

Workplace Health and Safety Queensland

# Guide to workplace use of non-potable water including recycled waters

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## Introduction

Water is used at workplaces in various processes including, wash-down, dust control, boiler feed, process water, open space irrigation, cooling tower water, gravel and sand sedimentation processes.

Workplaces usually obtain water for various processes from the drinking water (potable water) supply mains. However, workplaces may also obtain water from a variety of non-potable water sources including:

- recycled water from sewage and waste water treatment plants
- stormwater storages including that from dams, creeks, and rainwater tanks
- grey water from showers and laundries
- industrial processes
- agricultural irrigation (e.g. run-off water).

The quality of non-potable water will vary depending on its source and the level of treatment applied and therefore may contain biological hazards such as bacteria, viruses, protozoa, or helminths (e.g. worms), or chemical and metal residues

## What is this guide about?

This guide provides manufacturers, suppliers, and users of non-potable water with workplace health and safety information about the safe use, handling, storage and transport of non-potable waters, but does not apply to water treated to the potable (drinking) water standard<sup>1</sup>.

Manufacturers, suppliers, and users of recycled water sourced from **sewage treatment plants** must comply with regulatory provisions<sup>2</sup> in addition to that required for workplace health and safety. These other regulatory requirements (e.g. environmental) are not covered in this guide.

## What is non-potable<sup>3</sup> water?

Under the *Workplace Health and Safety Act 1995* (the Act), non-potable water is either a **manufactured substance** or a **non-manufactured substance** (See Figure 1).

Where water **has been treated**, it is considered to be a **manufactured substance** under the Act, and legal obligations apply to the **manufacturer, supplier, and end user** of the water.

Examples of manufacturers of non-potable water include:

- a sewage treatment plant that has applied a treatment process to waste water
- a workplace that has treated its industrial or agricultural process water.

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<sup>1</sup> Guidance on potable water can be obtained from the Queensland Department of Health (Queensland Health)

<sup>2</sup> See *Queensland Water Recycling Guidelines*, December 2005, Queensland Environmental Protection Agency for a description of other legislative requirements.

<sup>3</sup> Non-potable waters include but are not limited to water from sewage treatment plants, recycled industrial and agricultural water, water from dams, creeks, rivers, and stormwater, tank water of low quality, recycled laundry and shower water.

Where water **has not been treated**, it is considered to be a **non-manufactured substance** under the Act, but there are still statutory obligations on the **supplier** and **end user** of this water. For example, the use of untreated storm waters straight from dams, creeks, and rainwater tanks is considered to be a use of non-manufactured water.

## Workplace health and safety obligations

Non-potable water, including recycled water is considered to be a **substance**<sup>4</sup> under the *Workplace Health and Safety Act 1995*.

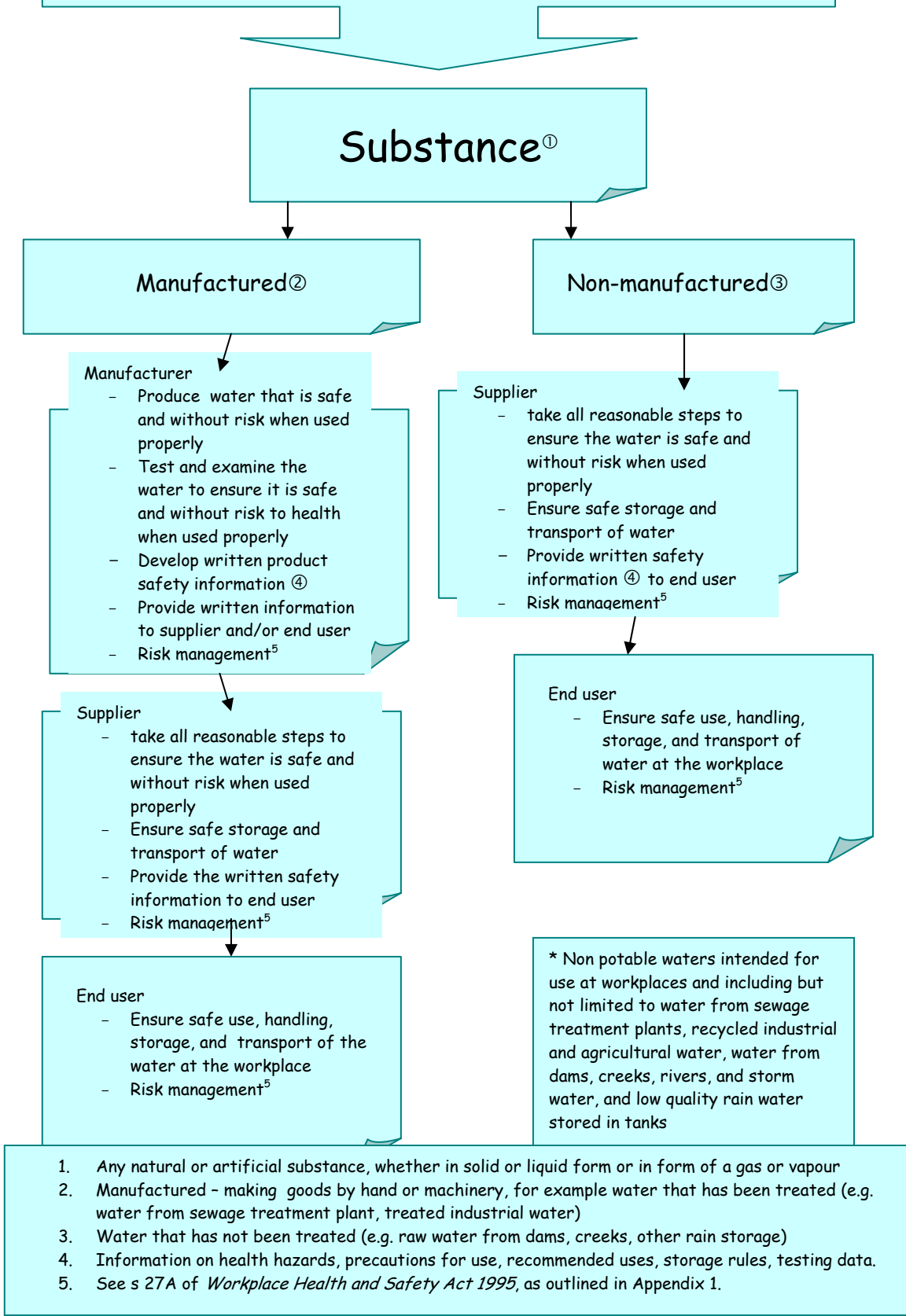
Under the Act, manufacturers, suppliers and users of non-potable water in a workplace have an obligation to prevent death, injury or illness being caused by the substance (i.e. non potable water)

See Figure 1 for a summary of the manufacturers, suppliers and end users workplace obligations for the safe use, handling, storage and transport of non-potable water.

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<sup>4</sup> Substance means any natural or artificial substance, whether in solid or liquid form or in the form of a gas or vapour.

Figure 1: *Workplace Health and Safety Act 1995* obligations for the use, handling, storage, and transport of non-potable water\*



\* Non potable waters intended for use at workplaces and including but not limited to water from sewage treatment plants, recycled industrial and agricultural water, water from dams, creeks, rivers, and storm water, and low quality rain water stored in tanks

1. Any natural or artificial substance, whether in solid or liquid form or in form of a gas or vapour
2. Manufactured - making goods by hand or machinery, for example water that has been treated (e.g. water from sewage treatment plant, treated industrial water)
3. Water that has not been treated (e.g. raw water from dams, creeks, other rain storage)
4. Information on health hazards, precautions for use, recommended uses, storage rules, testing data.
5. See s 27A of *Workplace Health and Safety Act 1995*, as outlined in Appendix 1.

## Manufacturers and suppliers of non-potable water

**Manufacturers** of non-potable water for use at a workplace have an obligation to ensure that the water:

- is safe and without risk to health when used properly; and
- is tested and examined to ensure it is safe and without risk to health when used properly; and
- when supplied to another person, is accompanied by written safety information.

**Suppliers** of non-potable water for use at a workplace have an obligation to:

- take all reasonable steps to ensure the water is safe and without risk when used properly; and
- ensure the water is accompanied by written safety information.

Guidance on the safe manufacture of recycled water sourced from **sewage treatment plants** can be obtained from the *Queensland Water Recycling Guidelines*, December 2005, Queensland Environmental Protection Agency.

## Providing written product safety information

**Manufacturers** and **suppliers** must provide written safety information about the non-potable water to any water user at a workplace. The **written safety information** should include:

- any health hazards associated with the water
- recommended uses of the water
- precautions for the safe use of the water, including guidance on storage
- any relevant testing data.

A copy of the written safety information should be provided to the **person in control** of the workplace under the following circumstances:

- when the water is first supplied
- if new information becomes available about the water quality or characteristics affecting its safety
- if the water quality changes significantly from what was originally supplied
- after receiving a request from a person in the workplace.

## Supplying non-potable water to workplaces

Generally non-potable water is transported to a workplace either by a pipeline or tanker truck. The person in control of the transport of the water has an obligation to ensure the quality of the water remains safe during the transportation process.

When the water is delivered to the workplace, the **person in control** of the workplace has the obligation to ensure the safe use, handling, storage, and transport of the water at that workplace.

## Supplying non-potable water to workplaces using water tankers

A common method of transporting non-potable water to workplaces is by water tanker trucks. Examples of where water may be transported by tanker truck are for suppression of dust and for landscape irrigation.

To maintain quality, the water should:

- not be stored for more than 24 hours in the tanker; either use it all at the site, or in the case of recycled water sourced from a sewage treatment plant (STP), discharge it as per instructions from the STP operator; or
- be appropriately disinfected if being stored in the tanker for longer than 24 hours (see section on storage and treatment of non-potable water).

Where the water has been sourced from a sewage treatment plant, guidance on the storage of recycled water in the tanker truck will be available from the sewage treatment plant operator.

The **person in control** of the workplace receiving the water has an obligation to ensure the water is used in accordance with:

- the written safety information, and
- any exposure control measures decided upon in a risk assessment (see section on risk management).

The **person in control** of the workplace is required to manage any risks to people associated with the transfer of the water from the tanker.

The tanker driver is required to:

- maintain the water to the quality that was supplied to the tanker
- provide the written safety information to the person in control of the workplace
- comply with the written safety information.

For example, to maintain the quality of the water, the water in the tanker should not be mixed with other water of a lesser or unknown quality and the tanker should be free of contamination.

Non-potable water should be transported in a tanker dedicated to the cartage of non-potable water. Potable water for consumption or direct human contact should **not** be carried in a tanker that has carried non-potable water. Permission from the local council will be required if potable water is to be carried in a tanker that has transported non-potable water. If permission is granted, the tanker may require disinfection to a standard stipulated by the local council.

The transportation of potable water by a water carrier in a water tanker is regulated in Queensland under the *Food Act, 2006*<sup>5</sup>. The Act devolves the administration of water carriers to local government in Queensland. Local councils create and enforce local laws that cover aspects of potable water carting. Each council may have different requirements or may require different training for potable water carters. Businesses that cart potable water are required to be licensed as a mobile food vehicle. A mobile food vehicle only requires licensing from the local council area in Queensland where it operates.

Conversion of a tanker from non-potable to potable cartage will require the tanker driver to apply due diligence to the conversion process, which would probably require a

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<sup>5</sup> Potable water is considered a food product under this legislation

series of tests for the presence of viruses, bacteria, and protozoa be undertaken. These tests can be expensive. Alternatively, independent verification of the disinfection process may be required.

Further information can be found in the *Guide to the supply of water to workplaces using water tankers*.

## Storage and treatment of non-potable water at workplaces

Non-potable water may need to be treated to maintain its quality during storage, and/or may need to be treated to a quality that is fit for its intended purpose.

Storing non-potable water at a workplace can result in a change in the microbial quality of the water. Therefore, when non-potable water is stored at a workplace any written safety information provided by a manufacturer or supplier should be followed.

Regardless of the source and original quality of water, when it is stored, changes can occur in its quality, particularly microbiological quality, and particularly if it is stored in an open storage that is subject to external impacts (e.g. stormwater run-off or bird and animal faeces). This can lead to increased levels of microbiological indicators (e.g. faecal coliforms or *Escherichia coli*) that could indicate increased risk of disease from the water use. Water of poor original quality is likely to deteriorate more in terms of its microbiological quality when stored.

Therefore, if water is stored on-site, the quality should be tested regularly and any hazards managed accordingly. The frequency of testing and need for subsequent treatment will have to be decided on the basis of the level of risk at each site.

For these reasons, storage of non-potable water onsite should be minimised unless additional treatment (e.g. filtration, regular addition of chlorine, or ultraviolet radiation treatment before use) is undertaken. Water storage systems should include a process for circulation of the water so as to minimise stagnation and to maximise the distribution of the disinfection process.

*Validation* of a water treatment system: It should be demonstrated that any proposed treatment technology is capable of achieving the desired water quality. Careful consideration should be given before choosing any water treatment products/procedures to ensure that such procedures/products have been proven by detailed case studies<sup>6</sup> indicative of local conditions.

These case studies should be based on continuous trials operating under field conditions and should be validated by independent laboratory<sup>7</sup> testing of the water in conjunction with various end users. These analytical tests need to be supported by physical examination and inspection of the water storage system for evidence that critical risk factors such as stagnant water, nutrient availability, and poor water quality are being controlled. Such trials would need to establish that the product/procedure is “tried and proven” and the respective claims made by the manufacturer/supplier have been substantiated.

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<sup>6</sup> Such case studies must demonstrate a reputable clearly defined methodology that allows consistent, reliable and repeatable results to be achieved under controlled conditions that demonstrate clear biocidal activity against pathogens found in the water, and control of other hazards (e.g. chemical) or factors (e.g. turbidity) causing or contributing to poor water quality.

<sup>7</sup> Laboratory should have National Association of Testing Authorities accreditation for the testing method/s

*Verification* of the effectiveness of the water treatment system: The operation of any on-site water treatment system should also be verified by a competent person. Verification may require testing of the quality of the water and inspection of the water storage system. The type of testing, and the frequency of testing, inspection and maintenance should be determined based upon the risk assessment.

Water treatment and storage systems should be commissioned and maintained in accordance with the manufacturer's instructions.

In addition storage systems such as tanks need to be maintained and kept clean. Such water storage systems can become contaminated by organic matter, and slime producing micro-organisms can deposit biofilm onto wetted surfaces. Disease producing bacteria can thrive within the biofilm. Regular inspection of the tank should be conducted looking for the accumulation of debris and the build-up of biofilm on the wetted surfaces of the tank and pipe distribution system. Cleaning and disinfection of the tank and the distribution system should be implemented based upon the findings of the inspection process and results from relevant water quality testing data. Signs that the quality of the water may have deteriorated include increased turbidity and change in appearance, and a change in the odour of the water.

Where recycled water sourced from a sewage treatment plant is stored at the workplace, the guidance on storage provided in the manufacturer's written safety information should be followed.

Records of inspection, maintenance, sampling, and cleaning of water storages and the treatment system should be kept at the workplace. For example, written records should include information, where relevant, on the following activities: water sampling results, pH levels, disinfectant concentrations/levels, turbidity results, type and concentrations of water treatment chemicals, observations of inspections of the cleanliness of the water storage and distribution system, and details of repairs and maintenance of the water treatment system. Records should include the date and time of the activity and the name of person or persons responsible for the activity. For example, the date and time of water sampling plus the name of the person/persons taking the samples and conducting the analysis. These records should be made available to a Workplace Health and Safety Queensland Inspector on request.

## Labelling and Plumbing Requirements for non-potable water

When water is stored at a workplace, either temporarily in tanker trucks or in more permanent storage, the storage area should be signposted to warn people against drinking or using the water for washing/bathing. For example, "Water not for drinking" or "Not drinking water" or "Non-potable water", or "Recycled water".

Where non-potable water is being piped around workplaces, suitable pipe labelling, or some other means of identifying that the pipe contains non-potable water should be implemented. Also, plumbing fixtures should be unique to the non-potable water system so as to minimise the misuse of the non-potable water.

Plumbing fixtures for the non-potable water system at a workplace should comply with:

- *The Plumbing Code of Australia*, in particular Part B3: Non-drinking water services; and

- *AS/NZS 3500.1:2003 - Plumbing and Drainage, Part 1: Water Services*, in particular Section 9.

These documents provide information on:

- the design, installation and maintenance requirements for non-drinking water services including recycled and reclaimed water from the point of supply to the point of discharge.
- installation so that the non-drinking water services (especially recycled or reclaimed water installations) cannot contaminate the drinking water system.
- cross connection control.
- Pipe-work and products that are to be used.
- installation requirements such as wording for pipe labelling, pipe colouring, fittings unique to the non-drinking system, and testing and commissioning a non-drinking water service.

### **Greywater use in the workplace**

Use of greywater on commercial or industrial properties is not currently permitted by the Plumbing and Drainage legislation. However, the government is considering options for increasing greywater use and this may include expanded opportunities for greywater use on commercial and industrial properties.

Greywater is defined in the Dictionary of the Plumbing and Drainage Act 2002 (the PD Act) and Standard Plumbing and Drainage Regulation 2003 as domestic wastewater from a bath, basin, kitchen, laundry or shower, whether or not the wastewater is contaminated with human waste. In sewerred areas of Queensland, the PD Act only permits greywater to be used in Class 1A dwellings, that is, single, detached housing. However, owing to its generally high loads of contaminants, use of kitchen greywater is not permitted in sewerred areas in Queensland.

Advice on the technical requirements that greywater treatment systems must meet to gain approval can be found in the Department of Local Government, Planning, Sport and Recreation (DLGPSR) - Queensland Plumbing and Wastewater (QPW) Code.

One purpose of the QPW Code is to ensure that greywater use facilities and their application areas are designed and constructed in a manner that protects public health and maintains and enhances the environment. Further information regarding the use and treatment of domestic greywater can be found in the QPW Code at [www.lgp.qld.gov.au/docs/building\\_codes/New%20plumbing%20laws/plumbing\\_and\\_wastewater\\_code.pdf](http://www.lgp.qld.gov.au/docs/building_codes/New%20plumbing%20laws/plumbing_and_wastewater_code.pdf)

## **Handling and using non-potable water at workplaces**

### **Specific information about recycled water sourced from sewage treatment plants**

The major hazard that may be associated with recycled water sourced from sewage treatment plants, **depending on its level of treatment and disinfection**, is the

possible presence of micro-organisms, such as bacteria, viruses and protozoa (e.g. Giardia).

The main risk to health occurs as a result of hand contamination and resultant transfer of micro-organisms to the mouth or wounds.

A possible risk to health may arise from the inhalation of endotoxins<sup>8</sup> that may be present in some classes of recycled water. Chemical hazards will largely be removed by the treatment process and then would only be expected to cause a risk to health if the water was being swallowed in large quantities for a long period of time.

In Queensland, the quality of recycled water from sewage treatment plants is distinguished by “class”. The class of water relates primarily to human health and indicates the level of human contact and suitable use for that water. The quality and class of recycled water will vary depending on the source and level of treatment applied<sup>9</sup>.

There are five classes of recycled water sourced from sewage treatment plants (STPs) described in the *Queensland Water Recycling Guidelines*<sup>10</sup>, which reflect the quality of the water. The more human contact there is likely to be with the recycled water, the higher the class that is required. Class A+ describes the highest class of recycled water quality in Queensland for non-drinking use. Table 1 provides a description of these recycled water classes.

**Table 1<sup>11</sup>: Description of the five classes of recycled water sourced from STPs**

Class <sup>(a)</sup> of recycled water	Description
Class A+	No pathogens <sup>(b)</sup> should be detectable. Safe for many uses other than those involving drinking or bathing.
Class A	Low levels of microbial indicators. Pathogens may be present, but at low levels. Safe for most end uses, including those that could involve occasional human contact
Class B and Class C	Pathogens are likely to be present. Only to be used with appropriate control measures in place
Class D	Has the lowest level of treatment, many pathogens and a very limited number of recommended uses.
<p>(a) Treatment of waste at STPs will result in the recycled water being classed as A+, A, B, C, or D with A+ having received the most treatment and D the least. When the non-potable water is not sourced from an STP, these classes do not apply and so some alternative description of the quality of the non-potable water should be used. This will generally require specific testing at a NATA accredited laboratory.</p> <p>(b) A pathogen is any disease producing micro-organism</p>	

Table 2 provides information on recommended water quality specifications for Class A-D recycled water sourced from **sewage treatment plants**. Such information should be

<sup>8</sup> A toxin produced by certain bacterium and released on destruction of the bacterial cell.

<sup>9</sup> For further information on hazards associated with recycled water from **sewage treatment plants** only, see *Queensland Water Recycling Guidelines*, December 2005, Queensland Environmental Protection Agency.

<sup>10</sup> Queensland Environmental Protection Agency, 2005.

<sup>11</sup> Reference: Manual for recycled water agreements in Queensland, December 2005, Queensland Environmental Protection Agency - [www.epa.qld.gov.au/environmental\\_management/water/manual\\_for\\_recycled\\_water\\_agreements/](http://www.epa.qld.gov.au/environmental_management/water/manual_for_recycled_water_agreements/).

included in the written safety information produced by the manufacturer (e.g. the sewage treatment plant operator).

**Table 2: Recommended water quality specifications for Class A-D recycled water sourced from sewage treatment plants<sup>12</sup>**

Class	E. coli (median) colony forming units/100mL	Biological oxygen demand 5 (mg/L) median	Turbidity (Nephelometric Turbidity Unit) 95% ile (max.)	Suspended solids, mg/L median	Total dissolved solids, mg/L or electrical conductivity, µS/cm medians	pH
A	< 10	20	2 (5)	5	1000/1600	6-8.5
B	< 100	20	-	30	1000/1600	6-8.5
C	< 1000	20	-	30	1000/1600	6-8.5
D	< 10,000	-	-	-	1000/1600	6-8.5

Validation and verification or achievement of Class A-D recycled water can occur through monitoring of the final water quality at point of supply and as required during storage and use at a workplace.  
 Where a recycled water producer intends to supply Class A<sup>+</sup> water they should demonstrate that the proposed treatment technology is capable of achieving the Class A<sup>+</sup> standard as outlined in the *Queensland Water Recycling Guidelines* (see list of references). The recommendations for Class A<sup>+</sup> recycled water are much more stringent than for classes A-D.

## Specific information about non-potable waters sourced from storm waters

Storm waters include water from dams, creeks, lakes, and storages, such as rainwater tanks.

Unlike recycled water sourced from sewage treatment plants, there is no “class” classification system for water sourced from storm waters.

It is important to recognise that any source of stormwater can contain a range of contaminants, including micro-organisms, chemicals and metals, which can be hazardous to people’s health, and must be used in a way that minimises risk to health.

Concentrations of microbiological hazards in storm waters are not well documented, and can vary markedly over time. Microbiological quality will depend on inputs of faecal waste from humans, livestock, pets and other animals. It will also be affected by rain events. For example, large storms following long dry spells can produce poor quality water containing high concentrations of contaminants.

Where a person is supplying storm waters to a workplace, the water must be accompanied by written safety information. Where a workplace is capturing, storing

<sup>12</sup> *Queensland Water Recycling Guidelines*, December 2005, Queensland Environmental Protection Agency. These “classes” only apply to recycled water sourced from a sewage treatment plant.

and using its own stormwater, information on the quality of the water must still be obtained. This may require analysis of the water quality.

The following two-step process can be used for assessing the quality of the water:

### **Step 1: Identification of all real and potential hazards in the water source**

The quality of dam, creek, and lake waters will vary depending on upstream influences in catchment areas. An inspection of the source of the water could involve:

- Assessing the water colour for clarity and for the presence of aquatic macrophytes<sup>13</sup>. If the water is green, green-blue in colour, not clear, or covered in surface scum, the water should be tested before use. The presence of aquatic macrophytes means it is more likely that blue-green algae will not be present, or will be at low levels because of competition with the aquatic macrophytes for nutrients.
- Asking property and industry owners in the area about any history of chemical contamination of the dam or creek water. This can include information on past and present pesticide usage, and contamination from industry.
- Identifying human faecal contamination and nutrient load (e.g. nitrogen and phosphorus) from septic systems, sewer leaks and overflows.
- Identifying if the water source receives water from sewage discharges.
- Reviewing water quality data held by council or government agencies.

These factors may contribute to human health concerns (e.g. skin and respiratory irritation from chemicals and infectious gastro-intestinal illnesses from micro-organisms).

### **Step 2: Water analysis**

The decision on the type of water analysis will be influenced by sources of water contamination identified in step 1, and the type of exposure of people to the water. For example, waters that are of very good quality, and waters of very poor quality in which exposure is controlled, would require minimal monitoring. Guidance on specific water monitoring should be sought from a competent person.

Rainwater stored in rainwater tanks should be maintained to a quality that is fit for the intended workplace use. The microbiological quality of rainwater collected in tanks may be lower than that of many mains water supplies. However, the risk of harmful organisms being present is low if the rainwater collection system is maintained.

Maintaining good quality water depends on correct design and installation, followed by proper maintenance of the rainwater tank and catchment area. Further guidance on the use and storage of rainwater in tanks can be found at:

[www.health.gov.au/internet/wcms/Publishing.nsf/Content/3D981B51B4FB458DCA256F1900042F6E/\\$File/env\\_rainwater\\_brochure.pdf](http://www.health.gov.au/internet/wcms/Publishing.nsf/Content/3D981B51B4FB458DCA256F1900042F6E/$File/env_rainwater_brochure.pdf)

If stormwater is the only available water source, and it is of poor or unknown quality, on-site treatment of stormwater should be considered. This treatment would typically involve filtration to remove suspended solids and improve clarity and disinfection, for example by chlorine, ultraviolet light or ozone, to kill pathogens (see section on storage and treatment of non-potable water at workplaces). If treatment is not possible, then

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<sup>13</sup> A macrophyte is a large aquatic plant

the water should not be used until other controls are implemented, including as a minimum, use of personal protective equipment as determined as part of the risk assessment process. (See section on risk management).

## Specific information about non-potable waters sourced from industrial and agricultural processes

Unlike recycled water sourced from sewage treatment plants, there is no “class” classification system for recycled water sourced from industrial and agricultural processes. Depending on the source of these waters, hazards present can be microbiological, chemical and metal in origin.

As for all non-potable waters, the user of these water sources must obtain information from the supplier. The user may also decide to conduct an analysis of the water so as to obtain information about hazards present in the water. In situations where the workplace is treating and reusing its own waste water the water is considered to be a manufactured substance and the obligations outlined in Figure One apply. Using the risk assessment process, a decision must be made about whether the water is fit for the intended workplace use, or the need for appropriate treatment. The choice of a water treatment process will be influenced by the identification of the likely hazards in the water. For example, if the waste water is likely to be contaminated with disease causing micro-organisms the waste water treatment system should be validated to remove such hazards.

The following two-step process can be used for assessing the quality of the water:

### **Step 1: Identification of all real and potential hazards in the water source**

The quality of the water will be influenced by the original use of the water, and the storage conditions of the water. As a result, microbiological, chemical and/or metal hazards may be present in the water. For example, the waste water may be contaminated with disease causing micro-organisms arising from human faecal matter, or *Cryptosporidium parvum* from infected cattle, or *Salmonella* and *Campylobacter* bacteria from poultry, or heavy metals from industrial processes.

### **Step 2: Water analysis**

The decision on the type of water analysis will be influenced by sources of water contamination identified in step 1, and the type of exposure of people to the water. For example, waters that are of very good quality, and waters of very poor quality in which exposure is controlled, would require minimal monitoring. Guidance on specific water monitoring should be sought from a competent person.

Examples of industrial and agricultural waste water sources include:

- process water recycled from quarrying activities
- cooling tower water treated and used for toilet flushing
- condensate water from air-conditioning systems
- agricultural run-off
- reuse of car washing water
- food processing waste water
- swimming pool back-wash water.

If the water is of poor or unknown quality, on-site treatment for any microbiological, chemical, and metal hazards should be considered (see section on storage and treatment of non-potable water at workplaces).

## Risk management process at workplaces

Where a person is conducting a business or undertaking that includes the use<sup>14</sup> of non-potable water, the *Workplace Health and Safety Act 1995* places an obligation on that person to ensure the workplace health and safety of the person, each of the person's workers and any other persons is not affected by the use of the water. This must include the management of any risks to any persons arising from the use, handling, storage, and transport of the water at that workplace.

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<sup>14</sup> Use includes handling, storage and transport

These risks can be managed by carrying out the following process:

- (1) Identify the proposed water usage
- (2) Obtain information about any water hazards from:
  - (a) the written safety information; or
  - (b) the users own water source hazard identification process and/or water quality testing data
- (3) Assess the likelihood and consequences of people being exposed to this water during use
- (4) Decide on an appropriate quality of water<sup>15</sup> in consultation with any manufacturer and/or supplier, and/or based on your own water quality testing data
- (5) Implement control measures required for the quality of water being used
- (6) Document the system for managing risks in a Water Management Plan<sup>16</sup>
- (7) Communicate the risks of exposure and necessary precautions to relevant people
- (8) Supervise and evaluate the effectiveness of the control measures.

Further guidance on risk management processes can be found in the *Risk Management Code of Practice* (see list of references).

## Assessing the risk

In assessing any risk to health from exposure to non-potable water, ask the following questions:

- What hazards are present in the water, or could develop in any water storage system?
- Is the water released or emitted into the work area and/or outside the work area?
- Are workers and other people exposed to the water through inhalation, swallowing, skin or eye contact?
- How much are workers and other people exposed to the water and for how long?
- What do the manufacturer or supplier written safety information, and/or your own independent water analysis indicate about “precautions for use”?
- What control measures are used or proposed?
- Are the existing control measures effective, properly used and maintained?
- What are the health consequences of exposure to the water?
- Are there any risks associated with the storage of the water?
- Are there any risks to the environment or people associated with release off-site to waterways or stormwater?

Table 3 provides a risk score matrix table which can be used to evaluate the significance of the risk<sup>17</sup>.

**Table 3: Risk score matrix table**

Likelihood		
Level	Descriptor	Description

<sup>15</sup> The Queensland workplace health and safety legislation does not mandate the quality or class of water for specific workplace uses, but the choice of water quality must be based on a risk assessment for the intended use of the water. Table 4 provides some recommended water qualities for certain water uses.

<sup>16</sup> For an example of a Water Management Plan, see the *Model Water Management Plan for the Queensland Civil Construction Industry* at [www.deir.qld.gov.au](http://www.deir.qld.gov.au). Although specific to the civil construction industry, this Model Water Management Plan may be used as guidance for other workplace water usage. Additional Model Water Management Plans may be developed for other specific industries in the future. Some local municipal councils may also have developed Water Safety Management Plans as a condition for the supply and use of recycled water from sewage treatment plants.

<sup>17</sup> An example of a risk assessment form that can be used to document the risk assessment can be found in the document “Model water management plan for the Queensland Civil Construction Industry” (see list of references)

A	Rare	May occur only in exceptional circumstances (e.g. once in 10 years)
B	Unlikely	Could occur at some time (e.g. once in two years)
C	Possible	Might occur at some time (e.g. several times a year)
D	Likely	Will probably occur occasionally (e.g. monthly)
E	Almost certain	Is expected to occur regularly (e.g. daily)

Consequence			
Level	Descriptor	Human health	Environment
1	Insignificant	No detectable human illness	No detectable environmental impact
2	Minor	Short-term, low level illness, affecting few people	Localised, short-term, reversible environmental impact
3	Moderate	Short-term, low level illness, affecting many people or more severe illness affecting few people	Localised environmental impact requiring remediation with medium-term recovery expected
4	Major	Severe illness affecting many people	Severe impact on entire ecosystem, requiring remediation, with long-term recovery
5	Catastrophic	Death of one or more people	Severe, irreversible impact on entire ecosystem; loss of threatened species or populations.

Risk rating					
Likelihood	Impact				
	1 (insignificant)	2 (minor)	3 (moderate)	4 (major)	5 (catastrophic)
<b>A (rare)</b>	Low	Low	Medium	High	High
<b>B (unlikely)</b>	Low	Low	Medium	High	Very high
<b>C (possible)</b>	Low	Medium	High	Very high	Very high
<b>D (likely)</b>	Medium	High	High	Very high	Very high
<b>E (almost certain)</b>	Medium	High	Very high	Very high	Extreme

Swallowing or inhalation of non-potable water or contact with broken skin can be hazardous events depending on the water quality.

The **likelihood** of swallowing or inhalation of the water or contact with broken skin can be assessed as follows:

- *Whole body contact* in which the whole body, or the face and trunk are frequently immersed, or the face is frequently directly wet by spray, increases the likelihood that some water will be swallowed or inhaled, or come into contact with ears, nasal passages, mucous membranes or cuts in the skin.
- *Incidental contact* in which only the limbs are regularly or occasionally indirectly wet would make it unlikely that water would be inhaled. Direct and indirect contact of non-potable water with the skin could result in hand-to-mouth contamination.
- *No contact* with the water would make it very unlikely that water would be swallowed or inhaled.

The **consequences** of swallowing or inhalation of the water or contact with broken skin can be assessed as follows:

- The lower the quality of water the higher the potential consequence of exposure.
- Whether a person becomes infected or ill after exposure to an infectious micro-organism may depend on the person's pre-existing immunity, which is dependent on factors such as previous exposure to the micro-organism, and whether they have an impaired immune system.

## Controlling exposure to non-potable water

Having determined a risk score, control measures need to be decided on. The hierarchy of controls must be used in the correct order, when deciding on the control measures, and reference made to the 'precautions for use' outlined in any written safety information provided by a manufacturer and/or supplier, and/or 'precautions for use' as identified as a result of your own water quality testing data.

### Hierarchy of controls

In order of preference:

- eliminate the hazard
- substitute the hazard for a lesser hazard
- isolate the hazard from people
- minimise the risk by engineering means
- apply administrative measures
- use personal protective equipment.

Table 4 provides examples of the risk management process about selected non-potable water uses. Table 4 is not an exhaustive list of all possible workplace uses of non-potable water, but rather a list of common uses which can be used as a comparison for similar uses.

Table 5 provides examples of a range of specific controls that may be used in conjunction with the hierarchy of controls.

Tables 4 and 5 should be used in conjunction:

- use table 4 to identify a workplace water usage similar to your intended usage
- use table 5 to select appropriate exposure control measures.

## Monitoring and reviewing exposure to non-potable water

Once the chosen controls are implemented, the risk assessment should be repeated as part of the evaluation process. The new risk score calculated using the risk score matrix table should be improved as a reflection of the new controls reducing the likelihood of exposure to hazards arising from the use of non-potable water.

**Table 4: Selected workplace usage of non-potable water and examples of on-site controls<sup>18</sup>**

Examples of non-potable water use at workplace	Examples of how people might be exposed to the water	Examples of people who might be exposed	Guidance on selection of appropriate water quality and exposure controls <sup>19</sup>
Above ground irrigation, such as golf courses, turf farms, garden watering, dust suppression during civil construction, retail plant nurseries	<ul style="list-style-type: none"> <li>• Sprayed onto broken skin, or open wounds</li> <li>• Sprayed into eyes</li> <li>• Aerosols breathed in</li> <li>• Hand contamination and resultant transfer of micro-organisms to the mouth or open wounds</li> </ul>	<ul style="list-style-type: none"> <li>• Workers</li> <li>• People using golf courses</li> <li>• Members of the public passing by the irrigation zone</li> </ul>	<ul style="list-style-type: none"> <li>• Use the best quality of water available based upon a risk assessment</li> <li>• Carry out a risk assessment</li> <li>• Use the water in accordance with any written safety information for the water or other information such as independent sampling data</li> <li>• Implement relevant controls to prevent exposure as outlined in Table 5. These controls must include no access during irrigation, and drying periods.</li> </ul>
Above ground open space irrigation, such as sporting fields	<ul style="list-style-type: none"> <li>• Sprayed onto broken skin, or open wounds</li> <li>• Sprayed into eyes</li> <li>• Aerosols breathed in</li> <li>• Hand contamination and resultant transfer of micro-organisms to the mouth or open wounds</li> <li>• Direct skin contact if playing sport while the sporting field is still wet</li> </ul>	<ul style="list-style-type: none"> <li>• People playing or watching sport</li> </ul>	<ul style="list-style-type: none"> <li>• Use the best quality of water available based upon a risk assessment</li> <li>• Carry out a risk assessment</li> <li>• Use the water in accordance with any written safety information for the water or other information such as independent sampling data</li> </ul>

<sup>18</sup> This table is not intended to be an exhaustive list of all potential workplace uses of non-potable water, but rather can be used to provide guidance for similar types of uses and exposures.

<sup>19</sup> The choice of water quality is dependent upon the potential exposure of people to the water. The more likely the potential exposure, the higher the quality of water that should be used, and/or range and type of exposure controls used (as outlined in table 5). The choice of a water treatment process for on-site recycling and storage of waste water will be influenced by the identification of the likely hazards in the water. For example, if the waste water is likely to be contaminated with disease causing micro-organisms the waste water treatment system should be validated to remove such hazards. See section on storage and treatment of non-potable water at workplaces.

Examples of non-potable water use at workplace	Examples of how people might be exposed to the water	Examples of people who might be exposed	Guidance on selection of appropriate water quality and exposure controls <sup>19</sup>
			<ul style="list-style-type: none"> <li>Implement relevant controls to prevent exposure as outlined in Table 5. These controls must include no access during irrigation, and drying periods before the sporting surface is used.</li> </ul>
<ul style="list-style-type: none"> <li>Closed system use, such as with subsurface irrigation (e.g. crop irrigation)</li> <li>Irrigation of no public access areas</li> </ul>	<ul style="list-style-type: none"> <li>Hand contamination and resultant transfer of micro-organisms to the mouth or open wounds</li> </ul>	<ul style="list-style-type: none"> <li>People performing maintenance on the irrigation system</li> <li>People having contact with the soil, such as farm workers</li> </ul>	<ul style="list-style-type: none"> <li>Use the best quality of water available based upon a risk assessment</li> <li>Carry out a risk assessment</li> <li>Use the water in accordance with any written safety information for the water or other information such as independent sampling data</li> <li>Implement relevant controls to prevent exposure as outlined in Table 5.</li> </ul>
<p>Open system spray use with potential for high human contact ( e.g. vehicle wash downs, plant and equipment wash down, or a quarry where aerosol generation is constant)</p>	<ul style="list-style-type: none"> <li>Sprayed onto skin</li> <li>Sprayed into eyes</li> <li>Aerosols breathed in</li> <li>Contact with open wounds</li> <li>Hand contamination and resultant transfer of micro-organisms to the mouth or open wounds</li> </ul>	<ul style="list-style-type: none"> <li>People using the water</li> <li>People in the vicinity of the water use</li> </ul>	<ul style="list-style-type: none"> <li>Use Class A+<sup>20</sup> water if the water is sourced from a sewage treatment plant. Other sources of water should be treated to a quality to remove likely hazards<sup>21</sup>.</li> <li>All water should be used in accordance with any written safety information for the water or other information, such as independent sampling data</li> <li>Carry out a risk assessment</li> <li>Implement relevant controls to</li> </ul>

<sup>20</sup> The treatment process required for Class A+ recycled water is designed to produce high quality water and to remove pathogens and chemicals likely to be present in sewage water.

<sup>21</sup> See section on storage and treatment of non-potable water at workplaces

Examples of non-potable water use at workplace	Examples of how people might be exposed to the water	Examples of people who might be exposed	Guidance on selection of appropriate water quality and exposure controls <sup>19</sup>
			prevent exposure as outlined in Table 5.
Fire fighting using water from a dual reticulation supply	<ul style="list-style-type: none"> <li>• Sprayed onto skin</li> <li>• Sprayed into eyes</li> <li>• Aerosols breathed in</li> <li>• Contact with open wounds</li> <li>• Hand contamination and resultant transfer of micro-organisms to the mouth or open wounds</li> </ul>	<ul style="list-style-type: none"> <li>• Fire fighters</li> <li>• Members of the public</li> </ul>	<ul style="list-style-type: none"> <li>• Use Class A+<sup>20</sup> water if the water is sourced from a sewage treatment plant. Other sources of water should be treated to a quality to remove likely hazards<sup>21</sup>.</li> <li>• All water should be used in accordance with the written safety information for the water as provided by the manufacturer and/or supplier</li> <li>• Carry out a risk assessment</li> </ul>
Dual reticulation system supplying workplace plumbing for non-potable purposes	<ul style="list-style-type: none"> <li>• Ingestion of non-potable water if there is a cross connection between the non-potable water pipe and the potable water pipe</li> <li>• Breathing in aerosols form toilet flushing</li> </ul>	<ul style="list-style-type: none"> <li>• People using the workplace plumbing</li> </ul>	<ul style="list-style-type: none"> <li>• Use the best quality of water available based upon a risk assessment and in accordance with the written safety information for the water as provided by the manufacturer and/or supplier;</li> <li>• Carry out a risk assessment</li> <li>• Class A+ water is recommended if the water is sourced from a sewage treatment plant</li> </ul>
Dual reticulation system supplying cooling towers	<ul style="list-style-type: none"> <li>• Breathing in aerosols from cooling tower drift</li> </ul>	<ul style="list-style-type: none"> <li>• People in proximity to the cooling tower</li> </ul>	<ul style="list-style-type: none"> <li>• Use Class A+<sup>20</sup> water if the water is sourced from a sewage treatment plant. Other sources of water should be treated to a quality to remove likely hazards<sup>21 22</sup>.</li> </ul>

<sup>22</sup> The standard or quality of makeup water supplied to a cooling water system should be of sufficiently high quality to avoid biological contamination, corrosion, and scale deposits within the cooling water system. Traditionally potable water from the municipal water supply is used for makeup water. Increasingly non-potable water such as recycled water is being used for makeup water. Non-potable water can vary in constituents such as ammonia,

Examples of non-potable water use at workplace	Examples of how people might be exposed to the water	Examples of people who might be exposed	Guidance on selection of appropriate water quality and exposure controls <sup>19</sup>
			<ul style="list-style-type: none"> <li>All water should be used in accordance with the written safety information for the water as provided by the manufacturer and/or supplier</li> <li>Carry out a risk assessment</li> </ul>
Laundering clothes	<ul style="list-style-type: none"> <li>Hand contamination and resultant transfer of micro-organisms to the mouth or open wounds</li> <li>Ingestion of non-potable water if there is a cross connection between the non-potable water pipe and the potable water pipe</li> </ul>	<ul style="list-style-type: none"> <li>Workers performing laundering tasks</li> </ul>	<ul style="list-style-type: none"> <li>Use Class A+<sup>20</sup> water if the water is sourced from a sewage treatment plant. Other sources of water should be treated to a quality to remove likely hazards<sup>21</sup>.</li> <li>All water should be used in accordance with the written safety information for the water as provided by the manufacturer and/or supplier</li> <li>Carry out a risk assessment</li> </ul>
<ul style="list-style-type: none"> <li>Irrigation of food crops</li> <li>Food manufacture/processing</li> <li>Animal husbandry</li> <li>Use of non-potable water at a non-workplace such as a private dwelling.</li> </ul>	Contact Queensland Health for guidance		

phosphate, nitrates, conductivity, suspended solids, total organic carbon, biological and chemical oxygen demand, and micro-organisms. Examples of an adverse impact of potential constituents of non-potable makeup water upon a cooling water system include: Ammonia can impact the ability of certain biocides to adequately inactivate micro-organisms; Phosphates and Nitrates can enhance biological growth potential; and Elevated conductivity from higher chlorides or sulphates can increase corrosion rates.

Therefore the water treatment program for the cooling water system must be specific to the water quality of the makeup water, the operational characteristics, and the materials used in the construction of the components of the cooling water system.

**Table 5: Examples of exposure controls<sup>23,24</sup>**

Engineering controls	Administrative controls	Personal protection <sup>25</sup>
<ul style="list-style-type: none"> <li>• treat the water on-site to improve the quality</li> <li>• increase droplet size if spraying water</li> <li>• lower the boom height of the tanker</li> <li>• use low pressure hosing</li> <li>• apply the water using trickle irrigation or subsurface irrigation</li> <li>• ensure pipe work does not leak</li> <li>• install screens ( e.g. manufactured screens, or trees/shrubs)</li> <li>• install backflow prevention valves (where required)</li> <li>• control public access by the use of barriers, fences, and lockable gates</li> <li>• use dedicated irrigation system and pipe work for non-potable water</li> </ul>	<ul style="list-style-type: none"> <li>• substitute the water for a higher quality water</li> <li>• only use a quality of water that is fit for the intended purpose</li> <li>• if water is being sprayed, exclude all non-essential people from the spray area</li> <li>• regular monitoring of the water source or review of the manufacturer’s monitoring data to ensure a consistent product</li> <li>• introduce buffer zones</li> <li>• introduce drying periods so people don’t have contact with wet surfaces (e.g. wet ground at sporting ovals irrigated with non-potable water)</li> <li>• do not allow surface ponding of recycled water</li> <li>• no surface water run-off / spray drift to external water bodies, or internal fresh water ponds / lagoons</li> <li>• no spraying during rainfall or storms</li> <li>• relocate workers (e.g. away from spray zones)</li> <li>• notify workers that you use non-potable water, tell them where it is</li> <li>• where water is being sprayed from the tanker truck, have a lookout to warn of the truck’s approach</li> <li>• train and educate all workers regarding the risks and use of non-potable water, including hygiene practices</li> <li>• provide ready access to adequate hand washing amenities, including potable water, soap and hand drying facilities</li> <li>• require hand washing after use of non-potable water and before consumption of food and drink, and smoking</li> <li>• record all incidents (e.g. workers accidentally sprayed with water)</li> <li>• label all non-potable water tanks, pipes, taps</li> <li>• follow procedures / management plan to make sure everyone is working safely with non-potable water</li> </ul>	<ul style="list-style-type: none"> <li>• P2 respirator to protect against possible endotoxins (if low quality water)</li> <li>• face shield</li> <li>• goggles</li> <li>• gloves</li> <li>• cover all wounds with waterproof dressings</li> </ul>

<sup>23</sup> In some situations the use of engineering and administrative controls may mean personal protective equipment is not needed.

<sup>24</sup> These examples are provided to illustrate a range of exposure controls. The selection of actual controls should occur as part of a risk management process and will be influenced by a range of factors including the class or quality of the water and the type of exposure at the workplace. Reference should always be made to any written safety information provided by the manufacturer or supplier, or other information, such as independent sampling data. It is probable that for Class A+ recycled water or equivalent, few exposure controls will be required because of the high quality of the water.

<sup>25</sup> PPE is unlikely to be required for Class A+ recycled water or equivalent due to its high quality – refer to written safety information as provided by manufacturer or supplier or other information, such as independent sampling data.

Engineering controls	Administrative controls	Personal protection <sup>25</sup>
	<ul style="list-style-type: none"> <li>• provide potable water for workers to drink and tell them not to drink non-potable water</li> <li>• irrigate at night, while areas are closed to the public</li> <li>• supervise the usage of the non-potable water</li> <li>• carry a first aid kit, which includes an antiseptic and an eyewash</li> <li>• display prominent warning signs where the water is used, such as “Recycled Water in Use”, “Recycled Water – Do not Drink or Bathe In”, “Non-potable Water in Use”, “Non-potable Water – Do not Drink or Bathe in”</li> <li>• ensure workers have access to the written product safety information sheets</li> <li>• carry out periodic checks for cross connection, e.g. using a dye injected into the non-potable water system</li> <li>• Inspect, maintain, and clean treatment and storage systems</li> </ul>	

## Other information sources about non-potable water

*National Guidelines for Water Recycling, Environmental Protection and Heritage Council*, retrieved 18 September 2006, Environmental Protection and Heritage Council.

[www.ephc.gov.au](http://www.ephc.gov.au)

*Guidelines for Managing Risks in Recreational Water 2006 (Draft)*, retrieved 4 December 2006, National Health and Medical Research Council.

[www7.health.gov.au/nhmrc/publications/synopses/eh38.htm](http://www7.health.gov.au/nhmrc/publications/synopses/eh38.htm)

*Guide to the supply of water to workplaces using water tankers*, Workplace Health and Safety Queensland (a division of the Department of Employment and Industrial Relations, Queensland).

[www.deir.qld.gov.au](http://www.deir.qld.gov.au)

*Model Water Management Plan for the Queensland Civil Construction Industry*, Workplace Health and Safety Queensland (a division of the Department of Employment and Industrial Relations, Queensland).

[www.deir.qld.gov.au](http://www.deir.qld.gov.au)

*Risk Management Code of Practice*, Workplace Health and Safety Queensland (a division of the Department of Employment and Industrial Relations, Queensland).

[www.deir.qld.gov.au](http://www.deir.qld.gov.au)

*Queensland Water Recycling Guidelines (2005)*, retrieved 18 September 2006, Environmental Protection Agency, Queensland.

[www.epa.qld.gov.au/waterrecyclingguidelines](http://www.epa.qld.gov.au/waterrecyclingguidelines)

*Manual for Recycled Water Agreements in Queensland (2005)*, retrieved 18 September 2006, Environmental Protection Agency, Queensland.

[www.epa.qld.gov.au/waterrecyclingagreement](http://www.epa.qld.gov.au/waterrecyclingagreement)

## Appendix 1

### Section 27A of the *Workplace Health and Safety Act 1995*

#### Managing exposure to risks

- (1) To properly manage exposure to risks, a person must—
- (a) identify hazards; and
  - (b) assess risks that may result because of the hazards; and
  - (c) decide on appropriate control measures to prevent, or minimise the level of, the risks; and
  - (d) implement control measures; and
  - (e) monitor and review the effectiveness of the measures.
- (2) To properly manage exposure to risks, a person should consider the appropriateness of control measures in the following order—
- (a) eliminating the hazard or preventing the risk;
  - (b) if eliminating the hazard or preventing the risk is not possible, minimising the risk by measures that must be considered in the following order—
    - (i) substituting the hazard giving rise to the risk with a hazard giving rise to a lesser risk;
    - (ii) isolating the hazard giving rise to the risk from anyone who may be at risk;
    - (iii) minimising the risk by engineering means;
    - (iv) applying administrative measures;
    - (v) using personal protective equipment.
      - Examples of subparagraph (iii)*— redesigning work, plant, equipment, components or premises
      - Examples of subparagraph (iv)* — training, reasonable hours of work.
- (3) However, this Act also specifies particular ways in which workplace health and safety must be ensured in particular circumstances.
- (4) Compliance with subsection (1) does not excuse a person from an obligation to ensure workplace health and safety or a particular obligation imposed on the person under this Act.

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