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May 23, 2025

Michael S. Weber, Manager
Water & Wastewater Engineering
Groton Utilities
295 Meridian Street
Groton, CT 06340

SUBJECT: Groton Utilities Hydraulic Model Calibration, Field Verification and Water Age Analysis – Ledyard System

Dear Mike,

Wright-Pierce is pleased to submit our scope and fee proposal for water distribution hydraulic model update and water age analysis related to the operations of the Groton's water system and water supply to the Town of Ledyard.

Project Understanding

Groton's water distribution system computer hydraulic model was created in 2007 by Stantec. The latest model update and calibration was completed in 2014 by Fay, Spofford & Thorndike (FST). The model includes 171 miles of water distribution piping (125 miles of Groton's system and 46 miles of Ledyard's system) ranging in size from less than 6-inch to 36-inch water and transmission mains, water treatment plant, pumping stations, water storage tanks, pressure reducing and flow control valves and regional interconnections. The model update included incorporating the Town of Ledyard into the Groton's system and model calibration using twenty hydrant flow tests to simulate existing conditions.

In 2023, Wright-Pierce further updated the water distribution hydraulic model to include the new finish water pumps and storage tanks at the Poquonnock Road Water Plant, the upgraded Walker Hill Pump Station and storage tank, Tollgate Road and Walker Hill Road 16-inch water main and resolved other miscellaneous distribution system connectivity issues. In addition, Wright-Pierce has recommended additional field pressure and fire flow testing using flow and residual hydrants to update calibration of the model.

Additionally, GU requested to complete a water age analysis throughout the system including Ledyard system to evaluate potential solutions to improving water age and chlorine residuals.

The following scope outlines the proposed project to check and recalibrate the Groton Utilities hydraulic model of the Town of Ledyard system.

Scope of Services

Based on our understanding of the project, we propose the following scope of services:

1. Project Management:
    a. Facilitate a kickoff meeting with GU staff to review any distribution piping changes and any known closed valves since the last model update in December 2023.
2. Fire Flow Field Testing:
    a. Develop a fire flow test plan of up to 10 (1 day) hydrant flow tests in Ledyard.
    b. Field, water storage tank, pump station and hydrant flow and pressure data will be collected and will be used to calibrate the model to actual operating conditions of the system. Wright-Pierce will provide two members of staff and the required equipment to conduct fire flow tests including flow dissipaters, hydrant tools, pressure gauges and pitot gauges. All work will be coordinated well in advance with GU and Town of Ledyard. The field work will include fire flow testing to collect flow and pressure in areas of the system. We will work with GU staff to determine optimal test locations prior to conducting the proposed program of field fire flow tests. Our scope includes 4 additional hours of fire flow and field testing in the Town of Ledyard, working together with the GU staff who will provide traffic control and operate valves and hydrants. A minimum of 3 GU staff will be required during the proposed field testing.
3. Model Calibration:
    a. Wright-Pierce will replicate the hydrant flow tests in the hydraulic model, update the hydraulic model calibration, and develop tables and figures which compare model results to field test results. Wright-Pierce anticipates adjusting Hazen-William C-value coefficients to improve the model to field agreement. Because it is highly likely that anomalies (e.g., partially closed valve, air in pipes, etc.) in the water system exist that would hinder model calibration, Wright-Pierce will assist GU and the Town of Ledyard with one (1) additional day of field flow testing to further refine calibration related to flow testing, C-factor testing, and/or select valves to confirm open/closed status.
    b. Evaluate accuracy of demand allocation and controls by comparing modeled tank level trends to actual level trend measurements.
4. Water Age Analysis:
    a. Wright-Pierce will develop an extended period simulation (EPS) model scenario and calibrate model parameters to reflect daily diurnal demand patterns (under average and low flow conditions).
    b. After the extended period hydraulic and model verification efforts are complete, Wright-Pierce will develop and execute the following existing system EPS model scenarios:
        - Annual Average Daily Demand (AADD)
        - Annual Winter Demand (AAWD)
        - Annual Maximum Daily Demand (MDD)
    c. Using the revised model, develop operational and capital improvements to reasonably satisfy the goals to reduce water age in the Ledyard's system. This effort will also focus on better maintaining chlorine residuals throughout GU system and Ledyard, reducing the maximum water age and improving system flushing. The following potential improvements will be considered:
        - Increasing the rate of flow through piping in areas with low chlorine residuals based on water flow direction in the water distribution system.

- Completing loops, installing check or control valves, closing valves, and/or installing low head recirculation pumping stations.
- Beneficial unidirectional flushing locations and procedures.
- Modifying the current flushing plan (e.g., flushing locations, volumes, and times of operation) and/or installing additional automatic flushing devices in the system.

d. Observations and recommended improvements will be summarized and described as discrete projects for potential implementation.
e. Conduct one workshop with GU to review progress and refine goals.

5. Report Preparation:
   a. A draft report of the observations and recommendations will be submitted to GU and Town of Ledyard WPCA for review. Three (3) hardcopies and one (1) digital copy (PDF format) will be provided.
   b. After meeting with GU to discuss any comments, a final version of the report will be developed and submitted. Three (3) hardcopies and one (1) digital copy (PDF format) will be provided.
6. Data and services from GU:
   a. GIS shape (.shp) files of hydrants and valves locations throughout the system.
   b. GU to verify the status of valves and hydrants to be operated during field testing activities.
   c. Operational SCADA data (water plant and pump stations flows, tank levels, discharge pressures).
   d. Hydrant flushing locations.
   e. Water quality data (chlorine residuals, temperature, TTHMS).
   f. Traffic control during field testing activities.

Additional Services

During the course of the project, it may become apparent to either GU or Wright-Pierce that Additional Services not included in the basic Scope of Services are needed. Wright-Pierce will undertake to provide such Additional Services upon written authorization.

Fee Proposal

For the proposed scope of services, we propose a not-to-exceed fee of $9,500 for the Town of Ledyard system We propose these fees on a Time-and-Materials (T&M) basis. WP will not exceed the proposed fee without written authorization from GU. If this proposal is acceptable, we will perform this work under the terms and conditions of our Master Services Agreement with the City of Groton dated February 12, 2021, and amended on December 6, 2023.

Sincerely,
WRIGHT-PIERCE

Mariusz Jedrychowski, PE
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