

# 1 Introduction

City Water Technology (CWT) is pleased to submit the following proposal to Warrumbungle Shire Council to undertake an options study for water supply scheme upgrades at Coolah.

## 1.1 Background

The township of Coolah is part of the Warrumbungle Shire Council (WSC) local government area. It is located 109 km southeast of Coonabarabran in the central western area of New South Wales (NSW) and has a population of approximately 129. The existing water supply system at Coolah includes a dedicated bore water supply with two reservoirs providing water security for the town.

Martin St reservoir is currently the main storage with a capacity of 1.08 ML. A secondary reservoir consisting of two hydraulically linked tanks, with a combined capacity of 0.09 ML, is located on Wentworth Avenue. Disinfection is undertaken via gas chlorination of the bore water. Disinfected water enters the rising main to Coolah where it is distributed both directly to consumers, and to the Wentworth and Martin St Reservoirs.

Currently, the Martin St reservoir is in poor condition with extensive spalling due to corrosion. Both Wentworth Avenue reservoirs and the Martin St. reservoir have observed settled and floating precipitates. There is also pH variation between the reservoirs. Previous studies report that spalling in the Martin St reservoir could be caused by aggressive CO<sub>2</sub> present in the town water supply. Council also suspects high concentrations of copper in the treated water due to bore water corrosivity and contact time with copper plumbing.

Additionally, a dedicated rising main section was constructed many years ago for the purpose of supplying the reservoirs directly, without customers on the line. Council wishes to finish this work to enable disinfection improvements by drastically improving the disinfection Ct and to reduce water age within the reticulation system.

## 1.2 Objectives and Outcomes

The key objectives to be addressed by this project are:

- ▲ Increased water stability – addressed by an options investigation for CO<sub>2</sub> removal and water stabilisation via aeration and chemical dosing;
- ▲ Determine the cause of heavy metals – high copper concentration levels have been identified. The project will identify whether this is caused by the high corrosivity of the water through analysis and testing;
- ▲ Disinfection and water age – poor disinfection and water age will be addressed via investigation of a dedicated water main to the reservoir and water stabilisation.

## 2 Methodology

### 2.1 Appreciation of Brief

We understand the brief to be as follows:

- ▲ Task 1: Objectives and Needs Understanding, including an inception meeting, review of previous reports, review of water quality data and a site visit;
- ▲ Task 2: Scoping Study, including development of a targeted water quality monitoring program, determination of Coolah water corrosivity effects and identification of a suitable WTP location;
- ▲ Task 3: Options Development, Assessment and Reporting, including development of the following:
  - ▲ Design basis;
  - ▲ Options identification, including a long list of feasible treatment options and shortlisting 3 process treatment train options;
  - ▲ Options development and assessment for the three shortlisted options, including:
    - Treatment process development;
    - High level scaled layouts and process flow diagrams;
    - Preliminary budget for capital, operating and net present value costs of each shortlisted option;
    - Comparison of shortlisted options using financial and non-financial criteria.
  - ▲ Recommendations for an improved water supply system at Coolah; and
  - ▲ A preliminary options report documenting study outcomes.

### 2.2 Copper Corrosion Considerations

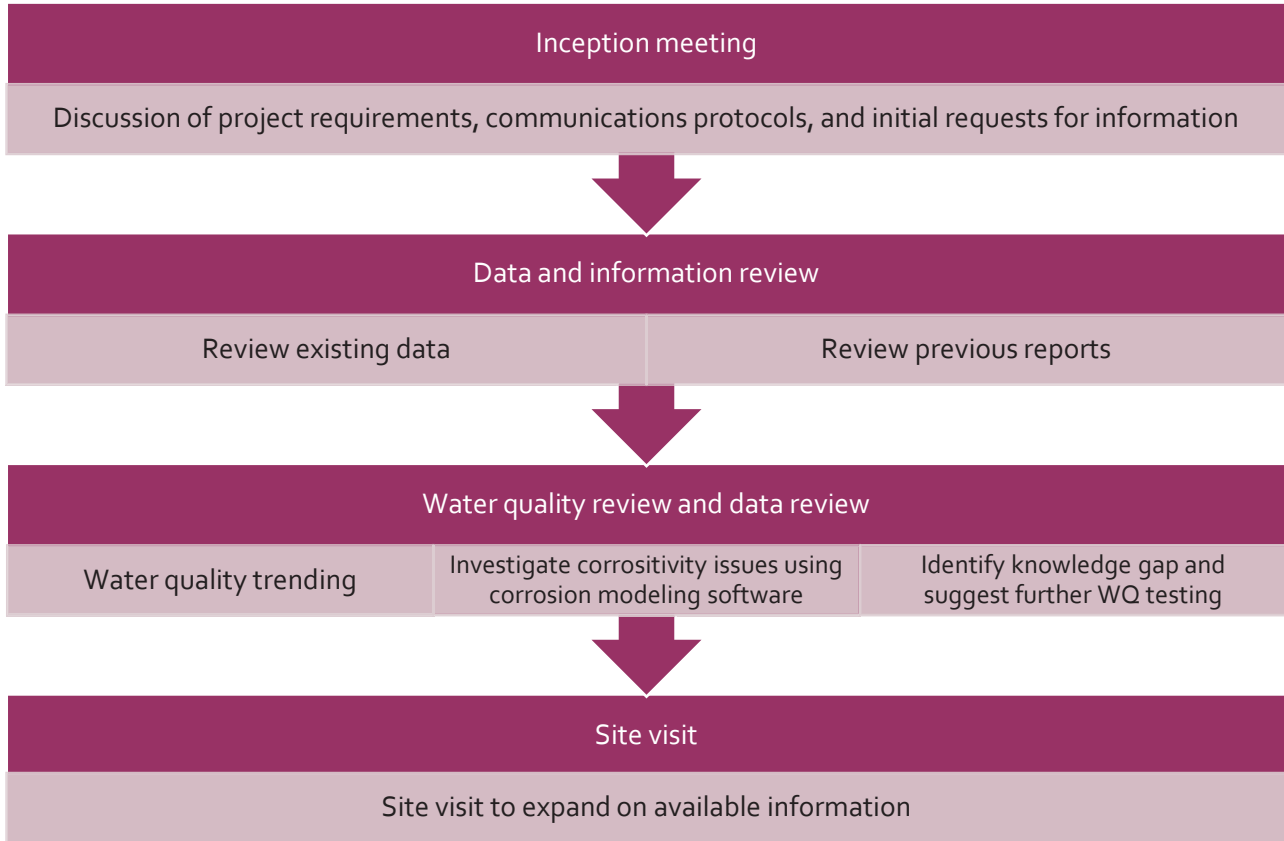
In the past, CWT was engaged by the Department of Land and Water Conservation (DLWC) to contribute to copper corrosion surveys for 128 local government councils in NSW. CWT assisted in data processing, reporting on the results of the survey and examining and identifying strategies for corrosion control.

Waters found on the east coast of Australia and Tasmania are typically low in alkalinity and hardness. Such waters can be aggressive to metals such as copper and brass and can leach various cations and anions from cement linings and concrete in pipes and reservoirs.

Copper corrosion is a complex issue and the subject has been studied all over the world. Corrosion is typically manifested as either pitting corrosion or 'blue water'. Soft cold water has often been found to lead these issues. Pitting is a damaging, localised, non-uniform corrosion that forms pits or holes in the pipe surface. 'Blue water' appears as a milky blue to green coloured water and is typically drawn off from infrequently used service lines. Discussion with local plumbers regarding the frequency and type of repairs can help pinpoint weak areas in the reticulation.

The mechanics of corrosion are influenced by several parameters. In most cases, corrosion is caused by factors including pH, alkalinity, hardness, chlorides, sulphates, temperature, and dissolved gases including free carbon dioxide, hydrogen sulphide, ammonia and oxygen. CWT will investigate these issues further within the tasks outlined in this proposal.

### 2.3 Task 1 – Objectives and Needs Assessment

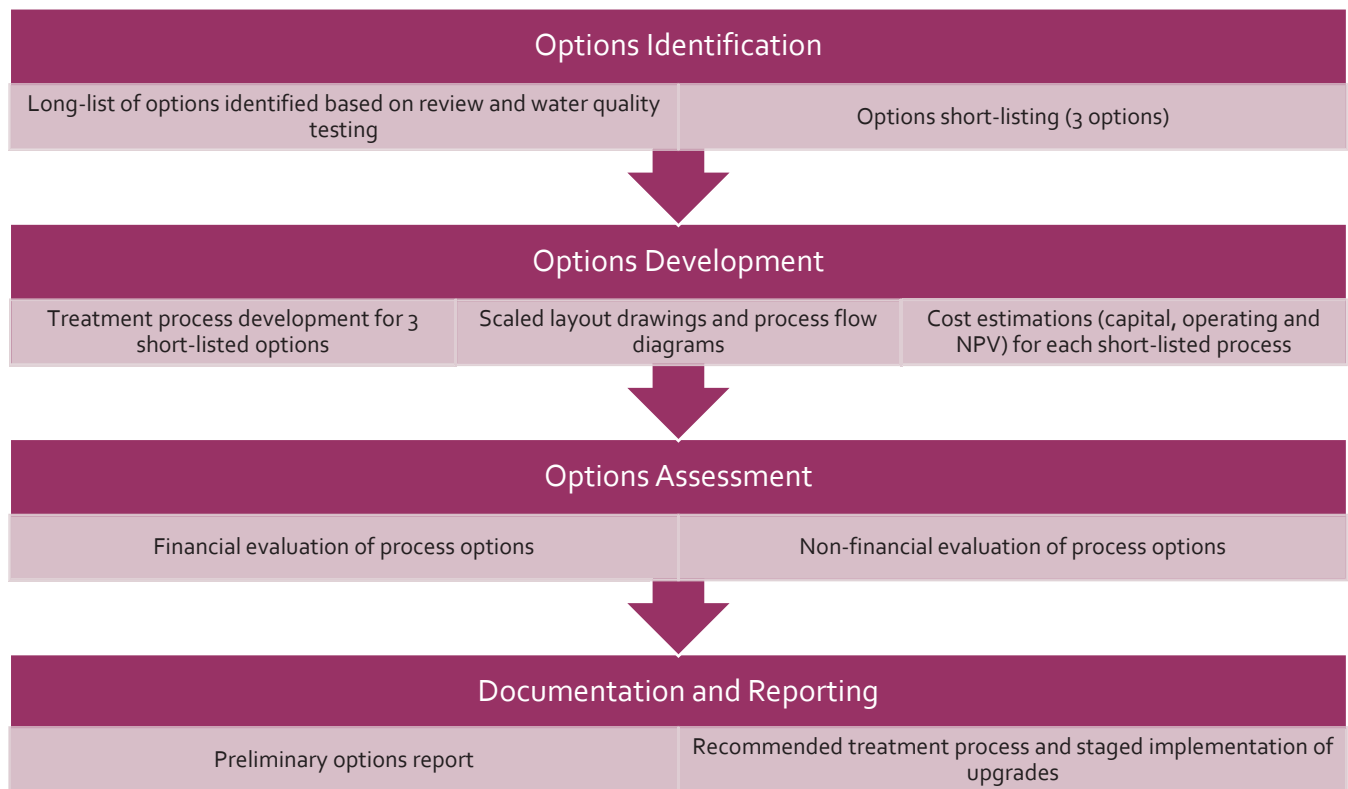


### 2.4 Task 2 – Scoping Studies

Based on the trends identified and conclusions reached from the water quality analysis undertaken during Task 1, CWT will propose a targeted monitoring program. This would likely include more sampling and testing for heavy metals, pH and disinfection residuals. Any gaps in the water quality data provided to CWT in Task 1 can be addressed via further testing in Task 2. A schedule for sampling and testing will be developed and provided to WSC.

CWT can also conduct jar tests in-house for samples collected at site. Jar tests can be used to identify the chemistry of the contaminants present in the raw water and what treatments would be optimal. Jar testing has been provided in the fee schedule of Section 7.4 and is strongly recommended. This service can be added on at any stage of the project.

## 2.5 Task 3 – Options Assessment and Development



## 2.6 Proposed Deliverables

CWT will provide the following deliverable(s) to WSC:

- ▲ Inception meeting minutes;
- ▲ Monitoring and sampling schedule for further water quality testing;
- ▲ Jar test results (should jar testing be undertaken, see Section 2.9); and
- ▲ Preliminary options assessment report, including the recommended strategy for implementing the upgrades identified.

## 2.7 Documents Received

- ▲ SSWP172 PHASE1-Coolah Water Supply System Upgrade\_Final ex prices
- ▲ SSWP172-WMB-WQ-Coolah Water Supply Scheme Upgrade - DRAFT Funding Deed ex prices
- ▲ Appendix A - Coolah WTP Previous Studies
- ▲ 5120 Coolah Water Stability Modelling – Draft
- ▲ 5148 Coolah Softening Options\_Letter of Opinion\_Draft
- ▲ 5294 HH2O - Reservoir Assessment Report - Martin St & Wentworth Avenue\_Final

## 2.8 Further Information Required

- ▲ Drawings displaying the general site layout;

- ▲ Historical water quality data (to-date) from the following sources:
  - ▲ Treated water from the Martin St reservoir and Wentworth Avenue reservoir;
  - ▲ Treated water from the existing treatment system (after chlorination); and
  - ▲ Raw water from the Coolah town bores.

## 2.9 Optional Involvement

CWT can provide optional jar testing services in-house to help determine the optimal chemical dosing and dose rates. This service can be provided at additional fees, which is discussed in Section 7.2.