

SECTION 1

Introduction

The Town of Cary's Engineering Department initiated the Water Distribution System Master Plan and Model project to develop a calibrated dynamic hydraulic and water quality model of its distribution system to use as a decision analysis tool for the planning, scheduling, budgeting, and design of water system projects in the Town's utility service area.

The primary goals of the project were to:

- Evaluate the Town's existing water distribution system, water storage tanks, pump stations, and system operations and make recommendations to improve the reliability and operation of the water system;
- Convert the previous water distribution system model to Wallingford Software's InfoWorks WS software platform, add Morrisville's distribution system to the model, and add Cary's new water system infrastructure put in place since the previous model was completed;
- Create a comprehensive, accurate, calibrated hydraulic and water quality model that reflects existing system conditions and identifies system needs to address future projected water demands;
- Prepare the model for the Town to use internally to evaluate day-to-day operations and future infrastructure projects; and
- Recommend a phased capital improvement program (CIP) of water system improvements to correct existing deficiencies and meet future needs in the most cost-efficient manner.

This Master Plan presents a description of the analyses conducted during this project, project findings, and a discussion of the phasing and timing of recommended capital projects that were determined to be beneficial for system operations. This Plan will facilitate the Town's preparation for future capital improvements to meet redundancy, capacity, and replacement challenges in the most cost-efficient manner.

1.1 Background

The Cary/Apex Water Treatment Plant (WTP) began operations in 1993 and supplies water to the Town of Cary water distribution system and the Town of Apex water distribution system. The Town of Cary's system provides water service to the Town of Cary, the Town of Morrisville, the Wake County portion of Research Triangle Park (RTP), and the Raleigh-Durham (RDU) International Airport. In 2006, the Town of Morrisville merged its system with the Town of Cary's system.

The Town of Cary's previous water system master plan was developed by CDM as presented in the *Town of Cary Water System Master Plan, March 2000*. Since 2000, growth

within Cary, Morrisville, and Apex has continued at a rapid pace. The Town of Cary recognized the need for a new master plan and associated computerized model of the distribution system to evaluate current conditions and operations, and to predict the impact of providing water service to its entire service area for the planning periods of 2010, 2015, 2025, and buildout.

The Town of Cary contracted CH2M HILL to prepare the new water distribution system master plan and develop the new InfoWorks WS computer model.

1.2 Water Quality Model

As CH2M HILL began the water quality modeling portion of this project, it was found that the water quality modeling conducted in the 2000 master plan used a water age-based approach rather than a chlorine residual-based approach. CH2M HILL's original contract scope assumed that a chlorine residual-based water quality model had previously been developed and that CH2M HILL would update the model. The Town and CH2M HILL discussed the benefits of a chlorine residual-based approach in July 2008 and determined that a contract amendment should be executed for the work needed to properly develop a water quality model within the InfoWorks WS modeling platform.

The work associated with the contract amendment should be completed by October, 2009. At that time, CH2M HILL will develop a separate addendum to this Master Plan that will summarize the approach used to develop the water quality model and present revised recommendations for capital improvement projects that are recommended in this Master Plan which may need to be modified to meet water quality performance criteria.

1.3 Previous Documents Reviewed

CH2M HILL reviewed the following documents describing previous work that had been completed for the Town of Cary associated with the water distribution system:

- *The Town of Cary Water System Master Plan*, CDM, March 2000
- *The Town of Cary Water Quality Study Report and Water Model*, CDM, November 2006 and the associated Water Distribution System Computer Model in Cyber Net 3.10
- *The Town of Cary's Water Distribution Model Time-of-Travel Calibration Technical Memorandum*, CDM, November 2006
- *The Town of Cary's Integrated Water Resources Management Plan*, CH2M HILL, June 2007
- *Towns of Cary/Morrisville Water Utility Study - Future Pressure Zone Hydraulic Modeling*, CH2M HILL and Hazen and Sawyer, April 2006
- *The Town of Cary's Initial Distribution System Evaluation Modeling Study Plan – Draft*, CDM, September 2006
- *Future Pressure Zone Hydraulic Modeling*, Hazen and Sawyer, April 2006
- *Cary/Durham Interconnection Study*, Hazen and Sawyer, March 2003

- *Raleigh/Durham Interconnect Study*, Hazen and Sawyer, 2008
- *Finished Water Pump Station Evaluation*, HDR, February 2008

1.4 Report Format

This Water Distribution System Master Plan is organized into the following sections:

- Section 1: Introduction
- Section 2: Water Demands
- Section 3: Existing Water System Operation
- Section 4: Model Development
- Section 5: Design Criteria & Preliminary Evaluation
- Section 6: Hydraulic Evaluation
- Section 7: Recommended Capital Improvement Program