# KOGAN CREEK PROCEDURE FOR

# *LEGIONELLA* RISK MANAGEMENT
# KA-CHM-22

Responsible Officer: Station chemist

Responsible Manager: Kogan Creek General Manager

Responsible Executive: Executive General Manager of Production

## DOCUMENT HISTORY

| Key Changes | Prepared By | Checked By | Approved By | Date |
|---|---|---|---|---|
| Created (12/04/2010) | K Rose | | | |
| Reviewed (27/09/2016) | K Rose | B Gothmann | J Edwards | 05.10.2016 |
| Included reference to Clarifier and updated anti-scalent information (18/07/2019) | L Smith | K Rose | T Danby | 30.07.2019 |
| Reviewed | M Wyburn | K Rose | G Dann | 12.07.2023 |
| Reviewed – minor updates | K Rose | L Smith | D Flynn | 27.10.2025 |

# CONTENTS

## 1 PURPOSE

The purpose of this instruction is to meet the requirements of CS Energy procedure CS-CHEM-02 – *Legionella* Risk Management and minimise the risk to workers at Kogan Creek Power Station of contracting legionellosis.

This Risk Management Plan (RMP) identifies the water systems on-site that may be contaminated with *Legionella* bacteria, and the controls used to minimise their presence and the possibility of workers being exposed to aerosols from these potentially contaminated systems.

## 2 SCOPE

This procedure applies to all workers and visitors on Kogan Creek Power Station site, and specifically in relation to the water systems and adjacent areas listed in *Table 1* below.

**Table 1 - Kogan Creek Power Station Water Systems with higher *Legionella* risk.**

| Water Source | Description and location |
|---|---|
| ACW (Auxiliary Cooling Water) | The ACW tower is located at the south-eastern side of power station between the laboratory and wastewater collection pond. The heat exchangers are located at the eastern side of the turbine hall. The function of the ACW system is to cool the closed cooling water system. |
| SCC (Submerged Chain Conveyer) Cooling Water Pond | SCC cooling pond is located at the far south-eastern end of the power station. The SCC is located under the boiler and the SCC drain pit is located between the SCC and the water treatment plant. The SCC removes the bottom ash from the boiler and is submerged in the cooling water. |
| Domestic water and hot water systems | Domestic water is supplied to the laboratory, workshop, stores, fire station, security, control room, boiler house, administration building and the mine. |
| Kogan Pond<br>(Northern Raw Water Pond) | The Kogan pond is located at the north-eastern end of the power station. It is used to supply firefighting water. |

*Table 2* lists other water sources on CS Energy Kogan Creek Power Station property that potentially contain *Legionella* bacteria. Work activities associated with these water systems, that may generate aerosols, need to considered risk of exposure to workers.

**Table 2 - Kogan Creek Power Station Water Sources with potential for *Legionella* contamination.**

| Water Source | Description and location |
|---|---|
| Lagoon Gully Pond<br>(AKA Southern Raw Water Pond) | The lagoon gully pond is located at the south-western side of the power station. It supplies makeup water to the auxiliary cooling tower as well as raw water to areas in the demin plant and boiler house. |
| Service Water | The service water tank is located south of the water treatment plant. Service water is used to feed the demineralisation plant and is used in the boiler house. |
| DRD (Drains Reclaim Dam) | The DRD is located north-east of the station outside the boundary fence. It is pumped back to the station for use in the ashing system. It is also clarified to feed into the Auxiliary Cooling Tower and Lagoon Gully Pond. |
| WWCP (Wastewater Collection Pond) | The WWCP receives wastewater from the demin plant, RO (Reverse Osmosis) plant, cooling tower blowdown, sewage treatment plant, oily water separator, plant drains, Lagoon Gully pond, DRD reclaim and SCC cooling pond. |
| NSWD (Northern Storm Water Dam) | The NSWD collects storm water runoff from the western half of the power station site. It is used for irrigation purposes around the security hut and administration building. |
| IADA SWD (Initial Ash Disposal Area Storm Water Dam) | The IADA SWD collects storm water runoff from the Initial ash disposal area. The water is reclaimed to the SCC cooling pond or the WWCP. |
| IPAC (In Pit Ash Cell) reclaim | The IPAC receives the bulk of the ash slurry produced by the power station. Water seepage from the slurry collects into the lined base of the IPAC and is reclaimed to the WWCP for ashing. |
| IPAC 2 (In Pit Ash Cell 2) reclaim | As above for IPAC |

The following plant systems have not been given further consideration in this procedure as there is no risk of either being contaminated with *Legionella* bacteria and/or creating aerosols.

- Air conditioning systems on site do not utilise wet cooling towers and the humidification systems are of a boiling – steam injection type.
- CCW (Closed Cooling Water) - The CCW is a “clean” water system and provides cooling to various auxiliary plant in the turbine hall and boiler house. The system is closed and not open to the atmosphere.
- Southern Storm Water Dam (SSWD) collects storm water runoff from the eastern half of the power station site and overflow from the DRD. It is reclaimed to the DRD for reuse on site.

# 3 RESPONSIBILITIES AND ACCOUNTABILITIES

## 3.1 Management

Management are responsible for ensuring that:

- Site notification of any significant (Action level 2 or greater) positive *Legionella* results and associated control measures are communicated to all workers and visitors on site as soon as practicable.
- General awareness of the risks and controls detailed in this procedure are communicated to all workers and visitors at Kogan Creek Power Station though site inductions or other training or communications.
- Notify Worksafe Queensland where the cause of a confirmed case of Legionnaires' disease is work related based on evidence that the cooling water system (or another source) at their workplace was the source of the legionellosis.
- This management plan is maintained to legislative and corporate requirements; and
- Periodic reviews of this management plan are undertaken.

## 3.2 Employees / Contractors / Consultants

Employees, Contractors, and Consultants are responsible for:

- Participating in any inductions or training associated with this procedure.
- Understanding and following the guidelines in this instruction and any site notifications issued in relation to positive *Legionella* results.
- Ensure any personnel under their supervision are aware of this procedure and the controls required to minimise exposure to potentially contaminated aerosols and subsequent risk of contracting Legionnaires' disease.
- Assess their own suitability, and/or that of the personnel they supervise, for work in areas or tasks associated with the risks of aerosols exposure, with respect to their current health, due to the increased risk to people with immune deficiency or other health risk factors.
- Notifying the Responsible Officer of any changes identified to the plant or processes specified in this instruction, for a review to be instigated; and
- Being involved in the review process when requested to by their supervisor or Manager.

## 3.3 Station chemist and chemical personnel

The station chemist or another suitably qualified competent person is responsible for:

- Maintaining the *Legionella* risk assessment for the site in association with other personnel who have specific knowledge of the plant, processes and maintenance systems associated with the identified areas of risk.
- Arranging, coordinating, and trending biological sampling and any other testing required to assess the performance of biological control of the cooling water systems.
- Informing station management of positive *Legionella* results and initiating corrective actions as detailed in this guideline.

# 4 ACTIONS

## 4.1 Risk Assessments

The type and extent of risk assessments undertaken for cooling water systems and water distribution systems at Kogan Creek Power Station is dependent on the risk of the system being contaminated with *Legionella* bacteria and the potential for aerosol generation and likelihood of exposure.

For the highest *Legionella* risk water system, the ACW cooling tower, a detailed risk assessment was undertaken using a CS Energy template which is based on *NSW Health – Approved Form 1 – Risk Management Plan – version 1/9/2022*. This meets the requirements of *AS/NZS 3666.3:2011 Air-handling and water systems of buildings-Microbial control. Part 3: Performance-based maintenance of cooling systems*. This risk assessment also incorporates a specific Risk Management Plan (RMP) for the ACW cooling tower.

Other water systems risk assessments were conducted with reference to *AS 5059-2006: Power station cooling tower water systems – Management of legionnaires' disease health risk*. CS Energy's ORA template and risk matrix was used to conduct risk assessments of all the water sources where potential aerosol formation could occur.

A summary of the overall risk classifications for each water system on site and location of risk assessments shown in *Table 3* below.

**Table 3 - Risk Assessment Summary.**

| Water System | Risk rating before control measures | Control measures in place | Residual risk rating | Risk assessment location |
|---|---|---|---|---|
| Auxiliary cooling water and cooling tower | Significant | Yes | Low | TRIM link K/D/23/2833 |
| SCC cooling water | Moderate | Yes | Low | TRIM link K/D/20/2754 |
| Domestic water and hot water systems | Moderate | Yes | Low | |
| Kogan Pond (Northern Raw Water Pond) | Low | No | Low | |
| Lagoon Gully Pond | Low | No | Low | |
| Service water | Low | No | Low | |
| DRD - Drains Reclaim Dam | Low | No | Low | |
| Wastewater Collection Pond | Low | No | Low | |
| Northern Storm Water Dam | Low | No | Low | |
| IADA Storm water run-off dam | Low | No | Low | |
| OPAC (Out of Pit Ash Cell) reclaim | Low | No | Low | |
| IPAC (In Pit Ash Cell) | Low | No | Low | |
| IPAC 2 (In Pit Ash Cell 2) | Low | No | Low | |

## 4.2 Risk Management

Specific risk control actions required for water systems assessed as having a moderate to significant risk of being contaminated with *Legionella,* and the potential for the presence of, and personnel exposure to, aerosol from these water systems is detailed below.

### 4.2.1 Auxiliary Cooling Water System

Refer to the Kogan Creek - ACW cooling tower - Legionella Risk Assessment - May 2023 – TRIM reference K/D/23/2833 for detailed design data and control measures.

#### 4.2.1.1 Requirements for Entry into the ACW Cooling Tower

*Kogan Creek Procedure - H&S - KA-OHS-08 - Auxiliary Cooling Tower Entry - (07/16) - Kogan Creek Registered, TRIM reference* K/D/16/996, details the requirements for entry into the ACW cooling tower for maintenance and inspection tasks, and requires the following prior to entry: -

- A P2 mask must be worn as a minimum level of respiratory protection and a JSEA

completed.

- Completion of Cooling Tower induction training, TRIM reference K/D/16/2565
- A Cooling Tower Access Health Statement, form S1844, TRIM reference B/D/12/15438. The purpose of the form is to exclude individuals from entry if they are deemed unfit.

#### 4.2.1.2 Requirements for Cleaning of ACW/CCW Heat Exchangers

Prior to cleaning the ACW side of the heat exchangers the following risk controls are required: -

- A JSEA is required which includes control measures to limit the exposure to any aerosols generated. A P2 mask or half-face canister respirator is required.
- Cleaning area access is controlled to prevent aerosol exposure to personnel without the required protection.

#### 4.2.1.3 Requirements for Disinfection of the ACW towers

- Plant instruction KA.OP.CO.5.1 ACW Cooling Tower Disinfection shall be undertaken in the event of a positive Legionella result, i.e., > 10 CFU/mL and/or a high HPC > = 100,000 CFU/mL.

### 4.2.2 Submerged Chain Conveyor (SCC) Cooling System

The SCC cooling systems comprises the cooling water system for the submerged chain conveyor (SCC). This system includes the SCC itself, the cooling pond, the cooling water pit and all of the associated pipe work, pumps, and ancillary equipment. The SCC cooling system may present a *Legionella* hazard. It has been observed that the cooling water pit, shown in Fig*ure 1* below, can produce mists and aerosols which may contain *Legionella* bacteria. An area of the SCC cooling system where mists and aerosols are present should be regarded as hazardous.

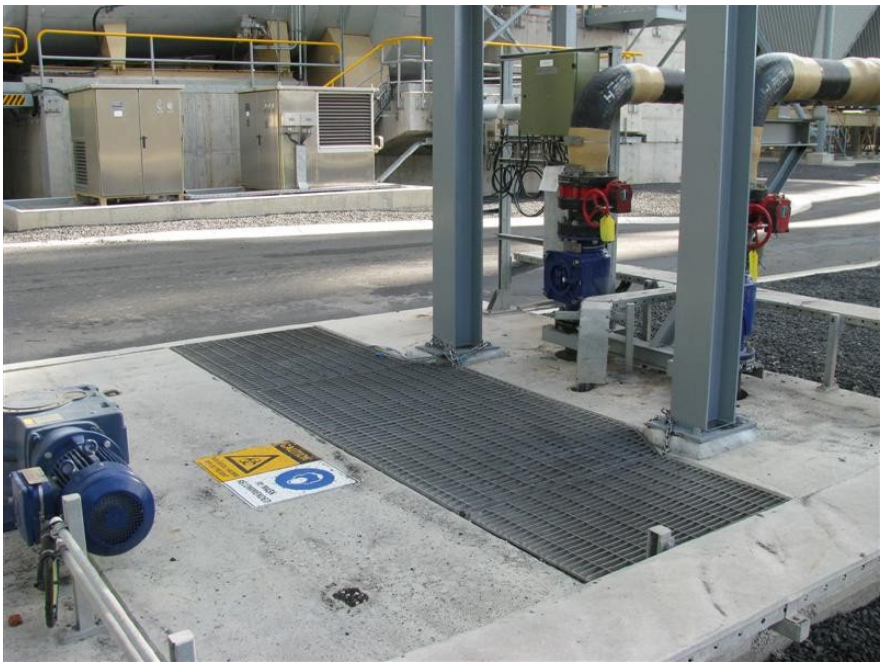

**Figure 1 - SCC cooling water pump pit**

#### 4.2.2.1 Control Measures

There is currently no chemical dosing to reduce bacteria or *Legionella* levels in the SCC cooling system. The risk of exposure from this source is considered to be low because of limited access. Signs have been placed near the pit, illustrated in *Figure 1* above, to warn people of the potential hazard and to recommend a P2 mask be worn if working in the immediate vicinity. A sample of SCC cooling water, collected from the SCC cooling pond, is taken monthly and analysed for HPC and *Legionella* to monitor for outbreaks of the bacteria.

A risk assessment should be performed before any work or access to areas of plant where *Legionella* may present a hazard occurs. The risk assessment should include the requirements of any Personal Protective Equipment (PPE) that is required to safely access the area. As *Legionella* presents a hazard through inhalation, respiratory protection is usually required, with the minimum level of protection being the use of a P2 mask.

### 4.2.3 Domestic Water

Domestic water is produced on site at Kogan Creek from a mixture of Kogan Bore water and Demineralised water. Some branches of the domestic water distribution system are used more than others and some dead legs may exist. Aerosol generation occurs mainly whilst using the showers but will also occur when using domestic water for hosing.

The risk of *Legionella* bacteria proliferating in the domestic water system is considered low due to the lack of nutrient and the automated chlorine dosing system. The system is also closed which prevents contamination.

#### 4.2.3.1 Control Measures

The water is automatically dosed to a free residual chlorine of 1.0 ppm. This ensures there is a >0.3 ppm free residual chlorine at the furthest point of use on site which is the administration building. The results of residual chlorine testing are recorded in TRIM reference K/D/11/2257.

The domestic water pumps are fitted with a minimum flow valve which continuously circulates the water in the tank preventing stagnation. Sodium hypochlorite is dosed into this recirculation line to maintain a free residual chlorine of 1.0 ppm. The free chlorine is measured continuously by an online analyser along with pH. The ICMS uses this value to automatically dose the system.

The presence of nitrogenous nutrients is low as the domestic water is made from a combination of bore water, which has little nitrogen (0.5-1.0 ppm), and demineralised water. The domestic water system is completely enclosed and is not exposed to sunlight. Suspended solids and scale are minimal within the system. At the point of production, the domestic water is chlorinated and passes through a contact vessel to maximise the contact time. The water then passes through a carbon filter which removes the chlorine, trihalomethanes (THMs) and other organic compounds. The water is re-chlorinated once inside the storage tank via the minimum flow line as discussed previously.

The domestic water is monitored weekly for pH, conductivity, turbidity, free and total chlorine. The free and total chlorine is also monitored at the laboratory lunchroom, control room, workshop lunchroom and administration building. Once a month a full ion balance, HPC, total and faecal coliforms analysis is performed. The results are stored in a database TRIM reference. K/D/11/2257 Testing for Legionella bacteria is performed 6 monthly and includes the hot water showers at the administration and laboratory buildings.

Personnel using the washdown water system should be aware of *Legionella* risks and controls.

Washdown offtakes that have not been used regularly should be flushed to ground away from personnel

and without spraying prior to undertaking any hosing.

#### 4.2.4 Kogan Pond (Northern Raw Water Pond)

The Kogan pond supplies firefighting water to the site. The risk of *Legionella* bacteria proliferating in the firefighting system water system is considered low, however dead legs do exist.

##### 4.2.4.1 Control Measures

There is currently no chemical dosing to reduce bacteria or *Legionella* levels in the firefighting water system.

Personnel using the fire system for washdown should be aware of *Legionella* risks and controls.

Fire system outlets offtakes that have not been used regularly should be flushed to ground away from personnel and without spraying prior to undertaking any hosing.

Access to any washdown work areas should be controlled with barriers and signage to minimise the risk of exposure to personnel not involved in the task.

Personnel using the fire system for any washdown task should wear a P2 mask as minimum respiratory protection if there is a risk of being exposed to any drift of aerosols from the washdown activity being undertaken.

#### 4.2.5 Other Water Sources at Kogan Creek Power Station

The remaining water sources on site listed in *Table 3* with a risk rating of *"Low - without control measures*" are not discussed in any further detail in this section given the low risk as a source of airborne *Legionella* bacteria. Consequently, there are no specific control measures in place to control *Legionella* bacteria in these water sources.

### 4.3 Monitoring for *Legionella* Bacteria and Recording Results

Monitoring of *Legionella* bacteria levels is undertaken monthly in the ACW system and the SCC cooling system. Samples are collected according to standing instruction KC-EI-27 *Legionella* sampling. The results are recorded in a database TRIM reference K/D/11/2257 and reviewed by station chemists.

A summary of the *Legionella* monitoring program at Kogan Creek Power Station is presented below in *Table 4* below.

**Table 4 - *Legionella* Monitoring Program**

| Sample | Frequency of *Legionella* Sampling |
|---|---|
| Auxiliary cooling water | Monthly |
| SCC cooling Pond | Monthly |
| Domestic water | 6 monthly |
| Hot water showers | 6 monthly |

## 4.4 Management and Reporting of Positive Results

A positive *Legionella* (Action level 2 or greater) result shall be reported as a health and safety incident using CS Energy's Incident reporting system CGR Insight via the Intranet. Any cases of site personnel contracting Legionnaires' disease must be recorded as a category 3 incident and investigated.

Health practitioners are required to report any instances of Legionellosis as it is a notifiable disease under the *Queensland Public Health Act 2005*. Under the *Work Health and Safety Act 2011*, Worksafe Queensland shall be notified where the cause of a confirmed case of Legionnaires' disease is work related, based on evidence that the cooling water system (or another source) at their workplace was the source of the legionellosis.

### 4.4.1 Auxiliary Cooling Water System

In the event of a positive *Legionella* result, i.e., > 10 CFU/mL and/or a high HPC > = 100,000 CFU/mL, **immediately** undertake plant instruction KA.OP.CO.5.1 ACW Cooling Tower Disinfection.

### 4.4.2 SCC Cooling Pond

In the event of a *Legionella* outbreak, i.e., >100CFU *Legionella Pnuemophila* issue site notice and place signs around SCC and SCC cooling pond.

### 4.4.3 Domestic water

In the event of a positive *Legionella* result, i.e., >10 CFU/mL and/or a high HPC > = 100,000 CFU/mL issue a site notice and restrict access to hot water showers. Increase chlorine dosing to 2 ppm and flush potable distribution system such that the furthest point on each branch of the ring main returns a free chlorine of >1.5 ppm. Retest within 3 days.

# 5 DOCUMENTATION AND REPORTING

Table 5 - ACW Cooling tower documents and reporting below contains the information required to fulfil the documentation and reporting requirements of Section 6 of Queensland Government Office of Industrial Relations "Guide to Legionella control in cooling water systems, including cooling towers", November 2018.

Table 5: ACW Cooling Tower Documents and Reporting

| Item | Document Name | Location/Reference/link |
|---|---|---|
| ACW documented risk Assessment | Kogan Creek - ACW cooling tower - Legionella Risk Assessment - May 2023 | TRIM link K/D/23/2833 |
| Water treatment specifications | 1. Kogan Creek - ACW cooling tower - Legionella Risk Assessment - May 2023<br>2. ACW cooling tower chemical dosing plant manual. | 1. TRIM link K/D/23/2833<br>2. TRIM link K/D/12/5053 |
| ACW entry procedure | Procedure – H&S – KA-OHS-08 Auxiliary Cooling Tower Entry | TRIM link K/D/16/996 |
| Planned service and maintenance requirements. | 1. ACW cooling tower maintenance strategy.<br>2. ACW cooling tower chemical dosing plant strategy. | 1. TRIM link B/D/22/12787<br>2. TRIM link K/D/13/6176 |
| Water sampling results | Auxiliary Cooling Tower Results Database | TRIM link K/D/11/2251 |
| Key performance indicators and targets | Kogan Creek - ACW cooling tower - Legionella Risk Assessment - May 2023 | TRIM link K/D/23/2833 |
| SDS for water treatment chemicals | 1. NALCO 3DT437<br>2. NALCO Stabrex ST70<br>3. Sodium hypochlorite solution.<br>4. Sodium bromide solution. | ChemAlert accessible via intranet |
| Water treatment dosing rates | Kogan Creek - ACW cooling tower - Legionella Risk Assessment – Updated October 2025 | TRIM link K/D/23/2833 |
| Water storage volumes for dosing calculations | Plant manual PCD.TP8.01+ - General – Wet Cooling Tower | TRIM link K/D/12/2273 |
| Disinfection/decontamination procedures. | Refer *4.5 Management and Reporting of Positive Results* | TRIM ref KA.OP.CO.5.1 |

| Item | Document Name | Location/Reference/link |
|---|---|---|
| Results of microbial testing. | *Legionella* and Pathogen control folder | TRIM link F/11/11691 |
| History of any previous action taken in response to positive *Legionella* results. | | Recorded in CGR Insite |
| Records of the inspection of the cooling water system and water treatment system by on-site person/s. | | TRIM ref BCS File Path<br>OVERHAULS - INSPECTIONS (OH) - Kogan Creek A Station |

## 6 DEFINITIONS

| Term | Definition |
|---|---|
| ACW | Auxiliary Cooling Water |
| Aerosol | Airborne particles <10µm in diameter |
| Biocide | A physical or chemical agent that kills bacterial and other microorganisms |
| Blowdown | The removal of water from a system to limit the concentration of dissolved salts and suspended solids |
| Ca | Calcium |
| CCW | Closed Cooling Water |
| CFU | Colony Forming Units |
| CoC | Cycles of concentration |
| DRD | Drains reclaim dam |
| HCC | Heterotrophic Colony Count (same as HPC) |
| HPC | Heterotrophic Plate Count (same as HCC) |
| IADA SWD | Initial ash disposal area stormwater dam |
| JSEA | Job Safety and Environmental assessment |
| Legionellosis | A term that includes both Legionnaires' disease and Pontiac fever. |
| Mg | Magnesium |
| NSWD | Northern stormwater dam |
| OPAC | Out of pit ash cell |
| P2 | A half face mask that is used for protection against mechanically or thermally generated particles (as per AS 1715:2009) |
| PPE | Personal Protective Equipment |
| ppm | Parts per million |
| SSWD | Southern storm water dam |
| TDS | Total dissolved solids |
| THMs | Trihalomethanes |
| WWCP | Waste water collection pond |
| | |
| | |

## 7 REFERENCES

| Reference No | Reference Title | Author |
|---|---|---|
| | AS/NZS 3666.3:2011 Air-handling and water systems of buildings-Microbial control. Part 3: Performance-based maintenance of cooling systems | Standards Australia |
| | AS 5059-2006 Power station cooling tower water systems-Management of legionnaires disease health risk | Standards Australia |
| | Guide to *Legionella* control in cooling water systems, including cooling towers, November 2018. | Office of Industrial Relations,<br>Queensland Government |
| | NALCO, Program Administration manual, CS Energy Kogan Creek Power Station, Auxiliary Cooling Water Treatment Program | NALCO |
| K/D/16/996 | Procedure - H&S - KA-OHS-08 - Auxiliary Cooling Tower Entry - (07/16) - Kogan Creek Registered | CS Energy |
| K/D/16/2565 | KOGAN CREEK - Auxiliary Cooling Tower Induction - February 2016 | CS Energy |
| | Plant Instruction - KOGPI - Kogan A - OPS - KA.OP.CO.5.1 - Abnormal Operations - ACW Cooling Tower Disinfection - (14) | CS Energy |
| K/D/10/3018 | Procedure - CHM - KC-EI-27 - *Legionella* Sampling - (P4) - (08/10) - Kogan Creek Registered | CS Energy |
| K/D/20/2754 | Operations Plant Risk Assessment - KA10G - Legionella in site water sources - April 2022 | CS Energy |
| K/D/23/2833 | Kogan Creek - ACW cooling tower - Legionella Risk Assessment - May 2023 | CS Energy |

## 8 RECORDS MANAGEMENT

In order to maintain continual improvement, suitability, safety and effectiveness of the organisation, CS Energy's registered documents will be reviewed on a two yearly basis or at intervals specified by legislative or regulatory requirements. Review of controlled documents should occur where it has been identified that there are changes in technology, legislation, standards, regulation or where experience identifies the need for alteration to the content. Registered documents should also be reviewed following an incident, change management process, modification or where directed as part of a risk assessment process.

CS Energy must ensure that records are retained according to accountability, legal, administrative, financial, commercial and operational requirements and expectations. In compliance with records retention and disposal, all documentation created in relation to CS Energy business must be retained in line with minimum retention periods as detailed in legal retention and disposal schedules.