

Mr. Danny Briggs  
City of Greensboro  
Water Resources Department  
2602 S. Elm-Eugene Street  
Greensboro, NC 27406

Arcadis G&M of North Carolina,  
Inc.  
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Greensboro  
North Carolina 27409  
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Subject:  
City of Greensboro, NC  
Proposal for Engineering Services  
Phase I: Design Services  
Townsend WTP Improvements 2020:  
Phase II Major Electrical/High Service Pumping/Sedimentation  
Basins/Chemical Trench Improvements

WATER

Date:  
December 12, 2019

Contact:  
Dennis Kachmarsky, PE

Dear Mr. Briggs:

Arcadis G&M of North Carolina, Inc. (Arcadis) is pleased to submit our proposal to provide engineering services for the study and design for the Phase II Major Electrical/High Service Pumping/Sedimentation Basins/Chemical Trench Improvements project at the Townsend Water Treatment Plant. This project includes four major elements as follows:

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- Major Electrical Improvements
- High Service Pumping Improvements
- Sedimentation Basins Improvements
- Chemical Trench Improvements

ARCADIS G&M of North Carolina, Inc.

NC Engineering License # C-1869  
NC Surveying License # C-1869

The project considerations and proposed Scope of Services are based on our meetings with the City and our field review of the anticipated work areas. The project will be executed as a Construction Manager At Risk. **This scope of services is for Phase I: Design Services.**

## SCOPE OF SERVICES

The proposed Scope of Services is detailed in Attachment A: Townsend WTP Improvements 2020: Phase II Major Electrical/High Service Pumping/Sedimentation Basins/Chemical Trench Improvements.

Arcadis proposes to complete the study and design utilizing a team of subconsultants as follows:

- Clemson Engineering Hydraulics, Inc.: Physical Modeling
- CITI, LLC: Automation / Controls Engineering
- S&ME, Inc.: Geotechnical: Test Borings and Evaluation
- SAMR, Inc.: Electrical Studies and HVAC/Plumbing Design
- Shermin Ata, Architect, PLLC: Code Compliance, Design and Drafting
- Stewart Engineering, Inc.: Site Surveying and High Definition Scanning
- Taylor Engineering & Consulting, PLLC: Process Mechanical Design

## SCHEDULE

Arcadis is positioned to begin work on this project immediately following written authorization and receipt of an executed supplemental agreement. Arcadis anticipates authorization in a few months and execution of work over a subsequent 15-month period.

## FEE PROPOSAL

Arcadis proposes to provide the engineering services defined in the Scope of Services (Attachment A) for a lump sum fee of \$2,385,000. Included in the fee is a separate task for an “Additional Design Reserve” of \$150,000.

Our proposed fee includes MWBE participation as follows:

CITI, LLC	MBE	\$ 30,000	1.26%
SAMR, Inc.	MBE	\$140,000	5.87%
Stewart Engineering, Inc.	MBE	\$ 22,930	0.96%
MBE Totals		\$192,930	8.09%
Shermin Ata, Architect, PLLC	WBE	\$ 35,000	1.47%
Taylor Engineering & Consulting, PLLC	WBE	\$ 100,000	4.19%
WBE Totals		\$135,000	5.66%
Total M/WBE		\$327,930	13.75%

We look forward to serving the City of Greensboro on these important improvements by providing the proposed engineering services. If this proposal meets your approval, please provide a Supplemental Agreement to our existing On-Call Engineering Services Agreement for execution. Thank you again for this opportunity to serve the City.

Sincerely,

Arcadis G&M of North Carolina, Inc.



Dennis J. Kachmarsky, PE  
Project Manager

Copies:

Mr. Dell Harney, City of Greensboro

Mr. David Hamilton, Arcadis

*This proposal and its contents shall not be duplicated, used or disclosed — in whole or in part — for any purpose other than to evaluate the proposal. This proposal is not intended to be binding or form the terms of a contract. The scope and price of this proposal will be superseded by the contract. If this proposal is accepted and a contract is awarded to Arcadis as a result of — or in connection with — the submission of this proposal, Arcadis and/or the client shall have the right to make appropriate revisions of its terms, including scope and price, for purposes of the contract. Further, client shall have the right to duplicate, use or disclose the data contained in this proposal only to the extent provided in the resulting contract.*

**ATTACHMENT A**  
**Townsend WTP Improvements 2020: Phase II Major Electrical/High Service**  
**Pumping/Sedimentation Basins/Chemical Trench Improvements**  
**City of Greensboro, NC**  
**Contract No. \_\_\_\_\_**

**SCOPE OF SERVICES**  
**(CMAR – Phase I: Design Services)**  
**December 12, 2019**

**OVERALL PROJECT**

This project is identified in the City's Fiscal Year 2018-2019 Capital Improvements Program (CIP) for Planning/Design. The project is currently titled "Townsend – Major Electrical and Genset – Phase II" within the CIP but has evolved to include improvements to High Service Pumping, the Sedimentation Basins and addition of Chemical Trenches. One important goal of this project is to provide "redundancy and resiliency" of finished water delivery from the City's treatment facilities through implementation of these improvements.

This project will be formally titled "Townsend WTP Improvements 2020: Phase II Major Electrical / High Service Pumping / Sedimentation Basins / Chemical Trench Improvements".

**SCOPE UNDERSTANDING**

The Townsend WTP Major Electrical project involves these elements:

- Major Electrical Improvements
- High Service Pumping Improvements
- Sedimentation Basin Improvements
- Chemical Trench Improvements

**It is understood that the resulting construction project will be delivered through a Construction Manager At Risk (CMAR) method.**

The scope of improvements for each element is outlined in the following sections and is the basis for the scope of engineering services.

**Major Electrical Improvements Overview**

- Evaluate standardizing voltage services and design necessary improvements
- Evaluate Low Lift Pump Station transformers and design necessary improvements
- Evaluate level of resiliency options as required by the City, considering pumping requirements, duration of crisis and fuel storage requirements
- Evaluate diesel vs. natural gas generators (High Level Evaluation)
- Design a second standby generator
- Design a diesel fuel storage and delivery system
- Evaluate upgrading or replacing switchgear
- Address harmonics and lightning protection with appropriate designs

- Provide guidance for Real-Time Monitoring and implement necessary improvements
- Instrumentation for proposed work
- HVAC Improvements
- Energy Study (LEED) for improvement areas

### **High Service Pumping Improvements Overview**

- Concept (High Level) evaluation of converting high service pumping system with vertical turbine pumps.
- Hydraulic analysis of suction conditions for High Service Pumps (HSP's)
- Physical modeling of suction piping system
- Hydraulic analysis of discharge conditions for HSP's
- Hydraulic analysis of system for multiple pump operational scenarios, including replacement of HSP No. 2 and/or add a fourth HSP
- Replace "Godzilla" HSP, motor and VFD
- Replace diesel engine HSP with new pump, motor and VFD
- Replace HSP No. 2, motor and VFD
- Add a fourth HSP
- Replace furnished water flow meters with full-bore magnetic flow meters
- Evaluate need to maintain 30 MGD Low Lift Pump
- Evaluate options and design valve/valve vault on high lift pump suction piping from clearwell
- Evaluate floor surface drainage issues in the instrument room and chemical day tank areas; and, design necessary improvements
- Evaluate and implement an automated high service pump drive power monitoring system

Drawings developed for the High Service Pumping Improvements will be from a 3D Model generated in REVIT.

### **Sedimentation Basin Improvements Overview**

- Replace sludge collectors in all three Sedimentation Basins
- Abandon/Removal obsolete systems
- Basin railing modifications
- Evaluate and implement an automation program for the sludge removal system

### **Chemical Trench Improvements Overview**

- Design Chemical Trenches from the Filter Building and Administration Building to the Rapid Mix; and for Pre-Filter chemical feeds, fluoride system and basin settled water sampling.

Our proposed scope of engineering services to evaluate and design the anticipated improvements outlined in the SCOPE UNDERSTANDING section is as follows.

## ***TASK 1: PROJECT MANAGEMENT***

Task 1.1 – Provide overall project management of the design process including project planning, budget and schedule oversight, along with administration of the engineering Agreement.

Task 1.2 – Provide management of our subconsultant team, contract administration and monitor M/WBE goal conformance.

Task 1.3 – Arrange and manage meetings including project kick-off meeting; monthly project status meetings; workshops; CMAR review meetings; coordination meetings with other consultants; subconsultant meetings; review meetings at 30%, 60%, and 90% deliverables; and special meetings as required to manage the design.

Task 1.4 – Complete project close out activities including documentation of quality assurance and control, and project recordkeeping.

## ***TASK 2: CMAR-RELATED SERVICES***

### Procurement Phase

Task 2.1 – Working with the City, develop a DRAFT Request for Proposals (RFP) to select a contractor firm to provide Construction Manager at Risk (CMAR) services. The RFP will be customized for the specifics of this project.

Task 2.2 – Meet with the City to review the DRAFT RFP and address comments. Finalize the RFP for advertising.

Task 2.3 – Assist the City during the solicitation period by responding to questions and support in the preparation of addenda.

Task 2.4 – Provide consultation and RFP review assistance to the City during the RFP evaluation process.

Task 2.5 – After selection of the CMAR firm, perform a review of the anticipated CMAA contract between the City and the CMAR firm for coordination with the Design Services Agreement between the City and Arcadis.

### Design Services Phase

Task 2.6 – Participate in a CMAR-led Kick-Off/Coordination Meeting to review the project approach, schedule, budget, key milestones and communication protocol.

Task 2.7 – Participate in monthly progress meetings led by the CMAR firm.

Task 2.8 – Submit 30% Design Package to the CMAR contractor for review and hold a Value Engineering meeting to address comments. Incorporate required revisions in the 60% Design submittal.

Task 2.9 – Submit 60% Design Package to the CMAR contractor for review and hold a Value Engineering meeting to address comments. Incorporate required revisions in the 90% Design submittal. Provide bid package assistance as required by the CMAR firm.

Task 2.10 – Submit 90% Design Package to the CMAR contractor for review and hold a Value Engineering meeting to address comments. Incorporate required revisions in the 100% Design submittal. Provide bid package assistance as required by the CMAR firm.

Task 2.11 – At each submittal, provide consultation and information to the CMAR firm for project schedule updates and cost updates.

### ***TASK 3: 30% DESIGN***

Task 3.1 – Arrange and hold a Kick-Off Meeting to initiate the design, confirm scope and schedule, establish communication and coordination protocols, request information and lay-out initial design activities.

Task 3.2 – Obtain and review pertinent data from the City including, but not limited to, drawings, technical specifications, shop drawings, maintenance and repair records, operations procedures, reports, testing data and other information as necessary.

Task 3.3 – Perform a field assessment of the improvement areas to document existing facilities and obtain critical dimensions to be used in the design and drawing development.

Task 3.4 – Perform a concept-level evaluation of switching to vertical turbine style high service pumps.

Task 3.5 – Review the City furnished hydraulics study of the high service pumping system to understand current and expected hydraulic performance and limitations. Assess available pumping records to establish maximum-minimum-average flow conditions.

Task 3.6 – Perform hydraulic calculations to determine the expected flow and head conditions under a range of pumping scenarios for the anticipated high service pumping improvements. Evaluate operation of the new high service pumps with the remaining existing pumps. Assumes City will provide flow and corresponding pressure data based on City's current hydraulic model.

Task 3.7 – Perform harmonic analysis for selection of proper drive harmonic mitigation methods.

Task 3.8 – Evaluate available pumps from various manufacturers to meet the established range of pumping conditions and make a preliminary pump selection, considering Hydraulic Institutes best practices where achievable.

Task 3.9 – Develop a Technical Memorandum summarizing the high service pumping hydraulics (minimum-average-peak flows) evaluation and preliminary pump, motor and variable speed drive recommendations.

Task 3.10 – Manage and complete a **PHYSICAL MODEL** of the high service pumping suction piping. Modeling to be performed by Clemson Engineering Hydraulics, Inc.

Task 3.11 – Evaluate need to maintain 30 MGD Low Lift Pump.

Task 3.12 – Evaluate and design incorporation of valve and valve vault on high lift pump suction piping from clearwell.

Task 3.13 – Evaluate and implement floor surface drainage improvements in the instrumentation room and chemical day tank areas.

Task 3.14 – Evaluate standardizing voltage services.

Task 3.15 – Evaluate Low Lift Pump Station transformers.

Task 3.16 – Evaluate level of resiliency options as required by the City.

Task 3.17 – Evaluate diesel vs. natural gas generators (High Level Evaluation).

Task 3.18 – Evaluate upgrading vs. replacing switchgear.

Task 3.19 – Perform an Energy Study (LEED) for improvement areas.

Task 3.20 – Evaluate and design improvements to automate the Sedimentation Basin's sludge removal system utilizing sludge blanket level analyzers.

Task 3.21 – Evaluate and design improvements to automate the high service pump drive power monitoring features.

Task 3.22 – Perform field survey of improvement areas as needed and 3D Scanning of the High Service Pumping area.

Task 3.23 – Perform geotechnical evaluation for improvement areas as needed.

Task 3.24 – Prepare base drawings of the improvement areas, plans and sectional plans.

Task 3.25 – Prepare preliminary demolition drawings reflecting removal of equipment, systems and structures.

Task 3.26 – Develop preliminary design and drawings for proposed major electrical, high service pumping, flow meter replacement, sedimentation basin and chemical trench improvements. Preliminary drawings for the High Service Pumping area will be generated from a 3D REVIT model.



Task 3.27 – Based on preliminary selection of major electrical and process mechanical equipment items, annotate and provide manufacturer cut-sheets/data sheets representing selected equipment and features.

Task 3.28 – Identify structural and mechanical (HVAC) support needed for the improvements.

Task 3.29 – Prepare a preliminary table of contents for technical specifications using the CSI 50-Division format.

Task 3.30 – Perform an internal quality assurance review of the various evaluation reports, preliminary drawings and equipment cut-sheets/data sheets. Address comments and revise documents accordingly.

Task 3.31 – Prepare an initial preliminary opinion of probable construction costs for the proposed improvements.

Task 3.32 – Submit the 30% Design Package to the City for review. Five copies will be provided. Allow for a two-week review period.

Task 3.33 – Meet with the City to review the 30% Design Package and discuss City comments. City comments and required revisions will be addressed and incorporated in the 60% Design submittal.

#### ***TASK 4: 60% DESIGN***

Task 4.1 – Finalize engineering calculations and design of switchgear, generator, fuel system, high service pumps, sedimentation basin equipment and Chemical Trenches. Update and finalize Technical Memoranda.

Task 4.2 – Further the design development of the demolition drawings with additional plans, sections, details and notes.

Task 4.3 – Further the design development of the major electrical, high service pumping, sedimentation basin improvements, including instrumentation; along with drawing development with additional plans, sections, details and notes.

Task 4.4 – Develop structural and mechanical (HVAC) discipline designs to support the designed improvements. Prepare preliminary drawings for each of these disciplines.

Task 4.5 – Update the technical specifications table of contents to reflect design development; prepare draft technical specifications for major process mechanical and electrical/equipment; include pre-edited standard specifications for remaining, anticipated equipment and materials for civil, structural, electrical and mechanical disciplines.

Task 4.6 – Identify and draft required permits for execution of the proposed work. Permits are anticipated for public water supply, building code compliance, and through the City’s Technical Review Committee site design approval process.

Task 4.7 – Perform an internal quality assurance review of the drawings, technical specifications and front end documents. Address comments and revise documents accordingly.

Task 4.8 – Update the opinion of probable construction costs to reflect the design progress.

Task 4.9 – Submit the 60% Design Package to the City for review. Five copies will be provided. Allow for a three-week review period.

Task 4.10 – Meet with the City to review the 60% Design Package and discuss City comments. City comments and required revisions will be addressed and incorporated in the 90% Design submittal.

### ***TASK 5: 90% DESIGN***

Task 5.1 – Complete all drawings and technical specifications.

Task 5.2 – Complete all required permit applications, ready for submittal.

Task 5.3 – Perform an internal quality assurance review of the drawings, technical specifications and Front-End documents. Address comments and revise documents accordingly.

Task 5.4 – Complete the opinion of probable construction costs and construction project delivery schedule.

Task 5.5 – Submit the 90% Design Package to the City for review. Five copies will be provided. Allow for a three-week review period.

Task 5.6 – Meet with the City to review the 90% Design Package and discuss City comments. City comments and required revisions will be addressed and incorporated in the Final Design submittal.

### ***TASK 6: FINAL DESIGN***

Task 6.1 – Finalize all drawings, technical specifications and Front End documents.

Task 6.2 – Re-evaluate the scope and character of the construction project and the opinion of probable construction costs for MWBE opportunities.

Task 6.3 – Deliver to the City an electronic file and five hard copies of all the final design drawings and final Project Manual.

### **SUBCONSULTANT TEAM**

ARCADIS proposes to complete the design of the overall project with the assistance of the following subconsultants.

- |  |     |
|--|-----|
| • CITI, LLC: Automation / Controls Engineering                           | MBE |
| • Clemson Engineering Hydraulics, Inc.: Physical Modeling                |     |
| • S&ME, Inc.: Geotechnical: Test Borings and Evaluation                  |     |
| • SAMR, Inc.: Electrical Studies and HVAC/Plumbing Design                | MBE |
| • Shermin Ata, Architect, PLLC: Code Compliance, Design and Drafting     | WBE |
| • Stewart Engineering, Inc.: Site Surveying and High Definition Scanning | MBE |
| • Taylor Engineering & Consulting, PLLC: Process Mechanical Design       | WBE |

## RESPONSIBILITIES OF THE CITY

It is our understanding that the City will be responsible for the following:

1. Furnish available information pertinent to the project to allow Arcadis to provide the scope of services contained herein. As-built drawings for the areas of work, system hydraulic information, pump curves and other necessary data.
2. Permit review fees will be the responsibility of the City.
3. Provide personnel to identify and open electrical panels.
4. Provide payment for independent third-party services as needed (and pre-approved). It is unlikely that any third-party services will be required for this project.
5. Arrange safe access onto the plant site for Arcadis to perform the scope of services. Arcadis staff will follow City of Greensboro or Arcadis safety requirements, whichever are stricter, when on site.
6. Provide, as required for the project, accounting, financial, insurance, or legal advisory services to address issues that the City requires, or Arcadis reasonably requests.
7. The City will give prompt notice to Arcadis when the City becomes aware of any environmental condition (hazardous or otherwise), or other developments that effect the scope or schedule of services provided by Arcadis.
8. Advise Arcadis of associated project issues as they arise, such as change in scope or schedule.

## SUBSEQUENT PROJECT PHASES

CMAR Phase II: Construction Administration and Resident Project Representation services can be provided to assist the City in implementation of this project under a separate proposal at the time these services are required.