

SUPPLEMENTAL AGREEMENT

ON-CALL CONTRACT

CITY OF GREENSBORO
GUILFORD COUNTY
NORTH CAROLINA

THIS SUPPLEMENTAL AGREEMENT to an On-Call Professional Services Agreement, made _____, by and between the CITY OF GREENSBORO, a municipal corporation in Guilford County, North Carolina, hereinafter called the "CITY" and of Hazen and Sawyer, P.C., hereinafter called the "CONSULTANT,"

WITNESSETH:

WHEREAS, the City has entered into an On-Call Professional Services Agreement dated January 29, 2014 for a duration of three years with the Consultant and allows for two (2) extensions of one year each; and

WHEREAS, pursuant to said Agreement the Consultant has contracted to perform various professional services described therein as requested by the City for various public works projects; and

WHEREAS, the City desires the Consultant to perform the said Design Services for the Townsend Water Treatment Plant Basin and Filter Improvements according to the terms of the Agreement and the letter attached hereto;

NOW, THEREFORE, it is hereby agreed that the Consultant will perform the professional services described in the attached letter dated February 7, 2014, the letter being incorporated herein by reference. It is further agreed that the charges and fees for the described services shall not exceed the total sum of \$545,000. The services shall be performed according to the terms and conditions as described in the basic Professional Services Agreement dated January 29, 2014 to which this Agreement is supplemental.

The Consultant shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes at all times during the term of this contract. The Consultant shall also require that all of its sub consultants that perform any work pursuant to this contract comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes. The terms "Consultant", "Sub Consultant" and "comply" shall have the same meanings intended by Chapter 160A Section 20.1(b) of the North Carolina General Statutes. Violation of this E-VERIFY section shall be deemed a material breach of this Agreement and can result in stoppage of the work by the Owner.

4944 Parkway Plaza Blvd.
Suite 375
Charlotte, NC 28217

704 357-3150
hazenandsawyer.com

February 7, 2014

Michael M. Borchers, PE, CFM
Engineering Manager
Water Resources Department
City of Greensboro
2602 S. Elm-Eugene Street
Greensboro, NC 27402

**Re: Townsend Water Treatment Plant
Basin and Filter Improvements
Engineering Proposal and Scope of Work**

Dear Mr. Borchers,

Thank you for the opportunity to submit this proposal and scope of work. The purpose of this project is to design flocculation basin and filter improvements at the Townsend WTP. The flocculation basins presently use technology pre-dating the 1960s which is now outdated, oversized, and maintenance intensive. Similarly, the Townsend WTP filters use an old technology for backwashing and are not automated. Filter operation is manually controlled by plant staff. Automation of filter controls is a common practice at modern WTPs, providing more consistent and efficient operation of the filtration process.

Hazen and Sawyer and our sub-consultants, SL King and Associates, Inc. and Ellum Engineering, Inc., both of whom are certified M/WBE firms with the City of Greensboro, propose to perform the engineering design as described in the attached scope of work for a **lump sum amount of \$545,000**, which includes costs for all labor, expenses, and sub-consultants for the design of **Townsend Water Treatment Basin and Filter Improvements. The M/WBE Percentage** of the lump sum amount is **10%**. Attached is the signed M/WBE Professional Services Certification.

Hazen and Sawyer thanks the City for this opportunity and we look forward to working on this important project. Should you have any questions, please do not hesitate to call.

Very truly yours,

Hazen and Sawyer, P.C.

A handwritten signature in blue ink, appearing to read "Jay C. Jackson", with a long horizontal flourish extending to the right.

Jay C. Jackson, P.E.
Vice President

City of Greensboro
M/WBE Professional Services Certification

The City of Greensboro's Minority and Women Business Enterprise (M/WBE) Program provides minority and women owned firms an equal opportunity to participate in all aspects of the City's contracting and purchasing programs. The City encourages prime consultants/contractors to take affirmative steps to provide M/WBEs an opportunity to participate on projects whenever they are potential sources of goods and services.

Please provide information on efforts undertaken by the consultant/contractor to include minority and women owned firms on the project or the consultant/contractor may submit documentation verifying that it is normal work practice to perform the work with its own workforces. Contact the M/WBE office at (336)373-2674.

The M/WBE Directory is located at www.doa.state.nc.us/hub/swuc.htm

We, **HAZEN AND SAWYER, P.C.** do certify that on **Townsend Water Treatment Plant Basin and Filter Improvements**

(Please select applicable line)

 X **A.** The consultant/contractor will use subconsultants/subcontractors to fulfill the requirements of the contract. **(Proceed to section 1)**

 B. The consultant/contractor will perform the total contract with its own workforce and without the use of subconsultants/subcontractors. **(Proceed to section 2)**

- 1.** The consultant/contractor certifies that it will expend a minimum of **10 %** of the total contract dollars with M/WBE subconsultants/subcontractors.

The consultant/contractor further states that he or she will enter into an agreement with certified M/WBE(s) for the described work and dollar value listed below upon execution of a contract with the City of Greensboro.

Name	Description of Work	Dollar Value
SL King and Associates, Inc.	Electrical Engineering and Design	\$49,675
Ellum Engineering, Inc.	Hydraulic Analysis	\$ 4,800

- 2.** The consultants/contractor certifies that it will perform the total contract with its own workforces and without the use of subcontractors.

- a.** The consultant/contractor states that it is the normal business practice of the company to perform all elements of the contract with its own work force without the use of subconsultants/subcontractors;

OR

- b.** The consultant/contractor in fact has demonstrated its capabilities to perform all elements of the contract with its own work force without the use of subconsultants/subcontractors;

- c.** And the consultant/contractor agrees to provide conclusive documentation to verify this claim.

- d.** And if it becomes necessary to subcontract some portion of the work at a later date, the consultant/contractor will notify the City of Greensboro and use provide equal opportunities to M/WBEs to subcontract the work.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the consultant to the commitment herein set forth.

2/7/2014

(Date)


(Jay Jackson, PE - Vice President)

SCOPE OF WORK

TOWNSEND WATER TREATMENT

DESIGN OF BASIN AND FILTER IMPROVEMENTS

PURPOSE OF PROJECT

The purpose of this project is to design flocculation basin and filter improvements (consisting of new media, air-scour system, and automation improvements) at the Townsend WTP. The Backwash Pump Station design will be combined into the construction documents for the Basin and Filter Improvements Project to allow regulatory approval, bidding, and construction of all improvements under a single construction contract. The combined project construction schedule will also allow phasing of the construction work at Townsend so as to not coincide with the clearwell and piping improvements construction project at Mitchell WTP.

BACKGROUND

The process steps ahead of the filters are important to good filter operation. The existing treatment prior to filtration at the Townsend WTP consists of coagulation – flocculation - sedimentation. The flocculation process is presently limited in its effectiveness due to outdated equipment that is oversized and maintenance intensive. The project includes the evaluation and design of improvements to the flocculation basins to restore their function with up-to-date vertical mixing equipment. The project will include drawings and specifications for structural crack and spall repair in the existing sedimentation basins, based on a previous concrete inspection report (report will be provided by the City).

The Townsend WTP filters are dual media sand and anthracite filters over existing clay tile underdrains. The underdrains and media for all 9 filters were installed in 1994-1995. Inspection of the existing underdrains (Filter 1) indicates that the existing underdrains are in good condition. All filters presently use surface wash instead of air-scour. Surface wash is an older technology dating to the original filter design of the 1960s, and while some WTPs still use surface wash, many have changed to air-scour to improve backwash effectiveness. The design will be based on the use of a grid-type air scour system that is to be installed above the existing underdrains. The scope of the project does not include replacement of the existing underdrains.

Observations of the media removed from one of the filters in 2013 (Filter 4), during the Filter Pilot Study conducted by Hazen and Sawyer, indicated that the coarse and fine sand layers have intermixed, and that the sand may not be fluidized or adequately cleaned during backwash. The addition of the backwash and air scour improvements will improve this situation and offer more efficient cleaning of the filter bed. In 2014, the original sand and anthracite media will be 20 years old, and while the underdrains are believed to have considerable useful life left, a 20 year replacement cycle for media is not unreasonable.

The Townsend WTP filters are not presently automated. Filter rate as well as filter backwash are manually controlled by plant staff. Automation of filter controls is a common practice at modern WTPs, providing more consistent and efficient operation of the filtration process.

Pilot testing conducted in 2013 by Hazen Sawyer of the use of ceramic media in the Townsend WTP filters indicated that the installation of a ceramic media cap over the anthracite layer can provide operations benefits. The project will include efforts to obtain regulatory approval from the State of North Carolina (NC DENR PWS) for Full-scale testing of the ceramic media in one of the Townsend WTP Filters.

Task Series 100 Preliminary Engineering

Task 101 – Project Kick-off Meeting and Information Collection

Hazen and Sawyer will conduct a project kick-off meeting with the City to discuss schedule, information needs, identification of key staff and responsibilities. Information needs and topics to be covered include:

- Drawings for existing plant electrical (Hazen and Sawyer has some of this information already through work on previous projects)
- Drawings, specifications, and other information for existing basins and filters (Hazen and Sawyer has much of this information already through work on previous projects)
- Previous sedimentation basin inspection reports/recommendations for structural repairs
- Drawings, specifications, Input/output lists, and other product information for existing filter controls, filter PLCs, and in-plant SCADA system
- Drawings and pump curves for existing Low-Lift Raw Water Pump Station (if needed)
- City's CSI Specification Numbering System
- City's Instrument tagging standard
- Control philosophy and hardware/software configuration
- City's preference for controls such as consoles, PLCs, touch-screen operator interfaces, mobile devices, level of automation, redundancy, and manual control
- Air-scour system manufacturers/product offerings (similar to the Grid system reviewed during the site visit to the Franklin WTP in Charlotte, NC)
- Site walkthrough – equipment, controls and instrumentation associated with filtration system; and site location for air scour blowers (between Filters 6 and 7)

Task 102 – Hydraulic Analysis

Hazen and Sawyer will conduct a hydraulic analysis of the existing WTP. The following will be considered:

- Hydraulic profile between flocculation basins and filters
- Possible adjustment to clearwell inlet weir to provide additional head to extend filter runs
- Estimate of headloss through new media
- Filter level and flow set points for automating filter operations
- Hydraulic profile with flocculation basin improvements in place (with allowance for Plate Settlers or DAF)

Task 103 – Preliminary Design and Review Meetings

Conduct review meetings with City staff during the preliminary design phase. Three (3) meetings are anticipated, covering topics as follows:

Meeting 1 - Flocculation Basin Improvements:

- Review alternatives (alternatives will be included in the Technical Memorandum developed by Hazen and Sawyer) for the flocculation basin improvements - Select an alternative for detailed design
- Review proposed electrical facilities such as pre-manufactured Powerhouses (similar to that reviewed during the site visit at the Franklin WTP in Charlotte, NC) for the electrical and variable frequency drives for Flocculator VFDs

Meeting 2 - Filter Automation and Controls:

- Review proposed control system architecture and incorporation into existing controls
- Review proposed reuse/modifications/replacement of existing filter consoles
- Review proposed reuse of existing filter instruments and valve controls; and new instruments such as turbidimeters
- Review control algorithms and proposed filtration and backwash control strategies

Meeting 3 – Filter Air-Scour and Media Improvements

- Review results of ceramic media testing
- Present recommendations for filter media and air-scour system
- Review results of filter hydraulic analysis (Task 102)

Prepare memorandum summarizing the outcomes of each meeting and incorporate review comments received from the City into the Final Design.

Deliverables for the preliminary design phase will include:

- Process and Instrumentation Diagrams (P&IDs)
- Hydraulic Profile
- General Arrangement Plans
- Draft Mechanical and Electrical Equipment Specifications
- Draft Valve and Piping Specifications
- Preliminary cost estimates, including two levels of filter automation improvements
- Design Memorandum for the Flocculation Improvements. The memorandum will include recommendations and budgetary costs for the option to replace the equipment in its current arrangement, or to reconfigure the flocculation basins for more modern vertical flocculation equipment.

Task 105 – Full-Scale Ceramic Media Test

Based on results of pilot testing conducted by Hazen and Sawyer in 2013, the addition of a ceramic media cap provided improved filter runs at the pilot-scale. The use of ceramic media in water treatment plants is a new technology and its use in the Townsend WTP will require approval from NC DENR PWS. A Full-scale test on one of the Townsend WTP filters will be conducted to obtain additional data and confidence for the use of ceramic media in the filters at the Townsend WTP.

Prior to conducting the test, Hazen and Sawyer will conduct a meeting with City Staff and NC DENR PWS to review the proposed Full-scale Test Protocol and Schedule. The results of the Pilot Filter Tests will be presented to NC DENR PWS during this meeting. Following the meeting, Hazen and Sawyer will prepare and submit the proposed Full-scale Test Plan to NC DENR PWS for approval to conduct the test.

Hazen and Sawyer will conduct periodic (weekly) site visits during the Full-scale test to monitor conditions, assist with sampling, and obtain results from the City for analyses. It is anticipated that the City's WTP instrumentation and SCADA will record the majority of the operating data (e.g. flow, turbidity, pH, loss of head, run time, UFRV, particle counts) during the Full-scale test. Similarly, it is anticipated that the City will conduct the laboratory analyses during the Full-scale test (e.g. turbidity, pH, manganese, TOC, THM/HAA).

Upon completion of the Full-scale test, Hazen and Sawyer will prepare a written report summarizing the results of the test and submit the report to NC DENR PWS. Provided satisfactory results are realized, the

purpose of the report will be to assist in obtaining regulatory approval to include the ceramic media cap in the final design of the filter improvements for all of the Townsend WTP filters.

Task Series 200 – Final Design

Task 201 – Final Design

1. The project includes the design of basin and filter improvements (including new media, air scour system, and automation upgrades). The design includes incorporating the sedimentation basin structural repairs and the new backwash pump station into a single set of construction documents. The design will be based on using the existing underdrains and the installation of a grid-type air scour system. The new air scour blowers will be installed in weatherproof, acoustical enclosures. The design of a building for the air scour blowers is not included in the Scope of Work.
2. Prepare detail and construction drawings including structure and foundation details, site piping and equipment details, electrical, instrumentation.
3. Develop 90% drawings and specifications for review by the City, and attend periodic meetings to review progress and obtain input from the City. Confirm City preferences, where applicable, for equipment and/or instrumentation and electrical device manufacturers that are to be named in the specifications.
4. Develop construction sequence and plant shutdown and operations criteria in specifications to maintain plant operability during construction. Confirm with City the number of basins and filters that may be out of service at a time. Confirm with City specific plant shutdown duration to make major piping and tank connections for the new backwash pump station.
5. Prepare the Project Manual containing the contract documents; including Instructions to Bidders, Bid Form, Agreement, General Conditions, Supplementary Conditions, Technical Specifications, and other documents as may be required for bidding. The scope is based on preparation of bidding documents for one construction contract; and the use of the Instructions to Bidders, Agreement, General Conditions, and Supplementary Conditions provided by the City.
6. Incorporate review comments received from the City and furnish sets of drawings and documents as may be required by the City for submission to State and City regulatory agencies and review authorities, and for the City's general use. Assist City with necessary permit applications and approvals.
7. Prepare a revised estimate of the cost of construction based on the final drawings and specifications. The final drawings and specifications will be completed suitable for bidding.

Construction phase services will be furnished under an amendment to this design contract.

Task Series 300 Permitting

Task 301 – Provide assistance to the City for permit applications and approvals. It is anticipated that the following permits and approvals will be required for the project.

- Authorization to Construct – NC DENR Public Water Supply
- City of Greensboro Building Permit (for New Backwash Pump Station)

Task Series 400 Quality Assurance

Task 401 – Conduct quality assurance review of the Preliminary and 90% Design Drawings and Specifications

SERVICES PROVIDED BY THE CITY

The following services will be provided by the City:

1. Supplemental ground surveys as may be necessary for site permit drawings/applications
2. Procurement and installation (through a construction contract) of the ceramic media for the Full-scale media test
3. Operation and recording of City's WTP instrumentation and SCADA during the Full-scale ceramic media tests (e.g. flow, turbidity, pH, loss of head, run time, UFRV, particle counts)
4. Laboratory testing as may be required during the full-scale ceramic media test (e.g. turbidity, pH, manganese, TOC, THM/HAA)
5. Permit application fees
6. Preparation of M/WBE Bidding Documents

SUB-CONSULTANTS AND M/WBE PARTICIPATION

Three (3) sub-consultants are proposed for the project:

1. SL King and Associates, Inc.*
2. Ellum Engineering, Inc.*
3. Water Treatment Research Inc. - James Amburgey, PhD, PE (Non MWBE)

*M/WBE Percentage of lump sum Engineering Fee listed below is **10%**

ENGINEERING FEE

The **lump sum amount** for the services described above is **\$545,000** which includes costs for all labor, expenses, and sub-consultants for the design of **Townsend Water Treatment Basin and Filter Improvements**.

PROJECT SCHEDULE

The following chart shows the proposed schedule, assuming Notice to Proceed in March 2014.

DESCRIPTION	2013	2014				2015				2016			
	4Q	1	2	3	4	1	2	3	4	1	2	3	4
Preliminary Engineering + Design													
Backwash Pump Station (90%)	X												
Design Notice to Proceed (03/01/2014)		X											
Air Scour + Automation + Floc/Sed													
NC DENR Approval for Ceramic Media Test		X											
Installation Contract Ceramic Media													
Full Scale Media Trial													
Regulatory Approval						X							
Finalize Documents						X							
Advertisement and Bidding													
Advertise						X							
Open Bids						X							
Review and Award						X							
Construction Notice to Proceed						X							
Construction and Start-Up													
On-Site Construction													
Shutdown Backwash Tank									X				
Major Shutdown 60x36										X			

Major Shutdown 36 Tie In				X
Shutdown - Basins (1 at a time)			X	xxx
Shutdown - Filters (1 at a time)			X	xxx
Mitchell Clearwell & RW Valves				