



Hazen and Sawyer
4011 WestChase Boulevard, Suite 500 • Raleigh, NC 27607

September 22, 2015

Mr. Danny Briggs
City of Greensboro Water Resources
P.O. Box 3136
Greensboro, NC 27402

Re: WRF BNR Upgrade Project- Package 4

Dear Danny:

We appreciate the opportunity to present this proposal for continued work at the T. Z. Osborne WWTP. As discussed previously, we completed a significant amount of BNR tank design before the City decided to defer the BNR facilities (referenced as Package 4) until 2021. In the meantime, plant influent loadings have significantly increased since 2007 and have made the BNR upgrade more extensive and pressing than the BNR project initially designed to meet the 2021 nutrient requirements. We now anticipate significant changes to Package 4 including additional basins and possibly additional blower capacity.

We have adjusted our scope and fee based on our meeting with you and Elijah Williams earlier this week. In general, our scope is divided the following areas of work:

Meetings, Management and Review – We have provided for the proper amount of meetings and workshops for this project and will also provide for meeting and review time for our MWBE subconsultant, CriTek.

Updated Preliminary Engineering Report – We will work with the City to revisit the design of the biological nutrient removal (BNR) facilities based on the latest wastewater characteristics coming into the plant. This update will address many items including number and layout of BNR tanks, options to reduce primary effluent load, mixing systems, controls, and required aeration. The report will include costs for each facility and project phasing. We will also include a sensitivity analysis for potential future changes in influent loads.

Pre-qualification of Contractors and Bifurcated Bid Period Services – We propose to assist the City in the pre-qualification of contractors for Package 4 and assist the City with your bidding process.

Design – We have included all efforts necessary for a complete design for Package 4.

Originally, the anticipated construction cost for Package 4 was approximately \$30 million. We are anticipating the updated construction cost to be in the range of \$40 to \$45 million. Large capital items that may be delayed such as additional blowers and standby generators have also been discussed with the City. These items will be planned in the undated PER but not designed in Package 4. It is anticipated

these items will be included in a future Package 5 that will include other deferred plant facilities and will be constructed after Package 4 is complete.

Fee under This Contract


Meetings, Management and Review	\$99,900
Updated Preliminary Engineering Report	\$536,398
Contractor Pre-qualification and Bidding	\$86,814
Design	\$1,254,955
Permitting	\$229,987
Other Direct Costs	\$11,133
Total	\$2,219,188

The proposed scope will allow the City to fully understand the significance of the changing influent wastewater characteristics and determine the best path forward to achieve compliance with current and future permit requirements and regulations. We will also be able to take advantage of the design work previously completed including modifications to the existing aeration basins and structural design of 4 proposed basins; our detailed design and permitting fee (not including process support under a separate contract) is approximately 3.5% of construction cost, which is well under industry average of 7- 8% for detailed design.

We will meet the MWBE goals for the overall project by utilizing CriTek at 6.3% and Westcott Small and Associates at 5.6%. CriTek will assist with overall reviews and drawings. Westcott Small and Associates will assist with civil design and permitting.

Our proposed scope of work is attached. Please contact me if you have any questions or comments.

Very Truly Yours,



Alan Stone, PE
Vice President

TZ Osborne WRF BNR Upgrade Project SCOPE OF SERVICES

1. General

The Owner intends to deliver this project under one construction project (WRF BNR Upgrade Project-Package 4). Plans for a second construction project (Package 5) will be included in the Preliminary Engineering Report (PER).

The Engineer shall provide and an updated preliminary report, detailed design, permitting and assistance with contractor pre-qualification and bid phase services under this contract.

The Engineer will conduct a series of design review workshops to discuss technical issues, decisions that must be made and the Engineer's recommendations for the Owner's consideration. Provide drawings, visual aids and concise data to assist the Owner in the understanding of issues and the decision-making process. The following is a summary of the topics anticipated to be covered in these workshops:

1. Kickoff Meeting
2. PER Draft Review Meeting
3. Final PER Review and Recommendations

2. Preliminary Engineering Report

The Engineer shall document the findings of the preliminary engineering phase of the project with a concise preliminary engineering report that compares alternatives where appropriate and recommend the best path forward for the Owner based on the unique conditions of this facility. For each recommendation, develop estimate of capital costs. Where appropriate to compare multiple alternatives, provide a net present cost comparison. The following technical evaluations are anticipated:

- 1) Document assumptions concerning flows and loads for each TZO. This will include analysis of data provided by the City and information from process sampling and analysis.
- 2) Develop and updated Biowin model and utilizing the model to analyze the treatability of the waste stream.
- 3) Evaluation and modeling of the following alternatives, and conduct sensitivity analysis on alternatives if future loads are not as projected:
 - a. 4 new basins with modified swing zone and NRCY configuration

- b. 6 new basins with existing or modified swing zone and NRCY configuration
 - c. 10 new basins (location TBD) with existing or modified swing zone and NRCY configuration
 - d. Chemically Enhanced Primary Treatment (CEPT)
 - e. Primary filtration (Aqua-Aerobics products) to reduce BOD
- 4) Evaluate long term alternatives for TZO to comply with stricter effluent limits and/or higher than expected industrial load:
 - a. Granular sludge
 - b. Mainstream deammonification (A/B process)
- 5) Evaluate air demands, proposed fine bubble diffuser layout and taper, and blower replacement options
- 6) Evaluate proposed basin layout, dedicated air piping to new basins for reliability, aeration basin hydraulics and flow split, and proposed mixing and aeration in swing zones.
- 7) Provide limited evaluation of instrumentation and process control to allow plant to attenuate peak BOD concentration events and reliably meet the low ammonia limits.
- 8) Evaluate current and proposed electrical loads, determine future generator needs, and provide recommendation for future utility service requirements. Evaluate current capacity and expansion options for switchgear. Size electrical buildings and equipment required to construct Package 4.
- 9) Provide recommendations and phasing of project. It is anticipated that new blowers and generator(s) will be included in a future Package 5.
- 10) Provide cost estimate for recommended alternative.

3. Contractor Pre-Qualification and Bidding Services

The Engineer will assist the City in drafting a prequalification package for a General Contractors. Engineer will evaluate the pre-qualification packages and make provide the City with the quantitative scores of the Contractor pre-qualifications. A total of two meetings with the City are anticipated as part of this effort.

The Engineer will also assist the City in the bidding process. It is anticipated this process will be the City's bifurcated bidding process.

4. Detailed Design

- 1) General – Provide general design for all facility upgrades and improvements, with components and features as described herein.
- 2) Process Mechanical Design – Develop general design of the process and mechanical equipment and associated components complete with piping, valves and ancillary items.
- 3) Site work Design – Develop general design of site grading, stormwater control, erosion and sedimentation control, paving, and curb and gutter for the project.
- 4) Yard Piping Design – Develop general design of major underground piping systems related to the work, including new yard piping related to new facilities, modifications to related existing piping, design of tie-ins to existing piping, modifications to eliminate piping conflicts and demolition and/or abandonment in place of impacted piping.
- 5) Hydraulic Profile – Develop a hydraulic provide that meets current and future proposed conditions.
- 6) Structural Design – Develop general design for new facilities and modifications to existing facilities structures including wall thickness and connections to existing structures.
- 7) Electrical Improvements – Develop general design for the electrical distribution system to provide normal and stand-by power to the TZO WRF. Stand-by power and reliability requirements shall be fully addressed.
- 8) Instrumentation and Control System – Develop general design of instrumentation and controls to allow monitoring and control of the new facilities and upgraded existing facilities from the existing plant-wide control system.
- 9) Opinion of Cost – Cost control, and maintaining the overall project cost within the Owner's project budget is a very important part of this project. Develop and maintain a detailed cost estimate throughout the final design of the work. Formal construction cost estimate shall be provided with the final design. Promptly identify any cost impacts resulting from design decisions made by the Owner and communicate such impacts to Owner.
- 10) Specifications – Develop preliminary specifications for major equipment.
- 11) Drawings – The drawings will include the following:
 - a. Cover Sheet and Index of Drawings
 - b. Site/Civil sheets showing horizontal and vertical controls, floodplain and floodway, existing and proposed facilities, existing and proposed roads, existing grading, setbacks/buffers, and stormwater facilities.
 - c. Process Mechanical sheets showing the hydraulic profile, existing yard piping and proposed major process piping, and basic facility plans and sections (for 2D facilities) or 3D model.

- d. No structural sheets will be included. Structural will review wall thickness and column and beam locations.
- e. Electrical sheets showing an overall plant electrical single line diagram and overall site plan.
- f. Instrumentation sheet showing the control system architecture.

12) Facilities included in this design scope include the following:

- a. New Aeration Basins 13-18 – A total of six new BNR basins are anticipated to meet the design conditions. Basins will be located between Basin 12 and RAS Pump Station 4. Swing zones at the beginning and end of the basins will be provided with flexibility to run in mixed or aerated mode. Nitrified Recycle (NRCY) will be provided via window pump and measured over a weir, and will allow flexibility in operation. The influent channel will be extended through Basin 18 and will be provided with vertical mixers.
- b. Retrofit of Aeration Basins 1-12 - The calibrated Biowin model will be used to determine creation of new swing cells at the downstream end of the basins. Nitrified Recycle (NRCY) will be provided via window pump and measured over a weir, and will allow flexibility in operation. Fine bubble diffusers grids will be replaced in the downstream swing zones, and membrane diffusers will be replaced in the upstream cells that have new grids installed under Package 2. The jet mix/air system Cells A-C is anticipated to remain in service.
- c. Instrumentation Upgrade with Real Time Control – Include limited instrumentation for biological nutrient removal as well as functional descriptions of the process. Include coordination with CITI for systems integration.
- d. Electrical Buildings – New electrical facilities are required for electrical gear associated with the mixers and NRCY pumps needed for BNR. No new generators are included in this contract.
- e. New and Replacement Piping – All buried air piping will be replaced, and a new air header for Basins 13-18 is anticipated to provide redundancy in air supply.
- f. Odor Control- A biofilter system is anticipated for the pre-anoxic cells in Basins 13-18.

13) Conduct a series of design review workshops to discuss technical issues, decisions that must be made and the Engineer's recommendations for the Owner's consideration. Provide drawings, visual aids and concise data to assist the Owner in the understanding of issues and the decision-making process. The following is a summary of the topics anticipated to be covered in these workshops:

- a. Design Review – Basins (mixing, aeration, NRCY)
- b. Design Review- Electrical
- c. Design Review- Odor Control

- 14) The Engineer shall prepare meeting minutes for Project meetings and such minutes shall specifically identify if/when decisions made in meetings significantly impact the project cost or schedule. Written meeting minutes shall be submitted to the Owner not more than 15 days after the meeting.

5. Project Schedule

- 1) The Owner and the Engineer agree that time is of the essence and that delays in the design or construction may significantly impact the feasibility and/or cost of the Project.
- 2) The Engineer shall commence, carry on, and complete the Project with all dispatch in a sound, economical, and efficient manner, in accordance with the provisions hereof and all applicable laws.
- 3) The following Project Schedule Table summarizes the anticipated Project Schedule.

PHASE	
Kickoff Meeting	2 weeks from NTP
Draft Preliminary Engineering Report	March, 2016
Design Submittal	December, 2016
Draft Contractor Pre-Qualification Package	September, 2016
Advertise for Bid	January, 2017
Award Contract	May, 2017

6. Project Deliverables

The Engineer agrees to deliver to the Owner in a timely and proper manner the items set forth below, which shall become the property of Owner and may be used by the Owner without restriction or limitation and at no additional cost to the Owner:

- a. BNR Preliminary Engineering Report. Ten copies and electronic copies in PDF shall be provided.
- b. Final design documents including Plans and Specifications
- c. Final probable estimate of construction cost
- d. Contractor Pre-Qualification recommendation

7. Payments to the Engineer

For Basic Services Having A Determined Scope - Lump Sum Method of Payment. An amount of up to \$2,219,188 based on Lump Sum compensation for the following Tasks:

PER GENERAL AND MANAGEMENT	\$ 99,900
PRELIMINARY ENGINEERING REPORT	\$ 536,398
CONTRACTOR PRE-QUALIFICATION AND BIDDING	\$ 86,814
DESIGN	\$ 1,254,955
PERMITTING	\$ 229,987
OTHER DIRECT COSTS	\$ 11,133
TOTAL THROUGH BID AND AWARD	\$ 2,219,188