



Circular No. LWU 18
Date 4 June 2014
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Assuring the safety of drinking water supplies

This Circular has been prepared to advise NSW local water utilities (LWUs) of an important new protocol for assuring the safety of all drinking water supplies in regional NSW. The protocol is robust and cost-effective and must be implemented by all LWUs providing a drinking water supply.

Protocol

Following its review of a number of recent boil water alerts¹ in regional NSW, the NSW Office of Water, in consultation with NSW Health and the NSW Water Directorate, has developed the new protocol, which is set out in Attachment 2 – Appendix E of the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* (www.water.nsw.gov.au). Appendix E documents the minimum requirements for ensuring each potable water supply is safe from microbial contamination. Under this protocol, each LWU will need to ensure that the **standard operating procedures (SOP)** for its water supply systems meet these requirements in order to achieve the following three key barriers:

Barrier 1 – Effective disinfection to kill, inactivate or remove pathogens in the water supply prior to distribution.

Barrier 2 – Ensure distribution system integrity to prevent contamination.

Barrier 3 – Maintain free chlorine residual in the water in the distribution system to help protect against minor contamination and as an indicator of a potential breach in distribution system integrity.

Together, these 3 barriers operate to assure the safety of each water supply and to prevent microbial contamination.

The *Public Health Act (2010)* requires each LWU to develop and implement a risk based Drinking Water Management System in accordance with the *NSW Guidelines for Drinking Water Management Systems*, NSW Health and NSW Office of Water, 2013. Activities related to disinfection and distribution system integrity should be clearly defined in each water utility's Drinking Water Management System, in accordance with the above Appendix E.

¹ Attachment 1 is a copy of page 10 of the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* which provides examples of recent failures of integrity of water supply distribution systems.

Once a water supply is effectively disinfected (Barrier 1), enteric pathogens should not reappear within the distribution system, unless there is a failure of the integrity of the distribution system. Maintaining the integrity of the distribution system (Barrier 2) is therefore the most important barrier to prevent contamination of a disinfected water supply. To verify and maintain integrity of all its distribution systems, each LWU must carry out the actions identified in section E3 of Appendix E as a matter of priority within **the next 12 months**. These actions include the following and need to be repeated at frequencies appropriate for each system, but no less than every **four (4) years**.

Carry out a careful and **detailed examination** of each service reservoir to ensure:

- (1) the reservoir and its roof are secured from entry by birds, animals, vermin and windborne contaminants;
- (2) rainwater cannot enter into the reservoir (i.e., no leaking roof or holes in the reservoir wall or gaps around the openings on the roof);
- (3) roof is adequately drained especially near the openings and landings. The roof should extend beyond the reservoir wall;
- (4) all inspection hatches are closed and locked at all times; and
- (5) the reservoir site and roof are secured from unauthorised access.

Where reservoir cleaning has been a routine activity for a water utility, reports from past cleaning episodes should be reviewed to find any reservoir integrity problems that have been identified but not corrected. Recent reports from experienced reservoir cleaners may satisfy the requirement for a detailed examination.

Any **deficiency in the roof or mesh design** will need to be **rectified** by the LWU following such examination.

Action

Each LWU will need to extend the standard operating procedures (SOP) for its water supply systems to meet the minimum requirements in Appendix E (Attachment 2) and to carry out the actions in section E3 of Appendix E within the next 12 months in order to ensure the integrity of its distribution systems and the safety of its water supplies.

Reporting

Each LWU will need to complete the attached Summary Report (Attachment 3) following its detailed examination of the integrity of each of its water supply distribution systems in accordance with Appendix E (Attachment 2).

Further information on this matter is available from the NSW Office of Water by contacting Mr Bill Ho, Manager Water and Sewerage on 8281 7326 or bill.ho@water.nsw.gov.au.

Yours sincerely



Michael Bullen
A/Deputy Director General, Water

Encl. Attachments:

- 1 Copy of page 10 of 2012-13 NSW Benchmarking Report
- 2 Appendix E - Effective disinfection of a potable water supply and assuring integrity of the distribution system to prevent contamination of the supply
- 3 Summary Report – Distribution System Integrity

Examples of Failure of Integrity of Distribution Systems

Photo 1 (right) shows the **hatch** of a 20m high service reservoir, which has inadvertently been **left open** for a few weeks. The result was repeat detections of *E. coli* in the reticulated water supply and the need to issue a boil water alert.



Photos 2 and 3 below are underwater photos in the above service reservoir showing evidence of contamination by birds – **bird eggs** (left) and **dead birds** (right).

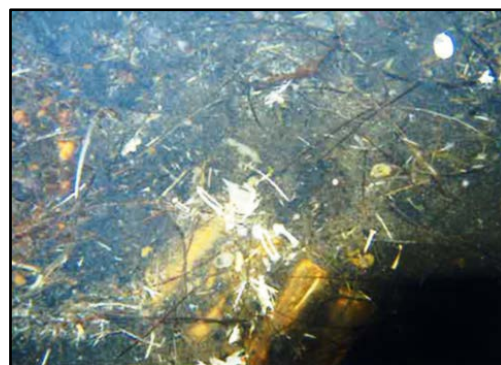


Photo 4 (below left) is a service reservoir where the **mesh openings** are **too large** and the roof design is deficient, allowing the entry of small birds, rainwater and windblown material to contaminate the stored water. The reservoir roof needs to be modified so that roof runoff and windblown material cannot contaminate the stored water. **Photo 5** (below right) shows mesh openings that are also too large, allowing entry of vermin, such as wasps and windblown material.



The continued detection of *E. coli* in reticulated water supplies and boil water alerts in the **last 2 years** have highlighted the need for a strategic approach for assuring the integrity of the distribution system to prevent contamination of a water supply that has been effectively disinfected. The recommended approach in Appendix E on page 277 was developed by the NSW Office of Water and NSW Health in consultation with the NSW Water Directorate and LWUs to provide a robust basis for assuring the safety of a water supply. As noted in the box on page 9, each LWU needs to review its present standard operating procedures (SOP) to ensure they address the minimum requirements in Appendix E for achieving safe water supplies:

Barrier 1 – **Effective disinfection** to kill, inactivate or remove pathogens in the water supply prior to distribution.

Barrier 2 – Ensure **distribution system integrity** to prevent contamination.

Barrier 3 – **Maintain free chlorine residual** in the water in the distribution system where practicable, to help protect against minor contamination and as an indicator of a potential breach in distribution system integrity.

Appendix E: Effective disinfection of a potable water supply and assuring integrity of the distribution system to prevent contamination of the supply

E1 Overview

This appendix highlights the key requirements for ensuring the effective disinfection¹ and assuring the safety of a potable water supply. Each NSW Local Water Utility (LWU) needs to ensure that the **standard operating procedures (SOP)** for its water supply systems **meet** these minimum requirements, in order to achieve the following three key barriers:

Barrier 1 – Effective disinfection to kill, inactivate or remove pathogens in the water supply prior to distribution.

Barrier 2 – Ensure distribution system integrity to prevent contamination.

Barrier 3 – Maintain free chlorine residual in the water in the distribution system to help protect against minor contamination and as an indicator of a potential breach in distribution system integrity.

Guiding principle 1 of the *Australian Drinking Water Guidelines* (below¹) highlights the risks to consumers from pathogenic organisms and the paramount importance of protecting water sources and water treatment.

For **free chlorine** disinfection, **Figure 1** on page 283 shows how the above 3 barriers work together to provide a safe water supply.

In addition, as indicated in the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* (page 9) each utility needs to develop and implement a risk based Drinking Water Management System in accordance with the *NSW Guidelines for Drinking Water Management Systems*, NSW Health and NSW Office of Water, 2013. These systems should include reference to sound standard operating procedures (SOP) in accordance with this Appendix and are required from 1 September 2014 under the *Public Health Act 2010*. Activities related to disinfection and distribution system integrity need to be clearly defined in each water utility's Drinking Water Management System (DWMS).

The *NSW Guidelines for Drinking Water Management Systems* is based on the Framework for the Management of Drinking Water Quality outlined in the *2011 Australian Drinking Water Guidelines (ADWG)* to assure the safety and quality of the water supplied to the consumers.

Effective disinfection of the source water and ensuring the integrity of the distribution system with or without a residual disinfectant are separate barriers (ADWG and above).

Effective disinfection of a water supply is essential to kill, inactivate or remove any pathogens in the water supply prior to distribution (Barrier 1 above). This could be achieved through a number of disinfection systems. Disinfection is a **critical control point** and must be appropriately monitored (ADWG).

¹ Guiding principles 1 to 6 in Chapter 1 of the 2011 ADWG are listed below to provide an overall context to this Appendix:

- The greatest risks to consumers of drinking water are pathogenic microorganisms. Protection of water sources and treatment are of paramount importance and must never be compromised.
- The drinking water system must have, and continuously maintain, robust multiple barriers appropriate to the level of potential contamination facing the raw water supply.
- Any sudden or extreme change in water quality, flow or environmental conditions (e.g. extreme rainfall or flooding) should arouse suspicion that drinking water might become contaminated.
- System operators must be able to respond quickly and effectively to adverse monitoring signals.
- System operators must maintain a personal sense of responsibility and dedication to providing consumers with safe water, and should never ignore a consumer complaint about water quality.
- Ensuring drinking water safety and quality requires the application of a considered risk management approach.

Preventing ingress of contaminants at vulnerable points within the distribution system is a key **system integrity** barrier (Barrier 2). Service reservoir integrity is a critical control point for water supply that has been effectively disinfected and should be appropriately monitored (section E3).

Maintaining a disinfectant² residual throughout the distribution system (Barrier 3) helps protect the reticulated water against minor contamination, and is an indicator of a potential breach in distribution system integrity.

Sound operational monitoring and verification monitoring³ programs are needed to assure that the minimum requirements in sections E2, E3 and E4 below for these three barriers⁴ are met. The monitoring frequency for each water supply system is dependent on its key characteristics identified through analysis and should be reviewed as part of a comprehensive risk assessment. The guidance in sections E2, E3 and E4 provides the minimum requirements for each barrier for inclusion in each LWU's standard operating procedures (SOP) for its water supply systems. Following risk assessment for its systems, a LWU should include additional requirements in its SOP where warranted.

E2 Barrier 1 – Effective Disinfection

Disinfection is the single process that has had the greatest impact on drinking water safety. In Australia the common disinfection systems used include chlorination, chloramination, ultraviolet (UV) light irradiation and ozonation. The advantages and disadvantages for each of these systems are discussed in detail in ADWG.

When chlorination is used, a water supply is effectively disinfected when the required *C.t* values have been achieved (ADWG 2013, page 186). However, the *C.t* values used in the design of chlorine disinfection systems in Australia are generally higher than those required for effective disinfection (ADWG and WHO general recommendation is 0.5 mg/L of free chlorine residual after 30 minutes). The *C.t* values can be achieved by adjusting the chlorine dose or the contact time to provide a minimum *C.t* value of 15 mg/L/minute. The LWU should check and document the contact times for its systems for setting appropriate chlorine doses to achieve the required *C.t* values.

To achieve effective disinfection of a water supply with **free chlorine**, monitoring of the following parameters prior to the distribution of the water should be included in your LWU's SOP, as some variations in these parameters could affect disinfection efficiency and/or effectiveness:

- Maintain appropriate levels of free chlorine residual above 0.5 mg/L⁵ prior to the first consumer for the available⁶ contact time to provide a *C.t* value greater than 15 mg/L/minute.
- pH, temperature⁷ and turbidity.

² Refer to page 186 of ADWG (Version 2.0, December 2013), under 'managing water supplies with no disinfection residual'.

³ Each LWU's drinking water monitoring program testing for *E. coli* (i.e. sampling location, frequency and number of samples tested) needs, as a minimum, to be in accordance with the NSW Health requirements. These requirements are consistent with ADWG and the number of annual samples allocated for each LWU is shown in Appendix D1, *2012-13 NSW Water Supply and Sewerage Benchmarking Report*. Appendix D1 shows that the required number of samples has been collected and tested for almost all LWUs. Each water utility should assess its monitoring requirements to determine whether additional monitoring above this minimum is needed.

⁴ For very small communities, typically serving a population of about 30, with a high quality source water such as groundwater from a confined aquifer, it may be cost-effective for the LWU to complete the actions outlined in section E3 on page 279 at 4-monthly intervals, rather than consistently maintaining a positive free chlorine residual disinfectant as long as the regular *E. coli* tests results continue to comply with ADWG. Refer also to the 4th paragraph of section E4 on page 281.

⁵ Part IV Information Sheet 1.3, Disinfection with Chlorine, ADWG.

⁶ If the source water does not contain pathogens (e.g., a good quality groundwater from a confined aquifer), no chlorine contact time is required.

⁷ Efficiency of chlorine disinfection increases with increasing temperature. Monitoring of temperature is warranted for water of temperature < 10°C.

- For a filtered supply, keep turbidity as low as practicable as defined in the filtration critical control point (generally <1 NTU⁸ is desirable for effective disinfection). Turbidity higher than 1 NTU is acceptable for unfiltered systems where the source water is free from faecal contamination or where the effectiveness of chlorination has been validated⁹.
- Keep pH <8.5¹⁰

Disinfection is a **critical control point** and must be adequately monitored, preferably continuously, to ensure effective disinfection (refer section E1). For **free chlorine** disinfection, in addition to an appropriate operational monitoring program, the minimum requirements to be included in the SOP are as follows:

1. For a filtered water supply, check that turbidity of the water being disinfected remains below the critical limits for the system. Take appropriate corrective actions if the critical limits are exceeded.
2. Check the chlorine demand of the water supply being chlorinated as the raw water quality changes and adjust the chlorine dose rate accordingly to achieve effective disinfection.
3. Check the pH of water to be disinfected where a pH correction facility has been provided.
4. Confirm correct functioning of each chlorination plant.
5. Verify that the required chlorine dose rate has been added to the water supply¹¹.
6. Provide continuous monitoring and/or daily testing of free chlorine residual at representative sampling points after the appropriate chlorine contact time.

For other types¹² of disinfection systems appropriate SOPs need to be developed to ensure effective disinfection.

E3 Barrier 2 - Distribution System Integrity

Once a water supply is effectively disinfected (Barrier 1), enteric pathogens should not reappear within the distribution system unless there is a failure of the integrity of the distribution system (ADWG 2013, page 186). Maintaining the integrity of the distribution system (Barrier 2) is therefore the most important barrier to prevent contamination of a disinfected water supply. To verify and maintain integrity of all its distribution systems, each LWU must carry out the following actions as a matter of priority within **the next 12 months**. Thereafter, **repeat** these actions at frequencies appropriate for each system but no less than every **four (4) years**.

- a. Carry out a careful and **detailed examination**¹³ of each service reservoir to ensure:

⁸ Table 10.5, ADWG.

⁹ Implementation of the requirements of this Appendix and monitoring test results which consistently find no *E. coli* in a water supply would validate the safety of the supply.

¹⁰ For efficient disinfection pH should be as low as possible, but this needs to be tempered by the need for corrosion control. In most cases a pH of 7.8 to 8.2 is desirable.

¹¹ Check to ensure the storage tanks or cylinders have adequate chlorine. For sodium hypochlorite dosing plants complete a drop test to verify the accuracy of the chlorinator dosing rate as in some instances the released oxygen could interfere with the actual dosage rate. Also check the concentration of the sodium hypochlorite solution in the storage tank and adjust the dosage rate to allow for any loss of chlorine strength.

¹² Refer to Part IV Information Sheets 1.4 to 1.8 of ADWG.

¹³ Note that the careful and detailed examination of each service reservoir in steps (1) to (5) on page 280 should be carried out in addition to the routine inspections identified in LWU Drinking Water Management Systems. The process described here is a detailed examination of each reservoir to detect and rectify any breaches of reservoir integrity that may not be identified during routine inspections.

It is essential all service reservoirs are designed and constructed to prevent ingress of contaminants. Additionally, for each service reservoir, a careful examination of the reservoir roof, wall and mesh is essential in order to detect any breaches to the reservoir's

- (1) the reservoir and its roof are secured from entry by birds, animals, vermin and windborne contaminants;
- (2) rainwater cannot enter into the reservoir (i.e., no leaking roof or holes in the reservoir wall or gaps around the openings on the roof);
- (3) roof is adequately drained especially near the openings and landings. The roof should extend beyond the reservoir wall;
- (4) all inspection hatches are closed and locked at all times; and
- (5) the reservoir site and roof are secured from unauthorised¹⁴ access.

Where reservoir cleaning has been a routine activity for a water utility, reports from past cleaning episodes should be reviewed to find any reservoir integrity problems that have been identified but not corrected. Recent reports from experienced reservoir cleaners may satisfy the requirement for a detailed examination.

Any **deficiency in the roof or mesh design** needs to be **rectified** by the LWU following such examination.

- b. Check the air valves and ensure they are functioning in accordance with the manufacturer's standard operating procedures.
- c. Check any testable backflow prevention devices¹⁵ and ensure they are operating in accordance with the manufacturer's standard operating procedures, tested in accordance with AS3500 and there is no cross contamination.
- d. Check and ensure all potable water connections with a risk of cross contamination such as connections to sewerage facilities (pumping station, treatment works, etc.), livestock watering and other non-drinking uses are provided with appropriate backflow prevention devices and are regularly tested in accordance with AS3500.
- e. Check and ensure all potable water connections to top up alternative water systems such as rainwater tanks/automatic switching device on premises are provided with backflow prevention devices (refer to Circular LWU 17) and are operating in accordance with the manufacturer's standard operating procedures, tested in accordance with AS3500 and there is no cross contamination.
- f. Review the reservoir maintenance standard operating procedures to ensure they are sound and fit for purpose^{14, 16}.
- g. Review the standard operating procedures for repair and re-instatement of distribution system infrastructure that comes into contact with potable water such as mains and reservoirs to ensure the procedures are sound and fit for purpose¹⁶. Thoroughly clean and super-chlorinate before use, all new and repaired distribution system infrastructure, such as mains and reservoirs, that is in contact with potable water.
- h. Undertake all remedial works to assure system integrity as a matter of **priority**.

integrity. In most cases the breach of reservoir integrity has been found to be not visible from ground level and required use of mobile lifting equipment in order to detect the breach.

A confirmed detection of *E. coli* in a microbiological test sample should **trigger** a careful **review** by the LWU of whether the requirements of section E3 above have been met.

¹⁴ Where access to third parties (e.g., telephone companies, SES, NSW Police, etc.) has been given to install equipment, appropriate written reinstatement and communication protocols need to be established between the LWU and each third party to ensure the reservoir integrity is not compromised. The LWU must conduct regular audits to ensure the protocols are being effectively implemented. Similar protocols should also be effected between the LWU and any service providers authorised by the LWU to access its service reservoir. A financial penalty should be imposed for any failures to comply with the protocol as these may breach the distribution system integrity and result in contamination of the supply and the need for a boil water alert. A model 'service reservoir integrity protocol' will be prepared by the NSW Office of Water to assist LWUs.

¹⁵ Annual testing of any testable backflow devices such as a Reduced Pressure Zone (RPZ) device or a double check valve assembly is required in accordance with section 4.4.6 of AS3500. Such testing does not generally apply for a household rainwater tank, where a standard air gap is generally used for backflow prevention (section 4.4.6 of AS3500).

¹⁶ As noted in section E2 on page 278, ensure your LWU's standard operating procedures including contracts with service providers include super chlorination and effective disinfection of any new and repaired or replaced water mains and other distribution system infrastructure that is in contact with potable water before the infrastructure is commissioned or the water service is reinstated.

A LWU should maintain records (including photos) of all distribution system examinations and inspections undertaken, the results obtained, any deficiencies identified, and the rectification works implemented.

E4 Barrier 3 – Maintain a Free Chlorine Residual in the Water in the Distribution System

A residual disinfectant such as chlorine is maintained in the water within the distribution system to help protect against minor contamination due to a breach in the distribution system integrity. Where there is a significant risk of *Naegleria fowleri* and water temperature exceeds 30°C, a free chlorine residual of 0.5 mg/L or higher will control *N. fowleri*, provided the disinfectant residual persists throughout the distribution system (ADWG 'Disinfection with Chlorine' Information Sheet, page 191). **Monitoring of free chlorine residual** of the water in a distribution system on at least a weekly basis provides one of the key indications of the proper operation of the chlorination system, of system integrity, and provides data to help the utility to carry out timely corrective action. More frequent monitoring will provide more information to make better and timely decisions on changes to chlorine dosage required to protect public health. On-site testing of free and total chlorine residual (and if possible pH and turbidity) should be carried out and recorded each time a microbiological sample is collected for testing by the NSW Health Drinking Water Monitoring Program. The ADWG suggests that:

- a minimum free chlorine residual of about 0.2 mg/L¹⁷ be maintained in the water throughout the distribution system. Re-chlorination may be necessary to achieve this chlorine residual in very extensive water supply distribution systems with long detention times.
- a sudden large drop in free chlorine residual in water in the distribution system may be an indicator of an increase in the chlorine demand of the water, a major breach in distribution system integrity, or a fault in the chlorination system,

When it is difficult to maintain the desired target free chlorine residual level of ≥ 0.2 mg/L at the extremities of your system, your LWU should using a trial and error process, increase the free chlorine concentration at the dosing points. Increased chlorine concentration can lead to community complaints about taste and odour. Advice can be given to community members about storing water in clean vessels before use so that the chlorine taste dissipates. Increased chlorine concentrations in systems that have routinely experienced low concentrations may lead to marked biofilm sloughing, leading to dirty water complaints. These problems should not last for long, especially if adequate chlorine concentrations are maintained and some flushing is carried out.

Once the desired free chlorine residual of the dosed water has been achieved and if the free chlorine residual at the extremities of the distribution system continues to consistently remain below 0.2 mg/L but not less than 0.05 mg/L with *E. coli* test results showing 100% compliance³, then the LWU should undertake the actions outlined in section E3 on an **annual**¹⁸ basis.

If however, the free chlorine residual level is consistently below 0.05 mg/L at the extremities of the distribution system, with *E. coli* test results showing 100% compliance^{3,19} and the LWU can demonstrate the continuous integrity of the water supply distribution system, the LWU should then undertake the actions outlined in section E3 on a **four monthly**¹⁸ basis and should also complete the following:

1. inspect and flush as needed the extremities of the system to remove 'stagnant' water.

¹⁷ Example in Table A1.10 on page A-20, ADWG. Such a chlorine residual can normally be achieved for the vast majority of consumers supplied by a water supply distribution system. However, as noted in the 2nd paragraph of section E4 above, it may be difficult to maintain such a residual at the extremities of a distribution system.

¹⁸ The first action in section E3 [action 'a. (1)' on page 280] may be undertaken from ground level using a telescope, binoculars, etc.

¹⁹ If the microbiological test samples regularly fail for *E. coli* then the LWU must investigate the reasons for the failures and consider maintaining a free chlorine residual of about 0.2 mg/L on a consistent basis. This could be achieved by one of many options such as early warning control/communication systems, secondary chlorination plants, sub-system cleaning including air scouring/swabbing of the pipeline, super chlorination, etc. It is expected the preferred option would be chosen on the basis of a cost-benefit analysis.

2. opportunistically install pipe loops to any existing dead-end mains (i.e. as part of your LWU's repair and/or renewal work).

The measures in the 2 preceding paragraphs are warranted in order to minimise capital and operating expenditure, while assuring safety of the water supply.

E5 Develop a Verification Monitoring Program

Water Utilities should comply with the sampling frequency and sample site advice set out in the NSW Health Drinking Water Monitoring Program: <http://www.health.nsw.gov.au/environment/water/Documents/october-2011-dwmp-booklet.pdf> The verification monitoring program developed by a LWU for each distribution system should include the following:

- Parameters to be monitored (e.g. disinfectant residual, pH and turbidity)²⁰.
- Sampling frequency.
- Sampling locations including system extremities²¹.
- Sampling methods and equipment.
- Schedules for sampling.
- Methods for quality assurance and validation of sampling results.
- Requirements for checking and interpreting results.
- Responsibilities and necessary training²² of staff including induction of contractors.
- Requirements for documentation and management of records, including how monitoring results will be recorded and stored.
- Requirements for reporting and communication of results.

E6 Field Tests

- Test kits for measuring chlorine residual, pH and turbidity are available.
- Chlorine residual, pH and turbidity measurements need to be done in the field.
- Ensure the operators have a thorough understanding of the field test kits, especially the range they can measure, detection limits, error and interference tolerances.

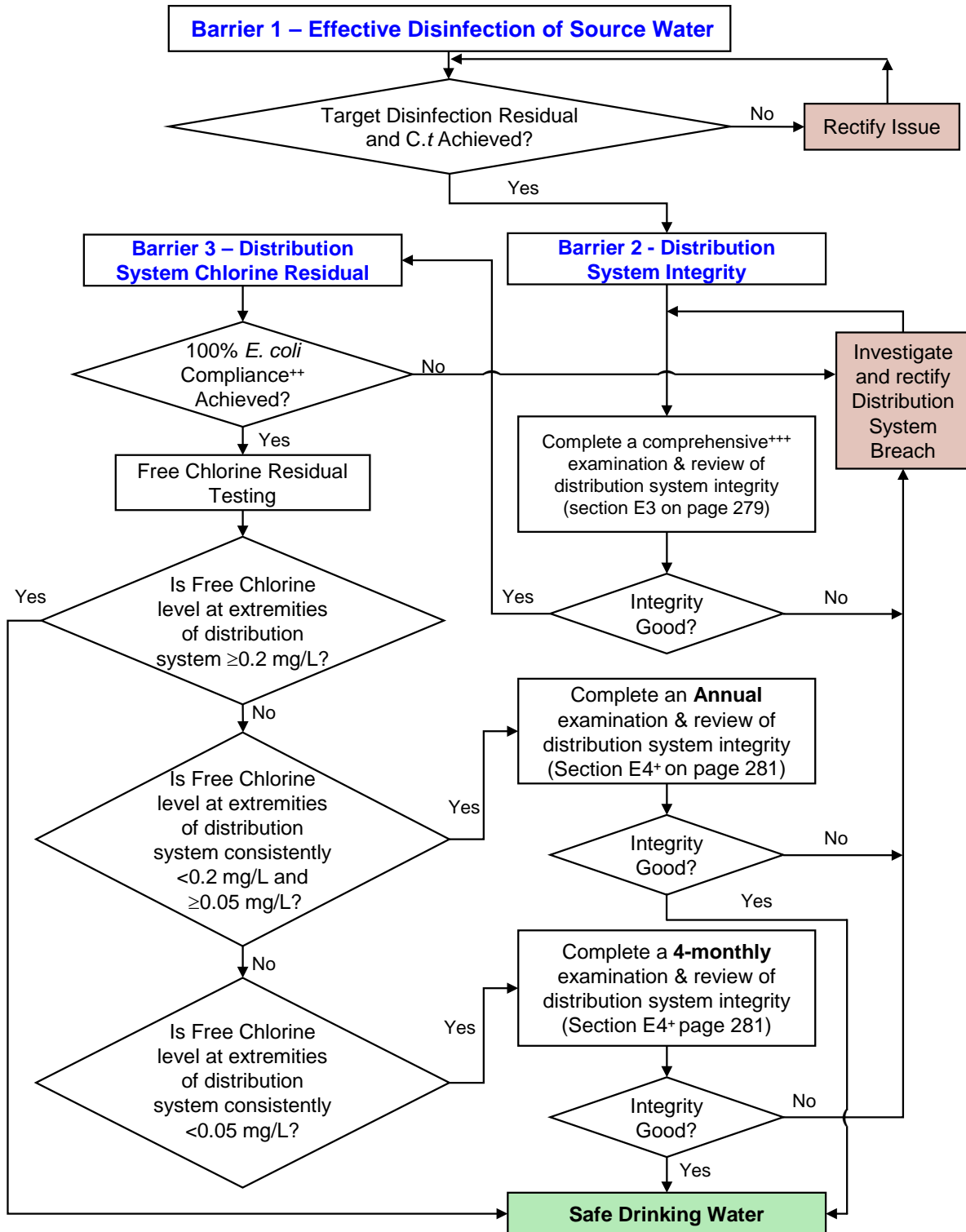
If you wish to discuss any aspects covered in this Appendix, please contact the Manager Water and Sewerage, NSW Office of Water on telephone: (02) 8281 7326 or email: bill.ho@water.nsw.gov.au.

²⁰ All filtered water supplies should meet the filtration critical control point target for the supply (generally <1 NTU is desirable for effective disinfection).

²¹ Each LWU's sampling locations for monitoring microbiological water quality for reporting in the NSW Water Quality Database would be suitable for this purpose.

²² LWU water treatment operators need to have appropriate skills and qualifications in accordance with page 23 of the NSW Guidelines for Drinking Water Systems, 2013. Refer also to page 35 of the *2012-13 NSW Water Supply and Sewerage Benchmarking Report* (www.water.nsw.gov.au) in regard to National Certification of Water Treatment Operators.

Figure 1 – Effective disinfection¹ of a potable water supply and assuring integrity of the distribution system to prevent contamination of the supply



+++ The first comprehensive examination and review of water supply system integrity should be completed within 12 months in order to assure system integrity.

++ The 100% *E. coli* compliance requirement refers to test results where any failures in distribution system integrity have been detected and rectified by the LWU.

+ The actions in the 3rd and 4th paragraphs of section E4 on page 281 should be undertaken by the LWU over the next 12 months or 4 months respectively in order to assure continuing distribution system integrity. These actions are only applicable for the extremities of a distribution system where the free chlorine residual is consistently below 0.2 mg/L.

1 Figure 1 is on the basis of disinfection with free chlorine.

**SUMMARY REPORT¹ ON ASSURING INTEGRITY & SAFETY OF
WATER SUPPLY DISTRIBUTION SYSTEMS**

LWU -
Contact Officer -

Date -
Phone -
Email -

- Water Supply Distribution **System** -

- Detailed examination of service **reservoirs** :
 - Date completed -

 - Key **Deficiencies** Identified -

 - **Rectification** Works Completed -

- Addressed all the requirements of **Circular LWU 18?** Y/N Date -

- Standard Operating Procedures (**SOP**) updated to address the requirements of Circular LWU18? Y/N Date -

¹ This summary report has been prepared in response to NSW Office of Water Circular LWU18 of 4 June 2014 and is to be retained in your LWU's records.

The first Summary Report prepared by a LWU for each of its water supply distribution systems is to be emailed to:
Bill.Ho@water.nsw.gov.au