# Content



# Functional Flowchart

Not applicable

# Objective

To provide a corporate standard that outlines SCL's guidelines for managing biological water hazards – specifically with regards to drinking water quality, legionella, blue-green algae and modified site specific biological water hazards.

# Scope

This standard applies to all SCL operated and / or maintained sites and / or any situation in which a worker may be exposed to a biological water hazard.

This corporate standard does not identify all potential biological water hazards. Rather, it provides information about the micro-organisms most likely to present a risk at SCL workplaces. Specific safety controls have been provided where possible for the identified hazards. Generic safety controls have also been included that can be applied to situations where workers are exposed to water sources to ensure that the risk of exposure to potential biological water hazards (whether identified or not) is minimised.

# Definitions

***Biological Water Hazard:*** A disease-causing micro-organism that causes infection in humans through waterborne transmission.

***Micro-organism:*** A minute living thing that individually is too small to be seen with the naked eye. Micro-organisms are present almost everywhere. Most require water at an appropriate temperature and nutrients to survive. Some can cause serious infections in humans. The main groups of micro-organisms are viruses, bacteria, fungi, algae, and protozoa.

***Non-potable water (other than drinking):*** For the purposes of this standard, non-potable water is not used for human consumption, bathing or showering. It is lower quality water than potable water and may be used in industrial processes, washing/cleaning plant and equipment and in other non-consumption applications.

***Potable water (drinking):*** For the purpose of this standard, potable water is defined as water intended primarily for human consumption but which has other domestic uses. It may be consumed from the tap, or indirectly in beverages or foods prepared with water, and among its other uses are bathing and showering.

***Susceptible individuals:*** Some individuals are at a potentially higher risk of injury from biological hazards than the rest of the population. Persons suffering from conditions such as hepatitis, liver cirrhosis, toxic liver injury or kidney damage are likely to be more susceptible to adverse health effects from blue-green algae toxins. Persons suffering from respiratory conditions, diabetes and HIV/AIDS are at greater risk of infection with Legionella bacteria. Immunocompromised people (i.e. post treatment for cancer, other diseases) are also more susceptible.

***Workers:*** SCL employees and controlled contractors.

# Responsibilities

OH&S Systems Manager

To maintain the currency and accuracy of the Biological Water Hazards Corporate Standard reflective of new research, new public health guidelines, legislative and corporate change.

Station / Site Manager

To monitor the implementation of this Corporate Standard and allocate responsibilities and resources to ensure site-specific practices/procedures are developed to satisfy the Corporate Standard guidelines.

Workers

To comply at all times with the requirements specified within this Corporate Standard and any site-specific procedures.

# Hazards

1. Biological water hazards relevant to each site are to be identified by the risk assessment process described below. The hazard identification process is to identify what activities may put workers or members of the public at risk of exposure to biological water hazards.

   For most water uses, individuals will come into contact with biological water hazards through the skin or the gastrointestinal tract. However the ears, eyes, nasal cavity and upper respiratory tract can also be exposed through splashes, inhalation of aerosols and if the head is submerged under water. The exposure pathway and duration of exposure will be dependant on the application of the water (i.e. potable water or non-potable water) and the work task (where applicable).

2. In relation to activities / situations where workers may be exposed to potential biological water hazards, a safe system will be implemented to control risks to health and safety arising from such hazards and issues.

# Risk Assessment

Risk Management of biological water hazards will occur through a step-wise process.

Identification

1. List all water bodies and sources that impact on or are impacted by the site that may present biological water hazards.
2. Determine the credible biological water hazards relevant to the identified water bodies/sources or site. This will require knowledge from a number of sources including:
   - site history and experience;
   - current guidelines and standards;
   - expert advice;
   - safety alerts;
   - information / feedback from other (similar) generation sites (if available); and
   - media statements / press releases / political directives which may be relevant for sensitive IR issues etc.

   Note: The success of this part of the risk assessment process will depend largely on the competence and experience of the person/s undertaking the process. There may be a requirement for the utilisation of external expertise to help sites develop their credible biological water hazards.

   Some questions that may be useful for determining what might be a credible biological water hazard:
   - What is the primary purpose of the water?
   - Where did the water source originate from?
   - How do the plant / site processes impact on the water?
   - What are the natural influences on the water (e.g. is it a stagnant body or continuous flow etc)?
   - What treatment is performed on the water?
   - What monitoring is conducted on the water?
   - Is the water subject to faecal contamination (e.g. receives influent water from sewerage plant discharge, wildlife impacts etc)?
   - Is the water quality subject to chemical influences?
3. Identify the tasks and activities that potentially expose workers to these risks. To some extent, this will be at a higher level as it is conceivable that there could be hundreds of activities that fall within this stage of the risk assessment. This focus should be on the most common / routine tasks that occur on the site. It is expected that over time, the WMS process will capture other tasks and work activities. Consider the people interactions and work activities occurring with each of the above water bodies that potentially expose the person/s to biological water hazards.

Assessment

4. To evaluate the risk level, the standard SCL Risk Matrix should be used (refer HBIRDPRO-#537700-HS&E Hazard Management).

   Note: Many of the resource materials and references present some variation of a risk matrix – these can be used as a guide but ultimately the risk levels need to be described by the SCL Risk Matrix to ensure consistency within the organisation.

   Assessing the risk will require consideration of the characteristics of the water body such as:
   - its use (recreational vs. industrial use such as water bodies that receive thermally enriched water from industrial processes);
   - its visual characteristics (stagnant pools, visible surface scum that may indicate a blue-green algae bloom, clarity etc.);
   - its smell; and
   - if it has a past history of contamination.

To do this assessment, it will also require an understanding of the types of microbiological species that may be present in such water conditions.

In assessing the risk to health from exposure to waters that may contain biological water hazards, the following questions should be considered:

- What are the potential exposure pathways for a person undertaking these activities (inhalation, ingestion, skin and eye contact)?
- What is the likelihood of exposure?
- What is the extent of the exposure (drift, spray, inundation etc) and what is the duration of the exposure?
- What are the health consequences of exposure to the water?
- What is the number of workers and other persons at risk of exposure?
- What is the level of knowledge and training of workers regarding biological water hazards such as safe work procedures and standard precautions (i.e. use of personal protective equipment and good hygiene)?
- Are there individual risk factors for the worker/s that need to be considered (e.g. medical conditions that cause damaged/broken skin such as dermatitis or eczema, susceptible individuals etc.)?
- What are the current risk control measures? Are they adequate? What additional control measures are needed?
- What PPE is in use (e.g. rubber gloves, eye goggles and face shields)? Is it appropriate? Has it been maintained properly? Consider the potential need for new risk control measures?
- Are there any risks associated with the storage of the water?
- What other factors might contribute to exposures (e.g. availability of equipment / resources, the nature of work, weather conditions, climate etc).

5. Biological water hazards are to be assessed and managed as per a work method statement for the relevant work activity.

# Control

1. Standard safety controls and hazard specific safety controls (some of which are outlined in the following sections) are to be implemented in conjunction with routine water monitoring. Those control measures selected are to be documented in the appropriate procedure, management plan or work method statements.

2. Standard safety controls include the following general personal hygiene practices:
   - Water impermeable gloves are to be available and worn when a worker is likely to be exposed to contaminated water.
   - Protective eyewear is to be worn where eyes may be exposed to splashes or sprays of contaminated water.
   - Appropriate respiratory protection (P2 or higher) is to be worn in environments where there is potential for respiratory exposure to hazardous levels of Legionella bacteria (refer Attachment 1) or endotoxins from other microbiological matter (e.g. blue green algae).
   - Cuts or abrasions on any part of a worker's body must be covered with waterproof dressings at all times where there is a risk of infection.
   - Hands are to be washed using potable water and soap and dried immediately after removing gloves, after contact with potentially contaminated water and before eating, drinking or smoking.
   - Where potable water is unavailable, alternative hand cleaning methods, such as alcohol based hand rubs (available from pharmacies or medical suppliers), are to be made available.

3. Standard safety controls also include the following water supply management recommendations:
   - The use of effective barriers to prevent contamination of the water supply system.
   - Control of animal and human activities within the catchment's boundaries.
   - An effective maintenance program for plant and equipment used in the water supply system.
   - Choice and use of approved water treatment chemicals.
   - Use of approved materials in contact with drinking water.
   - Use of appropriately skilled and trained personnel in the operation of water supply systems.
   - Awareness and education programs so that workers know what is being done to protect the water supply, and whom to contact if unauthorised activities are suspected.
   - Erection of signage. The aim of warning signs is to warn the workforce and members of the public (where applicable) that waters may be contaminated (particularly important with blue-green algae). Signs should be placed in any area of concern to maximise awareness. When placing signs, consider the point of entry to the water body, for example at boat ramps.

4. Details of hazard specific safety controls may be found within the Attachments section of this document.
   - Attachment 1: Legionella
   - Attachment 2: Microbiological Quality of Potable Water (Drinking Water)
   - Attachment 3: Blue-Green Algae (Cyanobacteria)

Documentation

5. The overall management of each identified biological water hazard is to be documented. This may be in the form of site specific management plans for the hazard or alternatively through documents and procedures for managing the particular water system in which the biological water hazard exists.

6. Specific risk assessments and control measures for task level activities should be progressively captured through Work Method Statements.

Water Monitoring

Information from water monitoring results may be relevant to all stages of the risk management process.

7. The requirement for routine water monitoring is generally based on legislative guidelines that take into account the application of the water, the environment and the potential for human exposure. Attachment 4 outlines the minimum routine water monitoring requirements of water systems at SCL workplaces.

   Where results of water monitoring exceed a particular guidance or alert level specified within this corporate standard (or the applicable guidelines if not explicitly stated in this document), there is an increased risk of adverse health effects occurring. The extent to which the level is exceeded will largely determine the likelihood of adverse health effects occurring in the exposed individuals.

8. The monitoring of potable (drinking) water is applicable to sites that produce their own drinking water from a supply source (i.e. raw water supply dam).

9. Records of water monitoring results are to be kept.

Site Specific Management

Each site / workplace is required to develop, document and monitor their own site-specific biological water hazard management plans.

Contingency Planning and Communications

10. Contingency plans are to be developed for biological water hazard related emergency situations such as when monitoring results indicate that drinking water may pose a health risk. The contingency plan can be integrated into the site specific management plans for the identified biological water hazards.

The contingency plans are intended to be working plans to address probable events/outcomes that would arise from utilising relevant guideline limits and standards for action levels and response points. Site experience would also be incorporated into the plans.

It is not the intent of these contingency plans to capture activities for response to extreme events such as natural disasters, floods or unusual incidents (e.g. spills in the catchment), damage to treatment plants and /or distribution systems, and human actions (strikes, sabotage). It is expected that these types of events will be addressed through site specific Emergency Response systems although there may be elements of the specific contingency plans that may be drawn upon to aid in responding appropriately.

11. A communication and notification plan is to be developed in conjunction with the contingency plan. The plan is to consider responses to events of varying seriousness and describe in detail:
    (i) communications coordination responsibilities;
    (ii) the personnel to be informed of the issue;
    (iii) how they will be informed; and
    (iv) the content of the message.

    Attachment 5 provides guidance on site communications and notifications.

Personnel Exposure

12. If a person experiences any unusual health symptoms after contact with potentially contaminated water, the OH&S - Occupational Health & Safety\HS&E Hazard-Incident Notification Form (Yellow Form) is to be completed and immediate medical advice is to be sought.

    Note: Contact with the necessary teams should also be encouraged, with the purpose of managing the source to limit continued exposure to other persons.

13. The treating doctor is responsible for the required pathology testing and issuing a QComp Certificate if required.

14. Contact a Rehabilitation Coordinator, who will initiate the rehabilitation process where required as per #559117-Worker's Rehabilitation and Compensation.

15. Follow-up counselling is to be offered / organised / provided for the worker for the worker as soon as possible after the exposure (counselling is also available to members of the immediate family as needed - a SCL has Employee Assistance Program providers who are available for all sites);.

16. In the unlikely event that a worker contracts work caused illness / disease, this is to be notified to the WH&S Authority for the particular State / Territory where relevant.

17. SCL is to maintain a record of notified illnesses / diseases for a period of 30 years

# Training and Competency

1. Training as per HBIRDPRO-#551031-Biological Water Hazard Awareness - HS030 is to be provided

    Note: Biological Water Hazard Awareness Training is to be tailored to the personnel receiving the training (i.e. information is to be relevant to the specific sites attended by those personnel)

# Review

This corporate standard is reviewed every 3 years and on an as needs basis (e.g. following legislative change, new information, relevant incident, etc.).

# Links and References

HBIRDPRO-#796990-Hazard and Incident Reporting
HBIRDPRO-#559117-Worker's Rehabilitation and Compensation

HBIRDPRO-#551031-Biological Water Hazard Awareness - HS030
HBIRDPRO-#623730-Biological Water Hazards Awareness Training

HBIRDPRO-#560099-Blue Green Algae Management (SPS)
HBIRDPRO-#560238-Legionella Management Plan (SPS)
HBIRDPRO-#559293-Access to Cooling Towers and Condenser (SPS)

QLD Workplace Health & Safety Act 1995
QLD Plant Code of Practice 2005

| | |
|---|---|
| AS/NZS 3666.1:2000 | Air handling and water systems of buildings - Microbial control – Design, installation and commissioning |
| AS/NZS 3666.2:2002 | Air handling and water systems of buildings - Microbial control - Operation and maintenance. |
| AS/NZS 3666.3:2000 | Air handling and water systems of buildings - Microbial control - Performance-based maintenance of cooling water systems. |
| AS 5059:2006 | Power station cooling tower water systems – Management of legionnaire's disease health risk. |

Chorus I & Bartram J (Eds.) Toxic Cyanobacterium in Water: A Guide to their Public Health Consequences, Monitoring and Management, published on behalf of the World Health Organisation, 1999

National Health and Medical Research Council/Natural Resource Management Ministerial Council (2004). *Australian Drinking Water Guidelines,*. Canberra: AGPS

New South Wales Department of Health (2004), *NSW Code of Practice for the Control of Legionnaire's Disease, June 2004, 2nd Edition.*

Queensland Health (2001), *"Cyanobacteria in Recreational and Drinking Waters".*

World Health Organisation (2003),"*Guidelines for safe recreational water environments, Vol 1, Coastal and Fresh Waters, Chapter 4 – Faecal Pollution and Water Quality and Chapter 5 – Free-living microorganisms".*

Qld Health Legionnaires Fact Sheet:
http://access.health.qld.gov.au/hid/InfectionsandParasites/BacterialInfections/legionnairesDisease_fs.asp

Workplace Health and Safety Qld – A Guide to workplace use of non-potable water including recycled waters (Version1 – June 2007) - http://www.deir.qld.gov.au/pdf/whs/non-potable_guide.pdf

Workplace Health and Safety Qld - Guide to Legionella Control in Cooling Water Systems, including Cooling Towers

# Attachments



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**Attachment 1:** Hazard Specific Safety Controls – Legionella

Legionella bacteria is very widespread and can survive and multiply in natural fresh water systems such as rivers, lakes and underground water systems, and readily enters man-made water systems. Conditions that promote the rapid growth of Legionella bacteria are:

- the presence of sludge, scale, rust, algae; and
- water temperature in the range of 20 – 45°C.

Health Effects and Exposure Pathways

This microorganism can cause serious infection of the lower respiratory tract in humans. The infection is called Legionellosis. It takes two different forms: Legionnaires' disease (the more severe form of infection that includes pneumonia), and Pontiac fever (a milder illness).

Inhalation is the greatest risk exposure pathway.

- People usually get Legionellosis by breathing in Legionella bacteria in very fine droplets of water called aerosols.
- Man-made water systems sometimes provide environments that let Legionella bacteria increase to large numbers - aerosols can then spread the Legionella. These man-made systems include showers, spa pools, fountains, and also cooling towers associated with air conditioning and industrial cooling processes.
- You cannot catch Legionellosis from another person, nor from drinking water contaminated by Legionella bacteria.

The early symptoms of Legionnaires' disease are often like a severe 'flu' infection, and include:

- Fever (up to 40ºC)
- Headache (often severe)
- Shortness of breath
- Sometimes a dry cough
- Chills, muscle aches and pains
- In severe cases, other systems of the body may be affected, leading to diarrhoea, vomiting, mental confusion and even kidney failure.

Most people exposed to Legionella bacteria do not become infected. The risk of disease increases with age, especially amongst smokers. People with chronic medical conditions that weaken the body's immune system (such as cancer, lung disease, diabetes, AIDS and transplant recipients) may be at increased risk of Legionnaires disease. Young people, especially children, rarely get Legionnaires disease. Pregnant women are not at any greater risk than the general population. The disease can be treated successfully with antibiotics.

Risk Management

There are three types of Legionella environments that are to be managed as per relevant AS guidelines:

1. Main cooling tower water systems of power stations (Refer AS 5059); and
2. Air handling and water systems of buildings, or other relatively smaller cooling tower water systems (Refer AS 3666 series); and
3. Other general water systems. For example, raw water systems service water systems and fire fighting systems. Management measures should only apply to those water systems where Legionella amplification is a credible outcome (i.e. presence of risk factors such as heat, nutrients, poor water quality, stagnant environment etc.) AND there is the likelihood of personnel exposure to aerosols that may result in disease formation. (Refer AS 3666 series)

The Workplace Health and Safety Queensland Guide to Legionella Control in Cooling Water Systems, including Cooling Towers is to be considered when developing guidelines for the management of Legionella in cooling water systems.

Safety Guidelines For Inspection And Maintenance Of Air-Handing And Water Systems

The highest level of control is to not expose workers to areas of high risk. For example: in cooling towers, conduits and water boxes. However when it is absolutely necessary for work to be carried out in high risk areas, engineering, administration and personal protective equipment (PPE) precautions to remove avenues of exposure to Legionella bacteria are to be employed, regardless of Legionella concentrations.

Attachment 6 provides guidance on the selection of appropriate PPE for use by personnel during inspection and maintenance of air-handling and water systems.

**Attachment 2:** Hazard Specific Safety Controls – Microbiological Quality of Potable Water

1. Introduction

Potable water should not contain organisms capable of causing disease. The most common and widespread health risk associated with drinking water is contamination, either directly or indirectly, by human or animal (including bird) excreta, and with the micro-organisms contained in faeces. If the contamination is recent, and if among the contributors there are carriers of communicable enteric diseases (diseases of the gut), some of the micro-organisms which cause these diseases may be present in the water. Drinking this water or using it in food preparation may cause new cases of infection.

For the purpose of this standard, potable water is defined as water intended primarily for human consumption but which has other domestic uses. It may be consumed from the tap, or indirectly in beverages or foods prepared with water, and among its other uses are bathing and showering.

The Australian Drinking Water Guidelines 2004 (ADWG) provide a framework of acceptable water quality characteristics. Chapter 4 of the ADWG, 'Framework for Management of Drinking Water Quality- Application to Small Supplies' discusses how the guidelines apply to SCL sites' reticulation systems (where relevant). Chapter 5, 'Microbial Quality of Drinking Water' goes on to discuss the microbiological aspects of drinking water quality. This section of the guideline seeks to ensure that drinking water is free of micro-organisms which can cause disease. The targets and limits recommended in these guidelines are intended to meet the needs of consumers and apply at the point of use, for example at the tap. 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.

*Packaged water (and ice) is regulated by S5 of the Food Standards Code. It is recommended that water dispensers (e.g. plastic well water coolers) are regularly cleaned. Occasional sampling of water from such cooling / dispensing devices is also recommended to check that the cleaning regime is adequate. Cleaning of water dispensers may be a service negotiated into water supplier contracts.

2. Health Effects and Exposure Pathways

As stated above, this water is intended primarily for human consumption; therefore any exposure pathway is possible (although direct ingestion and skin contact are the most probable). Potable water therefore has the potential to become a substantial health risk to people if the water quality or the management of the system fails.

3. Risk Management

Risk management for sites should be broken down into two aspects:

(i) Management of raw water supply dams, catchment areas, water treatment plant & storage facilities (including rain water tanks used for drinking water) – specifically for sites that manage the production of their own potable water.

(ii) Management of the Site Distribution System – for both site-produced and municipal supplied potable water – Sites are to ensure that the quality of water in the distribution system meets the ADWG guidelines

For sites with municipal supplied potable water, monitoring is normally undertaken by the water authority from a service pipeline directly off a water main selected to represent the quality of water in the system. However, on occasions it may be necessary to check the water quality at the consumer's tap to confirm that chosen distribution sampling points are representative for microbiological monitoring. For municipal supplied sites, this testing may be arranged through the water authority.

For site-produced potable water, the requirement for distribution system testing is to be an element of the overall water management system (refer to Section 5.1).

4. Monitoring of Water Supplies

Where applicable, sites are to develop a drinking water monitoring program as per the ADWG, summarised in Attachment 1. The following principles apply to the monitoring of water supplies:

- Regular testing of drinking water quality should be regarded as only one step in a broader treatment and surveillance program to ensure that water is safe for use and as a check that the water management system is working.
- Monitoring for the presence of specific pathogenic organisms is appropriate for special investigations, and in the face of evidence of outbreaks of water-borne disease. However these are not recommended for routine monitoring of water supplies, due to the complexity of testing, associated cost, and, very commonly, poor reliability of detection. Therefore in monitoring for microbiological quality, reliance is placed on relatively rapid and simple tests for the presence of indicator organisms.

### *4.1. Guidance Levels and Recommended Actions*

The microbiological quality of water is by far the most important factor in determining the safety of water supplies from a health perspective. Microbiological quality in small water supplies can be determined by monitoring for microbiological indicator organisms as outlined in Attachment 1.

The following table outlines the recommended actions to take if indicator organisms are detected through this process.

| Indicator Organism | Guideline | Actions |
|---|---|---|
| Thermotolerant coliforms (or alternatively E. coli) | No sample should contain any thermotolerant coliforms (or alternatively E. coli).<br><br>Minimum sample 100mL | If thermotolerant coliforms (or alternatively E. coli) are detected, then irrespective of the number of organisms, the following steps should be taken immediately:<br><br>1. Alternative drinking water arrangements will need to be made until corrective action is taken and water quality is confirmed to be suitable for drinking. A site communication should be made advising personnel of the current status of the potable water and any actions they need to be aware of. Refer to Attachment 5 - Guidance on Site Communications and Notifications.<br><br>2. Another sample (a repeat sample) should be taken from the same site and tested for the presence of both thermotolerant coliforms (alternatively E. coli) and coliforms.<br><br>▪ If the repeat sample is negative for both thermotolerant coliforms (alternatively E. coli) and coliforms, then routine sampling can resume, but only after step 3 below has been completed.<br>▪ If the repeat sample is positive for either thermotolerant coliforms (or E. coli) or coliforms, then increased disinfection and a full sanitary survey should be implemented immediately. The sanitary survey should include a review of the integrity of the system.<br><br>3. Disinfection should be increased and/or an investigation undertaken to determine possible sources of contamination. These might include a breakdown in disinfection, a mains break, interruption to the supply, surges in supply, or deliberate or accidental contamination of the system. The investigation may include a visual inspection of the system and associated service reservoirs by trained personnel. When found, the source of contamination should be eliminated. |
| Total coliforms | No sample | If coliforms are detected in any sample, then irrespective of the number of |

| Indicator Organism | Guideline | Actions |
|---|---|---|
| | should contain any coliform organisms.<br><br>Minimum sample 100mL | organisms, the following action should be taken immediately:<br><br>1. Alternative drinking water arrangements will need to be made until corrective action is taken and water quality is confirmed to be suitable for drinking. A site communication should be made advising personnel of the current status of the potable water and any actions they need to be aware of. Refer to Attachment 5 - Guidance on Site Communications and Notifications.<br><br>2. Another sample (a repeat sample) should be taken from the same sample site and tested for the presence of coliforms and thermotolerant coliforms (or E. coli).<br><br>▪ If the repeat sample is negative for both coliforms and thermotolerant coliforms (or alternatively E. coli), then routine sampling can resume and no further action is required unless local knowledge of a system dictates an increased response.<br>▪ If the repeat sample is positive for either coliforms or thermotolerant coliforms (or alternatively E. coli), then corrective action, such as increasing disinfection dosage, an investigative survey, and follow-up action, should be undertaken immediately. |

5. Sites that Manage the Production of their Own Potable Water

This section is applicable to sites that have their own raw water supply dam that is used to derive a potable water source.

*5.1. Water Management System*

To ensure the microbiological quality of potable water produced at sites is safe, a site-specific water management system is to be developed that includes:

- effective treatment processes, including disinfection;
- effective barrier mechanisms to prevent the entry and transmission of pathogens throughout the system;
- regular inspection and maintenance of the system;
- practices that identify likely external sources of contamination;
- ongoing evaluation and refinement of the overall operation of the system;
- monitoring programs which assess water quality throughout the system, and which can identify the location and nature of any water quality problem within the system;
- validation procedures for sampling and laboratory testing programs;
- the use of monitoring information both to facilitate day-to-day management of the supply, and to assess its performance over time;
- appropriate procedures for
  - immediate correction of any serious water contamination;
  - resolution of longer-term water quality problems which might be costly to address;
- defined lines of responsibility for remedial action;
- use of appropriately skilled and trained personnel;
- transparent auditing procedures;
- reporting to consumers.

Note: This standard only relates to the microbiological quality aspects of a site-specific water management system. However the above dot points can be applied to managing the other characteristics of drinking water quality described in the ADWG (physical, chemical and radiological quality).

*5.2. Disinfection of Drinking Water*

Sites must develop a water treatment program that includes disinfection (with rainwater tanks being the exception as the ADWG has no reference that requires water from a rainwater tank to be disinfected. For further guidelines on the management of water qualities in rainwater tanks refer to Section 5.3 below.)

The physical quality (particularly turbidity and pH) of the water should be improved before disinfection to decrease the likelihood that disease-causing organisms will be harboured in suspended matter, and to increase the efficiency of disinfection.

The ideal disinfectant should:

- effectively remove pathogens over a range of physical and chemical conditions;
- produce a disinfectant residual which is stable and easily measured;
- produce no undesirable by-products;
- be easily generated, safe to handle, and suitable for widespread use;
- be cost-effective.

None of the disinfectants currently used meet all of these requirements. Choosing the optimum process often involves a series of compromises, and the choice will be based on the quality of the source water, the origin of the contaminating micro-organisms, the length and complexity of the system, and the size of the population served.

Agents and processes that have been used to disinfect water include chlorine, chloramines, chlorine dioxide, ozone, bromine, bromine chloride, iodine, silver and silver compounds, ultraviolet and ionising radiation and filtration.

It is recommended that sites refer to the ADWG and consult a water quality specialist for guidance in developing a site specific water treatment program.

*5.3. Rainwater Tanks*

For small / remote sites that consume rainwater tank water, water quality should be protected by the use of barrier systems and maintenance programs. The quality of water from rainwater tanks can be affected by roofing and tank materials, paints, atmospheric contaminants, leaves, dust, animal and bird droppings. Brochures on barrier systems and maintenance of rainwater tanks are available from state and local government authorities. When considered necessary, sites should have their rainwater tested for health characteristics identified as being of local concern.

The principles of rainwater tank water quality management are detailed below:

- Provided sites are following the rainwater tank manufacturer's instructions on correct set up, usage and maintenance, the rainwater should not be exposed to contamination sources therefore the risk of harmful organisms being present would be low.

- Rainwater is generally safe to drink providing it is clear, has little taste or smell, and is from a well maintained system. If any of these qualities change then immediate additional control measures are to be taken (such as changing to bottled water) until the contamination source is investigated, disinfection and/or tank cleaning is carried out and water quality sampling is conducted to confirm that the water is safe to drink.

**Attachment 3:** Hazard Specific Safety Controls – Blue-Green Algae (Cyanobacteria)

Blue-green algae are a common and naturally occurring component of freshwater, estuarine and marine environments. When conditions are favourable blooms can occur. Conditions that may promote an algal bloom include:

- Low turbidity waters
- Warm water temperatures
- Adequate sunlight
- Stable water conditions/long residence times
- An increase in the nutrient levels in the water (e.g. from the aeration of a dam or riverbed by releasing nutrients trapped in the dam sediment, runoff etc.).

Health effects and exposure pathways

Many species of blue-green algae have the potential to produce toxins that present a hazard to human health. Ingestion, inhalation and contact with water with high levels of blue-green algae and/or toxins can produce a range of adverse health effects.

| Exposure Pathway | Effect |
|---|---|
| Ingestion of water containing blue-green algae cells | Diarrhoea, vomiting, ulcers, liver damage, possibly promotes the growth of tumours, death. |
| Ingestion of water containing toxins | Possibly promotes the growth of tumours |
| Inhalation of water containing blue-green algae cells | Asthma attacks |
| Skin contact with water containing blue-green algae cells | Rashes. Note that skin irritant effects are particularly enhanced in those areas of the body covered by bathing or wet suits. This is due to the cells becoming trapped in the fabric of the suit resulting in prolonged contact with the skin. |

If skin contact occurs, rinse the affected area with algae free water. If skin irritation is experienced, seek immediate medical advice.

The severity of a reaction to blue-green algae and/or its toxins is dependant upon the species in the bloom, the magnitude of the bloom and the length of exposure.

Risk management

Individual sites / workplaces are to develop procedures to ensure the growth of blue-green algae in workplace water sources is managed effectively.

The following diagram indicates some of the key issues that need to be considered in the risk assessment process.

(Reference: Queensland Health, Environmental Health Unit. Cyanobacteria in Recreational and Drinking Waters. Aug 2001)

## HAZARD IDENTIFICATION

- What species of blue-green algae are present in the water?
- What is the concentration of cells in the water at various sampling locations?
- Are any of the species potentially toxic? If so, are they producing toxin and what is the level of total toxin (cellular and soluble)?
- If the water is to be used for potable uses, levels of cells and toxin/s in the source and treated water should be determined.

## EXPOSURE ASSESSMENT

- Are people likely to be exposed?
- What are the exposure pathways?

***Non-potable water exposure***

- For what activities is the water body used?

***Potable water exposure***

- Is the water used for drinking, bathing, cooking?
- Is the treatment process capable of removing cells and toxins?

- Is it possible to estimate the extent to which people are exposed?
- Have any adverse effects been reported from using the water?
- Is anyone particularly at risk of greater exposure?

## DOSE-RESPONSE ASSESSMENT

**Likelihood of adverse health effects**

| Non potable water | Cells/mL | Potable water |
|---|---|---|
| Unlikely | < 2000 | Unlikely |
| Possible | > 20 000 | Increases with concentration and duration of exposure. |
| Likely | > 100 000 | |

Toxin: The Australian Drinking Water Guidelines has set a drinking water guideline level for microcystin-LR of 1.3 µg/L.

## RISK CHARACTERISATION

Overall risk is based on concentration of cells and/or toxin, the extent of the bloom/contamination, the type of activities/work the water body is used for and the amount of contact the workforce or public may have with the water body.

Monitoring Guidelines – Blue-Green Algae

Sites are to conduct routine monitoring so that specific recommended actions can be implemented if guidance level / alert* level concentrations are reached.

**alert* level is the term used when referring to blue green algae concentration levels in *potable* water (compare to *guidance* level when referring to *non potable* water.)

*Guideline Criteria to Enter or Downgrade a Guidance Level / Alert Level*

Cell counts for an algal bloom can proliferate rapidly between sampling intervals and guidance / alert levels are often entered and exited quickly or not at all (particularly the lower alert levels). In the same way, blooms can subside rapidly often within a matter of days. Therefore the following points are recommended to be considered before implementing a contingency plan:

- Consideration should be given to the detected species – identified potential toxic species should be treated much more conservatively than non-toxic species.
- The criticality of the water system should be taken into account – any blooms with the potential to impact on (for example) the domestic water system should be treated with the uttermost priority.
- In all cases, the bloom must be watched closely. If there is any uncertainty about managing the bloom, then expert advice should be sought (refer below for a list of contacts).

To downgrade an alert level the following aspects must be considered:

- Three consecutive weeks of results which meet the criteria for the lower alert level.
- The results must have continued to drop or showed no change for algae counts or toxin levels.
- Prevailing/expected weather conditions (rainfall, temperature etc).
- What the water body is doing (stable or fluctuating levels, turn over etc.)
- Historic characteristics of the bloom i.e. the duration or stability of the bloom.

Once a decision has been made based on the above considerations monitoring and actions can revert to the appropriate level. Site Management should be informed of the change in algae levels and where appropriate, site personnel should be informed of the current advice (particularly if there are issues with high exposure waters such as domestic water or service water). Refer to Attachment 5 - Guidance on Site Communications and Notifications.

*Guidance Levels and Recommended Actions*

The non-potable water guidance levels are set at higher algal cell concentrations than the alert levels for potable water. This is because non-potable water is not intended for consumption. The following tables outline the guidance levels and recommended actions for waters which contain blue green algae cells for non-potable and potable water.

Table 1 – Non Potable Water Guidelines

| Guidance Level No. | Guidance level or situation | Health risks | Recommended Action |
|---|---|---|---|
| 1 | 20 000 cells/mL<br>or<br>10 µg/L chlorophyll-a with a dominance of blue-green algae | Short term adverse health outcomes unlikely. | Signs to indicate blue-green algae either absent or present at low levels. |
| 2 | 100 000 cells/mL<br>or<br>50 µg/L chlorophyll-a with a dominance of blue-green algae | Short term adverse health outcomes e.g. skin irritations, gastrointestinal illness, probably at low frequency. | Watch for scums.<br>Restrict water contact.<br>Signs to indicate MODERATE alert level – increased risk for water contact activities.<br>Inform relevant health authority. |
| 3 | Blue-green algae scum formation | Short term adverse health outcomes such as skin irritations or gastrointestinal illness following contact or accidental ingestion.<br>Severe acute poisoning is possible in worst ingestion cases. | Immediate action to prevent contact with scums.<br>Signs to indicate HIGH alert level – warning of danger for water contact activities.<br>Inform relevant health authority. |

Table 2 – Potable Water Guidelines

| Alert Level | Density of Algal Cells | Action |
|---|---|---|
| Vigilance | 200 cells/mL | ▪ Non-bloom conditions, blue-green algae detected in the water samples at low numbers, weekly monitoring continuing. |
| 1 | 2000 cells/mL<br>or<br>1 µg/L chlorophyll-a with a dominance of blue-green algae | ▪ Trend towards increasing numbers, or maintenance of moderate numbers of blue-green algae.<br>▪ Water may be unsuitable for drinking without suitable treatment.<br>▪ Consider alternative water supply options.<br>▪ In drinking water supplies, **toxin testing to be initiated**, particularly if the sample is predominated by a known toxic species – repeat on weekly basis.<br>▪ Low risk of skin irritation or gastrointestinal illness from contact.<br>▪ Continue weekly blue-green algae counts and issue advisory notices to the workforce. |
| 2 | 100 000 cells/mL or 50 µg/L chlorophyll-a with a dominance of blue-green algae | ▪ Persistently high numbers of potentially toxin cyanobacteria widespread throughout the water source, and/or visible localised scums forming.<br>▪ Water may be unsuitable for drinking without appropriate treatment.<br>▪ In all storages, toxin testing to be initiated and/or continued on a weekly basis.<br>▪ Switching to an alternative water supply should be initiated if available.<br>▪ Weekly sampling for blue-green algae counts to continue.<br>▪ Increasing risk of adverse health effects from contact.<br>▪ Upgrade advisory notices to the workforce to the highest alert level. |

Reference: In Queensland Health, *Cyanobacteria in Recreational and Drinking Waters.* August 2001, adapted from Chorus and Bartram 1999 (WHO)

Safety Guidelines for Blue-Green Algae Sampling

Before a sample is collected from a water source, appropriate safety precautions are to be taken to ensure no contact is made with possibly toxic algal cells. It is recommended that:

- Gloves are worn when collecting algae samples from waterways affected by algae blooms and areas adjacent to any surface scums or dense algal soups.
- Standard hygiene precautions such as washing off any splashes and washing hands before eating, drinking and smoking are to be observed at all times.
- Rubber boots are to be worn (if necessary) to avoid contact with algae cells or scums.
- If contact does occur rinse the affected area with algae free water and complete an incident form. If skin irritation develops, seek medical advice.

Blue Green Algae Contacts and Resources

*Blue Green Algae monitoring and management, technical and scientific information*:
The Queensland Department of Natural Resources and Mines provides water quality biological assessment services such as technical and scientific advice on blue-green algae monitoring and management. General inquiries: 07 3896 9506; Water, soil and plant analysis inquiries:
07 3896 9475. Click on this link to view the laboratory services and price list.

Queensland Health Scientific Services provides analytical services for blue-green algae identification, enumeration and toxin levels, as well as technical and scientific information regarding blue-green algae and their toxins: Ph: 07 3274 9111 Fax: 07 3274 9119

*Human Health (Notify of bloom for drinking water):*
Queensland:
Queensland Health: Environmental Health Unit, Public Health Services http://www.health.qld.gov.au/phs.ehu/

New South Wales:
NSW Department of Health (NSW Health) - Manager Water Unit
Ph: (02) 9816 0589, Fax: (02) 9816 0377, Mobile: 0411 264 070

*Web based resources:*
List of Nationally Accredited Laboratories:
To be confident of results, laboratories which have good quality assurance programs in place should be used. A list of nationally accredited laboratories which can carry out testing can be found on the following website: http://www.nata.asn.au/

*Blue-Green Algae On-line Resources:*
Australian Research Network for Algal Toxins http://www3.aims.gov.au/arnat/arnat-00001.htm

The Queensland Department of Natural Resources and Mines blue-green algae factsheet: Description of blue-green algae and its effects on humans, fish and livestock. Management options and prevention measures are discussed. http://www.nrw.qld.gov.au/factsheets/pdf/water/w3.pdf

**Attachment 4:** Minimum Monitoring Requirements for Water Systems

| Water Use | Hazard | Monitoring requirement | Guidelines | Reference | Additional Information |
|---|---|---|---|---|---|
| **Potable Water**<br>Drinking Water | Microbiological Activity<br>Micro-organisms capable of causing disease in drinking water (such as e.coli, cryptosporidium and giardia). | Refer to Chapter 7 ADWG for guidelines on the frequency of monitoring for small water supplies.<br><br>The monitoring frequency of site produced drinking water (for small water supplies) is generally determined at the site's discretion based on expert advice and historical drinking water quality data.<br>Monitoring frequency should be based on the principle that it is much more effective to test for a narrow range of key characteristics as frequently as possible, supplementing this with sanitary inspection, than to conduct comprehensive but lengthy (and possibly largely irrelevant) analyses less often. | The ADWG recommends as a minimum, small community supplies should be monitored for the four characteristics which best establish the hygienic state of the water and the potential for other problems to occur:<br>- microbiological indicator organisms (thermotolerant / faecal coliforms, or alternatively E. coli; and total coliforms)<br>- disinfectant residual<br>- pH<br>- turbidity | The Australian Drinking Water Guidelines 2004 (ADWG) | The monitoring frequency guidelines are based on the ADWG classification of a "small water supply" i.e. serving less than 1000 people. |
| | Blue green algae | Water supplies are to be monitored routinely for the presence of blue green algae on a quantitative basis.<br>When the concentration of algal cells reaches 2000 cells/mL (Alert Level 1), the toxin concentrations of a bloom should be tested and monitored on a weekly basis. | Attachment 3 provides a summary of the World Health Organisation guidelines for the management of blue green algae in drinking water.<br>These guidelines are applicable to source/raw water (not treated drinking water). It is important to note that these Alert Levels are monitoring and management action sequences that can be used to provide a graduated response to the onset and progress of a blue-green algae bloom. | Queensland Government, Queensland Health (2001), "Cyanobacteria in Recreational and Drinking Waters".<br>Chorus I & Bartram J (Eds.) Toxic Cyanobacterium in Water: A Guide to their Public Health Consequences, Monitoring and Management, published on behalf of the World Health Organisation, 1999 | The frequency of algal monitoring is dependant on observations or predictions of blooms. The frequency may decrease during winter (e.g. based upon observations), when algal numbers are generally low, and increase (e.g. fortnightly) in summer when algal numbers are generally high. Advice on the frequency of monitoring should be determined by consultation between the local water supply authority and the relevant local Health Authority. |

| | | | | | |
|---|---|---|---|---|---|
| **Non-Potable Water** Generic Waters | Microbiological Activity | Where the potential exists for people to routinely be in contact with a water supply, then that water supply shall be monitored regularly for the presence of microbiological hazards.<br>The decision on the type and frequency of water analysis will be influenced by the origin of the water and the sources of contamination likely to occur. | No specific guidelines exist for non-potable waters sourced from stormwater run-off or process water reuse. However it may be appropriate to draw a comparison of the measured water quality values against the ADWG for potable waters and the WHS (Qld) guidelines for Recycled Water sourced from sewerage treatment plants to gauge the relative quality of the water. | Workplace Health and Safety Queensland:"Guide to workplace use of non-potable water including recycled waters" Version 1 – June 2007. | |
| | Blue green algae | Where the potential exists for people to be in contact with a water supply, then that water supply shall be monitored routinely (refer Additional Information) for the presence of blue green algae on a quantitative basis.<br>20 000 cells/mL (Guidance level 1) is the threshold where specific controls in addition to standard safety precautions need to be implemented and the situation monitored more frequently. | Refer to Attachment 3: Guidelines for Non – Potable Water. | Queensland Government, Queensland Health (2001), "Cyanobacteria in Recreational and Drinking Waters". | The frequency of algal monitoring is dependant on observations or predictions of blooms. The frequency may decrease during winter (e.g. based upon observations), when algal numbers are generally low, and increase (e.g. fortnightly) in summer when algal numbers are generally high. Advice on the frequency of monitoring should be determined by consultation between the local water supply authority and the relevant local Health Authority. |
| **Non-Potable Water** Cooling Tower condensing water systems and major auxiliary plant cooling water systems of power stations. | Legionella | A representative sample of water (in power station cooling tower water systems) is to be taken at least once per month, or more frequently as determined under the risk management plan and tested for the presence of Legionella and other heterotrophic bacteria (Total Bacteria Count). | As outlined under the relevant Risk Management Plan prepared in compliance with AS 5059:2003. | Australian Standard AS 5059:2003 – Power station cooling tower water systems – Management of legionnaire's disease health risk | The risk assessment may provide for variations to monitoring frequency, e.g. additional monitoring during summer months and reduced frequency of monitoring during winter, as appropriate to the site. |

| | | | | | |
|---|---|---|---|---|---|
| **Non-Potable Water**<br>Other work environments (other than power station cooling tower water systems). This provision applies only where the water is a credible Legionella amplification environment and its use results in potential generation of aerosols with reasonable expectation of exposure for personnel. | Legionella | Test for Total Bacteria Count (TBC) in system water regularly (at least monthly), to assess effectiveness of the water treatment system and general system cleanliness.<br>Regular examination of water for the presence of Legionella bacteria is not usually warranted. | Ideally, the Total Bacteria Count (TBC) should be below 100 000 cfu/ml of water sample. However, this may not be practical in all circumstances. Concentrations above 100 000 cfu/ml indicate that conditions in the system are favouring bacterial multiplication. | Australian Standard AS/NZS 3666.2:2002 - Air-handling and water systems of buildings- Microbial control Part 2 Operation and Maintenance, and its supporting document SAA/SNZ HB32 - Control of microbial growth in air-handling and water systems of buildings.<br>OR<br>AS/NZS 3666.3:2000 Air-handling and water systems of buildings – Microbial control Part 3 Performance-based maintenance of cooling water systems | Culturing for Legionella bacteria may be appropriate if carried out for a specific purpose such as establishing an effective water treatment regime, to trace the source of an infection, or to establish that decontamination procedures have been properly carried out. |

**Attachment 5:** Guidance on Site Communications and Notifications
Some considerations before distributing site-wide and/or external communications should include:

| | |
|---|---|
| **Establish the Scope of the Issue** | ▪ Identify the primary cause of the issue and not just symptoms or secondary problems<br>▪ Determine / establish the extent of the contamination / incident<br>▪ Determine the extent of the impact and potential consequence<br>▪ What, when, how are control measures being implemented<br>▪ How much actual monitoring data has been collected<br>▪ Verify the facts – follow-up samples, retests etc<br>▪ Identify who needs to be notified – personnel, contractors, external parties etc<br>▪ Identify whether the issue qualifies as a crisis in accord with Stanwell's Corporate Crisis Management Plan |
| **Internal notification** | ▪ SCL site specific policies / protocols for notifying and briefing Management on the issues<br>▪ Engage management endorsement prior to any site wide communication (unless extreme circumstances that require instant actions)<br>▪ Do public health authorities need to be notified? – discuss with management prior to proceeding<br>▪ Be aware of IR issues associated with the issue (particularly with drinking water) and how to manage these appropriately<br>▪ Establish whether the Crisis Management Team should assume corporate management of the issue in accord with aforementioned CCMP. |
| **External Notification** | ▪ SCL policies / protocols for notifying external parties on sensitive issues<br>▪ Establish specific communication protocols for stakeholder notification to ensure consistency of key messages and centralised communications<br>▪ Ensure Chief Executive endorsement of protocol |
| **Seek Additional Support** | ▪ What is the current advice from experts? (e.g. Public health expert from the health department or a water quality expert from the relevant water authority in your state)<br>▪ Be mindful not to disclose information that may be commercially or legally sensitive or contentious |
| **Preparation of the Communication** | ▪ Ensure that the objective of the communication is clear to help formulate the development of specific key messages that inform receivers of the magnitude and consequence of the problem and requests their attention to required actions<br>▪ Describe the problem and the consequences<br>▪ Describe who or what is impacted / affected<br>▪ Describe what actions are required by site personnel<br>▪ Describe what actions are being taken to resolve the issue<br>▪ Provide advice on expected timeframe of issue.<br>▪ Determine what the expected communication frequency will be during the event/issue<br>▪ Who to contact with queries? |
| **Distribution of the Communication** | ▪ Ensure that the most appropriate modes of communication are deployed in consideration of the desired receivers, this should include more than one communication method such as email, Safety Alert Bulletin posted on notice boards, flyers or direct meetings etc<br>▪ Maintain a consistent information focal point (as much as possible) for both site communications and contact queries, to ensure consistent, clear, and centralised communications targeted to stakeholders. |
| **Follow-up** | ▪ Monitor the Feedback<br>▪ Keep a record of the communication (or ensure the communication is documented and filed in the corporate information management system)<br>▪ Direct meeting |

**An example** of a possible site communication and some actions in the event of a failure with the potable water system could be:

*"The microbiological quality of the site's drinking water is routinely monitored. The most recent monitoring results have come back positive for microbiological contamination, which means that the water is unsuitable for normal domestic purposes (such as drinking and cooking) at this time. Do not use the urns or drinking water coolers.*

*Because of the requirements of sanitation, this contaminated water will still be supplied through the water reticulation system, but supplies of water for drinking will be available from the bottled water coolers in the lunchrooms.*

*Rapidly boiling the water for at least one minute before drinking will make it acceptable for human consumption, however, it is preferred that you use the supplied bottled water.*

*Water for showers will be available from (to be determined). Water for hand washing will be available from the (to be determined) in the following toilets (to be determined). For anyone wanting further information please contact any of the following: (Insert name and phone number of site contact person/s.)*

*Investigation and treatment is underway to ensure that the contamination source is eliminated. Further advice will be issued when the water quality has been confirmed to be safe for drinking again.*

*The following signage is to be posted in each lunchroom:*
*Water is not suitable for human consumption. For anyone wanting further information please contact any of the following: (Insert name and phone number of site contact person/s.)*

*The following signage is to be posted in each toilet and wash area:*
*Water is not suitable for washing hands or showering. For anyone wanting further information please contact any of the following: (Insert name and phone number of site contact person/s.) "*

**Attachment 6:** Guidelines for Inspection and Maintenance of Air Handling and Water Systems

Guidelines for access to operating cooling towers, condensers, cooling water conduits, cooling tower ponds and associated environments:

- Each member of the work party must read and sign the **COOLING SYSTEM ACCESS MEDICAL STATEMENT SELF CHECK QUESTIONNAIRE** which is attached to the SCL procedure HBIRDPRO-#559293-Access to Cooling Towers and Condenser.
- The completed and signed questionnaire(s) is to be handed to the OIC who will attach it to the PTW form before issuing the authority.
- All open wounds are to be covered before entering the work environment. (Bacteria could be present in some of the mist and may infect open wounds.) If any injuries occur during work, the worker must immediately leave the area, wash wound and seek treatment as appropriate.

- The following personal protective equipment is to be supplied:
  - A plastic raincoat is to be worn while in the tower.
  - Where there is risk of being sprayed with mist an approved positive pressure self-contained breathing apparatus must be worn.
  - Where there is no risk of being sprayed with mist (e.g. for example in a cooling tower pond quadrant that is out of service) a half face P2 respirator is acceptable and may be worn as an alternative to a positive pressure self-contained breathing apparatus.
  - The half face P2 respirator selected must be resistant to the type of water exposure that occurs in the cooling tower environment. A suggested mask for this task is the UVEX Survive Air half face respirator.

- At breaks wash hands and exposed skin, remove PPE before entering crib rooms. Where disposable masks are issued, new masks should be used after each break.
- As an extra precaution, it is recommended that workers have a shower (thoroughly wash skin and hair with soap/shampoo) after each shift / day / work session in the cooling tower environment to remove bacteria. A clean set of clothes is to be worn home.

Recommended minimum PPE required during inspection and maintenance of air-handling and water systems:

| Job | Potential Hazard | Respirator and Clothing |
|---|---|---|
| Inspection. | Aerosol. | Half face piece, Class P2 particulate filter, ordinary site clothing (long sleeved shirt, long pants, safety boots). |
| High pressure spraying. | Aerosol. | Respirator as above, waterproof overalls, gloves, boots, goggles or face shield. |
| Chemical treatment with sodium hypo-chlorite solution ventilated space. | Spray mist and very low concentration chlorine. | Half face piece, acid gas and particulate respirator, goggles or face shield, overalls, gloves, and boots. |
| As above, still air but not confined space. | Low concentration chlorine. | Full face piece respirator, with a Type B AUS or B1 filter, overalls, gloves and boots. |
| As above, confined space. | Unknown chlorine concentration, high mist, possible lack of oxygen. | Full face piece air line respirator with compressor or compressed air bottles, overalls, gloves and boots. |

Reference: AS/NZS 3666.2:2002

**Attachment 7:** Audit Checklist (Corporate Standard Implementation Checklist)
Refer Word SCL Templates/Corporate Management/Audit Report Template for further explanation of Risk Levels/RootCauses.
Complete page 1 of the Audit Report Template when the findings are to be entered into the ARD and combine with this table.

| ARDI D# | STANDARD / OBLIGATION BEING AUDITED AND FINDING | RECOMMENDATION | RECOMMEND'N CLASSIFICATION | TARGET DATE | ACTION OFFICER | APPROVING OFFICER | GM | RISK LEVEL/ROOT CAUSE |
|---|---|---|---|---|---|---|---|---|
| **Hazards** | | | | | | | | |
| | Has the risk management process (as described in this Corporate Standard) been undertaken to identify and control Biological Water Hazards for the site? | | Please select: | | | | | RL: RC: |
| | Has the level of risk associated with identified biological water hazards been assessed using the standard SCL Risk Matrix? | | Please select: | | | | | RL: RC: |
| | Are Work Method Statements used to document control measures for identified work tasks that may expose workers to biological water hazards? | | Please select: | | | | | RL: RC: |
| **Risk Control** | | | | | | | | |
| | Is there a documented control / management system or process for each of the biological hazards that have been identified from the risk assessment process?<br>*Needs to cover off on (where relevant or appropriate):*<br>*Identified Risk, Response limits / action framework control measures, contingency plans and communication* | | Please select: | | | | | RL: RC: |

| ARDI D# | STANDARD / OBLIGATION BEING AUDITED AND FINDING | RECOMMENDATION | RECOMMEND'N CLASSIFICATION | TARGET DATE | ACTION OFFICER | APPROVING OFFICER | GM | RISK LEVEL/ROOT CAUSE |
|---|---|---|---|---|---|---|---|---|
| | *plan.* | | | | | | | |
| | Has the above control system been implemented on site? | | Please select: | | | | | RL: RC: |
| | Are specific risk assessments and control measures for task level activities progressively being captured through work method statements? | | Please select: | | | | | RL: RC: |
| | Does routine water monitoring undertaken meet the minimum standards detailed in Attachment 4 of this Corporate Standard? | | Please select: | | | | | RL: RC: |
| | Are records of water monitoring results kept? | | Please select: | | | | | RL: RC: |
| | Are there documented contingency plans to address water management?<br>Note: this can be integrated into the site specific management plan for biological water hazards. | | Please select: | | | | | RL: RC: |
| | Does the plan include a communication and notification plan which describes:<br>▪ communications coordination responsibilities<br>▪ the personnel to be informed of the issue<br>▪ how they will be informed<br>▪ the content of the message | | Please select: | | | | | RL: RC: |
| | Following a person experiencing | | Please select: | | | | | RL: RC: |

| ARDI D# | STANDARD / OBLIGATION BEING AUDITED AND FINDING | RECOMMENDATION | RECOMMEND'N CLASSIFICATION | TARGET DATE | ACTION OFFICER | APPROVING OFFICER | GM | RISK LEVEL/ROOT CAUSE |
|---|---|---|---|---|---|---|---|---|
| | unusual health symptoms after contact with potentially contaminated water was:<br>- a hazard / incident report form completed;<br>- medical advice sought immediately;<br>- a QCOMP certificate issued by the treating doctor (if required);<br>- the rehabilitation process started where required; and<br>- counselling offered / organised / provided for the worker as soon as possible? | | | | | | | |
| | Where a worker has contracted a work caused illness / disease has this been notified to the relevant WH&S Authority as required? | | Please select: | | | | | RL: RC: |
| | Is there a process in place to ensure that records of notified illnesses / diseases are kept for 30 years? | | Please select: | | | | | RL: RC: |
| **Training** | | | | | | | | |
| | Has training been provided as per HBIRDPRO-#551031-Biological Water Hazard Awareness - HS030? | | Please select: | | | | | RL: RC: |
| | Was the provided training tailored to the specific personnel receiving the training (i.e. information relevant to the specific sites | | Please select: | | | | | RL: RC: |

| ARDI D# | STANDARD / OBLIGATION BEING AUDITED AND FINDING | RECOMMENDATION | RECOMMEND'N CLASSIFICATION | TARGET DATE | ACTION OFFICER | APPROVING OFFICER | GM | RISK LEVEL/ROOT CAUSE |
|---|---|---|---|---|---|---|---|---|
| | attended by those personnel)? | | | | | | | |

Further Information:

Completed by (print name): Date:

Entered into ARD: Name: Signature: Date: