater contamination, the values given in Table 5-B of Schedule B (6) are applied as Investigation Levels at the point of extraction, and Response Levels at the point of use. Therefore, the guideline values provided here are referred to as Groundwater Investigation Levels (GILs).

2.3.4 Application of Guidelines (Investigation Levels)

Soil and Groundwater

The application of the various guidelines (Schedule Bs) within the Assessment of Site Contamination NEPM is identified within Schedule A. Schedule A illustrates the individual steps necessary to complete a contaminated site assessment, indicating when each Schedule B should be applied, including those with numeric guideline values (soil and groundwater). The initial site investigation will involve the following components:

- Setting data quality objectives
- Establishing a site history
- Determining the proposed site use
- Reviewing the local geology and hydrology
- Conducting a detailed site inspection
- Establishing a sampling strategy for soil and groundwater.

It is recommended that the Investigation Levels provided by the Assessment of Site Contamination NEPM be carefully applied to each specific site under assessment. That is, professional judgment is required when determining which Investigation Level is applied, depending on the type of human activity (HILs), presence of ecologically sensitive values (EILs) and/or use of groundwater (GILs). A preliminary site-specific appraisal risk assessment can be undertaken whereby the site results are compared to the appropriate Investigation Levels. Where these levels are exceeded, a remediation strategy can be implemented if sufficient information is available, if not, a detailed site investigation is required. Such investigation determines whether a risk assessment is needed to determine action, if not required a decision can be made regarding whether remediation is needed. If a risk assessment is required, the process will determine whether the Response Levels are exceeded, and whether remediation based on these results is required.

In the case of soil, HILs and EILs are neither cleanup nor response levels, nor are they desirable soil quality criteria. They are intended as an assessment tool for existing contamination, they are not to be interpreted as condoning contamination to the levels provided within the guidelines.

Where soil concentrations exceed the site-specific response levels, a response may involve merely informing landowners of the contamination, to large-scale remediation, the extent of response is determined on a site-by-site basis.

2.3.5 Status of Document

The primary responsibility for ensuring the assessment of site contamination rests with individual State and Territory governments (excluding Commonwealth owned sites). Despite this, there should be a consistent approach to the assessment of site contamination across Australia; however, each State and Territory government may implement the necessary controls as it sees fit. The guidelines are designed to be used by regulatory authorities within their scope of environmental and planning legislation. Landowners, developers and consultants may also use the guidelines within the NEPM, to assist in the training of professionals for contaminated site assessment. Whilst the guidelines are not mandatory, they provide a basis for harmonised approaches, and may stand-alone or be part of another NEPM.

The Assessment of Site Contamination NEPM is scheduled for review in 2005.

2.4 Water and Sediment Quality

Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000	
Aquatic Ecosystems	• Water • Sediments
Primary Industries	• Irrigation and general water use • Livestock drinking water • Aquaculture and human consumption of aquatic foods
Human Health	• Recreation • Aesthetics

2.4.1 Overview of Guideline Document for Water and Sediment quality

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) are designed to help users assess whether the water quality of a water resource is good enough to allow it to be used for humans, food production or aquatic ecosystems (these uses are termed environmental values). If the water quality does not meet the water quality guidelines, the water may not be safe for those environmental values and management action could be triggered to either more accurately determine whether the water is safe for a particular use or, if not, to remedy the problem. For some environmental values the guideline provided may be an adequate guide to quality (e.g. for recreation or drinking). For other specific environmental values the guideline can be just a starting point to trigger an investigation to develop more appropriate guidelines based on the type of water resource and inherent differences in water quality across regions. For water whose environmental value is aquatic ecosystem protection, for example, the investigation should aim to develop and adapt these guidelines to suit the local area or region. This document incorporates protocols and detailed advice to assist users in tailoring the water quality guidelines to local conditions.

The guideline trigger values are the concentrations (or loads) of the key performance indicators, below which there is a low risk that adverse biological effects will occur. The physical and chemical trigger values are not designed to be used as 'magic numbers' or threshold values at which an environmental problem is inferred if they are exceeded. Rather they are designed to be used in conjunction with professional judgment, to provide an initial assessment of the state of a water body regarding the issue in question. They are the values that trigger two possible responses:

A. To continue monitoring – this first response, occurs if the test site value is less than the trigger value, showing that there is a 'low risk' that a problem exists

B. Management/remedial action or further site-specific investigations – this alternative response, occurs if the trigger value is exceeded - i.e. a 'potential risk' exists.

The aim with further site-specific investigations is to determine whether or not there is an actual problem. Where, after continuous monitoring, with or without site-specific investigations, indicator values at sites are assessed as 'low risk' (no potential impact), guideline trigger values may be refined. The guidelines have attempted as far as possible to make the trigger values specific for each of the different ecosystem types. Four sources of information are available for use when deriving low-risk trigger values: biological and ecological effects data; reference system data; predictive modelling; and professional judgment. The guidelines for physical and chemical stressors promote and focus principally on the derivation of low-risk trigger values, from biological and ecological effects data and through the use of reference data.

The Water Quality Guidelines have been prepared as part of Australia's National Water Quality Management Strategy (NWQMS) and relate to New Zealand's National Agenda for Sustainable Water Management. They provide government and the general community (particularly catchment/water managers, regulators, industry, consultants and community groups) with a sound set of tools for assessing and managing ambient water quality in natural and semi-natural water resources. They are not meant to be applied directly to recycled water quality, contaminant levels in discharges from industry, mixing zones, or stormwater quality, unless stormwater systems are regarded as having conservation value. The NWQMS provides a framework for water quality management that is based on policies and principles that apply nationwide. In particular, the strategy is based on the philosophy of ecologically sustainable development (ESD). This can be defined as '[development] using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

The guidelines are not mandatory and should not be regarded as such. The vast range of environments, ecosystem types and food production systems in Australia and New Zealand require a critically discerning approach to setting water quality objectives. The NWQMS aims to achieve sustainable use of water resources by protecting and improving their quality while maintaining economic and social development. The Water Quality Guidelines provide recommendations that water managers can use to guide practice and formulate policy, taking into account local conditions and associated costs and benefits.

2.4.2 Scope of chemicals evaluated

Water	• Nutrients • Metals and metalloids • Non-metallic inorganics • Organic alcohols • Chlorinated alkanes • Chlorinated alkenes • Anilines • Aromatic hydrocarbons, including PAHs and nitrobenzenes • Chlorinated aromatic hydrocarbons • Phenols and Xylenols • Chlorophenols • Nitrophenols • Organic sulphur compounds • Phthalate esters • Miscellaneous industrial chemicals • Organochlorine pesticides • Organophosphorus pesticides • Carbamate Pesticides • Insect growth regulators • Pyrethroids • Herbicides and fungicides • Generic groups of chemicals
Sediments	• Metals • Metalloids • Organometallics • Organics
Primary Industries	• Major ions • Heavy metals and metalloids • Nitrogen and phosphorus • Pesticides • Radiological
Health (Recreation and Aesthetics)	• Inorganics • Organics • Radiological

2.4.3 Development and derivation of guidelines

A ***water quality guideline*** is a numerical concentration limit or narrative statements recommended to support and maintain a designated water use. This document includes guidelines for chemical and physical parameters in water and sediment, as well as biological indicators. The guidelines are used as a general tool for assessing water quality and are the key to determining water quality objectives that protect and support the designated environmental values of our water resources, and against which performance can be measured. Water quality parameters can be divided into those that have direct toxic effects on organisms and animals (e.g. insecticides, herbicides, heavy metals and temperature) and those that indirectly affect ecosystems causing a problem for a specified environmental value (e.g. nutrients, turbidity and enrichment with organic matter). Whether the effects are direct or indirect has important implications for management, and perhaps for how a guideline might be derived. Some physical and chemical stressors can also indirectly modify the toxicity of other contaminants. While specific guidelines are not provided for this mode of action, guidance is provided in each relevant section on how it can be taken into account.

The guidelines have been derived with the intention of providing some confidence that there will be no significant impact on the environmental values if they are achieved. Exceeding the guidelines indicates that there is potential for an impact to occur (or to have occurred), but does not provide any certainty that an impact will occur (or has occurred).

In areas where protection of aquatic ecosystems is a designated environmental value, the Guidelines recommend direct assessment of the biological community to assess whether ecosystem integrity is being maintained, threatened or compromised to a level that causes pollution. Biological indicators should, therefore, be used to complement the use of physical and chemical indicators for this value. These Guidelines describe indicators for biological assessment and give guidance for determining an acceptable level of change so that the relative condition of the ecosystem can be estimated. For some environmental values it may not be feasible to protect all water resources to the same level, and the community may wish to aim for different levels of protection for different resources. Whatever the level of protection, it should be reflected in the management goals and the water quality objectives determined for a particular resource.

In this document three levels of protection, based on ecosystem condition, are recognised for aquatic ecosystems. For aquatic ecosystems the guidelines in this document have mainly been developed for use at the second and third levels of protection: slightly to moderately disturbed ecosystems and highly disturbed ecosystems. The highest level of protection is for high conservation/ecological value systems where management would be expected to ensure there is no change in biological diversity, relative to a suitable reference condition. For highly disturbed ecosystems that cannot feasibly be returned to a slightly to moderately disturbed condition, these Guidelines provide advice to assist managers to derive alternative guidelines that give lower levels of protection.

The earlier guidelines (ANZECC 1992) acknowledge there is such inherent variability within the environment that 'site-specific' environmental information needs to be used to develop appropriate guidelines and indices of environmental quality. For example, light availability is a key factor controlling the growth and survival of benthic plants. In naturally turbid waters the biomass of a particular species may decrease with depth to a limit beyond which there is insufficient light. This limit would be deeper in naturally less turbid waters. Thus, the selection of a water clarity guideline value (e.g. light attenuation coefficient) would need to take into account site-specific considerations of natural water clarity.

By far the most widely used method for ***sediment quality*** is an effects database for contaminated and uncontaminated sites based on or derived from field data, laboratory toxicity testing and predictions based on equilibrium partitioning of contaminants between sediment and pore water. There are few reliable data on sediment toxicity for either Australian or New Zealand samples from which independent sediment quality guidelines might be derived, and without a financial impetus there is little likelihood that further data will be forthcoming in the immediate future. Because of this, and as has been done in many other countries, the option selected for the sediment quality guidelines is to use the best available overseas data and refine these on the basis of our knowledge of existing baseline concentrations, as well as by using local effects data as they become available.

2.4.4 Application of guideline values

Long-term management of any water resource requires:

- Clear definition of environmental values, or uses
- A good understanding of links between human activity (including specific communities) and environmental quality
- Setting of unambiguous management goals
- Identification of appropriate water quality objectives, or targets
- Effective management frameworks, including cooperative, regulatory, feedback and auditing mechanisms.

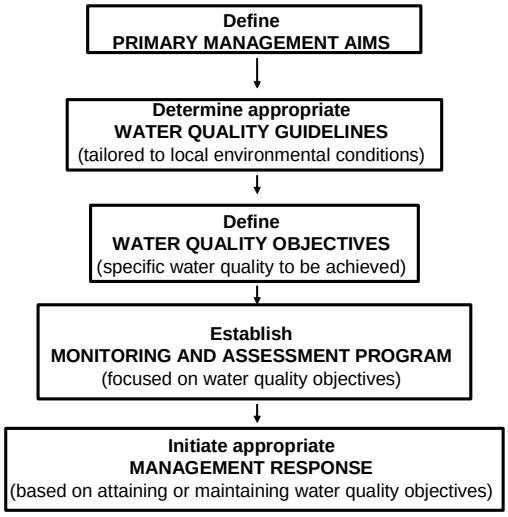
Water resource management is most effective when national, state and regional powers and responsibilities are consistent and, wherever possible, integrated. Both Australia and New Zealand have a regional or local government framework in place. In Australia, responsibility for the management of natural resources mostly rests with the States and Territory governments. In New Zealand, primary responsibility for water management rests with regional councils.

The Water Quality Guidelines provide a framework that water managers can use to implement a broad national management strategy at a local level (see figure below). Terms used in this framework are explained below. 'Environmental values' is the term applied to particular values or uses of the environment. The Water Quality Guidelines recognize the following environmental values:

- Aquatic ecosystems
- Primary industries (irrigation and general water uses, stock drinking water, aquaculture and human consumers of aquatic foods)
- Recreation and aesthetics
- Drinking water
- Industrial water (no water quality guidelines are provided for this environmental value)
- Cultural and spiritual values (no water quality guidelines are provided for this environmental value).

These environmental values may be important for healthy ecosystems or for public benefit, welfare, safety or health. They require protection from the effects of pollution and inappropriate land management practices. Identification of community needs and wants is an essential step in defining environmental values for a particular water resource. Associated with each environmental value are 'guidelines' or 'trigger values' for substances that might potentially impair water quality (e.g. pesticides, metals or nutrients). If these values are exceeded, they may be used to trigger an investigation or initiate management response. Where two or more agreed environmental values apply to a water body, the more conservative, or stringent, of the associated guidelines should be selected as the water quality objectives. These are the specific or detailed targets that managers will aim to meet in order to protect the agreed value of the water body. In the absence of a clear and agreed set of environmental values for a particular water resource, managers should take a conservative approach and assume that all appropriate environmental values apply by default. For example, drinking water would not apply as a default environmental value for near shore marine waters, but ecosystem protection and recreation would apply. Once the environmental values to be protected have been decided, the level of protection of environmental or water quality necessary to maintain each value should be determined. Management goals that describe precisely and in detail what is to be protected can then be formulated. A management goal could be to eliminate or reduce the occurrence of algal blooms, to improve livestock health and productivity, to minimise the occurrence of fish kills, or to increase biodiversity and ecosystem health.

Management goals should be defined according to community needs and desires and after consultation with stakeholders. They should be achievable and measurable and should be realised through clear management plans. A ***water quality guideline*** is a recommended numerical concentration level (e.g. of a contaminant) or a descriptive statement (e.g. visual appearance of a water body) that will support and maintain the designated use of a particular water. Water quality guidelines are provided for chemical and physical parameters of water and sediment, as well as biological indicators. They form the basis for determining water quality objectives. A ***water quality objective*** goes a step further than a water quality guideline. It is a numerical concentration level or descriptive statement used by managers to measure and report on performance. Water quality objectives are targets agreed between stakeholders, or set by local authorities. These then become the indicators, or measures, of success in meeting agreed goals. Although it is based on scientific water quality guidelines, a water quality objective may be modified by other inputs such as social, cultural, economic or political constraints. The process of modifying guidelines to establish water quality objectives would normally involve considering costs and benefits. The community might decide, after such consideration, to allow a longer period to achieve the desired water quality or even accept a lower water quality.



These Guidelines should not be used as mandatory standards because there is significant uncertainty associated with the derivation and application of water quality guidelines. For example, data on biological effects are not available for all local species; there is uncertainty over the behaviour of contaminants in the field; there is uncertainty in water quality measurements. The user should be aware of this uncertainty when determining if an environmental value has been supported or not. However, the Guidelines should provide a framework for recognising and protecting water quality for the full range of existing environmental values. The Guidelines also provide risk-based decision frameworks wherever possible, simply to help the user refine guideline trigger values for application at local and/or regional scales.

2.4.5 Status of document

The Guidelines have not been designed for direct application in activities such as discharge consents, recycled water quality or stormwater quality, and should not be used in this way. The exception to this may be water quality in stormwater systems that are regarded as having some conservation value. They have been derived to apply to the ambient waters that receive effluent or stormwater discharges, and protect the environmental values they support. In this respect, the Guidelines have not been designed to deal with mixing zones, explicitly defined areas around an effluent discharge where the water quality may still be below that required to protect the designated environmental values. As such, the application and management of mixing zones are independent but very important processes.

At this stage a time for review of this document has not been assigned.

2.5 Water Quality – Drinking

NHMRC Australian Drinking Water Guidelines 1996	
Drinking Water	• Health • Aesthetic

2.5.1 Overview of Guideline Documents

The National Health and Medical Research Council (NHMRC) Australian Drinking Water Guidelines (ADWG) are the primary reference on drinking water quality in Australia and provide necessary guidance for the provision of a safe and high quality drinking water supply that protects public health and meets the needs and expectations of consumers.

These guidelines are intended to meet the needs of consumers and apply at the point of use, for example at the tap. They provide the Australian community and the water supply industry with guidance on what constitutes good quality drinking water (as distinct from water, which is acceptable). They are concerned with the safety of water from a health point of view and with its aesthetic quality. The guidelines are applicable to any water intended for drinking (except bottled or packaged water) irrespective of its source (municipal supplies, rainwater tanks, bores, point-of-use treatment devices etc.) or where it is used (the home, restaurants, camping areas, shops etc.). The guidelines provide:

- An authoritative Australian reference on good quality drinking water and a framework for identifying acceptable quality of water through community consultation
- Information on the significance of a range of water-borne micro-organisms which can cause disease
- Guideline values for a wide range of chemical and radiological substances and physical properties which affect water quality, to ensure that drinking water does not pose any significant health risk to the consumer and is aesthetically of good quality
- Advice to operators of water supply systems on the significance of water quality characteristics for the operation of the system
- Guidance on developing monitoring programs
- Procedures for assessing performance of a water supply system, and advice on reporting performance to the public and to health authorities.

The guidelines provide a reference for use within the Australian administrative and legislative framework to ensure the accountability both of water authorities, as managers, and of State health authorities, as auditors of the safety of water supplies. The guidelines should not, however, be construed as legally enforceable standards.

With appropriate consultation with the community, the guidelines may be used directly as agreed levels of service, or they may form the basis for preparing or negotiating regional levels of service. This applies particularly to the aesthetic characteristics. What is aesthetically acceptable or unacceptable depends on public expectations, and must ultimately be determined by water authorities in consultation with consumers, taking into account the costs and benefits of further treatment of the water. These guidelines provide a starting point for that process. The guidelines could also be used by a standards body for defining quality processes suitable for third party accreditation of a quality assurance system.

The guidelines do not address:

- Packaged water and ice, which are regulated by Standard S5 of the Food Standards Code
- Water for specialised purposes such as renal dialysis and some industrial uses, where water of higher quality than that specified by the guidelines may be required
- Bottled water.

The drinking water guidelines are not intended for use as environmental water quality guidelines.

2.5.2 Scope of chemicals evaluated

Radionuclides	
Inorganic Compounds	
Organic Compounds	• Disinfection by-products • Pesticides • Other organic compounds

2.5.3 Development and derivation of guidelines

These guidelines have been prepared by a joint committee of the Agricultural and Resource Management Council of Australia and New Zealand and the National Health and Medical Research Council. They supersede the 1987 NHMRC/AWRC Guidelines for Drinking Water Quality in Australia. Specialist panels produced sections on micro-organisms, physical quality, inorganic chemicals, organic chemicals, radiological quality, and pesticides, and the entire process was overseen by the joint committee. The specialist panels and the joint committee included representatives from the NHMRC, water authorities, private industry, universities, departments of health, departments of water resources, and others.

In 1991/92 the World Health Organization undertook a review of the 1984 WHO Guidelines for Drinking Water Quality, and the WHO working papers and assessments by the WHO expert panels have formed the basis for this document. The guidelines also reflect recent improvements in understanding water quality problems. Referenced material includes scientific papers, guidelines published by overseas agencies, issues papers prepared by Australian water authorities, and assessments made by the NHMRC Standing Committee on Toxicity and the NHMRC Pesticides and Agricultural Chemicals Standing Committee. Only the key references have been cited, particularly those that were used as a basis for determining guideline values. The guideline values are based primarily on the latest WHO recommendations and any departures from these are detailed in the text. It should be noted, however, that while the WHO Guidelines seek to define drinking water which, as well as being safe, is aesthetically acceptable, the emphasis in the Australian guidelines is on defining good drinking water quality. The Australian Drinking Water Guidelines document is one of a suite of papers prepared for the National Water Quality Management Strategy.

WHO are presently finalising the third edition of their drinking water guidelines and it is expected that these will be released sometime in 2004.

2.5.4 Application of guideline values

The guideline values should be used in two separate but complementary ways:

- As "action levels": that is, if the guideline value is exceeded, some form of action is initiated. This will generally be short-term and immediate. For example, if the guideline value for a health-related characteristic is exceeded, the response should be to take immediate action to reduce the risk to consumers, and if necessary, to advise the health authority and consumers of the problem and the action taken. If the characteristic is not related to health, the action may be to advise the community of a deterioration in water quality
- As a basis for assessing how well a water supply system meets agreed levels of service over time ("performance assessment", as presented, for example, in an annual report). When used in this way, the data are largely of historical rather than immediate interest, and any resulting action to improve the quality of the supply will generally be longer term.

The guideline values relate to the quality of water at the point of use (e.g. kitchen tap, shower rose etc.) and apply to reticulated water at the consumer's tap, rainwater for drinking, and to source water if water is to be used without prior treatment. This does not, however, imply that the water authority is responsible for water quality problems caused by plumbing or other factors within the consumer's property. The water authority should ensure that the quality of water in the reticulation mains meets the guidelines or agreed levels of service. Monitoring by the authority would normally be undertaken from a service pipeline directly off a water main selected to represent the quality of water in the system. This is not usually within a private consumer's property. However, on occasion it may be necessary to check at the consumer's tap to confirm that chosen distribution sampling points are representative for microbiological monitoring, for specific

investigations such as leaching of metals into water, or as a consumer service. It should be emphasised that the guidelines define water which, based on current knowledge, is safe to drink over a lifetime, that is, it constitutes no significant risk to health. For most of the water quality characteristics discussed, there is a grey area between what is clearly safe and clearly unsafe, and often the latter has not been reliably demonstrated. Thus, the guidelines always err on the side of safety, and it follows that, for most characteristics, occasional excursions beyond the guideline value are not necessarily an immediate threat to health. The amount by which and the duration for which any health-related guideline value can be exceeded without raising public health concern depends on the particular circumstances. Exceeding a guideline value should be a signal to investigate the cause and, if appropriate, to take remedial action. If the characteristic is health-related, the relevant health authority should be consulted.

Nevertheless, the guidelines provide the minimum requirements for drinking water of good quality, both aesthetically and from a public health viewpoint. Water authorities should adopt a "best practice" approach to maintain the supply of water at the highest practicable quality. The guidelines should never be seen as a license to degrade the quality of a drinking water supply to the guideline level.

2.5.5 Status of document

The Australian Drinking Water Guidelines define good quality drinking water from the perspectives of both health and aesthetics. They are intended as the primary reference on drinking water quality in Australia, and as a basis for negotiating the quality of drinking water supplies throughout the country. These Guidelines are not mandatory standards but represent a framework for identifying acceptable water quality through community consultation. The Guidelines do not cover bottled or packaged water, these are regulated by Food Standards Australia New Zealand.

The current ADWG were released in 1996 by NHMRC (National Health and Medical Research Council, Australia) and ARMCANZ (Agricultural and Resource Management Council of Australia and New Zealand). From July 2001, following a restructuring of the natural resources management area, the role of ARMCANZ was assumed by the National Resource Management Ministerial Council (NRMMC). The Australian Drinking Water Guidelines are now subject to rolling revision as required by changes in scientific understanding. The review process will be undertaken by a joint committee with representatives from national health, water, environmental and community organisations, and supported by specialist panels.

SECTION 3
List of Chemicals Included in this Guide

Below is a list of **645 chemicals** included in the Reference Guide for Chemicals in the Environment database. Chemicals are named according to the nomenclature used within source guideline and standard documents. The database does, however, contain synonyms for these chemicals which can be searchable (using the "Chemical Keyword" option in cases where users of the database are searching under a different name. In addition, the database does contain the option to search for unique CAS numbers, thereby refining searches for chemicals with multiple names.

Note that guideline values are not always available for each chemical in each medium (i.e. water, soil, sediment, air and/or biota).

1,1,1-trichloroethane
1,1,1-trichloropropanone
1,1,2,2-tetrachloroethane
1,1,2,2-tetrachloroethylene
1,1,2-trichloroethane
1,1,2-trichloroethylene
1,1,3-trichloropropanone
1,1-dichloroethane
1,1-dichloroethylene
1,1-dichloropropane
1,1-dichloropropanone
1,2,3,4-tetrachlorobenzene
1,2,3,5-tetrachlorobenzene
1,2,3-trichlorobenzene
1,2,4,5-tetrachloro-3-nitrobenzene
1,2,4,5-tetrachlorobenzene
1,2,4-trichlorobenzene
1,2-dichloro-3-nitrobenzene
1,2-dichlorobenzene
1,2-dichloroethane
1,2-dichloroethene
1,2-dichloroethylene
1,2-dichloropropane
1,2-dimethyl-3-nitrobenzene
1,2-dimethyl-4-nitrobenzene
1,2-dinitrobenzene
1,2-diphenylhydrazine
1,3,5-trichloro-2,4-dinitrobenzene
1,3,5-trichlorobenzene
1,3,5-trinitrobenzene
1,3-Butadiene
1,3-dichloro-5-nitrobenzene
1,3-dichlorobenzene
1,3-dichloropropane
1,3-dichloropropanone
1,3-dichloropropene
1,3-dinitrobenzene
1,4-dichloro-2-nitrobenzene
1,4-dichlorobenzene
1,4-dinitrobenzene
1,5-dichloro-2,4-dinitrobenzene
19-Nortestosterone
1-chloro-2,4-dinitrobenzene
1-chloro-2-nitrobenzene
1-chloro-3-nitrobenzene
1-chloro-4-nitrobenzene
1-chloronaphthalene
1-fluoro-4-nitrobenzene
1-methoxy-2-nitrobenzene
1-methoxy-4-nitrobenzene
2,2',4,4',6,6'-hexachlorobiphenyl
2,2',4,5,5'-pentachlorobiphenyl
2,3,4,5-tetrachlorophenol
2,3,4,6-tetrachlorophenol
2,3,4'-trichlorobiphenyl
2,3,4-trichlorophenol
2,3,5,6-tetrachlorophenol
2,3,5-trichlorophenol
2,3,6-trichlorophenol
2,3,7,8-TCDD
2,3-dichlorophenol
2,3-dinitrophenol
2,3-dinitrotoluene
2,4,5-T
2,4,5-trichlorophenol
2,4,6-trichlorophenol
2,4,6-trinitrophenol
2,4,6-trinitrotoluene
2,4-D
2,4-dichloro-2-nitrobenzene
2,4-dichloroaniline
2,4-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,5-dichloroaniline
2,5-dichlorophenol
2,6-dichlorophenol
2,6-dinitrotoluene
2-chlorophenol
2-Hexanone
2-methoxy-4H-1,3,2-benzodioxaphosphorium-2-sulfide
2-methyl-4-chlorophenol
2-methyl-6-chlorophenol
2-Naphthol
2-nitrophenol
2-nitrotoluene
2-Pentanone

3,4-dichloroaniline
3,4-dichlorophenol
3,5-dichloroaniline
3,5-dichlorophenol
3,6-Dichloropicolinic acid
3-chlorophenol
3-chloropropene
3-methyl-4-chlorophenol
3-nitrophenol
3-nitrotoluene
4,4'-dichlorobiphenyl
4-chloro-3-nitrotoluene
4-chlorophenol
4-nitrophenol
4-nitrotoluene
Abamectin (B1 isomer)
acenaphthalene
acenaphthene
Acephate
Acetaldehyde
Acetic acid
Acetone
Acetonitrile
Acetophenone
Acrolein
Acrylamide
Acrylic acid
Acrylonitrile
Alachlor
Alcohol ethoxylated surfactants (AE)
Alcohol ethoxyolated sulfate (AES)
Aldicarb
Aldrin
Aldrin + Dieldrin
alpha (gross)
Aluminium
a-methylstyrene
Ametryn
Amitrole
Ammonia
Amoxicillin
Ampicillin
Amprolium
Aniline
Anthracene
Antimony
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262
Aroclor 1268
Arsenic
Arsenic (III)
Arsenic (V)
Asbestos
Asphalt (petroleum) fumes
Asulam
Atrazine
Azamethiphos
a-Zearalanol
Azinphos methyl
Azinphos-ethyl
B,B-dichlorodiethyl ether
Barban
Barium
Benomyl
Bensulfuron
Bentazone
Benzene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzyl chloride
Benzylpenicillin
Beryllium
beta (gross) (excluding K-40)
Betamethasone
Bicarbonate
Bifenthrin
Bioresmethrin
Biphenyl
Bis(diethylthiocarbamyl)disulfide
Bis(dimethylthiocarbamyl)sulfide
Bismuth
Boldenone (a and b)
Boron
BP 1100X
Bromacil
Bromate
Bromochloroacetonitrile
Bromochloromethane
Bromoform
Bromophos-ethyl
Bromotrifluoromethane
Bromoxynil
Butyl mercaptan
b-Zearalanol
b-Zearalenol
Cadmium
Calcium
Capacitor 21
Captan
Carbaryl
Carbendazim
Carbofuran
Carbon black
Carbon disulfide
Carbon monoxide

Carbon tetrachloride
Carbophenothion
Carboxin
Chloramphenicol
Chlorate
Chlordane
Chlordimeform
Chlorfenapyr
Chlorfenvinphos
Chlorfluazuron
Chloride
Chlorinated benzenes
Chlorinated furanones (MX)
Chlorinated phenols
Chlorine
Chlorine dioxide
Chlorite
Chloroacetic acid
Chlorobenzene
Chloroethylene
Chloroform
Chloromethane
Chloropicrin
Chloropropane
Chlorothalonil
Chloroxuron
Chlorpyrifos
Chlorpyrifos-methyl
Chlorsulfuron
Chlortetracycline
Chromic acid
Chromium
Chromium III
Chromium VI
Chrysene
Cimaterol
Clenbuterol
Closantel
Cloxacillin
Cobalt
Copper
Copper fumes
Corexit 7664
Corexit 8667
Corexit 9527
Corexit 9550
Coumaphos
Coumatetralyl
Crotonaldehyde
Cyanide
Cyanides (complexed)
Cyanides (free)
Cyanogen chloride (as cyanide)
Cyclohexane
Cyclohexanol
Cyclohexanone
Cyfluthrin (and isomers)
Cyhalothrin (and isomers)
Cyhexatin
Cypermethrin (and isomers)
Cyromazine
DDD
DDE
DDT
DDT + DDD + DDE
Deltamethrin
Demeton
Demeton-S
Demeton-S-methyl
Dexamethasone
Di(2-ethylhexyl)adipate
Di(2-ethylhexyl)phthalate
Diacetone alcohol
Dialkyltins
Diazinon
Dibenzo(a,h)anthracene
Dibromoacetonitrile
Dibutylphthalate
Dicamba
Dichlobenil
Dichloroacetic acid
Dichloroacetonitrile
Dichlorobenzidine
Dichloromethane
Dichlorvos
Diclofop-methyl
Dicofol
Dieldrin
Dienoestrol
Diethylamine
Diethylphthalate
Diethylstilboestrol
Difenoconazole
Difenzoquat
Diflubenzuron
Dihydrostreptomycin
Dimethoate
Dimethomorph
Dimethylamine
Dimethylformamide
Dimethylphthalate
Dimetridazole
Dinitrobenzene
Dinitrotoluene
Diphenamid
Diphenyl ether
Diphenylamine
Diphenylmethane di-iso-cyanate
Diphenylnitrosamine
Diquat
Diquat dibromide
Diquat dibromide monohydrate

Disulfoton
Dithiocarbamates
Diuron
Doramectin
DPA
EDB
Endosulfan
Endosulfan alpha
Endosulfan beta
Endothal
Endrin
Epichlorohydrin
Eprinomectin (B1 isomers)
EPTC
Erythromycin
Esfenvalerate
Ethanethiol
Ethanol
Ethanolamine
Ethion
Ethoprophos
Ethyl acetate
Ethyl Acrylate
Ethyl butyl ketone
Ethyl chloride
Ethylbenzene
Ethylene glycol
Ethylene oxide
Ethylenediamine tetraacetic acid (EDTA)
Etridiazole
Fenamiphos
Fenarimol
Fenchlorphos
Fenitrothion
Fenoprop
Fenoxycarb
Fenpyroximate
Fensulfothion
Fenthion (and isomers)
Fenvalerate
Fipronil
Flamprop-methyl
Fluazuron
Flumethrin
Flunixin
Fluometuron
Fluoranthene
Fluorene
Fluoride
Fluorine
Formaldehyde
Formothion
Fosamine
Fosamine (ammonium salt)
FRP (Filterable Reactive Phosphate)
Gallium
Gasoline
Glyphosate
Guaicol
Hardness (as $CaCO_3$)
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclohexane
Hexachlorocyclopentadiene
Hexachloroethane
Hexaconazole
Hexaflurate
Hexazinone
Hexoestrol
Hydrogen chloride
Hydrogen cyanide
Hydrogen sulfide
Imazalil
Imazethapyr
Indoxacarb
Iodide
Iodine
Ioxynil
Iprodione
Iron
Iron oxide fumes
Isophorone
Isopropyl alcohol
Isopropyl disulfide
Isopropylbenzene
Ivermectin (B1 isomers)
Kerosene
Kerosene plus kaolin
Ketoprofen
Lanthanum
Lasalocid
Lead
Lindane
Linear alkylbenzene sulfonates (LAS)
Lithium
Mabuterol
Magnesium
Magnesium oxide fumes
Malathion
Maleic anhydride
Manganese
m-cresol
Melamine
Mercury
Mercury (inorganic)
Mercury (organic)
Metalaxyl
Methabenzthiazuron
Methamidophos
Methandriol

Methanol
Methidathion
Methiocarb
Methomyl
Methoprene
Methoxychlor
Methyl acrylate
Methyl ethyl ketone
Methyl isobutyl ketone
Methyl mercaptan
Methyl mercury
Methyl methacrylate
Methylamine
Metolachlor
Metribuzin
Metsulfuron
Metsulfuron-methyl
Mevinphos
Mirex
Molinate
Molybdenum
Monensin
Monochloramine
Monocrotophos
Moxidectin
m-xylene
Nabam
Naphtha
Naphthalene
Napropamide
Narasin
n-Butanol
Neomycin
NH4+ (Ammonium)
n-Hexane
Nicarbazin
Nickel
Nickel carbonyl
Nitralin
Nitrate
Nitrate-N
Nitric acid
Nitrilotriacetic acid
Nitrite
Nitrobenzene
Nitrogen
Nitrogen dioxide
Nonylphenol
Norflurazon
NOx (oxides of nitrogen)
n-Pentane
n-Propanol
n-propyl sulfide
o-cresol
Oil, emulsifiable
Omethoate
o-phenylphenol
Organics (CCE & CAE)
Oryzalin
o-sec. Butylphenol
Outboard motor fuel as exhaust
Oxamyl
Oxychlordane
Oxyfluorfen
Oxygen
o-xylene
Oxytetracycline
Ozone (photochemical oxidants)
PAHs (total)
Paraquat
Parathion
Parathion-methyl
p-cresol
Pebulate
Pendimethalin
Pentachlorobenzene
Pentachloroethane
Pentachlorophenol
Perfluidone
Permethrin
Petroleum Hydrocabon Components (>C35 Aliphatics)
Petroleum Hydrocabon Components (>C16-C35 Aliphatics)
Petroleum Hydrocabon Components (>C16-C35)
Phenanthrene
Phenol
Phenolics
Phenols in polluted rivers
Phenothrin
Phenyl disulfide
Phenylbutazone
Phorate
Phosgene
Phosphine
Phosphorus
Phthalate esters (other)
Phthalic anhydride
Picloram
Piperonyl butoxide
Pirimicarb
Pirimiphos-ethyl
Pirimiphos-methyl
Poly(acrylonitrile-co-butadiene-costyrene)
Polychlorinated biphenyls
Potassium amyl xanthate
Potassium Cyanide
Potassium ethyl xanthate
Potassium hexyl xanthate
Potassium isopropyl xanthate
p-quinone
Procymidone
Profenofos

Promecarb
Propachlor
Propanil
Propargite
Propazine
Propiconazole
Propoxur
Propyl disulfide
Propylene glycol monomethyl ether
Propylene oxide
Propyzamide
Prothiofos
p-tert. Butylphenol
p-xylene
Pyrazophos
Pyrene
Pyridine
Pyrocatechol
Pyrogallol
Quinoline
Quintozene
Ractopamine
Radium 226
Radium 228
Salbutamol
Salinomycin
Selenium (IV)
Selenium (total)
Sethoxydim
Silver
Simazine
S-methoprene
Sodium
Sodium ethyl xanthate
Sodium fluoroacetate (1080)
Sodium isobutyl xanthate
Sodium isopropyl xanthate
Sodium sec-butyl xanthate
Spinosad
Stanozolol (16-hydroxy)
Streptomycin
Styrene
Sulfate
Sulfatroxazole
Sulfide
Sulfur
Sulfur dioxide
Sulfuric acid
Sulphadiazine
Sulphadimidine
Sulphadoxine
Sulphafurazole
Sulphamerazine
Sulphaquinoxaline
Sulprofos
Surfactant (Methylene blue active substances)
Tau-fluvalinate
Tebuconazole
Tebufenozide
Tebufenpyrad
Tebuthiuron
Temephos
Terbacil
Terbufos
Terbutryn
Tert-butyl sulfide
Tetrachlorvinphos
Tetracycline HCl
Thallium
Thiabendazole
Thiobencarb
Thiometon
Thiophanate
Thiram
Tin
TN (Total Nitrogen)
Toluene
Toluene-2,4-di-isocyanate
Toxaphene
TP (Total Phosphorus)
Trenbolone
Triadimefon
Tributyltin oxide
Tributyltin-TBT
Trichlorfon
Trichloroacetaldehyde
Trichloroacetic acid
Trichloroacetonitrile
Trichlorobenzenes (total)
Trichlorofluoromethane
Trichlorofon
Triclabendazole and metabolites
Triclopyr
Triethylamine
Triflumuron
Trifluralin
Trihalomethanes (THMs) (total)
Trimethylbenzene
Tylosin
Uranium
Uranium 238
Vanadium
Vernolate
Vinyl toluene
Welding fumes (total particulate)
Xylene
Zearalenone
Zinc
Zinc chloride fumes
Zinc oxide fumes

SECTION 4
Other Large Scale Compilations of Environmental Guidelines and Standards

4.1 Australian State and Territory Guideline and Standard Documents Available

Below is a list of Australian State and Territory guideline and standard documents provided by the agencies contacted (outlined in Section 3):

Queensland	• Draft Guidelines – for the assessment and management of contaminated land in Queensland 1998 (http://www.epa.qld.gov.au/publications?id=90)
New South Wales	• Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales (www.epa.nsw.gov.au/air/amgmaap.pdf) • Guidelines for Assessing Service Station Sites (http://www.epa.nsw.gov.au/resources/servicestnsites.pdf) • Environmental guidelines: Assessment, classification & management of liquid & non-liquid wastes (http://www.epa.nsw.gov.au/resources/waste_guide.pdf)
Australian Capital Territory	• Environment Protection Act – Water quality Standards (http://www.legislation.act.gov.au/sl/1997-36/default.asp)
Victoria	• Victorian EPA SEPP for air quality management (http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp)
Tasmania	• Classification and Management of Contaminated Soil for Disposal (http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/CDAT-57FVE2?open)
South Australia	• South Australian Biosolids: Guidelines for the safe handling, ruse or disposal of biosolids (http://www.environment.sa.gov.au/epa/pdfs/biosolids.pdf) • Environment Protection (Water Quality) Policy 2003 and Explanatory Reports (http://www.environment.sa.gov.au/epa/pdfs/epwq_report.pdf)
Western Australia	• Contaminated Sites Management Series - Assessment Levels for Soil, Sediment and Water (http://202.148.132.234/downloads/1056_CSMS_ALSSW.pdf)

4.2 International Guidelines and Standards Available

WATER QUALITY

Canadian water quality guidelines	http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Water/default.cfm

- **Canadian Water Quality Guidelines for the Protection of Aquatic Life**

  Canadian Water Quality Guidelines for the Protection of Aquatic Life help to protect all plants and animals that live in our lakes, rivers, and oceans by establishing acceptable levels for substances or conditions that affect water quality such as toxic chemicals, temperature and acidity. As long as conditions are within the levels established by the guidelines, one would not expect to see negative effects in the environment. The guidelines are based on toxicity data for the most sensitive species of plants and animals found in Canadian waters and act as science-based benchmarks for the protection of 100% of the aquatic life species in Canada, 100% of the time.

- **Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses**

  Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses help to protect sensitive crop species that may be exposed to toxic substances such as pesticides in irrigation water. They are based on maximum irrigation rates and the sensitivity of crops to pollutants. Similarly, the Canadian Water Quality Guidelines for Livestock Water are based on how livestock are affected by their drinking water and whether certain substances, such as toxic chemicals, accumulate in the animals' bodies.

- **Guidelines for Canadian Drinking Water Quality**

  Canadian Drinking Water Quality Guidelines help to protect the health of Canadians by establishing maximum acceptable concentrations for substances found in water used for drinking. To date, guidelines have been established for more than 85 physical, chemical, and biological attributes of water quality. The guidelines apply to all public and private drinking water supplies and to treated or finished water as it emerges from the tap. Drinking Water Quality Guidelines are developed by and available through Health Canada.

- **Guidelines for Canadian Recreational Water Quality**

  Canadian Recreational Water Quality Guidelines help to protect the health of Canadians using water for recreational activities like swimming and diving, white water sports, sailing, canoeing, and fishing. The guidelines deal mainly with potential health hazards such as infections transmitted by disease-causing micro-organisms, and aesthetics and nuisance conditions. Recreational Water Quality Guidelines are developed by and available through Health Canada.

USEPA Compilation of National Recommended Water Quality Criteria	http://www.epa.gov/waterscience/pc/revcom.pdf

EPA's compilation of national recommended water quality criteria is presented as a summary table containing recommended water quality criteria for the protection of aquatic life and human health for approximately 150 pollutants. These criteria are published pursuant to Section 304(a) of the Clean Water Act (CWA) and provide guidance for States and Tribes to use in adopting water quality standards under Section 303(c) of the CWA.

USEPA Drinking Water Standards - List of Drinking Water Contaminants & MCLs	http://www.epa.gov/safewater/mcl.html#mcls

Contains information on standards EPA has implemented on a number of topics related to Drinking Water. The Environmental Protection Agency sets standards that, when combined with protecting ground water and surface water, are a critical to ensuring safe drinking water. EPA works with its regional offices, states, tribes and its many partners to protect public health through implementing the Safe Drinking Water Act.

National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable standards that apply to public water systems. Primary standards protect public health by limiting the levels of contaminants in drinking water. Visit the list of regulated contaminants with links for more details.

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odour, or colour) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

USEPA National Recommended Water Quality Criteria: 2002	http://epa.gov/waterscience/standards/wqcriteria.html

The recommended water quality criteria contained in this document provide guidance for states and tribes authorized to establish water quality standards under the CWA to protect human health and aquatic life. Under the CWA, states and authorized tribes are to establish water quality standards to protect designated uses. Such standards are used in implementing a number of environmental programs, including setting discharge limits in National Pollutant Discharge Elimination System (NPDES) permits. While this document constitutes the EPA's guidance regarding ambient concentrations for various pollutants, this document does not substitute for the CWA or EPA's regulations; nor is it a regulation itself. Thus, it cannot impose legally binding requirements on the EPA, states, authorized tribes or the regulated community, and might not apply to a particular situation based upon the circumstances. State and tribal decision-makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance when appropriate. The EPA may change this guidance in the future.

USEPA water quality guidelines	http://www.epa.gov/waterscience/standards/states/

This web-site contains EPA's compilation of the State, Territory and authorized Tribal water quality standards that are EPA-approved or were effective prior to May 30, 2000, for Clean Water Act purposes. Some of these documents are more recent than May 2000. These State and Tribal water quality standards constitute the baseline of water quality standards in effect for Clean Water Act purposes. Any revisions determined to be less stringent must be approved by EPA prior to use in Clean Water Act programs. This site will be updated periodically to reflect EPA approved revisions and additions to State and Tribal water quality standards. For the most recent version of a State or Tribe's water quality standards please contact the appropriate Regional EPA Water Quality Standards coordinator listed below.

WHO Guidelines for drinking-water quality - 3rd edition. DRAFT.	http://www.who.int/water_sanitation_health/dwq/guidelines3rd/en/

The Guidelines include:

- A drinking-water safety framework
- A quality management approach for drinking-water systems from catchment to tap
- Assessment of the health risk presented by
- Microorganisms
- Chemicals
- Radiological constituents
- An explanation of the criteria used to select the various constituents addressed
- Approaches used in deriving Guidelines, including Guideline Values
- Explanation on how the Guidelines are intended to be used
- Summary statements either supporting the Guidelines recommended or explaining why no health-based guideline is required, or possible, at the present time.

WHO Guidelines for Safe Recreational Waters	http://www.who.int/water_sanitation_health/bathing/srwe1/en/

The World Health Organization's (WHO) new Guidelines for Safe recreational Water Environments describes the present state of knowledge regarding the impact of recreational use of coastal and freshwater environments upon the health of users – specifically drowning and injury, exposure to cold, heat and sunlight, water quality (especially exposure to water contaminated by sewage, but also exposure to free-living pathogenic microorganisms in recreational water), contamination of beach sand, exposure to algae and their products, exposure to chemical and physical agents, and dangerous aquatic organisms. As well, control and monitoring of the hazards associated with these environments are discussed.

The primary aim of the Guidelines is the protection of public health. The Guidelines are intended to be used as the basis for the development of international and national approaches (including standards and regulations) to controlling the health risks from hazards that may be encountered in recreational water environments, as well as providing a framework for local decision-making. The Guidelines may also be used as reference material for industries and operators preparing development projects in recreational water areas, as a checklist for understanding and assessing potential health impacts of recreational projects, and in the conduct of environmental impact and environmental health impact assessments in particular.

SOIL QUALITY

Canadian Soil Quality Guidelines (CSoQGs)	http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Soil/default.cfm

Canadian Soil Quality Guidelines (CSoQGs) consider both human health and ecological receptors. The final guideline is set to protect the more sensitive of the two. These guidelines are intended as general guidance for the protection, maintenance, and improvement of specific uses of land and water. Recommended CCME Soil Quality Guidelines have been developed for four different land-uses with defined exposure scenarios:

Agricultural; Residential/parkland; Commercial; and, Industrial. Soil Quality Guidelines can be used as benchmarks to evaluate the need for further investigation or remediation with respect to a specified land use. Guidelines are applied to identify and classify sites, to assess the general degree of contamination at a site and to determine the need for further action, and as a basis for remediation objectives.

SEDIMENT QUALITY

Canadian Sediment Quality Guidelines (CSeQGs)	http://www.ec.gc.ca/ceqg-rcqe/English/Ceqg/Sediment/default.cfm

The Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CSeQGs) protect aquatic organisms that live in or on the sediment that forms on the bottom of lakes and rivers. Good quality sediment provides habitat and food for aquatic life. Many toxic chemicals entering lakes and rivers end up in the sediment. Some of these substances may leave the sediment, returning to the water or entering the food web.

National Oceanic and Atmospheric Administration – Sediment Quality Guidelines	http://response.restoration.noaa.gov/cpr/sediment/SQGs.html

Through its National Status and Trends (NS&T) Program, NOAA generates considerable amounts of chemical data on sediments. Without national criteria or other widely-applicable numerical tools, NOAA scientists found it difficult to estimate the possible toxicological significance of chemical concentrations in sediments. Thus, numerical sediment quality guidelines were developed as informal, interpretive tools for the NS&T Program.

The guidelines were initially intended for use by NOAA scientists in ranking areas that warranted further detailed study on the actual occurrence of adverse effects such as toxicity. Also, they were intended for use in ranking chemicals that might be of potential concern. In many regional surveys of sediment toxicity performed throughout North America, NOAA has used the guidelines to compare the degree of contamination among sub-regions, and to identify chemicals elevated in concentration above the guidelines that were also associated with measures of adverse effects.

The guidelines were not promulgated as regulatory criteria or standards. They were not intended as cleanup or remediation targets, as discharge attainment targets, as pass-fail criteria for dredged material disposal decisions or any other regulatory purpose. Rather, they were intended as informal (non-regulatory) guidelines for use in interpreting chemical data from analyses of sediments.

USEPA Sediment Quality Guidelines	http://www.epa.gov/waterscience/cs/guidelines.htm

CONTAMINATED SITES

New Zealand Ministry for the Environment - Contaminated Land Management Guidelines	http://www.mfe.govt.nz/publications/hazardous/

AIR QUALITY

Canada's National Ambient Air Quality Objectives (NAAQOs)	http://www.hc-sc.gc.ca/hecs-sesc/air_quality/regulations.htm

National Ambient Air Quality Objectives (NAAQOs) identify benchmark levels of protection for people and the environment. NAAQOs guide federal/provincial/territorial and regional governments in making risk-management decisions, playing an important role in air quality management (e.g. local source permitting, for air quality index and as benchmarks for developing provincial objectives and standards). NAAQOs are viewed as effects-based long-term air quality goals.

New Zealand Ministry for the Environment - Ambient air quality guidelines	http://www.mfe.govt.nz/publications/air/ambient-air-quality-may02/index.html

These guidelines provide guidance in how to manage air quality. They set guideline values to ensure our air is clean and healthy to breathe.

USEPA National Ambient Air Quality Standards (NAAQS)	http://www.epa.gov/ttn/naaqs/

The Clean Air Act, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (NAAQS) for widespread pollutants from numerous and diverse sources considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings. The Clean Air Act requires periodic review of the science upon which the standards are based and the standards themselves. EPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants.

WHO Air Quality Guidelines for Europe	http://www.euro.who.int/document/e71922.pdf

This publication includes an introduction on the nature of the guidelines and the methodology used to establish guideline values for a number of air pollutants. In addition, it describes the various aspects that need to be considered by national or local authorities when guidelines are transformed into legally binding standards. For the pollutants addressed, the sections on "Health risk evaluation" and "Guidelines" describe the most relevant considerations that have led to the recommended guideline values. For detailed information on exposure and on the potential health effects of the reviewed pollutants, the reader is referred to the Regional Office's web-site, where the background documents on the individual air pollutants can be accessed.

SECTION 5
Other Databases on Chemicals in the Environment

Agency for Toxic Substances and Disease Registry (ATSDR) - Hazardous Substance Release and Health Effects Database http://www.atsdr.cdc.gov/hazdat.html	HazDat, the Agency for Toxic Substances and Disease Registry's Hazardous Substance Release/Health Effects Database, is the scientific and administrative database developed to provide access to information on the release of hazardous substances from Superfund sites or from emergency events and on the effects of hazardous substances on the health of human populations. The following information is included in HazDat: site characteristics, activities and site events, contaminants found, contaminant media and maximum concentration levels, impact on population, community health concerns, ATSDR public health threat categorization, ATSDR recommendations, environmental fate of hazardous substances, exposure routes, and physical hazards at the site/event. In addition, HazDat contains substance-specific information such as the ATSDR Priority List of Hazardous Substances, health effects by route and duration of exposure, metabolites, interactions of substances, susceptible populations, and biomarkers of exposure and effects. HazDat also contains data from the US Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, including site CERCLIS number, site description, latitude/longitude, operable units, and additional site information.
AICS Online http://www.nicnas.gov.au/obligations/aics/search.asp	Contains the Australian Inventory of Chemical Substances listing over 38,000 industrial chemicals that are on the non-confidential inventory.
ATSDR Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) http://www.atsdr.cdc.gov/clist.html	The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) section 104 (i), as amended by the Superfund Amendments and Reauthorization Act (SARA), requires ATSDR and the EPA to prepare a list, in order of priority, of substances that are most commonly found at facilities on the National Priorities List (NPL) and which are determined to pose the most significant potential threat to human health due to their known or suspected toxicity and potential for human exposure at these NPL sites. CERCLA also requires this list to be revised periodically to reflect additional information on hazardous substances.
ATSDR Minimal Risk Levels (MRLs) http://www.atsdr.cdc.gov/mrls.html	The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [42 U.S.C. 9604 et seq.], as amended by the Superfund Amendments and Reauthorization Act (SARA) [Pub. L. 99-499], requires that the Agency for Toxic Substances and Disease Registry (ATSDR) develop jointly with the U.S. Environmental Protection Agency (EPA), in order of priority, a list of hazardous substances most commonly found at facilities on the CERCLA National Priorities List (NPL) (42 U.S.C. 9604(i)(2)); prepare toxicological profiles for each substance included on the priority list of hazardous substances, and to ascertain significant human exposure levels (SHELs) for hazardous substances in the environment, and the associated acute, subacute, and chronic health effects (42 U.S.C. 9604(i)(3)); and assure the initiation of a research program to fill identified data needs associated with the substances (42 U.S.C. 9604(i)(5)). The ATSDR Minimal Risk Levels (MRLs) were developed as an

	initial response to the mandate. Following discussions with scientists within the Department of Health and Human Services (HHS) and the EPA, ATSDR chose to adopt a practice similar to that of the EPA's Reference Dose (RfD) and Reference Concentration (RfC) for deriving substance-specific health guidance levels for non-neoplastic endpoints. An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. These substance-specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites. It is important to note that MRLs are not intended to define clean-up or action levels for ATSDR or other Agencies.
Environment Canada's National Pollutant Release Inventory http://www.ec.gc.ca/pdb/npri/npri_home_e.cfm	The National Pollutant Release Inventory (NPRI) is the only legislated, nation-wide, publicly-accessible inventory of its type in Canada. It is a database of information on annual releases to air, water, land and disposal or recycling from all sectors - industrial, government, commercial and others.
European Chemicals Bureau http://ecb.jrc.it/	The European Chemicals Bureau (ECB) is the focal point for data and the assessment procedure on dangerous chemicals.
European Environment Agency – Star Database (Guidelines for Soil, Water Nature and Air) http://star.eea.eu.int/available.asp	'STAR' stands for Sustainability Targets and Reference value. The STAR database is an inventory of current environmental policy targets and sustainability reference values (SRVs) which apply in the EU, in a range of countries in the European Free Trade Association (EFTA), in Central and Eastern Europe (CEE), and in the Newly Independent States (NIS).
IPCS INCHEM - Chemical Safety Information from Intergovernmental Organizations http://www.inchem.org/	IPCS INCHEM is a means of rapid access to internationally peer reviewed information on chemicals commonly used throughout the world, which may also occur as contaminants in the environment and food. It consolidates information from a number of intergovernmental organizations whose goal it is to assist in the sound management of chemicals.
National Pollutant Inventory http://www.npi.gov.au/	The NPI now holds emission data for close to 3400 facilities, 33 airsheds and 32 water catchments around Australia. Emissions are estimated for industrial facilities across Australia, and for diffuse sources such as transport and domestic activities in airsheds, and agriculture in water catchments.
NIOSH Pocket Guide to Chemical Hazards http://www.cdc.gov/niosh/npg/npg.html#dload	The NIOSH Pocket Guide to Chemical Hazards is intended as a source of general industrial hygiene information for workers, employers, and occupational health professionals. The Pocket Guide presents key information and data in abbreviated tabular form for 677 chemicals or substance groupings (e.g. manganese compounds, tellurium compounds, inorganic tin compounds, etc.) that are found in the work environment. The industrial hygiene information found in the Pocket Guide should help users recognise and control occupational chemical hazards. The chemicals or substances contained in this revision include all substances for which the National Institute for Occupational Safety and Health (NIOSH) has recommended exposure limits (RELs) and those with permissible exposure limits (PELs) as found in the Occupational Safety and Health Administration (OSHA) General Industry Air Contaminants Standard (29 CFR 1910.1000).
UK Department for Environment Food and Rural Affairs – Chemical	Defra's chemicals pages are a source of information on what the Government is doing to protect the environment, and consequently,

Information http://www.defra.gov.uk/environment/chemicals/index.htm	human health, from the risks posed by exposure to hazardous chemicals. At the same time, the Government aims to maximise the important socio-economic benefits that we rely on chemicals for. Whether a chemical represents a hazard or not depends on its scientific properties. Defra's job is to manage the risks relating to such hazards, that is, the chances of a hazard leading to the harm of humans or the environment.
USEPA Numeric Criteria - Water Quality Standards Database http://oaspub.epa.gov/wqsdatabase/wqsi_epa_criteria.rep_parameter	The report includes: Priority Pollutant, EPA Freshwater CMC, EPA Freshwater CCC, EPA Saltwater CMC, EPA Saltwater CCC, EPA Water and Organism, EPA Organism Only, Pollutant Unit, and Effective Date.
USEPA Ecotox Database www.epa.gov/ecotox	The ECOTOXicology database (ECOTOX) is a source for locating single chemical toxicity data for aquatic life, terrestrial plants and wildlife. ECOTOX was created and is maintained by the U.S.EPA, Office of Research and Development (ORD), and the National Health and Environmental Effects Research Laboratory's (NHEERL's) Mid-Continent Ecology Division.
USEPA Integrated Risk Information System (IRIS) http://www.epa.gov/iris/	IRIS is a database of human health effects that may result from exposure to various substances found in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. The information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences.
USGS Acute Toxicity Database http://www.cerc.usgs.gov/data/acute/acute.html	The following database summarises the results from aquatic acute toxicity tests conducted by the USGS CERC located in Columbia, Missouri. The acute toxicity test provides a relative starting point for hazard assessment of contaminants and is required for federal chemical registration programs such as the Federal Insecticide Fungicide Rodenticide Act (PL 80-104) as amended by the Federal Environmental Pesticide Control Act of 1972 (7 U.S.C. 136-136y) and the Toxic Substances Control Act of 1976 (PL 94-469).
USGS National Contaminant Biomonitoring Program Database http://www.cerc.usgs.gov/data/ncbp/ncbp.html	The National Contaminant Biomonitoring Program (NCBP) was established to document trends in the occurrence of persistent toxic chemicals that may threaten fish and wildlife resources. Begun in the early 1960s as part of the National Pesticide Monitoring Program, the NCBP has expanded its initial focus on persistent organochlorine insecticides to include industrial chemicals, herbicides, and potentially toxic elemental contaminants. The program also provides necessary feedback to the regulatory process by documenting the success (or failure) of regulatory actions related to environmental contaminants. The NCBP provides a nationwide source of material that is searched analytically for the occurrence of new or previously undetected environmental contaminants to provide information on emerging problems and for the development of new and improved analytical methods. Through its archival function, the NCBP also provides a means for retrospective analyses and documentation of historical trends for newly identified environmental contaminants. Information from this historical program has also provided an impetus for developing a revised and expanded monitoring program (Biomonitoring of Environmental Status and Trends BEST), which was transferred to USGS in 1996.

SECTION 6
Glossary of Terms

Acute toxicity	The ability of a substance to cause severe biological harm or death soon after a single exposure or dose. Also, any poisonous effect resulting from a single short-term exposure to a toxic substance.
Acute-to-chronic ratio (ACR)	The ratio of the acute toxicity to chronic toxicity of a chemical or sample that can be used to predict acute toxicity from chronic data and vice-versa. Example: LC_{50} = 100 µg/l and Chronic Value = 5 µg/l, ACR = 20.
Acceptable Daily Intake (ADI)	Estimate of the amount of a substance in food or drinking water, expressed on a body mass basis (usually mg/kg body weight), which can be ingested daily over a lifetime by humans without appreciable health risk.
ADWG	Australian Drinking Water Guidelines published by the National Health and Medical Research Council/Agriculture and Resource Management Council of Australia and New Zealand.
Assessment Factor (AF)	Method of dividing the lowest toxicity value by an assessment factor, the magnitude of which is based on the number, character and quality of the available toxicity data. The more data, and the more realistic they are, the lower the magnitude of the assessment factor. Typical assessment factors used are 10, 100 and 1,000. The aim of such methods is to protect all species from lifetime exposures to toxicants. This type of approach is used by a variety of countries including Australia, New Zealand, USA, Canada, Denmark, The Netherlands and South Africa and the OECD has recommended it.
ANZECC	Australian and New Zealand Environment and Conservation Council
Bioavailability	Is a unit-less measure of the ratio of the amount of a chemical exposure and the amount of chemical that enters the blood of exposed biota.
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.
Biomagnification	A cumulative increase in the concentration of a persistent substance in successively higher trophic levels of the food chain. The process by which the concentration of a substance increases in different organisms at higher levels in the food chain. For example, if another organism eats an organism, these substances move up the food chain and become more concentrated at each step.
Biota	Plants, animals, including humans, fungi or bacteria.
Catchment	The areas of land which collect rainfall and contribute to surface water (streams, rivers, wetlands) or to groundwater.
Chronic toxicity	A long-term toxic effect produced in an organism by a toxicant, a substance or a mixture of substances.

Contamination	The impairment of water, sediments, plants, or animals by chemicals or bacteria to such a degree that it creates a hazard to public and environmental health through poisoning, bioconcentration (bioaccumulation), or the spread of disease. Contamination can be naturally occurring or manmade.
Criteria	Statements of the conditions presumed to support or protect the designated use or uses of an environment. Criteria may be narrative or numeric.
Critical Limit	A prescribed tolerance that must be met to ensure that a CCP effectively controls a potential health hazard; a criterion that separates acceptability from unacceptability (Codex Alimentarius).
Decision framework or decision tree	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. The decision frameworks or trees begin with the simplest steps and finish with the most difficult and expensive.
Dose-response	The quantitative relationship between the dose of an agent and an effect caused by the agent.
Drinking water quality monitoring	The wide-ranging assessment of the quality of water in the distribution system and as supplied to the consumer; includes the regular sampling and testing performed for assessing conformance with guideline values and compliance with regulatory requirements and/or agreed levels of service.
EC_{50} (median effective concentration)	Effective concentration; the dosage at which the desired response is present for 50% of the population.
Environmental Concern Level (ECL)	ECLs are derived for chemicals for which there is no trigger value but should only be used as working levels until more data can be obtained or the guidelines can be independently derived.
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 water body.
EPHC	Environment Protection and Heritage Council
Exposure	Contact of a chemical, physical or biological agent with the outer boundary of an organism, e.g. inhalation, ingestion or dermal contact.
Exposure assessment	The estimation (qualitative or quantitative) of the magnitude, frequency, duration, route and extent of exposure to one or more contaminated media.
Ground Level Concentration	Concentration of chemicals in air at ground level.
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.

Groundwater	All waters occurring below the land surface.
Guideline	Numerical concentration limit or narrative statement recommended to support and maintain a designated environmental use.
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 value	The concentration or measure of a water quality characteristic that, based on present knowledge, either does not result in any significant risk to the health of the consumer (health-related guideline value), or is associated with good quality water (aesthetic guideline value).
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.
Hazard Analysis and Critical Control Point (HACCP)	A systematic methodology to control safety hazards in a process by applying a two part technique: first, an analysis that identifies hazards and their severity and likelihood of occurrence; and second, identification of critical control points and their monitoring criteria to establish controls that will reduce, prevent, or eliminate the identified hazards.
Health Risk Assessment	The process of estimating the potential impact of a chemical, biological or physical agent on a specific human population system under a specific set of conditions.
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 and, hence, require less extrapolation from the data to protect ecosystems.
ISO 14001:1996 (Environmental Management Systems)	An international accredited standard that provides a generic framework for guidance on the development and implementation of an environmental management system to minimise the impacts of business operations on the environment and to foster environmental sustainability.
ISO 9001:1994(Quality Systems)	An international accredited standard that provides a generic framework for quality systems. Designed to assure conformance to specified requirements by a supplier at all stages during the design, development, production, installation, and servicing of a product. It sets out the requirements needed to achieve an organisation's aims with respect to guaranteeing a consistent end product.
ISQG	Interim Sediment Quality Guideline
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

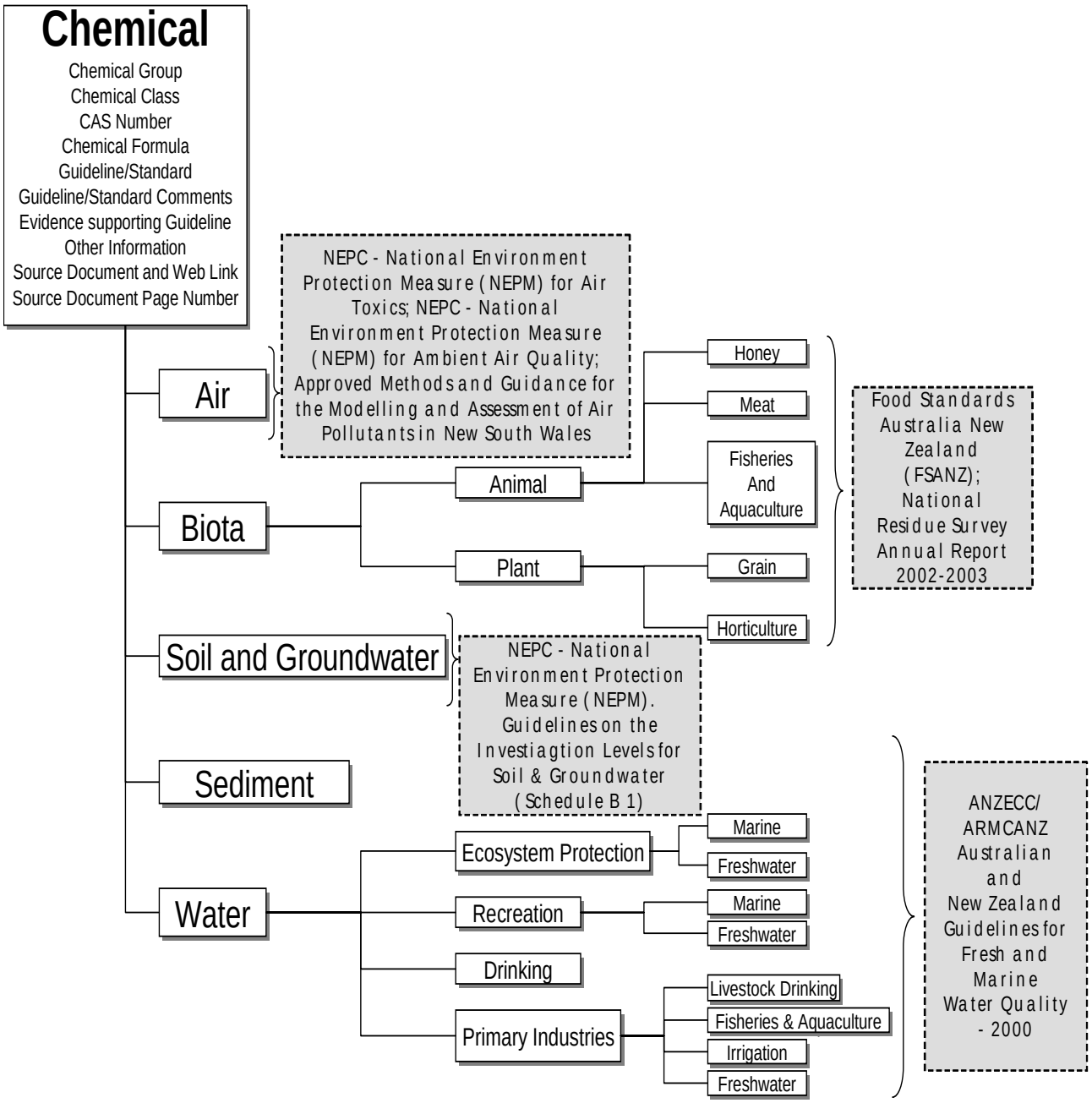
	estimated to be lethal to 50% of the test organisms after 24 or 96 hours of exposure.
LD_{50} (median lethal dose)	The dose of material that is estimated to be lethal to 50% of the test organisms. Appropriate for use with test animals such as rats, mice and dogs, it is rarely applicable to aquatic organisms 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.
Lowest observed effect concentration (LOEC)	The lowest concentration used in a toxicity test that has a statistically significant adverse effect on the exposed population of test organisms as compared with the controls; the statistical significance is measured at the 95% confidence interval.
Lowest observed effect level (LOEL)	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 a contaminant in irrigation water that can be tolerated, assuming 100 years of irrigation, based on key irrigation loading assumptions.
Low reliability guideline trigger values	Trigger values that have a low degree of confidence because they are derived from an incomplete data set. 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.
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.
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
No Observed Effect Concentration (NOEC)	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 interval.
OECD	Organisation for Economic Co-operation and Development
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.
Practical Quantitation Limit (PQL)	The Practical Quantitation Limit (PQL) is the lowest level achievable among laboratories within specified limits during routine operations. The PQL represents a practical and routinely achievable detection level with a relatively good certainty that any reported value is reliable. The PQL is often around 5 times the method detection limit.

Quantitative Structure Activity Relationship (QSAR)	A quantitative prediction of the biological, ecotoxicological or pharmaceutical activity of a molecule. It is based upon structure and activity information gathered from a series of similar compounds.
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.
Risk	The probability of a specified hazard causing harm; estimated in terms of consequences and likelihood (adapted from AS/NZS 4360:1999).
Risk assessment	The overall process of using available information to predict how often hazards or specified events may occur (likelihood) and the magnitude of their consequences (adapted from AS/NZS 4360:1999).
Salinity	The presence of soluble salts in or on soils or in water.
STV (Short-term trigger value)	The maximum concentration of contaminant in irrigation water that can be tolerated for a shorter period of time (20 years) assuming the same maximum annual irrigation loading to soil as for the long-term trigger value (qv).
Standard	Legally enforceable numerical limits or narrative statements specified in permits, approvals, regulations, legislation and orders.
Tolerable Intake (TI)	An estimate of the intake of a substance that can occur over a lifetime without appreciable health risk. It may have different units depending on the route of administration (WHO, 1994).
Toxicity	The quality or degree of being poisonous or harmful to plant, animal or human life.
Toxicology	Study of poisons, their effects, antidotes and detection.
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.
Water quality criteria	Scientific data evaluated to derive the recommended quality of water for various uses.
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.

SECTION 7
Database Functions

7.1 How is the database structured and what's in it?

This flow diagram outlines the structure of the database and information guidelines and standards that can be found within the database.



7.2 Limitations of Information in Database

- This database compiles values for chemicals in the environment set only by Australian guideline and standard documents (although extensive NSW guidelines for Air Quality were used). If values are not present for chemicals of interest, then reference to International and/or Australian State/Territory government guidelines is recommended (Section 2.8), though these values are not necessarily endorsed by the Australian Government Department of Environment and Heritage.
- Users of the database should be made aware of the application of information extracted from the database. This can be achieved by either:

    1. Providing a "Please Read" stage prior to entry into the database
    2. Having a hyperlink to abbreviated material on the source documents provided in Section 1 of this report
    3. Providing a hyperlink to the source document.

- Provision of Standards for **Biota** in the database is limited to food products assessed by the National Residue Survey. It was impracticable to include the food products outlined in the Australian New Zealand Food Standards Code (FSANZ) due the high diversity of products that have standards. Reference is made, however, that this information can be obtained from the source document.
- Instances will occur where a chemical has been included in the database though has no guideline or standard value. These will result with a "**Not Set"** remark in the "Guideline Value" part of the database search page.
- **Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000** - The Guidelines have not been designed for direct application in activities such as discharge consents, recycled water quality or stormwater quality, and they be used in this way. The exception to this may be water quality in stormwater systems that are regarded as having some conservation value. They have been derived to apply to the ambient waters that receive effluent or stormwater discharges, and protect the environmental values they support. In this respect, the Guidelines have not been designed to deal with *mixing zones*, explicitly defined areas around an effluent discharge where the water quality may still be below that required to protect the designated environmental values. As such, the application and management of mixing zones are independent but very important processes.