Understanding & Optimising
Disinfection Performance in a Water
Supply Network
Case study of the Gladstone Regional Council’s
Three Scheme Network
Presentation Overview

1. Case Study Context
2. Disinfection performance Drivers
3. Case Study Methodology
4. Results
5. Sustainability of Outcomes
6. Lessons Learnt and Critical Success Factors
7. Status of Implementation
Gladstone Regional Council

- Approximately 500 kms north of Brisbane
- GRC supplies approximately 63,000 residents with drinking water across three chlorinated water supply schemes
- Region encompasses:
  - Two of the world’s largest alumina refineries
  - Queensland’s largest multi commodity port
  - Tourism (Agnes Water/1770)
  - Primary production (particularly beef cattle and timber)
Lake Awoonga WSS

Infrastructure Details
• Source: Awoonga Dam
• 2 WTPs (Owned by GAWB)
  • 9 reservoirs
  • 5 pump stations
  • 5 re-chlorination stations
• 14 reservoirs (GRC)
• 2 new reservoirs coming on line
• 2 pump stations (GRC)
• 645 kms length main (GRC)
• Supplies 56,800 residents
Agnes 1770 WSS

Infrastructure Details
- Source: Bores and Seawater
- 1 x WTP (Operated by Trility)
- 4 reservoirs
- 2 pump stations
- 36 kms length main
- Supplies 5,200 residents
Case Study Context

Miriam Vale & Bororen WSS

Bororen Infrastructure Details
- Source: Bores
- 1 x WTP
- 1 reservoir
- 1 pump station
- 5 kms length main
- Supplies 500 residents

Miriam Vale Infrastructure Details
- Source: Baffle Creek and Bores
- 1 x WTP
- 1 elevated tower
- 1 pump station
- 14 kms length main
- Supplies 500 residents
Disinfection Performance Drivers

- Raw and Treated Water Characteristics
- Water Temperature Variance
- System Water Demand and Water Age
- Reservoir Operation and Retention
- Pipe Wall Decay
- Network Configuration
• Historical Water Quality Assessment

• Hydraulic Model Development

• Chlorine MSX Model Development for Lake Awoonga Water Supply Scheme

• Three Schemes Improvement Plans
Case Study Methodology

Historical Water Quality Assessment

![Graph showing temperature over time](image1)

![Graph showing reaction over time](image2)

- Lake Awoonga (Gladstone)
- 1770-AW
- Miriam Vale
- Bororen

- Glad25C2
- Glad25C4
- Glad30C2
- Glad30C4

Temperature [deg C]

Date

0 5 10 15 20 25 30 35 40

10/06/14 18/09/14 27/12/14 06/04/15 15/07/15 23/10/15

Reaction time [h]

0 50 100 150 200

C [mg/L]
Case Study Methodology

Hydraulic Model Development

GRC Models → Input Latest Demand → Verified Models → Water Age Analysis

Graph: % Water Demand Consumed vs. Water Age (Days)

- 0%: Water Age 0-1 days
- 10%: Water Age 1-3 days
- 20%: Water Age 3-5 days
- 30%: Water Age 5-8 days
- 40%: Water Age 8-10 days
- 50%: Water Age 10-15 days
- 60%: Water Age 15-20 days
- 70%: Water Age 20-25 days
- 80%: Water Age 25-30 days
- 90%: Water Age Above 30 days

Aggregate % Water Demand Consumed
Chlorine MSX Model Development for Lake Awoonga Water Supply Scheme

- AQUASIM Decay Algorithms
- Input to MSX WQ Module of LAWSS Hydraulic Model
- Verify Chlorine Performance
- Existing Performance
- Test Improvement Performance
### Three Schemes Improvement Plans – Lake Awoonga Scheme

<table>
<thead>
<tr>
<th>Chlorine Range (mg/L)</th>
<th>Existing Chlorine Performance (% Water Demand)</th>
<th>Chlorine Performance with Improvements (% Water Demand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0.2</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>0.2-0.6</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>0.6-1</td>
<td>29%</td>
<td>33%</td>
</tr>
<tr>
<td>1-1.6</td>
<td>43%</td>
<td>1%</td>
</tr>
<tr>
<td>1.6-2</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>&gt;2</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Three Schemes Improvement Plans – Agnes Water / 1770
Sustainability of Outcomes

Operating and Communicating Protocols

- Action
- Monitor
- Review
Critical Success Factors

Chlorine (mg/L) 0.2 - 0.6 mg/L at customer tap
• Review of Sampling Program
• Agnes Waters Water Treatment Chlorine set point
• Dedicated mains
  ◦ Clint Park Reservoir
  ◦ Agnes Waters 2nd Phase
• Reservoir Levels
Thank you for listening.

Questions?