

Jana Stewart, PE
Project Manager
City of Greensboro Water Resources Department
2602 S. Elm-Eugene Street
Greensboro, NC 27406

Subject:

Horsepen Creek, North Buffalo Transfer, and Bledsoe Drive Force Main Condition Assessment Proposal

Dear Ms. Stewart:

Arcadis is pleased to present this scope and price proposal for assessing the condition of the Horsepen Creek, North Buffalo Transfer, and Bledsoe Drive Force Mains.

BACKGROUND AND OBJECTIVES

Greensboro has experienced premature ductile iron force main failures in several of their force mains from internal corrosion, especially the Horsepen Creek Force main. They wish to know:

- The likely next failure locations
- An estimate of years remaining service life without intervention
- Identification of interventions and their costs and benefits
- Identification of rehabilitation and replacement options and costs

A planning workshop was held on January 11, 2018 with Greensboro to evaluate a path-forward to achieve the above objectives. After reviewing various approaches, Greensboro accepted Arcadis' recommendation to conduct a SmartBall investigation to identify air pockets as likely locations of greatest wall loss followed by BEM measurements to determine the loss of wall at key sites informed by the Smartball investigation.

We will verify through the field reconnaissance that these are the best methods of investigation. The following scope of work is based on SmartBall and BEM investigations. .

WATER

Date:

February 7, 2018

Contact:

Jim Shelton

Phone:

302 723 1450

Email:

James.Shelton@arcadis.com

Our ref:

ARCADIS G&M of North Carolina, Inc.

NC Engineering License # C-1869

NC Surveying License # C-1869

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SCOPE OF WORK

Task 1: Planning and Recon

Arcadis will examine the record plans for the three force mains to develop an intimate understanding of plan, grade, fitting, access, ARV, and blowoff arrangements of each force main. Arcadis will walk the entire alignment to ground truth the plans, assess grade and alignment change issues, and look for evidence of small leaks expressions at grade. Arcadis will examine each pump station and discharge point to evaluate Smartball introduction and retrieval options. Arcadis will escort PURE for their planning evaluations regarding Smartball inspections. Arcadis will identify potential locations to excavate potholes for BEM remaining pipe wall measurements and walk these sites with Greensboro staff, and identify nearby metal pipes, high voltage power sources, and nearby high volume traffic (all of which affect time to conduct BEM) . Final selection of BEM sites will be done after completion of SmartBall work.

Task 2: SmartBall Investigation

Arcadis will engage PURE to conduct their Smartball investigations to identify air pockets, which are locations of accelerated corrosion, of all three force mains. Arcadis will interpret the Smartball findings and suggest changes to the planned BEM excavation locations.

Task 3: Broadband Electro Magnetic Pipe Wall Investigation

Arcadis use the RockSolid BEM tool to determine pipe wall thickness. For the purposes of this scope of work we have assumed 12 crown measurements (air pocket corrosion is typically worse at the crown) and 3 full 360° measurements. We have assumed that Greensboro will excavate all holes needed to complete this work, including shoring, traffic/pedestrian safety, spoils handling, backfill, and site restoration at all sites, and that the excavations will be prepared such that BEM work can be completed within a single two-week period. Arcadis will interpret the BEM findings and determine remaining wall thickness.

Task 4: Data Assessment and Reporting

Arcadis will identify the likely next failure locations, estimate of years remaining service life without intervention, identify interventions and their costs and benefits, and identify rehabilitation and replacement options and costs. These assessments and findings will be prepared in a technical memo and in a Powerpoint presentation. Arcadis will present the findings at a workshop held at Greensboro.

GREENSBORO RESPONSIBILITIES

Greensboro will be responsible for the following:

1. Furnish Arcadis with all available GIS databases for the site.

2. Furnish Arcadis with all available record plans, including plans/profiles, technical specifications, original inspection reports, photos, and tests for each force main.
3. Furnish Arcadis with record plan information and current pump flow and pressure information for each of the three pump stations.
4. Furnish Arcadis with piping record plans for the three pump stations.
5. Escort Arcadis during pump station site reconnaissance.
6. Operate the pump stations so we can evaluate the operability of each ARV.
7. Support SmartBall testing including check valve disassembly and reassembly and or any flow control protocols necessary.
8. Escort Arcadis on all force main walks.
9. Open ARV vaults and conduct confined space entries to demonstrate operability of isolation valve.
10. Excavate all holes needed to complete BEM work, including shoring, dewatering, traffic/pedestrian safety, spoils handling, backfill, and site restoration at all sites, and complete this work such that BEM work can be completed within a single two-week period. Full 360° BEM testing requires 4 lf of pipe be exposed (no bell), including 2' under the invert. Crown BEM testing requires 1 lf of pipe be exposed (no bell) to the spring line with 6 inches clear between the springline and the shoring/excavation.

DELIVERABLES

1. Initial excavation site figures
2. SmartBall data findings
3. Final excavation site figures
4. BEM data findings
5. Technical Report of findings and recommendations

SCHEDULE

Arcadis will work with Greensboro to determine appropriate schedules for this work. The SmartBall work typically needs to be scheduled 3 months in advance. Smartball findings are typically available 8 weeks after field work. The BEM work typically needs to be scheduled 10 weeks in advance. BEM findings are typically available 4 weeks after field work. We expect to deliver the Technical report 3 months after completion of fieldwork.

BUDGET ESTIMATE

Arcadis proposes to perform the services indicated above on a cost reimbursement fee basis with a 3.2 multiplier on direct labor, plus expenses at a 1.0 multiplier, plus subcontractors at a 1.1 multiplier.

We estimate the cost for this effort will be \$360,000, as shown in the below task breakdown.

Task	Hours	Expenses	Subcontractors	Total Cost
Planning and Recon	170	\$2000	\$29,000	\$63,000
SmartBall Investigation	150	\$2000	\$189,000	\$225,000
Broadband Electro Magnetic Pipe Wall Investigation	160	\$15,000	\$17,000	\$55,000
Data Assessment and Reporting	85	\$2000		\$17,000
Total	565	\$21000	\$235,000	\$360,000

Arcadis will track the costs associated with this work and report to Greensboro monthly throughout the project; we will not exceed the authorized budget without written professional services authorization from Greensboro. Payment for services will be based upon the actual labor and expenses incurred. When the invoiceable fees reach 85 percent of the budget, Arcadis will advise Greensboro's project manager in writing with an opinion on whether the budget would be exceeded based on the extent of remaining services anticipated at the time of such estimate. The total fee amount will not be exceeded without prior authorization by Greensboro, therefore the scope of services may be adjusted by Greensboro to remain within the project budget.

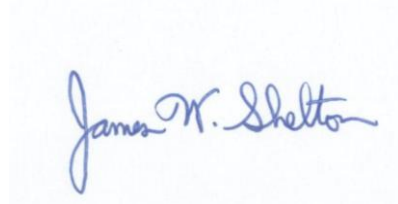
MBE/WBE INVOLVEMENT

Much of the project cost is comprised of specialized testing subcontractors, BEM subconsultants and Smartball subconsultants. Arcadis will utilize Critek, an MBE firm, will provide excavation oversight prior to the BEM work. Their time is approximately 50 hours, or \$5,000. This represents about 10% of the non-specialized testing hours (or about 5% of the non- specialized project cost.)

Should you have questions or comments on this proposed scope of professional services and fee proposal, please contact me.

Sincerely,

Arcadis G&M of North Carolina, Inc.



James W. Shelton, PE
Vice President