



## LOGAN CITY COUNCIL

### **DRINKING WATER QUALITY MANAGEMENT PLAN ANNUAL REPORT – 2015/16 FINANCIAL YEAR DECEMBER 2016**

SPID: 542

150 WEMBLEY RD

LOGAN CENTRAL QLD 4114

Phone: (07) 3412 3412

Email: [council@logan.qld.gov.au](mailto:council@logan.qld.gov.au)




# DOCUMENT CONTROL

## Document Revision and Modification Control

DATE	AUTHOR	MODIFICATION / ACTION	REV.	KEY REVIEWER	DM REF #
17.11.16	Kristen Smyth / Natasha Georgius	Draft	D1	Chris Pipe- Martin	10632665 (word)
12.12.16	Natasha Georgius	Update from reviewers.	V1	Chris Pipe- Martin	10632665 (word) 10735898 (PDF)

Final Document Approval for Issue

DATE	APPROVER	POSITION	SIGNATURE / COMMENTS
13.12.16	Daryl Ross	Logan City Council Water Business Manager	

*This document is the property of Logan City Council and its issue is controlled.*

*The information contained herein may not be disclosed in whole or in part, either verbally or in writing, without the prior consent of Logan City Council.*

*Printed copies are uncontrolled.*

## NOTATIONS AND ABBREVIATIONS

<b>ADWG</b>	Australian Drinking Water Guidelines, 2011. Published by the National Health and Medical Research Council of Australia
<b>AS</b>	Australian Standard
<b>BAU</b>	Business As Usual
<b>CCP</b>	Critical Control Point (as defined by HACCP)
<b>CRM</b>	Customer Relationship Management (system)
<b>DEWS</b>	Department of Energy and Water Supply
<b>DWQMP</b>	Drinking Water Quality Management Plan
<b><i>E. coli</i></b>	Escherichia coli, a bacterium which is considered to indicate the presence of faecal contamination and therefore potential health risk
<b>EPI</b>	Eastern Pipeline Interconnector
<b>ERP</b>	Emergency Response Plan
<b>FY</b>	Financial Year
<b>GCCC</b>	Gold Coast City Council
<b>HACCP</b>	Hazard Analysis Critical Control Point
<b>HLZ</b>	High Level Zone
<b>IMP</b>	Incident Management Plan
<b>KPI</b>	Key Performance Indicator
<b>LCC</b>	Logan City Council
<b>LIMS</b>	Laboratory Information Management System
<b>LLZ</b>	Low Level Zone
<b>LOD</b>	Limit of Detection
<b>LOR</b>	Limit of Reporting
<b>LWA</b>	Logan Water Alliance
<b>LWIA</b>	Logan Water Infrastructure Alliance
<b>mg/L</b>	Milligrams per litre
<b>MPN/100mL</b>	Most Probable Number per hundred millilitres
<b>NATA</b>	National Association of Testing Authorities
<b>RMIP</b>	Risk Management Improvement Plan
<b>SAMMS</b>	Strategic Asset Maintenance Management Systems
<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>SEQ</b>	South East Queensland
<b>SOP</b>	Standard Operating Procedure
<b>SRWP</b>	Southern Regional Water Pipeline
<b>THM</b>	Trihalomethane
<b>WGM</b>	Water Grid Manager
<b>WOP</b>	Work Operating Procedure
<b>WPR</b>	Water Planning and Regulation (formally QLD Office of the Water Supply Regulator)
<b>WQZ</b>	Water Quality Zone
<b>WSZ</b>	Water Supply Zone
<b>WTP</b>	Water Treatment Plant
<b>WWETT</b>	Water and Wastewater Event Tracking Tool

## CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>6</b>
<b>2</b>	<b>OVERVIEW OF OPERATIONS.....</b>	<b>7</b>
2.1	LOGAN CITY COUNCIL NETWORK DESCRIPTION OVERVIEW.....	7
2.2	SEQ WATER – BULK WATER SUPPLY GRID TO LOGAN .....	7
2.3	WATER SUPPLY DISINFECTION .....	7
2.4	WATER QUALITY ZONES .....	9
<b>3</b>	<b>ACTIONS TAKEN TO IMPLEMENT THE DWQMP .....</b>	<b>10</b>
3.1	PROGRESS IN IMPLEMENTATING THE RISK MANAGEMENT IMPROVEMENT PLAN .....	10
3.1.1	<i>Risk Management Improvement Plan Process.....</i>	<i>10</i>
3.1.2	<i>Implementation of the RMIP .....</i>	<i>10</i>
3.2	OPERATIONAL MONITORING PROGRAM REVISIONS TO MAINTAIN WATER QUALITY COMPLIANCE .....	12
3.3	AMENDMENTS MADE TO THE DWQMP .....	12
<b>4</b>	<b>COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER QUALITY</b>	<b>13</b>
4.1	COMPLIANCE SUMMARY .....	13
4.2	MONITORING PROGRAM OVERVIEW .....	13
4.3	DATA ANALYSIS METHODOLOGY .....	14
<b>5</b>	<b>NOTIFICATIONS TO THE REGULATOR UNDER SECTIONS 102 AND 102A OF THE ACT.....</b>	<b>15</b>
5.1	NON COMPLIANCES WITH THE WATER QUALITY CRITERIA .....	15
5.1.1	<i>Detection of E.coli (Logan East WQZ: Barhs Scrub – newly installed sampling tap) .....</i>	<i>15</i>
5.1.2	<i>Detection of E.coli (Logan East WQZ: Belivah – reservoir) .....</i>	<i>15</i>
5.1.3	<i>Detection of E.coli (Greenbank WQZ: Browns Plains – re-instated sampling tap) ... ..</i>	<i>15</i>
<b>6</b>	<b>CUSTOMER COMPLAINTS RELATED TO DRINKING WATER QUALITY .....</b>	<b>17</b>
6.1	COMMUNITY ENGAGEMENT .....	17
6.1.1	<i>Key Projects.....</i>	<i>17</i>
6.2	CUSTOMER COMPLAINTS .....	17
6.2.1	<i>Suspected Health.....</i>	<i>19</i>
6.2.2	<i>Appearance.....</i>	<i>19</i>
6.2.3	<i>Taste and Odour.....</i>	<i>20</i>
<b>7</b>	<b>FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR.....</b>	<b>22</b>
	APPENDIX A - Summary of Compliance With Water Quality Criteria .....	24
	APPENDIX B - Implementation of the DWQMP Risk Management Improvement Program .....	38

## TABLES

Table 1	Logan City Council Water Source Summary (DWQMP Rev 5.2).....	9
Table 2	Water Quality Customer Complaints by Water Quality Zone .....	18
Table 3	Water Quality Customer Complaints per 1000 Connections .....	18
Table 4	Greenbank WQZ.....	25
Table 5	Kimberley Park WQZ .....	27
Table 6	Marsden WQZ.....	29
Table 7	Springwood WQZ.....	31
Table 8	Logan East WQZ .....	33
Table 9	Logan South WQZ .....	35
Table 10	LCC <i>E.coli</i> Verification Monitoring .....	37

## FIGURES

Figure 1	ADWG Framework.....	6
Figure 2	Seqwater Water Supply .....	8

# 1 INTRODUCTION

On the 1st July of 2008, the *Water Supply (Safety and Reliability) Act 2008* (the Act) came into effect. As detailed in Section 3 of the Act, the **purpose** is to provide safe and reliable water supply throughout Queensland.

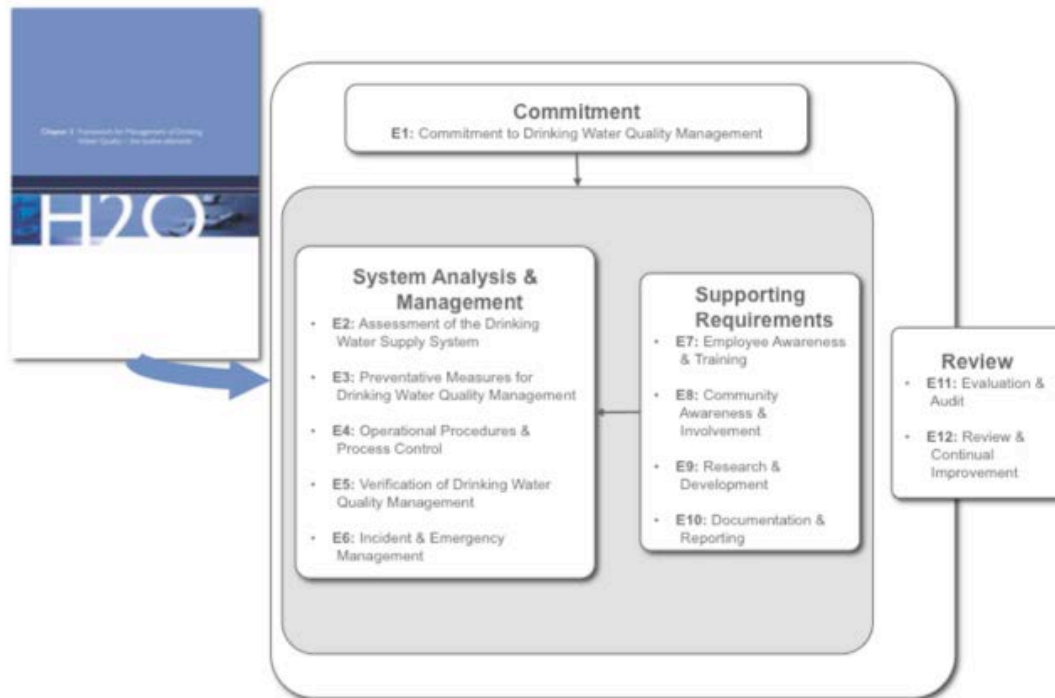
The **aim** is to protect public health through the management of drinking water quality achieved via a Regulatory Framework, thus under the Act, Service Providers are required to have an approved Drinking Water Quality Management Plan (DWQMP). Logan City Council (LCC) is governed by the Act and has had an approved DWQMP since December 2013.

This DWQMP Annual Report documents the performance of LCC's drinking water with respect to water quality and performance in implementing the actions detailed in the DWQMP Rev5.2 for the 2015/16 Financial Year (FY), as required under the Act.

This report assists the office of Water Planning and Regulation (formally the QLD Office of the Water Supply Regulator), Department of Energy and Water Supply (DEWS), to determine compliance with the approved DWQMP, and any approval conditions. It also provides a mechanism for water service providers to disclose information publicly on their performance in managing drinking water quality.

This report has been prepared in accordance with the Water Quality and Reporting Guideline for a Drinking Water Service September 2010 and the Drinking Water Quality Management Plan report template, published by DEWS.

The DWQMP Rev 5.2 uses the Framework for Management of Drinking Water Quality from the Australian Drinking Water Guidelines (ADWG), published by the National Health and Medical Research Council of Australia to help meet the Act requirements. The ADWG Framework consists of 12 Elements, 32 Components and 76 Actions, as shown in **Error! Reference source not found.**



**Figure 1 ADWG Framework**

## 2 OVERVIEW OF OPERATIONS

### 2.1 Logan City Council Network Description Overview

LCC covers an area of approximately 957 square kilometres and has a population greater than 300,000 people, with approximately 110,000 connected to potable water supply.

LCC is bounded by Underwood in the North, Mundoolun in the South, the Albert River in the east and Greenbank in the west. There are significant areas of bushland, National Parks and waterways. LCC is the water service provider to Logan City's residential, non-residential, commercial and industrial users connected to the reticulated water supply.

LCC is a drinking water service provider which is responsible for receiving bulk treated water from Seqwater and delivering it to customers through its water distribution network. LCC manages, maintains and operates the reticulation network, including disinfection facilities located within Logan City. Extensive monitoring is also undertaken by our NATA accredited laboratory, to verify drinking water quality complies with internal targets and regulatory conditions.

### 2.2 SEQ Water – Bulk Water Supply Grid to Logan

LCC is part of the South East Queensland (SEQ) Water Supply Network, managed and operated by Seqwater. The SEQ Water Supply Network is an extensive drinking water distribution system that includes Noosa, Sunshine Coast, Moreton Bay, Brisbane, Ipswich, Lockyer Valley, Redlands, Logan, Gold Coast, Somerset and the Scenic Rim regions, as shown in Figure 2.

Seqwater is the Queensland Government Statutory Authority responsible for ensuring a safe, secure and reliable water supply for SEQ, as well as managing catchment health and providing recreational facilities to the community.

LCC does not treat any raw water for drinking purposes. It relies solely on the treated drinking water supplied by Seqwater. The treated drinking water supply for LCC is predominantly from the Mount Crosby Water Treatment Plant (WTP), which treats water from Wivenhoe Dam via the Brisbane River, and from the Molendinar WTP, that treats water from the Hinze Dam. Drinking water is also regularly sourced from the North Stradbroke Island WTP, and at times, the Gold Coast Desalination plant. However, due to the operation of the SEQ Water Supply Network, safe drinking water can be sourced from other WTPs at times.

Water supply from Seqwater to Logan can occur via a number of routes, including the Southern Regional Water Pipeline (SRWP) and Eastern Pipeline Interconnector (EPI), where water can flow in either direction, depending on demand.

Seqwater and LCC work together to manage the water supply system to ensure our customers receive safe drinking water that meets the health guideline values stated in the Australian Drinking Water Guidelines (ADWG).

### 2.3 Water Supply Disinfection

The ADWG place a heavy emphasis on ensuring drinking water is microbiologically safe. An effective way to achieve this is by chemical disinfection.

LCC can receive both chloraminated and chlorinated disinfected water from Seqwater. LCC can also convert chloraminated water to chlorinated water via its breakpoint chlorination systems located at various locations within Logan. Conversion generally occurs during the hotter months to ensure continued effective disinfection of water supply or during network maintenance.

Drinking water distributed by LCC contains either chloramine or chlorine as the disinfectant. These chemicals are an effective way to kill or inactivate a wide range of harmful micro-organisms and have been used in the water industry worldwide for over 80 years.



**Figure 2 Seqwater Water Supply**

LCC closely monitors the level of disinfectant within the water supply, and undertakes extensive monitoring of *Escherichia coli* (*E.coli*) to ensure that disinfection is effective.

Seqwater, who is responsible for treating raw water, and Logan City Council, who distributes treated water, normally maintain the level of disinfectants between 0.2 and 2 mg/L (parts per million). This is sufficient to protect customers against potential contamination of the drinking water supply, and assist in the maintenance of water quality in the water supply network.

LCC endeavours to ensure that there is a sufficient amount of disinfectant throughout our network to ensure that there is a continual barrier against potential contamination. This is consistent with world best practice.

LCC has a number of locations where re-chlorination of the drinking water can occur to maintain disinfection or as part of the network disinfection maintenance program. Customers who live close to these locations, at times, may notice a stronger taste or smell of chlorine.



## 2.4 Water Quality Zones

A Water Quality Zone (WQZ) can be defined as a section of the water distribution network that receives water with particular quality characteristics. *“Taking into account the various bulk water supply sources and two different disinfection types. During 2015/16 FY, LCC defined six discrete WQZs. WQZs are used when undertaking medium to long term water quality trend analysis and regulatory annual reporting.”*

The WQZs supplied from each bulk water source, under general operating conditions, are shown in Table 1, indicating general water source and disinfection type. Blending can occur within some of the zones.

**Table 1 Logan City Council’s Current Water Source Supply**

MAJOR ZONE	DISINFECTION TYPE	BLENDED	APPROXIMATE WATER SUPPLY FROM EACH SOURCE				
			MT CROSBY (KURABY)	MT CROSBY (SRWP)	REDLAND CITY (EPI)	GOLD COAST (SRWP)	
Logan North	Greenbank	Chloraminated	Yes	80%	15%	-	5%
	Kimberly Park	Chloraminated	Yes	70%	-	30%	-
	Marsden	Chloraminated	No	100%	-	-	-
	Springwood (formally Springwood Low & High)	Chloraminated	No	100%	-	-	-
Logan East	Chloraminated (Winter) Chlorinated (Summer)	No	100%	-	-	-	
Logan South	Chloraminated <sup>A</sup>	Yes	-	95%	-	5%	

**Note:** (A) Some areas maybe chlorinated if incoming chlorine residual is low, generally during Summer.

## 3 ACTIONS TAKEN TO IMPLEMENT THE DWQMP

### 3.1 Progress in Implementing the Risk Management Improvement Plan

#### 3.1.1 Risk Management Improvement Plan Process

LCC's Risk Management Improvement Plan (RMIP) is the key document used to capture opportunities for improvements to reduce risks to drinking water and hence public health. It is also used to improve the quality of drinking water provided to LCC's customers.

Opportunities for improvements are captured in the RMIP and are identified from the following:

- *Risk Assessments – high risks;*
- *Internal DWQMP Reviews and Audits – non-conformances and general improvements;*
- *Incidents; and*
- *Water Regulator feedback.*

To ensure the RMIP is communicated, implemented and monitored for effectiveness, RMIP reviews with key internal stakeholders are undertaken at least annually.

#### 3.1.2 Implementation of the RMIP

The following section summarises the progress of the key RMIP actions with reference to ADWG Elements, with details included in Appendix B.

#### Element 1 – Commitment to Drinking Water Quality Management

The DWQMP Policy was finalised & endorsed by the Senior Water Branch Managers & Deputy CEO November 2013. Senior Management awareness training continues to occur annually to keep abreast of the latest legislation responsibilities. Development and implementation of formalised Policy training is planned for the 2016/17 Financial Year (FY) as per Element 7.

Seqwater have now included additional Trihalomethane (THM) notifications to Logan with changes to be incorporated into the Operating Protocol in 2016/17 FY.

#### Element 2 – Assessment of the Drinking Water Supply System

'Whole of system' Risk Assessment workshops were undertaken in 2016 to help identify and consolidate key risks associated with recent system changes and residual risks from Seqwater. The updated risk matrix will be captured in the DWQMP in the 2016/17 FY. Any actions to address new risks identified will be added to the RMIP.

Online water quality monitoring SCADA alarming and validation will continue during the 2016/17 FY, together with the identification of new monitoring sites.

#### Element 3 – Preventative Measures for Drinking Water Quality

Round Mountain Reservoir disinfection system is currently in design phase with construction and commissioning planned for the 2017/18 FY. Once commissioned, the changes at Round Mountain Reservoir will help improve water quality by reducing water age and improving disinfection residuals in the Logan South water supply network. Delays have been due to the requirement for an additional outlet main to be designed and constructed.

Network Water Quality Maintenance and Operating Strategies were developed to help with the implementation of disinfection systems and help improve water quality and continue to maintain public health. The Network Maintenance Disinfection Program was undertaken in Kimberley Park WQZ in August 2015, previously undertaken in 2012, and will be undertaken in Greenbank WQZ in September 2016. These programs help clean the network pipes and have resulted in a 50% reduction in dirty water complaints since implementation, thus contributing to a significant improvement in water quality.

Detailed design was completed for the installation of two new chlorine dosing systems for Logan East, with commissioning planned during the 2016/17 FY, to help improve chlorine disinfection residuals.

Review of the Critical Control Points (CCPs) continue into the 2016/17 FY, to incorporate newly commissioned chlorine dosing systems with associated procedures to be updated.

#### **Element 4 – Operational Procedures & Process Control**

The Water Quality Network & Operation Strategy will help improve operational processes by optimising set-points and establishing procedures for main repairs, returning mains to service, network flushing, hygiene practises and cleaning of tools & equipment. Implementation will continue during the 2016/17 FY with additional focus on disinfection during repairs and sampling tap design and maintenance.

Improvements to the maintenance notification system (MEX) to avoid overdue reservoir inspections. Reservoir inspection forms modified to better identify ingress concerns which could lead to contamination risks. LCC now has SCADA read access to related Seqwater online water quality monitoring at supply points, to assist with trending and early alerts for any major diversions.

To help maintain effective chlorine disinfection residual in the smaller reservoirs, work was undertaken to trial potable water chlorine tablets, as a safer alternative to liquid hypochlorite. Trial work to continue into the 2016/17 FY.

#### **Element 5 – Verification of Drinking Water Quality**

Implementation of the Tap Audit findings resulted in a number of tap relocations and repairs, to ensure staff safety and improved sampling representation of Logan City. Work will continue during 2016/17 FY including improved tap design and routine maintenance audits.

In the future, LCC's plans to integrate the numerous customer complaint systems into one Customer Relationship Management (CRM) system, post Strategic Asset Maintenance Management System (SAMMS) implementation. Timeline is dependent on whole of Council's implementation.

#### **Element 6 – Management of Incidents & Emergencies**

LCC's Incident Management Plan (IMP) was updated early 2016 to include improved processes with finalised document submitted to DEWS. Additional staff IMP exercise training was also conducted and ongoing regular IMP exercise training is planned for the 2016/17 FY.

#### **Element 7 – Employee Awareness & Training**

Formalised and WH&S safety training is well captured however a system to best capture and record 'on-the-job' training is still to be developed.

Drinking Water Policy awareness training still to be developed. The ADWG and Water Supply Act awareness training will continue to be delivered annually to senior staff and management, as part of internal audit review process.

#### **Element 8 – Community Involvement & Awareness**

New drinking water fact sheets and information for LCC's public website have been developed and will continue to be developed during the 2016/17 FY.

#### **Element 9 – Research & Development**

Due to recent incidents at reservoirs, the development of a Reservoir Strategy and Function Specification commenced, which will continue into 2016/17 FY. This will assist with reservoir asset condition audits, maintenance and replacement programs and appropriate escalations relating to drinking water quality risks. Investigations into the replacement of one of the smaller reservoirs and maintenance of larger ones will also be carried out.

Appropriate scheduling will be integrated with the new Strategic Asset Maintenance Management System (SAMMS), currently being developed Council wide.

Water Age modelling was undertaken during the 2015/16 FY, following recent system changes. This will assist with network set-ups and proposed disinfection sites hence work will continue into 2016/17 FY.

To help address long term effective disinfection residual throughout SEQ, a SEQ Disinfection Optimisation Strategy commenced which includes key stakeholders from a number of water service providers including Seqwater and LCC. This will continue during the 2016/17 FY.

#### **Element 10 – Documentation & Record Keeping**

Drinking water quality KPIs are reported monthly to Council via the Water Branch with the DWQMP Annual Report to be displayed on LCC's website by 2016/17 FY.

A document control system framework is still being investigated and will continue during the 2016/17 FY.

#### **Element 11 – Evaluation & Audit**

The Process Improvement Team was established during 2014 and continues to focus on reviewing and improving reservoir chlorine residuals. Progress review of long term actions from drinking water incidents will be incorporated during the 2016/17 FY with the establishment of a Water Information Management System (WIMS) to help with effective medium/long term trend analysis.

The LCC internal audit program has been well established and continues to undertake annual audits highlighting key improvements and areas requiring improvements which are then updated into the RMIP.

An external audit is to be undertaken during the 2016/17 FY.

#### **Element 12 – Review & Continual Improvement**

The RMIP process continued to be reviewed and refined with senior management during the 2015/16 FY with evidence of RMIP focus being integrated into Business Planning for 2016/17 FY.

Review and incorporation into the RMIP of any newly identified high risks from the whole of system risk assessment undertaken in 2016.

Investigate the use of Intellex to help better manage long term actions from incidents, non-conformances and high risks during the 2016/17 FY.

### **3.2 Operational Monitoring Program Revisions to Maintain Water Quality Compliance**

No additional revisions were made to the Operating Monitoring Program to those already included in the improvements described in the current RMIP.

### **3.3 Amendments made to the DWQMP**

Major amendments were identified during the DWQMP review undertaken in 2015, with findings summarised in the DWQMP Annual report 2014/15FY. This initiated a DWQMP update, which together with a WSR506 DWQMP Amendment Application form, was submitted to the Office of Water Planning and Regulation August 2015. The DWQMP Rev5.2 was approved December 2015.

Major amendments were either immediately implemented or included in the Risk Management Improvement Plan (RMIP).

## 4 COMPLIANCE WITH WATER QUALITY CRITERIA FOR DRINKING WATER QUALITY

### 4.1 Compliance Summary

Results from the verification monitoring program have been compared against the water quality criteria specified by the Regulator in the water quality and Reporting Guideline for a Drinking Water Service. The water quality criteria refer to the health guideline values in the most current Australian Drinking Water Guidelines (ADWG), as well as the standards in the Public Health Regulation 2005 and any other water quality criteria specified by the Regulator.

During the 2015/16 financial year (FY), all samples met health related compliance targets for fluoride. There were two non-conformances for the detection of *E.coli* during the Verification Monitoring of Logan City's drinking water and one detected as part of LCC's procedure for re-instating a sample tap back into the verification sampling program. Details describing these non-conformances can be found in Section 5.

### 4.2 Monitoring Program Overview

Monitoring of drinking water quality in Logan is undertaken on a regular basis to assess whether water quality is meeting regulatory requirements. This practice verifies the safety of the water along with the effectiveness of the network operation and integrity of the system. Monitoring also allows for the review of results and an opportunity to assess overall performance and identify emerging problems in a proactive manner.

Verification monitoring during the 2015/16 FY was carried out in accordance with that defined in LCC's current DWQMP, Section 6.1.1 Sampling Plan.

LCC's current verification program remains appropriate for the following reasons;

- The minimum frequency for monitoring of *E.coli* is compliant with Schedule 3A of the Public Health Regulation (2005) and Table 9.4 of the ADWG (2011);
- The monitoring of *E.coli* under Schedule 3A is based upon projected population of 2017 planning horizons, thus is conservative;
- The frequency of monitoring for non-microbial health and aesthetic parameters is as per the recommendations of Table 9.5 ADWG (2011);
- Monitoring is undertaken at both reservoirs and points within the reticulation network and spread across a range of locations to ensure a true understanding exists of the network and the water supplied to consumers;
- Sampling frequency in some water supply zones is well beyond the minimum frequency required. Zones identified as having particular traits that present challenges to water quality management are sampled in excess of regulatory requirements in some case by over 100% to ensure good data is available;
- Verification of drinking water undertaken by LCC also includes consumer satisfaction, the results of which are included in Section 6;
- Ongoing review of the program has resulted in the cessation of sampling at sites where water was not representative of that supplied to customers. Alternate sites that were more representative were identified to maintain compliance where needed with the minimum sampling requirements.

### 4.3 Data Analysis Methodology

Statistical principles applied whilst undertaking analysis of water quality data are important to note, as management of the data must be appropriate, accurate and practical.

- **Outliers** – Data that appears to be extreme when contrasted against typical results can be classified as an outlier. Outliers are not excluded from data analysis unless it can be proven that they are a result of a transcription error or malfunction of measuring equipment. Though outliers have the possibility to skew statistical results, it is not acceptable to censor them out of data, as doing so could potentially affect public health.
- **'Less-than' values (<)** – 'Less than' values occur in a data set if a test is conducted and the measured result is less than the Limit of Reporting (LOR). There is no one correct or prescriptive method for the censoring and substitution of 'less-than' values however varying methods exist. It is important to note the methodology selected and the reason. The method adopted by LCC to rationalize 'less-than' values is to censor the result by substituting a value that is equivalent to half the LOR, known as L/2. This approach is consistent with the statistical principles recommended in Information Sheet 3.3 in the ADWG (2011). This approach, whilst not free of flaws, is more conservative than substituting for zero as trace levels could be present below the Limit of Detection (LOD).
- Due to censorship of data (use of L/2) minimum and mean values for some analytes may compute to less than the LOR. In this case, the minimum values are displayed as less than (<) the LOR.
- The reported water quality data do not include results derived from repeat samples, or from emergency or investigative samples undertaken in response to an elevated result.

The summary of water quality data is presented in six separate tables representing each of the six water quality zones found in Appendix A.

Also included, is a summary of compliance results for *E.coli* undertaken during drinking water verification monitoring. Whilst monitoring for *E.coli* is undertaken in each six individual water quality zones, results are displayed in this report as one table for the whole of Logan City.

## 5 NOTIFICATIONS TO THE REGULATOR UNDER SECTIONS 102 AND 102A OF THE ACT

During the 2015/16 FY, there were three instances where the Regulator was notified under sections 102 and/or 102A of the Act.

Notifications include any limits exceeding the ADWG Health Limits and/or if there was reason to believe public health was potentially at risk. Limits exceeding aesthetic limits are not reportable unless there is reason to believe that public health is at risk.

### 5.1 Non Compliances with the Water Quality Criteria

All of the reportable notifications related to the detection of *E.coli*, an organism that may not directly represent a hazard to human health but may be indicative of recent faecal contamination and is often associated with the presence of other harmful pathogens from warm blooded organisms.

#### 5.1.1 Detection of *E.coli* (Logan East WQZ: Bahrs Scrub – newly installed sampling tap)

##### Incident Description

The first non-compliance was the detection of *E.coli* from Parkview Street newly installed sampling tap, Bahrs Scrub. This was part of LCC's routine verification monitoring program, with the sample collected on the 15<sup>th</sup> July 2015, resulting in a *E. coli* detection of 14 MPN/100mL and disinfection residual of 0.1mg/L total chlorine.

##### Corrective and Preventative Actions

Parkview Street and surrounding areas were flushed and re-testing undertaken. LCC's recent routine verification monitoring of the surrounding area and re-testing indicated no *E.coli* present with chlorine residual present. Investigations found that valves near the newly installed tap that were presumed open were actually closed thus creating a stagnant environment conducive to erroneous *E.coli* detection. A review of procedure improvements for installing new taps including disinfection, network configuration and testing was assigned to be undertaken.

#### 5.1.2 Detection of *E.coli* (Logan East WQZ: Belivah – reservoir)

##### Incident Description

The second non-compliance was the detection of *E.coli* from the small Brosnahan Reservoir sample tap, Belivah. This was part of LCC's routine verification monitoring program, with the sample collected on the 28<sup>th</sup> October 2015, resulting in a detection of 1 MPN/100mL and disinfection residual of 0.08mg/L total chlorine.

##### Corrective and Preventative Actions

Brosnahan reservoir supplying the area was isolated and surrounding areas flushed, noting there was no detection of *E.coli* in other Logan East WQZ sites. Inspection of the reservoir found no point of ingress. The reservoir was drained, scoured, disinfected and passed re-testing prior to being reinstated. Manual chlorine dosing was implemented to maintain effective disinfection. The future status of reservoir (i.e. refurbish or replace) is under investigation.

#### 5.1.3 Detection of *E.coli* (Greenbank WQZ: Browns Plains – re-instated sampling tap)

##### Incident Description

The third non-compliance was a detection of *E.coli* from a Parkland Avenue sampling tap at Browns Plains, as part of LCC's procedure for re-instating a sample tap that has been out of service for some time prior to bringing it back into the verification sampling program. In this case the tap had been out of service for approximately 6 months. The sample was collected on the 27<sup>th</sup> April 2016, resulting in an *E. coli* detection of 220 MPN/100mL and disinfection residual of

0.06mg/L total chlorine. The sampling tap check was undertaken approximately one week after the main was repaired and flushed ready to be re-connected to the network. No *E.coli* was detected in other surrounding sites or supplying reservoirs of the Greenbank WQZ hence it appeared to be an isolated event.

### **Corrective and Preventative Actions**

The affected main remained isolated until localised flushing and sampling was undertaken, which confirmed that the issue was isolated. Investigations found that the cause of the *E.coli* was most likely from potential contamination during mains repairs and ineffective flushing. In addition the sampling tap may not have been appropriately disinfected when reassembled after being dismantled to assist with the mains flushing post repair. As a result procedures relating to drinking water supply isolation, repairs and recommissioning are being reviewed to incorporate appropriate disinfection with changes communicated via tool box meetings and training.



## 6 CUSTOMER COMPLAINTS RELATED TO DRINKING WATER QUALITY

### 6.1 Community Engagement

Consumer satisfaction is considered a critical aspect in the verification of drinking water quality. Due to this, the monitoring and analysis of customer complaints is considered a key part of LCC's drinking water quality verification program. At all times, LCC encourages customers to lodge complaints about their water quality if they feel their drinking water is unsatisfactory or if they believe their health is at risk.

Encouraging customers to lodge complaints establishes a link between the service provider and the customer and provides a real time indicator of water quality.

#### 6.1.1 Key Projects

The Kimberley Park WQZ network disinfection maintenance program commenced in the last few weeks of the 2014/15 FY and continued through to the end of August 2015. This program is carried out as part of routine network maintenance to reduce nitrification in the network for Logan North and help improve water quality. As part of community engagement, a letter drop was carried out in the area affected. Fact sheets and public notices were made available via LCC's website and local newspaper and information was posted on social media, informing the community of the proposed changes and timelines.

### 6.2 Customer Complaints

Customer complaints are closely linked to the performance of the water supply system and thus are an important link in forming preventative strategies and process improvement activities. In all cases, LCC's primary aim is to respond to the complaint to investigate and rectify the condition, ensuring public health is not compromised. During this process data is collected which assists with future improvement activities. Establishment of this process is crucial in driving LCC's process improvement activities.

Over the 2015/16 FY, LCC recorded customer complaints according to the following categories;

- Water Quality - Suspected Health
- Water Quality - Appearance
- Water Quality - Taste and Odour

A total of 185 complaints were received for the 2015/16 FY, equating to less than 2 complaints per 1000 connections for all types of complaints across the whole of the city.

Of the 185 complaints, the majority related to Appearance (71%), followed by Taste and Odour (20%) and Suspected Health (9%). The number of customer complaints received by LCC per category for each Water Quality Zone (WQZ) is shown in Table 2.

**Table 2 Water Quality Customer Complaints by Water Quality Zone**

<b>TOTAL WATER QUALITY COMPLAINTS 2015/16 FY</b>				
<b>WATER SUPPLY ZONE</b>	<b>Suspected Health</b>	<b>Appearance</b>	<b>Taste/Odour</b>	<b>TOTAL</b>
<b>GREENBANK</b>	3	22	6	31
<b>KIMBERLEY PARK</b>	2	29	13	44
<b>MARSDEN</b>	2	18	5	25
<b>SPRINGWOOD</b>	4	25	5	34
<b>LOGAN EAST</b>	3	23	4	30
<b>LOGAN SOUTH</b>	2	15	4	21
<b>TOTAL</b>	<b>16</b>	<b>132</b>	<b>37</b>	<b>185</b>
<b>% OF TOTAL</b>	<b>9 %</b>	<b>71 %</b>	<b>20 %</b>	

Customer complaints per 1000 connections is shown below in Table 3. Whilst the number of total complaints is relevant, analysing complaints per 1000 connections helps us understand the intensity distribution of complaints, as each zone has a different number of connections and thus people within it. The number of connections was based on all water connected properties and residences.

**Table 3 Water Quality Customer Complaints per 1000 Connections**

<b>CUSTOMER COMPLAINTS / 1000 CONNECTIONS 2015/16 FY</b>					
<b>WATER SUPPLY ZONE</b>	<b>Suspected Health</b>	<b>Appearance</b>	<b>Taste/Odour</b>	<b>TOTAL</b>	<b>No. Connections</b>
<b>GREENBANK</b>	0.17	1.27	0.35	1.79	17,354
<b>KIMBERLEY PARK</b>	0.17	2.48	1.11	3.76	11,688
<b>MARSDEN</b>	0.11	1.03	0.28	1.42	17,560
<b>SPRINGWOOD</b>	0.11	0.66	0.13	0.90	37,957
<b>LOGAN EAST</b>	0.18	1.38	0.24	1.80	16,608
<b>LOGAN SOUTH</b>	0.21	1.58	0.42	2.21	9,508
<b>ALL ZONES TOTAL</b>	<b>0.14</b>	<b>1.19</b>	<b>0.33</b>	<b>1.66</b>	<b>110,675</b>

### 6.2.1 Suspected Health

Complaints are occasionally received from customers concerned that their drinking water may be causing illness and these are thus categorised as Suspected Health complaints. At all times LCC encourages customers to lodge a complaint if they believe they are experiencing illness due to their drinking water.

During the 2015/16 FY, LCC received a total of 16 suspected health complaints of which there were no confirmed cases after water quality testing. Test results confirmed that the water supply to their homes met the stringent ADWG health related guidelines or regulated values.

All 16 complaints were actioned and closed out following appropriate consultation with the customer. No operational changes have been implemented as a result of the 16 suspected health complaints across the 2015/16 FY. However a fact sheet relating to avoiding chemical contamination of your own water supply was developed, with further details below.

#### Hydrocarbons

Fuel/chemical tasting complaints (i.e. hydrocarbon related) have been identified as a sub-set of Suspected Health or Taste & Odour. Whilst not common, residents do occasionally spill petrol or oil on their property and call LCC with water quality concerns. Of the 16 suspected health complaints, Logan City Council received 2 relating to hydrocarbon contamination this financial year. In all cases, LCC liaises with the concerned resident to provide advice on appropriate corrective and preventative actions that should be undertaken.

A fact sheet outlining how to avoid chemical contamination of the residence's own water supply, with focus on hydrocarbon contamination, has been published on the LCC's website.

### 6.2.2 Appearance

Appearance of water was the highest complaint type for the 2015/16 FY reporting period. Of the 185 total complaints, 132 were related to the appearance of the water and thus represented 71% of all water complaints received.

The WQZ with the most complaints for the appearance of water was Kimberley Park with 29 complaints, equating to about 2.5 complaints per 1,000 connections. This is also the WQZ which undertook the network disinfection maintenance program during August 2015.

All water appearance complaints received during the 2015/16 FY were investigated with the most common remedial action being flushing of water mains. In all cases the aim is to respond to the complaint to restore clean water to the property and ensure public health is maintained.

There are two sub-sets to Appearance, being the following, with further descriptions below:

- Dirty Water; and
- Milky and/or White Water

#### Dirty Water

Dirty Water is a sub-set of water appearance complaints and is typically associated with brown or turbid water. In total, there were 108 of these complaints received which shows that 80% of all water appearance complaints across the city were related to dirty water.

Of all six WQZs in the city, the Kimberley Park zone had the highest incidence of dirty water complaints at 26, while Logan South obtained the least with only 11 complaints.

Analysis of complaints within the Kimberley Park WQZ shows that around 42% of the dirty water complaints occurred whilst work was being undertaken for the Kimberley Park network disinfection maintenance program. The remainder were most likely in relation to unplanned broken mains or main repairs. As such a review of the mains repairs procedures will be undertaken in the 2016/17 FY.

## **Milky and or White Water**

Milky and or White Water is considered a sub-set of water appearance complaints. A total of 24 complaints of this nature were recorded and investigated across the entire Logan City area for this reporting period. The majority of these complaints were suspected to be associated with mains repairs, resulting in air in the line.

As part of the customer complaint management process, complaints lodged by customers for white or milky water are first investigated to see if air entrainment is the cause. This is done by requesting the customer to perform a settling test and observing if the water cleared after a defined time period. All complaints that were not rectified by a settling test, had nearby mains flushed along with sampling and additional testing for further investigation.

No operational changes were implemented as a result of investigations into these complaints over the 2015/16 FY.

### **6.2.3 Taste and Odour**

Taste and Odour complaints are characterised by an objectionable odour or taste noticed by customers. Typical descriptions from customers include earthy, metallic, or a chemical taste in the water. A total of 36 of these complaints were received across the whole of Logan City this financial year.

Occasionally, a taste and odour complaint may accompany a claim of illness, thus these complaints are often treated in the same manner as suspected health related complaint types. All 36 complaints relating to Taste and odour were attended to and flushed with customers on occasion being supplied bottled water, whilst investigation and remedial activities were undertaken. No operational changes have been implemented by LCC as a result of these complaints.

There are two main sub-sets to Taste and Odour (other than the fuel/chemical objectionable taste that has been described in section 6.2.1) being the following with further descriptions below:

- Chlorine; and
- Musty / Earthy / Stale

#### **Chlorine**

Whilst most WQZs of Logan have chloramine as the disinfectant, some zones can at times have free chlorine in the water as the disinfectant. People typically taste chlorine more easily than chloramine. Due to this, complaints received regarding chlorine smell or taste are usually in areas where free chlorine is used, particularly during network disinfection maintenance programs or summer periods.

The ADWG advises that customers may notice the taste of chlorine at levels as low as 0.6 mg/L however this will vary between people. The ADWG health limit is 5mg/L however LCC aims to operate well below this limit to balance effective disinfection and aesthetic quality.

At all times it is important to maintain a sufficient amount of disinfectant within the drinking water network to ensure the water remains safe for consumption and as a barrier against microbial contamination. It is important to note that this requires a balance between ensuring customers receive water that is safe but also pleasant to drink.

During the 2015/16 FY, 40% of received taste and odour complaints were associated with a chlorine taste or odour. Of these complaints over a third occurred in the Kimberley Park zone whilst the network disinfection maintenance program was being undertaken. At this time, the Kimberley Park zone, normally chloraminated, was converted to free chlorine disinfection and some customers responded to this with complaints.

No operational changes have been implemented by LCC as a result of these complaints. Review of the effectiveness of the network disinfection maintenance program, along with consumer satisfaction, is ongoing. Fact Sheets about network disinfection were developed and are available on LCC's website.

**Musty / Earthy / Stale**

Of the remaining 60% of taste and odour complaints, the majority were generally due to musty, earthy or stale tasting water. The unpleasant tastes can be due to a number of things including;

- stale water in the pipes in areas of low water usage or stale water in residence's pipes when they have been away for a long period; or
- high rainfall in the Seqwater catchment area which can increase the amount of organics and minerals in the raw water which can impact taste even after water treatment.

All complaints were investigated and in cases where samples were collected and analysed, the customer was informed of the water quality results, of which all met the ADWG health guidelines. Generally flushing was also carried out by Water Operations.

No operational changes have been implemented by LCC as a result of these complaints.

## **7 FINDINGS AND RECOMMENDATIONS OF THE DWQMP AUDITOR**

No regulatory external audit of LCC's DWQMP was undertaken in the 2015/16 financial year. External audits are required within 4 years of an approved DWQMP and the LCC's DWQMP was originally approved December 2013, with major amendments included in Rev 5.2 approved in December 2015. Thus LCC's regulatory external audit is due prior to the 30<sup>th</sup> of June 2017.

## **8 OUTCOME OF THE REVIEW OF THE DWQMP AND HOW ISSUES RAISED HAVE BEEN ADDRESSED**

The purpose of the review is to ensure that the DWQMP remains relevant and current, having regard to the operation of the drinking water service.

In accordance with the requirement of Section 99 (2)(b) and 106 of the Act, LCC undertook its first review of their approved DWQMP Rev 5.1 which was completed by the regulatory deadline of the 30<sup>th</sup> June 2015.

Major amendments were identified hence an updated DWQMP Rev5.2 together with a WSR506 DWQMP Amendment Application form was submitted to the office of Water Planning and Regulation August 2015 and approved in December 2015.

Major amendments were either immediately updated in the DWQMP Rev5.2 or included in the Risk Management Improvement Plan (RMIP).

The next internal review of the DWQMP is due by the 30<sup>th</sup> of June 2017.

## **APPENDIX A - SUMMARY OF COMPLIANCE WITH WATER QUALITY CRITERIA**

The results from the verification monitoring program have been assessed against the water quality criteria specified by the Regulator in the Water Quality and Reporting Guideline for a Drinking Water Service. Data from each water quality zone assessed is tabulated below.

Please refer to Section 4.2 - Monitoring Program Overview and Section 4.3 – Data Analysis Methodology for further descriptions on the sampling program regime and statistical analysis principles used.

The Limit of Reporting (LOR) is quoted within the tables below, as is the Laboratory name. LCC laboratory was responsible for conducting all verification monitoring and analytical testing except for Trihalomethanes (THMs), which was conducted by either ALS or the Gold Coast Water Laboratory, depending on availability.

Where less-than (<) values are seen, the value will be in reference to the LOR as per Section 4.3 – Data Analysis Methodology.



## Reticulation Verification Monitoring

Table 4 Greenbank WQZ

GREENBANK										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	LOR	LABORATORY NAME
<b>MICROBIAL</b>										
<i>E.coli</i> by Colilert	MPN/100mL	WEEKLY	182	0	0	<1	<1	<1	1	LCC
<b>CHEMICAL / PHYSICAL</b>										
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	13	13	0	74	87	82	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	48	48	0	0.03	0.09	0.05	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	90	47	0	<0.1	0.3	0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	48	32	0	0.001	0.005	0.002	0.001	LCC
Barium, Total	mg/L	EACH PERIOD	48	48	0	0.021	0.036	0.024	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	48	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	48	48	0	0.03	0.03	0.03	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	48	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	48	48	0	57.1	85.8	65.0	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	48	48	0	22.9	34.4	26.0	0.1	LCC
Chloride	mg/L	EACH PERIOD	48	48	0	47	102	61	1	LCC
Chlorine, Free	mg/L	WEEKLY	182	50	0	<0.05	0.32	<0.05	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	182	176	0	<0.05	1.61	0.38	0.05	LCC
Chromium, Total	mg/L	EACH PERIOD	48	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	48	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	48	48	0	2	12	3	1	LCC
Colour, True	Hazen	EACH PERIOD	48	17	0	<1	2	<1	1	LCC

Conductivity	µS/cm	EACH PERIOD	90	90	0	389	615	434	1	LCC
Copper, Total	mg/L	EACH PERIOD	48	48	0	0.001	0.110	0.008	0.001	LCC
Fluoride	mg/L	EACH PERIOD	48	48	0	0.6	0.9	0.8	0.1	LCC
Iron, Total	mg/L	EACH PERIOD	48	48	0	0.006	0.151	0.018	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	48	21	0	<0.001	0.003	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	48	48	0	11.2	16.7	12.8	0.1	LCC
Manganese, Total	mg/L	EACH PERIOD	48	47	0	<0.001	0.030	0.003	0.001	LCC
Molybdenum, Total	mg/L	EACH PERIOD	48	45	0	<0.001	0.001	<0.001	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	48	6	0	<0.001	0.001	<0.001	0.001	LCC
NO <sub>3</sub> -N	mg/L	EACH PERIOD	48	47	0	<0.1	0.8	0.4	0.1	LCC
NO <sub>2</sub> -N	mg/L	EACH PERIOD	48	18	0	<0.1	0.4	0.1	0.1	LCC
pH	pH Units	EACH PERIOD	90	90	0	7.5	8.7	7.7	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	48	48	0	3	4	3	1	LCC
Selenium, Total	mg/L	EACH PERIOD	48	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sodium, Total	mg/L	EACH PERIOD	48	48	0	34	54	37	1	LCC
Sulphate	mg/L	EACH PERIOD	48	48	0	22	45	26	1	LCC
TDS, Calculated	mg/L	EACH PERIOD	55	55	0	236	358	261	1	LCC
Temperature	°C	WEEKLY	182	182	0	17	32	24	1	LCC
Thallium, Total	mg/L	EACH PERIOD	48	0	0	<0.001	<0.001	<0.001	0.001	LCC
THM Total	mg/L	EACH PERIOD	14	14	0	0.019	0.097	0.066	0.001	ALS/GC
Total Hardness	mg/L	EACH PERIOD	48	48	0	107	155	118	1	LCC
Turbidity	NTU	EACH PERIOD	90	85	0	<0.1	1.2	0.4	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	48	3	0	<0.01	0.02	<0.01	0.01	LCC

**Table 5 Kimberley Park WQZ**

KIMBERLY PARK										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	LOR	LABORATORY NAME
<b>MICROBIAL</b>										
<i>E.coli</i> by Colilert	MPN/100mL	WEEKLY	164	0	0	<1	<1	<1	1	LCC
<b>CHEMICAL / PHYSICAL</b>										
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	25	25	0	42	88	79	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	40	40	0	0.03	0.08	0.05	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	118	28	0	<0.1	0.2	<0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	40	30	0	0.001	0.005	0.002	0.001	LCC
Barium, Total	mg/L	EACH PERIOD	40	40	0	0.007	0.032	0.023	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	40	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	40	40	0	0.01	0.03	0.03	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	40	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	40	40	0	49.4	86.6	64.3	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	40	40	0	19.8	34.7	25.8	0.1	LCC
Chloride	mg/L	EACH PERIOD	40	40	0	20	102	61	1	LCC
Chlorine, Free	mg/L	WEEKLY	164	68	0	<0.05	1.18	0.14	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	164	158	0	<0.05	1.86	0.49	0.05	LCC
Chromium, Total	mg/L	EACH PERIOD	40	2	0	<0.001	0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	40	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	40	39	0	<1	9	4	1	LCC
Colour, True	Hazen	EACH PERIOD	40	15	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	118	118	0	184	734	410	1	LCC

<b>Copper, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>0.002</b>	<b>0.062</b>	<b>0.011</b>	<b>0.001</b>	<b>LCC</b>
<b>Fluoride</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>0.6</b>	<b>0.9</b>	<b>0.8</b>	<b>0.1</b>	<b>LCC</b>
<b>Iron, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>0.006</b>	<b>0.076</b>	<b>0.023</b>	<b>0.003</b>	<b>LCC</b>
<b>Lead, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>24</b>	<b>0</b>	<b>&lt;0.001</b>	<b>0.005</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>Magnesium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>1.7</b>	<b>17.1</b>	<b>12.1</b>	<b>0.1</b>	<b>LCC</b>
<b>Manganese, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>0.001</b>	<b>0.014</b>	<b>0.003</b>	<b>0.001</b>	<b>LCC</b>
<b>Molybdenum, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>36</b>	<b>0</b>	<b>&lt;0.001</b>	<b>0.005</b>	<b>0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>Nickel, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>5</b>	<b>0</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>NO<sub>3</sub>-N</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>38</b>	<b>0</b>	<b>&lt;0.1</b>	<b>0.8</b>	<b>0.3</b>	<b>0.1</b>	<b>LCC</b>
<b>NO<sub>2</sub>-N</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>19</b>	<b>0</b>	<b>&lt;0.1</b>	<b>0.5</b>	<b>0.1</b>	<b>0.1</b>	<b>LCC</b>
<b>pH</b>	<b>pH Units</b>	<b>EACH PERIOD</b>	<b>118</b>	<b>118</b>	<b>0</b>	<b>7.2</b>	<b>8.0</b>	<b>7.6</b>	<b>0.1</b>	<b>LCC</b>
<b>Potassium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>38</b>	<b>0</b>	<b>&lt;1</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>LCC</b>
<b>Selenium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>LCC</b>
<b>Sodium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>14</b>	<b>56</b>	<b>36</b>	<b>1</b>	<b>LCC</b>
<b>Sulphate</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>5</b>	<b>46</b>	<b>25</b>	<b>1</b>	<b>LCC</b>
<b>TDS, Calculated</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>103</b>	<b>103</b>	<b>0</b>	<b>112</b>	<b>446</b>	<b>245</b>	<b>1</b>	<b>LCC</b>
<b>Temperature</b>	<b>°C</b>	<b>WEEKLY</b>	<b>164</b>	<b>164</b>	<b>0</b>	<b>18</b>	<b>32</b>	<b>24</b>	<b>1</b>	<b>LCC</b>
<b>Thallium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>0</b>	<b>0</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>THM Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>27</b>	<b>27</b>	<b>0</b>	<b>0.005</b>	<b>0.100</b>	<b>0.063</b>	<b>0.001</b>	<b>ALS/GC</b>
<b>Total Hardness</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>56</b>	<b>157</b>	<b>114</b>	<b>1</b>	<b>LCC</b>
<b>Turbidity</b>	<b>NTU</b>	<b>EACH PERIOD</b>	<b>118</b>	<b>111</b>	<b>0</b>	<b>&lt;0.1</b>	<b>1.3</b>	<b>0.4</b>	<b>0.1</b>	<b>LCC</b>
<b>Zinc, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>40</b>	<b>10</b>	<b>0</b>	<b>&lt;0.01</b>	<b>0.02</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>LCC</b>

Table 6 Marsden WQZ

MARSDEN										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	LOR	LABORATORY NAME
<b>MICROBIAL</b>										
<i>E.coli</i> by Colilert	MPN/100mL	WEEKLY	212	0	0	<1	<1	<1	1	LCC
<b>CHEMICAL / PHYSICAL</b>										
Alkalinity as CaCO3	mg/L	EACH PERIOD	13	13	0	74	90	83	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	54	54	0	0.03	0.10	0.05	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	93	63	0	<0.1	1.3	0.2	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	54	37	0	0.001	0.005	0.002	0.001	LCC
Barium, Total	mg/L	EACH PERIOD	54	54	0	0.021	0.034	0.024	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	54	54	0	0.03	0.03	0.03	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	54	54	0	56.5	89.9	64.1	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	54	54	0	22.6	36.0	25.7	0.1	LCC
Chloride	mg/L	EACH PERIOD	54	54	0	47	105	63	1	LCC
Chlorine, Free	mg/L	WEEKLY	212	130	0	<0.05	1.68	0.11	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	212	211	0	<0.05	2.3	0.87	0.05	LCC
Chromium, Total	mg/L	EACH PERIOD	54	1	0	<0.001	0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	54	54	0	2	8	3	1	LCC
Colour, True	Hazen	EACH PERIOD	54	17	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	93	93	0	386	621	436	1	LCC

Copper, Total	mg/L	EACH PERIOD	54	54	0	0.001	0.040	0.007	0.001	LCC
Fluoride	mg/L	EACH PERIOD	54	54	0	0.5	0.9	0.7	0.1	LCC
Iron, Total	mg/L	EACH PERIOD	54	54	0	0.003	0.050	0.013	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	54	24	0	<0.001	0.001	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	54	54	0	11.4	17.4	13.0	0.1	LCC
Manganese, Total	mg/L	EACH PERIOD	54	54	0	0.001	0.012	0.003	0.001	LCC
Molybdenum, Total	mg/L	EACH PERIOD	54	50	0	<0.001	0.004	<0.001	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	54	4	0	<0.001	0.001	<0.001	0.001	LCC
NO <sub>3</sub> -N	mg/L	EACH PERIOD	54	43	0	<0.1	0.8	0.2	0.1	LCC
NO <sub>2</sub> -N	mg/L	EACH PERIOD	54	25	0	<0.1	0.6	0.1	0.1	LCC
pH	pH Units	EACH PERIOD	93	93	0	7.5	8.2	7.7	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	54	54	0	3	4	3	1	LCC
Selenium, Total	mg/L	EACH PERIOD	54	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sodium, Total	mg/L	EACH PERIOD	54	54	0	34	56	38	1	LCC
Sulphate	mg/L	EACH PERIOD	54	52	0	<1	47	25	1	LCC
TDS, Calculated	mg/L	EACH PERIOD	52	52	0	234	367	261	1	LCC
Temperature	°C	WEEKLY	212	212	0	17	31	24	1	LCC
Thallium, Total	mg/L	EACH PERIOD	54	0	0	<0.001	<0.001	<0.001	0.001	LCC
THM Total	mg/L	EACH PERIOD	14	14	0	0.05	0.11	0.075	0.001	ALS/GC
Total Hardness	mg/L	EACH PERIOD	54	54	0	106	160	118	1	LCC
Turbidity	NTU	EACH PERIOD	93	90	0	<0.1	1.4	0.4	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	54	2	0	<0.01	0.01	<0.01	0.01	LCC

Table 7 Springwood WQZ

SPRINGWOOD										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	LOR	LABORATORY NAME
<b>MICROBIAL</b>										
<i>E.coli</i> by Colilert	MPN/100mL	WEEKLY	364	0	0	<1	<1	<1	1	LCC
<b>CHEMICAL / PHYSICAL</b>										
Alkalinity as CaCO3	mg/L	EACH PERIOD	27	27	0	65	88	82	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	95	95	0	0.03	0.20	0.05	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	172	137	0	<0.1	0.4	0.2	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	95	66	0	0.001	0.005	0.002	0.001	LCC
Barium, Total	mg/L	EACH PERIOD	95	95	0	0.018	0.033	0.024	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	95	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	95	95	0	0.03	0.04	0.03	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	95	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	95	95	0	55.7	90.0	63.8	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	95	95	0	22.3	36.1	25.5	0.1	LCC
Chloride	mg/L	EACH PERIOD	95	95	0	48	109	63	1	LCC
Chlorine, Free	mg/L	WEEKLY	365	264	0	<0.05	1.84	0.16	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	365	365	0	0.05	2.70	1.19	0.05	LCC
Chromium, Total	mg/L	EACH PERIOD	95	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	95	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	95	95	0	1	56	4	1	LCC
Colour, True	Hazen	EACH PERIOD	95	39	0	<1	5	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	172	172	0	387	623	435	1	LCC

Copper, Total	mg/L	EACH PERIOD	95	95	0	0.001	0.130	0.021	0.001	LCC
Fluoride	mg/L	EACH PERIOD	95	95	0	0.6	0.9	0.8	0.1	LCC
Iron, Total	mg/L	EACH PERIOD	95	95	0	0.003	1.51	0.035	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	95	27	0	<0.001	0.003	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	95	95	0	10.6	17.7	13.0	0.1	LCC
Manganese, Total	mg/L	EACH PERIOD	95	95	0	0.001	0.099	0.005	0.001	LCC
Molybdenum, Total	mg/L	EACH PERIOD	95	89	0	<0.001	0.002	<0.001	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	95	9	0	<0.001	0.001	<0.001	0.001	LCC
NO <sub>3</sub> -N	mg/L	EACH PERIOD	95	72	0	<0.1	0.8	0.2	0.1	LCC
NO <sub>2</sub> -N	mg/L	EACH PERIOD	95	23	0	<0.1	0.5	<0.1	0.1	LCC
pH	pH Units	EACH PERIOD	172	172	0	7.4	8.0	7.6	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	95	95	0	3	4	3	1	LCC
Selenium, Total	mg/L	EACH PERIOD	95	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sodium, Total	mg/L	EACH PERIOD	95	95	0	32	57	38	1	LCC
Sulphate	mg/L	EACH PERIOD	95	94	0	<1	49	26	1	LCC
TDS, Calculated	mg/L	EACH PERIOD	104	104	0	235	378	262	1	LCC
Temperature	°C	WEEKLY	365	365	0	16	32	25	1	LCC
Thallium, Total	mg/L	EACH PERIOD	95	0	0	<0.001	<0.001	<0.001	0.001	LCC
THM Total	mg/L	EACH PERIOD	54	54	0	0.013	0.220	0.079	0.001	ALS/GC
Total Hardness	mg/L	EACH PERIOD	95	95	0	103	161	117	1	LCC
Turbidity	NTU	EACH PERIOD	172	161	0	<0.1	13.0	0.5	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	95	16	0	<0.01	0.03	<0.01	0.01	LCC



Table 8 Logan East WQZ

LOGAN EAST										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	LOR	LABORATORY NAME
<b>MICROBIAL</b>										
<i>E.coli</i> by Colilert	MPN/100mL	WEEKLY	266	2	2 <sup>1</sup>	<1	14	<1	1	LCC
<b>CHEMICAL / PHYSICAL</b>										
Alkalinity as CaCO <sub>3</sub>	mg/L	EACH PERIOD	13	13	0	73	85	80	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	70	70	0	0.03	0.08	0.05	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	109	27	0	<0.1	0.3	<0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	70	37	0	0.001	0.005	0.003	0.001	LCC
Barium, Total	mg/L	EACH PERIOD	70	70	0	0.012	0.033	0.022	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	70	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	70	70	0	0.02	0.06	0.03	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	70	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	70	70	0	40.6	97.2	65.2	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	70	70	0	16.3	38.9	26.1	0.1	LCC
Chloride	mg/L	EACH PERIOD	70	70	0	32	104	60	1	LCC
Chlorine, Free	mg/L	WEEKLY	266	97	0	<0.05	1.38	0.09	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	266	257	0	<0.05	1.98	0.37	0.05	LCC
Chromium, Total	mg/L	EACH PERIOD	70	1	0	<0.001	0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	70	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	70	69	0	<1	8	3	1	LCC
Colour, True	Hazen	EACH PERIOD	70	19	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	109	109	0	212	901	426	1	LCC

<b>Copper, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>0.002</b>	<b>0.032</b>	<b>0.008</b>	<b>0.001</b>	<b>LCC</b>
<b>Fluoride</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>0.6</b>	<b>0.9</b>	<b>0.8</b>	<b>0.1</b>	<b>LCC</b>
<b>Iron, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>0.004</b>	<b>0.066</b>	<b>0.015</b>	<b>0.003</b>	<b>LCC</b>
<b>Lead, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>55</b>	<b>0</b>	<b>&lt;0.001</b>	<b>0.003</b>	<b>0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>Magnesium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>6.0</b>	<b>17.8</b>	<b>11.8</b>	<b>0.1</b>	<b>LCC</b>
<b>Manganese, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>0.001</b>	<b>0.009</b>	<b>0.003</b>	<b>0.001</b>	<b>LCC</b>
<b>Molybdenum, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>53</b>	<b>0</b>	<b>&lt;0.001</b>	<b>0.003</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>Nickel, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>1</b>	<b>0</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>NO<sub>3</sub>-N</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>64</b>	<b>0</b>	<b>&lt;0.1</b>	<b>0.6</b>	<b>0.3</b>	<b>0.1</b>	<b>LCC</b>
<b>NO<sub>2</sub>-N</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>15</b>	<b>0</b>	<b>&lt;0.1</b>	<b>0.3</b>	<b>&lt;0.1</b>	<b>0.1</b>	<b>LCC</b>
<b>pH</b>	<b>pH Units</b>	<b>EACH PERIOD</b>	<b>109</b>	<b>109</b>	<b>0</b>	<b>7.4</b>	<b>8.3</b>	<b>7.6</b>	<b>0.1</b>	<b>LCC</b>
<b>Potassium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>LCC</b>
<b>Selenium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>0</b>	<b>0</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>LCC</b>
<b>Sodium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>23</b>	<b>57</b>	<b>37</b>	<b>1</b>	<b>LCC</b>
<b>Sulphate</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>17</b>	<b>46</b>	<b>25</b>	<b>1</b>	<b>LCC</b>
<b>TDS, Calculated</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>201</b>	<b>547</b>	<b>264</b>	<b>1</b>	<b>LCC</b>
<b>Temperature</b>	<b>°C</b>	<b>WEEKLY</b>	<b>266</b>	<b>266</b>	<b>0</b>	<b>17</b>	<b>31</b>	<b>24</b>	<b>1</b>	<b>LCC</b>
<b>Thallium, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>0</b>	<b>0</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>LCC</b>
<b>THM Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>71</b>	<b>71</b>	<b>0</b>	<b>0.006</b>	<b>0.210</b>	<b>0.084</b>	<b>0.001</b>	<b>ALS/GC</b>
<b>Total Hardness</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>70</b>	<b>0</b>	<b>65</b>	<b>161</b>	<b>114</b>	<b>1</b>	<b>LCC</b>
<b>Turbidity</b>	<b>NTU</b>	<b>EACH PERIOD</b>	<b>109</b>	<b>102</b>	<b>0</b>	<b>&lt;0.1</b>	<b>1.2</b>	<b>0.4</b>	<b>0.1</b>	<b>LCC</b>
<b>Zinc, Total</b>	<b>mg/L</b>	<b>EACH PERIOD</b>	<b>70</b>	<b>13</b>	<b>0</b>	<b>&lt;0.01</b>	<b>0.04</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>LCC</b>

<sup>1</sup> The Logan East WQZ was within the ADWG health guideline for *E.coli* being 99% for 2015/16FY, with compliance being 98%.

**Table 9 Logan South WQZ**

LOGAN SOUTH										
PARAMETER	UNITS	FREQUENCY	TOTAL NO. OF SAMPLES COLLECTED	NO. OF SAMPLES IN WHICH PARAMETER WAS DETECTED	NO. OF SAMPLES EXCEEDING WATER QUALITY CRITERIA (HEALTH)	MIN	MAX	MEAN	LOR	LABORATORY NAME
<b>MICROBIAL</b>										
<i>E.coli</i> by Colilert	MPN/100mL	WEEKLY	360	0	0	<1	<1	<1	1	LCC
<b>CHEMICAL / PHYSICAL</b>										
Alkalinity as CaCO3	mg/L	EACH PERIOD	22	22	0	81	95	88	1	LCC
Aluminium, Total	mg/L	EACH PERIOD	90	90	0	0.04	0.26	0.08	0.01	LCC
Ammonia-N	mg/L	EACH PERIOD	154	9	0	<0.1	1.0	<0.1	0.1	LCC
Arsenic, Total	mg/L	EACH PERIOD	90	63	0	0.001	0.005	0.002	0.001	LCC
Barium, Total	mg/L	EACH PERIOD	90	90	0	0.021	0.035	0.025	0.001	LCC
Beryllium, Total	mg/L	EACH PERIOD	90	0	0	<0.001	<0.001	<0.001	0.001	LCC
Boron, Total	mg/L	EACH PERIOD	90	90	0	0.03	0.04	0.03	0.01	LCC
Cadmium, Total	mg/L	EACH PERIOD	90	0	0	<0.001	<0.001	<0.001	0.001	LCC
Calcium Hardness	mg/L	EACH PERIOD	90	90	0	61.1	96.2	71.1	0.1	LCC
Calcium, Total	mg/L	EACH PERIOD	90	90	0	24.5	38.5	28.5	0.1	LCC
Chloride	mg/L	EACH PERIOD	90	90	0	47	102	63	1	LCC
Chlorine, Free	mg/L	WEEKLY	358	124	0	<0.05	1.85	0.18	0.05	LCC
Chlorine, Total	mg/L	WEEKLY	358	337	0	<0.05	2.18	0.35	0.05	LCC
Chromium, Total	mg/L	EACH PERIOD	90	0	0	<0.001	<0.001	<0.001	0.001	LCC
Cobalt, Total	mg/L	EACH PERIOD	90	0	0	<0.001	<0.001	<0.001	0.001	LCC
Colour, Apparent	Hazen	EACH PERIOD	90	89	0	<1	49	4	1	LCC
Colour, True	Hazen	EACH PERIOD	90	22	0	<1	2	<1	1	LCC
Conductivity	µS/cm	EACH PERIOD	154	154	0	405	625	452	1	LCC
Copper, Total	mg/L	EACH PERIOD	90	90	0	0.001	0.042	0.007	0.001	LCC

Fluoride	mg/L	EACH PERIOD	90	90	0	0.6	0.9	0.8	0.1	LCC
Iron, Total	mg/L	EACH PERIOD	90	88	0	<0.003	0.330	0.024	0.003	LCC
Lead, Total	mg/L	EACH PERIOD	90	47	0	<0.001	0.004	<0.001	0.001	LCC
Magnesium, Total	mg/L	EACH PERIOD	90	90	0	11.6	16.6	12.8	0.1	LCC
Manganese, Total	mg/L	EACH PERIOD	90	86	0	<0.001	0.064	0.004	0.001	LCC
Molybdenum, Total	mg/L	EACH PERIOD	90	84	0	<0.001	0.001	<0.001	0.001	LCC
Nickel, Total	mg/L	EACH PERIOD	90	8	0	<0.001	0.001	<0.001	0.001	LCC
NO <sub>3</sub> -N	mg/L	EACH PERIOD	90	88	0	<0.1	0.8	0.6	0.1	LCC
NO <sub>2</sub> -N	mg/L	EACH PERIOD	90	12	0	<0.1	0.3	<0.1	0.1	LCC
pH	pH Units	EACH PERIOD	154	154	0	7.6	8.6	8.0	0.1	LCC
Potassium, Total	mg/L	EACH PERIOD	90	90	0	3	4	3	1	LCC
Selenium, Total	mg/L	EACH PERIOD	90	0	0	<0.01	<0.01	<0.01	0.01	LCC
Sodium, Total	mg/L	EACH PERIOD	90	90	0	34	54	38	1	LCC
Sulphate	mg/L	EACH PERIOD	90	90	0	22	51	25	1	LCC
TDS, Calculated	mg/L	EACH PERIOD	86	86	0	246	379	274	1	LCC
Temperature	°C	WEEKLY	358	358	0	17	31	24	1	LCC
Thallium, Total	mg/L	EACH PERIOD	90	0	0	<0.001	<0.001	<0.001	0.001	LCC
THM Total	mg/L	EACH PERIOD	92	91	0	0.003	0.220	0.083	0.001	ALS/GC
Total Hardness	mg/L	EACH PERIOD	90	90	0	113	164	124	1	LCC
Turbidity	NTU	EACH PERIOD	154	145	0	<0.1	6.5	0.5	0.1	LCC
Zinc, Total	mg/L	EACH PERIOD	90	5	0	<0.01	0.02	<0.01	0.01	LCC

### E.Coli Verification Monitoring

**Table 10 LCC E.coli Verification Monitoring**

<b>WHOLE OF LOGAN CITY ALL ZONES</b>												
<b>2015/16 FY</b>												
<b>Month Sampled</b>	<b>July</b>	<b>Aug</b>	<b>Sept</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>
<b>No. of samples collected</b>	135	132	144	121	130	100	121	134	137	120	143	133
<b>No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)</b>	1	0	0	1	0	0	0	0	0	0	0	0
<b>No. of samples collected in previous 12 month period</b>	1463	1490	1508	1512	1530	1510	1513	1529	1529	1522	1547	1550
<b>No. of failures for previous 12 month period</b>	3	3	3	4	4	4	3	3	2	2	2	2
<b>% of samples that comply</b>	99.79	99.8	99.8	99.74	99.74	99.74	99.8	99.8	99.87	99.87	99.87	99.87
<b>Compliance with 98% annual value</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

## **APPENDIX B - IMPLEMENTATION OF THE DWQMP RISK MANAGEMENT IMPROVEMENT PROGRAM**

The following table summarises the progress of the proposed actions undertaken as part of the current Risk Management Improvement Plan.

Item No.	G-General Improvement R-Risk Assessment NC-Non-Conformance (health exceedance)	ADWG Element & Component	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2016)	LEAD POSITION	TARGET DATE	% COMPLETE (JUN'16)	STATUS
									DWQMP SECTION
<b>E1 : Commitment to Drinking Water Quality Management</b>									
1.00	2.3 (R)	1.3	LCC not formally notified by Seqwater of high THM experienced in bulk water supply to Gold Coast early 2015. This notification not in current SEQ Operating Protocol hence update required.	<b>Short Term:</b> Seqwater to notify LCC of increase changes in THMs as per current GC limits in Operating Protocol.	Seqwater have ammended THM trigger limits to notify LCC when alert limits have been exceeded at Beaudesert, Stapylton and Molendinar.	Senior Water Quality Scientist	Sep-15	100%	COMPLETE
1.01	2.3 (R)	1.3		<b>Long Term:</b> Incorporate THM Notification alert limits for events which may affect LCC with next Operating Protocol update.	LCC has incorporated new THM alerts into updated Operating Protocol, which currently awaits Seqwater's approval and final sign-off.	Water Grid & Operations Support Coordinator	Jun-17	90%	ON TRACK
<b>E2: Assessment of Drinking Water Supply Systems</b>									
2.00	3.3 (R) DOS 1.0 DIS 1.0 SEQ 1.0	2.3	Backup online chlorine monitoring system required if Seqwater disinfection systems failed (i.e. dosing and monitoring).	Undertake "Online Water Quality Monitoring Strategy" - online instrumentation with SCADA alarms as backup to Seqwater system.	Online Water Quality Monitoring prioritisation - Preliminary Planning & Design and Installation - completed ✓  (Note: logistics of sites chosen was extensive hence finish date revised).  SCADA alarming & validation to be completed 2016/17FY.	Product Quality Program Leader	Jun-17	95%	ON TRACK
2.01	3.3 (G)	2.3	Regular reviews not undertaken, taking into account system changes and various risk assessments exist for newly installed dosing systems. Need to review & consolidate risk assessments, taking into account any system changes from Seqwater which may impact LCC.	Arrange workshop to undertake entire system risk assessment, taking into account water source changes, standpipes and any new Seqwater residual risks entering LCC network and consolidate numerous risk assessment undertaken since commissioning new dosing systems.  Ensure current processes & systems captured.	Whole of system Risk Assessment undertaken early 2016.	Senior Water Quality Scientist	Jun-16	100%	COMPLETE
2.02	3.3 (G)	2.3		Incorporate any newly identified high risks from whole of system Risk Assessment into RMIP.	<b>NEW Ref Item 12.01</b>				
<b>Element 3: Preventive Measures for Drinking Water Quality</b>									
3.00	4.1 (G) & R	3.1	Poor disinfection residual, particularly during Summer periods.	<b>Strategy &amp; Planning Investigation outcome</b> to help with implementation of routine network chlorination and chlorine dosing systems as required.  Install two chlorine booster stations in Logan East.	CAPEX approved for two booster stations in Logan East 2015/16FY ✓  Delivery, construction & commissioning expected <b>end 2016</b> .	Product Quality Program Leader	Dec-16	50%	ON TRACK
3.01	4.1 (G) & R	3.1	Poor disinfection residual, particularly during Summer periods.	<b>Strategy &amp; Planning Investigation outcome</b> to help with implementation of routine network chlorination and chlorine dosing systems as required.  Install chlorination system at Round Mt Reservoir. Requires construction of additional outlet main.	CAPEX approved and planning completed for electro-chlorinator system at Round Mt Reservoir 2015/16FY ✓  Construction & commissioning expected by <b>Dec'17</b> .	Product Quality Program Leader	Dec-17	30%	ON TRACK
3.02	4.1 (G) & R	3.1	Poor disinfection residual, particularly during Summer periods.	<b>Implement</b> LWA 90-12-98 & LWA 90-12-98 Network Water Quality Maintenance & Operating Strategies to help improve network chlorine residual in the network systems. Develop associated Plans (i.e. valving, monitoring, communication, etc) & SOPs. Need to ensure business Plans capture associated costs, as now part of BAU.	Kimberley Park WSZ networks disinfection maintenance completed Aug'15 ✓  Marsden & Greenbank WSZ scheduled <b>Sep'16</b> .  Develop long term schedules & associated WOPs. <b>Ref Item 4.00 &amp; 4.05.</b>	Product Quality Program Leader & Senior Water Quality Scientist	Jun-17	50%	ON TRACK
3.03	4.2 (G) & R	3.2	Internal audit identified that not all CCPs are easily visible on SCADA system to confirm limits. CCP limits are hard coded.  Inconsistency of CCP SCADA limits vs CCP chart limits.	Undertake workshop to ensure CCP limits are relevant, SCADA updated to reflect this and ensure visibility of CCP limits on SCADA.  Once completed WOPs updated & associated training as required to ensure effective implementation.	Logan River breakpoint facility WOP review commenced with CCP reviews.  Develop and implemented CCP & associated WOP for any newly identified CCP sites, including SCADA updates.	Senior Water Quality Scientist & Mech & Elec Operations Program Leader	Jun-17	10%	ON TRACK
<b>Element 4: Operational Procedures and Process Control</b>									
4.00	5.2 (G)	4.2 & 9.2	Poor residual disinfection in Marsden and Greenbank water supply zones during Summer periods.	Breakpoint chlorination systems to be instigated (Illaweena & Greenbank Reservoirs) - The Logan North (Marsden/Greenbank Water Supply Zone (WSZ)) Disinfection Maintenance Program. Review effectiveness.	Review effectiveness of Disinfection Maintenance Project: LWA 90-12-97 Network Water Quality Maintenance Strategy.  <b>Ref Item 3.02 &amp; 4.05.</b>	Product Quality Program Leader & Senior Water Quality Scientist	Dec-17	30%	ON TRACK
4.01	5.1 (R) WOS 2.0	4.1	Risk Assessment: Private Works - Same staff work on wastewater and water systems and potentially same tools and equipment used. Need to confirm and develop disinfection of tools & equipment Work Operating Procedure (WOP).	Private Works - develop disinfection of tools and equipment WOP.  Need to confirm what Contractors do.	Disinfection of Tools WOP developed & currently being implemented.  Contractors follow SEQ Code.	Network Maintenance Program Leader	Jun-16	100%	COMPLETE

Item No.	G-General Improvement R-Risk Assessment NC-Non-Conformance (health exceedance)	ADWG Element & Component	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2016)	LEAD POSITION	TARGET DATE	% COMPLETE (JUN'16)	STATUS
4.02	5.1 (R) WOS 2.0	4.1	Risk Assessment: No formal potable water hygiene practises WOP exists.	Review & potentially develop formal Potable Water Hygiene Practises WOP and incorporate into future inductions and sign off (Staff & Contractors).	Incorporate hygiene practises into WOP as part of document review process to align with 5xC's philosophy.  Investigate incorporation into Water Certificate training.  <b>Ref. Item 4.03 &amp; 7.00.</b>	Network Maintenance Program Leader & Senior Water Operations Engineer	Jun-17	10%	ON TRACK
4.03	5.1 (R) DIS 4.0 WOS 2.0 2012RMIP (G7) <b>NC</b>	4.1	Risk Assessment: Need to confirm what flushing system is used when main has been not used for some time <b>and can result in E.coli incident if not effectively implemented.</b>	Undertake further WOP review in light of incident & internal audit findings: a). Flushing & Scouring of mains; b). Mains Repairs; and c). Minor Works (incl. Sampling Taps).	Further review included "key improvements" to WOPs such as improved valve isolation identification processes, hygiene practises and equipment disinfection, incorporating 5xCs philosophy ✓ Communicate changes via toolbox meetings prior implementation. <b>Ref. Item 4.06.</b>	Network Maintenance Program Leader & Senior Water Operations Engineer	Mar-17	85%	ON TRACK
4.04	5.1 (R) DIS 4.0 WOS 2.0 2012RMIP (G7) <b>NC</b>	4.1	Risk Assessment: Need to confirm what flushing system is used when mains has been not used for some time <b>and can result in E.coli incident if not effectively implemented.</b>	Undertake further WOP review in light of incident: a). Recommissioning assets such as mains that have been out of service for a period (> 4 weeks), including both planned and 'hot standby' due to emergency re-instatement.	Currently under further review.  <b>Ref. Item 4.06</b>	Network Maintenance Program Leader & Senior Water Operations Engineer	Jun-17	10%	ON TRACK
4.05	5.2 (R) DIS 4.0 WOS 2.0	4.2	Internal audit identified that routine flushing ceased 2014 post Marsden/Greenbank Disinfection project. This was a preventative measure in the previous Risk Assessment hence needs review. Additionally, with network changes since 2012 a review is warranted to identify changed/new hot spots.	Re-establish flushing program by reviewing customer complaints & water quality verification trends to identify hot spots.  Additionally Water Age modelling would also assist, noting network change ( <b>Ref Item 9.00</b> ).	Initial review indicated that routine Network Disinfection Program provided a 50-75% reduction in dirty water customer complaints indicating, generally, greater effectiveness than routine flushing. <b>Ref. Item 4.00 &amp; 9.00.</b>	Senior Water Quality Scientist & Network Maintenance Program Leader	Jun-16	100%	COMPLETE
4.06	<b>NC</b>	4.1	There have been two non-conformances relating to re-instatement of sampling taps which have either been newly installed or been out of service for some time.	Review Verification Sampling Tap installation & repair WOP to ensure disinfection of all parts and best practise Tap design, to minimise contamination risks.	<b>NEW</b> Consider incorporating tap installation process into Minor Works WOP, to ensure no accidental contamination of parts. <b>Ref. Item 4.03.</b>	Network Maintenance Program Leader & Senior Water Operations Engineer	Jun-17	0%	NEW
4.07	<b>NC</b>	4.4	<b>Also refer to Items 4.03, 4.04 &amp; 4.08 which are related.</b>		<b>NEW</b> Investigate best practise Verification Sampling Tap design.	Network Maintenance Program Leader & Senior Water Operations Engineer	Jun-17	0%	NEW
4.08a		4.3	Internal audit identified slow response to alert Water Operations &/or WPQ of unusually high turbidity &/or metals, delaying prompt response to address unexpected events. In relation to E.coli health exceedances, notification was promptly reported & well managed. <b>Ref Item 4.08b - linked.</b>	Improve response time from Verification Monitoring to promptly inform Water Operations &/or WPQ of "unusual results" for "lead indicators" such as high turbidity, colour, pH or key metals.	<b>NEW</b>	Product Quality Program Leader	Dec-17	0%	NEW
4.08b	<b>NC</b>	4.3	There have been two non-conformances relating to re-instatement of sampling taps which have either been newly installed or been out of service for some time.  <b>Also refer to Items 4.03, 4.04, 4.06, 4.07 &amp; 4.08a which are related.</b>	Investigate formalised drinking water sampling NATA accreditation, currently undertaken by NATA accredited laboratory to ensure consistency & key observations reported.	<b>NEW</b>	Product Quality Program Leader	Dec-17	0%	NEW
4.09	2012RMIP (G6)	4.4	2012RMIP (G6) To reduce the risk of contamination from properties without backflow prevention devices.	2012RMIP (G6) Residual project from Allconnex period where existing properties were mainly located in Gold Coast areas.  Investigate if project still required. Undertake project to identify the unmetered properties & install a meter with backflow prevention (ongoing project).	New properties require backflow prevention.  Review outcomes from Risk Assessment undertaken 2016.	Network Maintenance Program Leader	TBC	0%	NOT STARTED
4.10	5.1 (R) DOS 1.0 SEQ 1.0	4.3	Risk Assessment: The need for disinfection would only apply if recieved water was not adequately disinfected. Online monitoring exists at entry points with alarms. Kimberly Park (Seqwater) LCC requires read access to online monitoring.	1. Arrange online read access to Seqwater online water quality SCADA monitoring via Seqwater Protocol (Kimberley Park, Kuraby & Chambers Flat).  2. Determine when Seqwater's Kuraby Reservoir chlorination dosing system will be installed. <b>Ref Item 9.05</b>	Interfaces between Seqwater 's PLCs and LCC RTUs have been completed with mimics to be finalised ✓  Await access to Seqwater site ✓	Water Asset Management Program Leader & Telemetry Coordinator	Dec-15	100%	COMPLETE



Item No.	G-General Improvement R-Risk Assessment NC-Non-Conformance (health exceedance)	ADWG Element & Component	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2016)	LEAD POSITION	TARGET DATE	% COMPLETE (JUN'16)	STATUS
4.11	5.2 (G)	4.2	No clear <b>operational monitoring</b> program currently in place. Develop and show how to link to <b>corrective actions</b> by operations. Also relate to SCADA. Informal operational monitoring occurs as part of the Lab's routine Verification Monitoring program (i.e. HPC, etc) and ad hoc SCADA trend reviews.	Formalise operational monitoring.	Formalisation will commence post LWA project findings & recommendations. Implementation will be assisted with the development of Water Information Management System (WIMS). <b>LWA 90-12-97 Network Water Quality Maintenance Strategy.</b> <b>LWA 90-12-98 Network Water Quality Operating Strategy.</b>	Product Quality Program Leader & Network Operations Program Leader	2017/18	40%	ON TRACK
4.12	5.2 (G)	4.3	No formal <b>corrective action</b> system currently exists. Documented WOPs for corrective action to control excursions in operational parameters required.  Needs to align with updated LCC IMP.	Establish effective drinking water Corrective Action system with associated responsibilities and WOP to be developed.  Consider implementation process across all 3 Water Branches required.	Drinking water health incidents currently managed via IMP, with reporting to Regulator and long term actions captured via RMIP ✓  Use of <b>Intelix system</b> being investigated as a Corrective Action tool, including drinking water near miss incidents, to allow for communication trail & status reporting. <b>Ref. Item 11.00.</b>  Intelix recently implemented for WH&S incidents ✓	Product Quality Program Leader & Senior Water Quality Scientist	Dec-17	30%	ON TRACK
4.13	5.1 (R) DIS 1.0	4.1, 4.2 & 4.3	Internal Audit (2013) - large gaps and dirt close to vent holes found at reservoir.	<b>Short Term</b> - maintenance undertaken to promptly address gaps and vent holes. Reservoir inspection form updated and review conditions of other reservoirs.	Maintenance undertaken to promptly address gaps and vent holes.  Reservoir inspection form updated and review conditions of other reservoirs beind undertaken.	Network Operations Program Leader	Jun-16	100%	COMPLETE
4.14	5.1 (R) DIS 1.0	4.4		<b>Long Term:</b> Develop and implement Reservoir Inspection training to operational staff.	a). Reservoir inspections included in internal audits since 2015 ✓ b). On-the-job training undertaken during 3 mthly inspections Nov'15 ✓ b). Water Quality Distribution training workshop delivered by QLD Water Directorate (incl. reservoir inspections) Jul'15 ✓	Senior Water Quality Scientist & Product Quality Program Leader	Dec-16	100%	COMPLETE
4.15	5.1 (R) DIS 1.0	4.1 TR		<b>Long Term:</b> Develop and implement Reservoir Inspection training to operational staff.  Investigate on-going refresher training.	<b>NEW</b> Investigate Reservoir Inspection refresher training.	Senior Water Quality Scientist & Product Quality Program Leader	Dec-17	0% (NEW)	NEW
4.16	5.4 (G) & R	4.4	Recent internal audit found reservoir inspections and cleans were overdue (i.e. 2 yearly cleans up to one year overdue).	<b>RESERVOIRS</b> Undertake internal audit review to ensure schedules are followed and not significantly over-due (eg reservoir inspections & cleans). MEX System.	Improved Maintenance notification system (MEX) and internal audit review found schedules being followed (i.e. reservoir inspections and cleans).	Network Operations Program Leader	Dec-15	100%	COMPLETE
4.17	NC	4.4	<i>E.coli</i> incidents were a result of poor reservoir condition & design with <b>low chlorine residual</b> .	<b>RESERVOIRS</b> Trial chlorine tablets as safer alternative to liquid hypochlorite dosing to maintain chlorine residual for smaller reservoirs (short term).  Also investigate other alternatives.	<b>NEW</b> Chlorine tablet trial commenced with initial indications being effective for smaller reservoirs.	Product Quality Program Leader & Network Operations Program Leader	Mar-17	50%	NEW
<b>E5: Verification of Drinking Water Quality</b>									
5.00	6.1 (G)	5.1	A number of sampling tap sites were identified as either not representative of water supplied to customers or had WH&S issues associated with location and tap design or difficult to find.	Implement Sampling Tap Audit findings to improve WH&S and WQZ sample representation and spread, ensuring internal processes updated.	Sampling Tap Audit findings implemented (taps fixed or relocated to safer locations ensuring appropriate spread).  <b>Investigate annual sampling tap condition audit review process.</b>	Senior Water Quality Scientist	Jun-16	100%	COMPLETE
5.01	6.2 (G)	5.2	Various "disjointed" customer complaint systems exist (i.e. pathways, WWETT, various CM database (emails/letters), etc).	<b>Short term:</b> WWETT system developed to replace UMD.  <b>Long term:</b> investigation is taking place to look at "one" Customer Relationship Management System (CRM) integrated with other systems such as SAMMS.	WWETT system implemented ✓  Customer Service audit commenced by external provider. Anticipate to incorporate a CRM system, once SAMMS implemented. Limited by Corporate initiatives.  <b>Ref Item 9.02.</b>	Business & Customer Mgt Program Leader	TBC	40%	ON TRACK
5.02	6.3 (G)	5.3	Informal review of weekly/monthly lab and SCADA data currently undertaken.	Water Information Management System (WIMS) required for more efficient capture and trending of water quality information.	<b>Ref. Item 11.00</b>				
5.03	6.4 (G)	5.4	Recent internal audit found incorrect	<b>Short Term</b> - meet with staff to discuss the importance of Priority rating for health related water quality complaints.	Met with staff to discuss the importance of Priority rating for health related water quality complaints.	Water Grid & Operations Support Coordinator	Aug-15	100%	COMPLETE

Item No.	G-General Improvement R-Risk Assessment NC-Non-Conformance (health exceedance)	ADWG Element & Component	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2016)	LEAD POSITION	TARGET DATE	% COMPLETE (JUN'16)	STATUS
5.04	6.4 (G)	5.4	Priority assignment to health related customer complaints in WWETT.	<b>Medium Term</b> – investigate if health related complaints can be automatically rated a Priority 1 with current systems. <b>Long Term</b> - CRM integrated with SAMMS. Ref to Item 5.01.	Long Term - CRM integrated with SAMMS. Ref to Item 5.01.	Business & Customer Mgt Program Leader	TBC	0%	ON TRACK
<b>Element 6: Management of Incidents and Emergencies</b>									
6.01	7.2 (G)	6	LCC Incident Management Plan (IMP) requires updating to reflect improved processes.	Update LCC IMP to reflect recent workshop and training sessions.	LCC IMP updated and endorsed .	Business & Customer Mgt Program Leader	Jan-16	100%	COMPLETE
6.02	7.2 (G)	6	Internal exercises to test new IMP	Trial exercise completed July 2015 Full internal exercise planned Sept 2015 & Seqwater exercise planned Sept 2015.	Trial exercise undertaken and outcomes used to update IMP. Incorporate ongoing exercises.	Business & Customer Mgt Program Leader	Dec-15	100%	COMPLETE
<b>Element 7: Employee Awareness and Training</b>									
7.00	8.1 (G)	7.1	Internal audit review highlighted that some staff were still unsure of the DWQMP & clarity of Drinking Water Policy.	Develop & deliver DWQMP & Policy awareness/toolbox training to all Water Branch staff and possibly include in future Induction Program.	a). Policy endorsed & displayed.✓ b). Annually awareness training delivered to senior management . ✓ c). Investigate DWQMP & Policy awareness training material to be developed & implemented to all Water Branch staff, eventually via inductions.	Business & Customer Mgt Program Leader & Senior Water Quality Scientist	TBC	0% (NEW)	NEW
7.01	8.1 (G)	7.2	Recent audit identified external & OH&S training well documented however internal "on-the-job" training is not.	Develop and implement appropriate tool to document "on-the-job" training.	<b>NEW</b> Investigate future certificate training to incorporate drinking water quality component.	Network Maintenance Program Leader	TBC	0% (NEW)	NOT STARTED
7.02	8.1 (G)	7.2	Recent audit identified external & OH&S training well documented however internal "on-the-job" training is not.	Develop and implement appropriate tool to document "on-the-job" training.		Water Branch Managers	TBC	0% (NEW)	NOT STARTED
<b>Element 8: Community Involvement &amp; Awareness</b>									
8.00	9.2 (G)	8.2	Limited drinking water quality information currently exists on LCC website, like what some of the other water service providers have. On rare occasions, customers have contaminated their own water supply such as tipping old fuel/chemicals onto their lawn.	Develop and upload on LCC's public website helpful information about drinking water quality such as disinfection type, rainwater tanks, water hardness for dishwashers, avoiding contamination of own water supply.	Commenced development and upload of useful drinking water quality information onto LCC's website, including Fact Sheets and Frequently Asked Question (FAQ).	Business & Customer Mgt Program Leader & Senior Water Quality Scientist	Feb-17	85%	ON TRACK
<b>Element 9: Research &amp; Development</b>									
9.00	10.2 (G)	9.2	Water age modelling is required as inputs to review of flushing program and assist with identifying any other low residual hot spots.	Undertake Water Age Modelling for Logan to incorporate more recent network changes. Outputs will be used for various other projects such as re-establishing flushing program, network disinfection programs and identification of future chlorine booster dosing systems.	Water Age modelling undertaken together with customer complaint trending, highlighting the effectiveness of the Network Disinfection Program (NDP). <b>Ref. to Item 4.05.</b> <b>Ongoing review as systems change.</b>	Product Quality Program Leader	Jun-16	100%	COMPLETE
9.01	10.3 (G)	9.3	Document the design approaches used to ensure appropriate equipment deployed.	Document the design approaches used to ensure appropriate equipment deployed.	Exists with previous LWA however needs to be reviewed in set-up of new Alliance (LWIA). Liaise with Asset Management.	Product Quality Program Leader	Jun-17	10%	ON TRACK
9.02	5.4 (G)	4.4	Recent internal audit found reservoir inspections and cleans were overdue (i.e. 2 yearly cleans up to one year overdue).	Strategic Maintenance Management System (SAMMS) to have effective schedule systems to ensure associated escalations if due dates not met.	<b>NEW</b> The Water Branch as part of the whole of Council's approach to implement SAMMS hence timeline dependant on Cooperate progress. Water project team formed.	Water Asset Management Program Leader	TBC	5% (NEW)	NEW
9.03	NC	4.4	<i>E.coli</i> incidents were a result of <b>poor reservoir condition &amp; design</b> with low chlorine residual.	<b>RESERVOIRS</b> Development of Reservoir Strategy & Functional Specification by LWIA to address appropriate design, asset condition audits, functional specifications and optimal use.	<b>NEW</b> Reservoir Strategy and Function Specification documents in development.	Water Asset Management Program Leader	Mar-17	30% (NEW)	NEW
9.04	NC	4.4	<i>E.coli</i> incidents were a result of <b>poor reservoir condition &amp; design</b> with low chlorine residual.	<b>RESERVOIRS</b> LWIA to investigate replacement of Brosnahan reservoir.	<b>NEW</b> Investigation commenced.	Water Asset Management Program Leader	Jun-17	30% (NEW)	NEW

Item No.	G-General Improvement R-Risk Assessment NC-Non-Conformance (health exceedance)	ADWG Element & Component	ISSUES / RISKS	KEY ACTIONS	CURRENT STATUS COMMENTS (JUNE 2016)	LEAD POSITION	TARGET DATE	% COMPLETE (JUN'16)	STATUS
9.05	5.1 (R) DOS 1.0 SEQ 1.0	4.4	<i>E.coli</i> incidents were a result of poor reservoir condition & design with <b>low chlorine residual</b> .	Develop SEQ Disinfection Strategy to investigate long term solution to improve network residuals for Logan.	<b>NEW</b> Develop SEQ Disinfection Strategy to investigate long term solution to improve network residuals for Logan - commenced.	Product Quality Program Leader	Dec-16	30% (NEW)	NEW
<b>Element 10: Documentation &amp; Reporting</b>									
10.00	11.1 (G)	10.1	Internal audit identified changed or out dated document DM# used. Various doc mgt approaches exist across the various Water Branches since Allconnex dissolution. DWQMP has documented WOPs known to date.	Establish Document Control Framework Principles. Water Ops & Lab have an established but different system.	Establish Document Control Framework Principles. Investigate management tool to meet requirement needs.	Product Quality Program Leader	Dec-17	30%	ON TRACK
10.01	11.2 (G)	10.2	Various internal/external WQ reports are generated with no formal procedures.	Ensure register of reports is maintained and associated procedures developed.	Water Branch monthly Council reports undertaken which incorporate drinking water quality KPIs.	Product Quality Program Leader	Jun-16	100%	COMPLETE
10.02	11.2 (G)	10.2	Public display of DWQMP annual report will be a Regulatory requirement for 2014/15FY onwards.	Upload LCC's DWQMP annual report onto LCC website.	Finalising support information, such as suburb maps, WQZ, etc. as part of DWQMP Annual Report upload to LCC's website.	Business & Customer Mgt Program Leader & Senior Water Quality Scientist	Feb-17	90%	ON TRACK
<b>Element 11: Evaluation of Audit</b>									
11.00	12.1 (G)	11.1	Long term data is not fully evaluated or documented.	Establish Process Improvement team to commence review of medium/long term trends & identify opportunities for improvements. Investigate an integrated Water Information Management System (WIMS) with links to other systems (i.e. LIMS, SCADA, field data, etc) to enable effective long term trends.	a). Process Improvement team established reviewing trends, improvement opportunities & action effectiveness ✓ b). WIMS tender awarded. Development and implementation required to broaden trend analysis capability.	Senior Water Quality Scientist & Product Quality Program Leader	Dec-17	60%	ON TRACK
11.01	12.2 (G)	11.2	Internal audit undertaken & presented 2013, however processes for annual audit not yet established.	Establish internal annual audit review process. Investigate use of Intellex system and <b>WSA-AQuality</b> audit tool.	Established annual internal audits over next 4 years using external provider ✓ Investigate capacity & capability to undertake internal audits by LCC staff by 2018.	Senior Water Quality Scientist	Jun-18	50%	ON TRACK
11.03	12.2 (G)	11.2	External audit to be undertaken as per Regulator's "condition" of an approved DWQMP.	Arrange external audit & report findings as per Regulator's conditions prior June 2017.	Execute regulatory external audit with report findings prior <b>June 2017</b> .	Senior Water Quality Scientist	Jun-17	0%	NOT STARTED
<b>Element 12: Review &amp; Continual Improvement</b>									
12.00	13.1 (G)	12.1	Identify RMIP "none actions" which could impact the Business by RMIP annual review, which includes high risks, internal audit non-conformances and long term actions to address drinking water health incidents.	Program Leaders responsible to ensure RMIP actions implemented such as incorporation into appropriate Water Branch Plans.	Evidence of some RMIP actions incorporated into Water Branch Plans ✓ DWQMP (ADWG Component) facilitators assigned to help Program Leaders facilitate actions ✓ Investigate Intellex as appropriate tool to assist with RMIP action implementation and status reporting (Ref Item 4.12).	Water Branch Managers	Jun-17	20%	ON TRACK
12.01	13.2 (G)	12.2	Ensure RMIP is kept up to date by incorporating any new risks identified via risk assessments, incidents or internal audit findings. Communicate and implement improvements, monitoring effectiveness.	Incorporate any newly identified high risks from whole of system Risk Assessment undertaken 2016 into RMIP. Communicate changes with key stakeholders to ensure effective implementation.	<b>NEW</b> (Ref. Item 4.12 & 12.00)	Senior Water Quality Scientist	Jun-17	0%	NEW