City of Greensboro

Water Valve Criticality Assessment

SCOPE OF WORK

PROJECT UNDERSTANDING:

The City of Greensboro (City) operates over 1,500 miles of water distribution pipelines and approximately 10,000 associated water line valves in the system. The City has an internal valve maintenance program that takes place as staff time allows, but they desire to assess valve criticality in their system to help better direct future valve maintenance programs and internal programs. The City requested that Freese and Nichols (FNI) assist the City in a water valve criticality assessment using information from the City's maintenance history program and the City's water distribution system hydraulic model.

A detailed scope of work is provided below:

SCOPE OF WORK:

Task A: Data Collection and Project Coordination

1. Kickoff Meeting - FNI will conduct a kickoff meeting with City staff to discuss project goals, expectations, scope, deliverables and schedule.

2. Data Collection and Review - FNI will prepare a data request memorandum summarizing data needs for the project. This includes, but is not limited to the following:
    - Water system GIS database (including water lines, valves, meters, normally closed valves, and pressure zone boundaries)
    - Existing water system hydraulic model
    - Available maintenance history for water system valves
    - Previous valve assessment study information (downtown area)
    - Water system InfoAsset Planner database (including associated reference files)

3. Project Management – FNI will perform project management duties including preparing and updating project schedule, monthly invoicing, development of monthly progress reports, written summaries of meetings (minutes), and any informal project collaboration.

Task B: GIS Evaluation

1. Evaluate existing water distribution system GIS network to verify the existing water system isolation valves are mapped appropriately with spatial accuracy relative to the water distribution system pipe network to confirm the valves will properly associate to the water lines for the valve criticality model.
2. Provide City with statistics for number of valves that appropriately associated with water lines through the import and a list of any valves and/or components in the GIS database that did not import properly into the valve criticality model. Provide City with assistance with GIS database edits to repair valve connectivity for use in the valve criticality model.
3. Obtain and analyze water system maintenance and work order history (for up to previous 10 years) from City operations staff and incorporate with existing valve information in GIS database. Work order history must be assigned a unique facility ID by the City to pair with the correct valve in the GIS database. The work order information will be utilized to further evaluate valve criticality relative to its operability.
4. Meet with City operations staff to discuss work order information and any known problem areas. Include staff feedback from this meeting when prioritizing valve criticality.
5. Identify and map critical customers within the water system to use in valve criticality analysis. Critical customers will be based on GIS information as provided by the City staff identifying customers by user class, quantity of water use, type of use, and/or staff feedback.

Note: Based on initial review of GIS provided, water valves in the GIS database are classified by the following designations: Air release (178), blowoff (176), bypass (138), special control (11), hydrant isolation (16,479), post indicator (417), pressure zone isolation (48), pressure reducing (9), line valves (9,228), and unassigned (604). Criticality analysis will focus on the bypass, line valves and unassigned valves (as appropriate).

Task C: Water System Model Review & Set up

1. Obtain copy of the City's current water distribution (all-pipes) InfoWater model.
2. Review existing water system master plan, hydraulic model and modeling scenarios to develop an understanding of existing system operation and the background and assumptions built into the water system model.
3. In conjunction with the City staff, determine the model configuration/scenario(s) to utilize to evaluate valve criticality within the system. Scenarios may include existing topology and demands, or future topology and demand conditions. The criticality analysis may also consider normal operating conditions vs. alternate operating conditions. Identify up to two (2) scenarios to evaluate in criticality analysis.
4. Identify level of service criteria to be utilized in the analysis, which may include minimum pressures, fire flows, etc. Work with the City to identify the current level of service and desired level of service to apply to criticality analysis.

Task D: Valve Criticality Analysis

1. Develop a valve criticality model to evaluate the existing valves in the City's water distribution system based on the GIS information available.
2. Utilize the valve criticality model to assess each valve's impact on the system when that valve is closed, and impacts if that valve is inoperable, requiring other valves to be closed for system isolation purposes. Criticality results shall be based on number of customers impacted according to meter information or service laterals from the GIS, length of pipe impacted, or demand loss and reduced level of service in the system.
3. Criticality model will also include analysis of critical customers, as identified in conjunction with the City staff. Final valve prioritization will include critical customer analysis.
4. Criticality model results will be used to assist the City in prioritizing the current and future valve maintenance program. Criticality results will be provided to the City in a GIS database format.

Task E: Field Condition Assessment

1. The valve priority list generated from the Valve Criticality Analysis in Task D will be used to identify specific valves with higher criticality in the system that the City may want to further investigate through field condition assessment. A WBE Firm, Taylor Engineering, was selected to help with this task based on their past experience with water modeling and distribution systems, which complements this project.
2. FNI will contract with local WBE Firm, Taylor Engineering, to:
    a. prepare mapping and documentation for the most critical valves (as determined in conjunction with the City staff) within the distribution system based on the criticality modeling results.
    b. direct and manage the City's operations staff and/or City's valve maintenance contractor to perform field condition assessments for the most critical valves. It's anticipated that the Field Condition Assessment task will include up to 50 of the most critical valves based on the NTE budget amount for this task.
    c. prepare a rehabilitation plan with opinion of probable construction costs for any valves that are identified as inoperable through the field condition assessments.

Task F: Technical Memorandum

1. FNI will prepare a draft technical memorandum that documents the Valve Criticality Assessment process including the model development and all assumptions and recommendations from the analysis. FNI will submit an electronic copy of the draft TM in PDF format.
2. FNI will meet with the City and provide PowerPoint presentation with study results to review and solicit comments on the draft TM.
3. FNI will revise the TM to incorporate comments from the City. FNI will submit final TM report in an electronic format to the City.
4. FNI will provide City with a GIS database with results from the Valve Criticality Model and all electronic files associated with the model and results.

COMPENSATION:

FNI proposes to furnish services as described herein for the not to exceed fee of one hundred ninety-eight thousand dollars ($198,000) for Basic Services. If FNI sees the Scope of Services changing so that additional services are needed, FNI will notify the City before proceeding.

Task Description	Total Fee
Task A: Data Collection and Project Coordination	$ 17,000
Task B: GIS Evaluation	$ 22,000
Task C: Water Model Review & Setup	$14,000
Task D: Valve Criticality Model	$70,000
Task E: Field Condition Assessment[1]	$60,000
Task F: Technical Memorandum	$15,000
TOTAL	**$ 198,000**

[1]FNI will contract with local WBE firm, Taylor Engineering, in the amount of $40,000 (20%) for work under Task E – Field Condition Assessment.