

**EXHIBIT A  
SCOPE OF WORK**

**CITY OF CORPUS CHRISTI  
O. N. Stevens Water Treatment Plant Flocculation Upgrades and  
Baffling  
CITY PROJECT NO. 22407**

**PROJECT DESCRIPTION**

The City of Corpus Christi (City) owns and operates the 161.5 million gallons per day (mgd) O.N. Stevens Water Treatment Plant (ONSWTP) and currently has walking beam flocculators installed in the two primary sedimentation basins in Plant 1 (Sedimentation Basins No. 1 and 2). The walking beam flocculators have lived out their useful design life, are unreliable, have issues providing adequate mixing at higher flow rates, and are maintenance intensive. At speeds required for good mixing (40 to 60 Hz) and higher flow rates, the walking beam flocculator motors often trip or experience significant vibration resulting in damage to the flocculators. The narrow channels in the flocculation area often results in damages to the walking beam trees, necessitating frequent repairs. Due to the inefficiencies and ineffectiveness of the existing walking beam flocculators at Plant 1, the City is requesting that Hazen and Sawyer (ENGINEER) perform a condition and operational assessment; an alternatives analysis; and design, bid and construction phase services for flocculator replacement.

In the near future, ONSWTP is expected to see an increased demand and all major improvements are currently being designed for a rated plant flow rate of 200 mgd (50 mgd per basin). An additional service to perform a capacity and hydraulic evaluation is proposed as a part of this project to determine whether the flocculators should be designed for a higher flow rate. ENGINEER will coordinate with the City to incorporate future conditions (projects anticipated within next 5-10 years). This evaluation will also identify process capacity constraints while taking into account TCEQ requirements, and feasible solutions such as tube/plate settlers or any other improvements necessary to expand basin capacity as needed. If it is determined there are other hydraulic bottlenecks not within the boundary of the scope of this project (i.e. raw water pumping, filter hydraulics, etc.), the City and ENGINEER will meet and decide on a final design flow rate that meets the City needs for operational flexibility.

Part A of this project is to perform a condition/operational assessment of the existing flocculators and then perform an alternatives analysis of flocculator mixing technologies for ONSWTP. There will be a preliminary screening phase to select two technologies to perform a detailed comparison. The detailed comparison will evaluate the benefits and limitations of each technology, provide planning level cost estimates, create conceptual layouts, and develop and run simulation scenarios of a computational fluid dynamics (CFD) model to help select the flocculator technology to proceed with preliminary and detailed design. Additional services have been provided if a third alternative is selected as part of the screening phase.

Part B of this project includes a baffling configuration analysis for the secondary basins at Plant 1. The City wants to evaluate the need for a baffle wall in the secondary basins to enhance plug flow potential as well as ensure adequate mixing of caustic after chemical addition. CFD modeling will be performed to assist in determining the benefits of baffling and the selection of the baffling design. A final baffle wall configuration will be selected to proceed with preliminary and detailed design.

Part C of this project is to complete the detailed design, bid, and construction phase assistance for a new flocculator system to replace the existing horizontal walking beam flocculators.

ENGINEER will be responsible for the following:

- Condition and operational evaluation of the current flocculation system and associated structures
- Design of sedimentation basin structural modifications and repairs as necessary where the flocculator system is located
- Alternatives analysis to select the appropriate flocculator technology
- New flocculator system detailed design for Plant 1 sedimentation basins
- Site visit with ONSWTP staff to another facility that utilizes the recommended flocculator technology
- Construction sequencing plan based on Owner/ENGINEER constraints
- Demolition plans for the existing flocculator system
- Analysis and selection of baffling material and layout alternatives to ensure plug flow through the sedimentation basins
- New baffle wall detailed design for Plant 1 sedimentation basins
- Instrumentation and controls to integrate the flocculator system with the plant control system
- Development of Opinion of Probable Construction Cost (OPCC)
- Preparation of Contract Documents
- Technical assistance during bidding phase of the project
- Services during construction including review of submittals, requests for information (RFIs), change order requests, and attending regular construction progress meetings
- Providing a part time project representative for specialized inspection for up to 80 hours during construction
- Assistance during startup and commissioning

The current scope of services as described herein assumes replacement of flocculator equipment with the least amount of construction improvements (i.e., horizontal flocculator technology replacement and utilization of existing infrastructure). The alternatives analysis may select a more intensive design and construction approach for an improved design or lower capital costs but could increase ENGINEER's effort for design. A supplementary scope item has been added to the end of the scope of services to address the additional effort associated with the selection of a different technology, such as vertical turbine mixers with baffle wall installation.

Engineer proposes the following approach and order of work to be done on this project:

<b>Activity</b>
Part A & B – Alternatives Analysis and Baffle Wall Analysis with Memorandum
Part C1 – Flocculator System and Baffle Wall Preliminary Design with PDR
Part C2 – Flocculator System and Baffle Wall Design
Part C3 – Bidding and Construction NTP
Part C4 – Flocculator System and Baffle Wall Construction

# SCOPE OF SERVICES

## PART A – FLOCCULATOR ALTERNATIVES SELECTION AND ANALYSIS

ENGINEER will perform a preliminary condition and operational evaluation of the existing flocculator system. The condition and operational evaluation will include a review of mechanical, structural, electrical and instrumentation assets via a site visit and interviews with City Staff. ENGINEER will consider potential future expansions or modifications to the existing basins to meet future flow conditions to better understand current limitations and requirements to replace the existing flocculators.

ENGINEER will perform an alternatives analysis of various flocculator technologies for ONSWTP. ENGINEER will evaluate common flocculator technologies including hydraulically baffled (non-mechanical), hyperbolic flocculators, vertical impeller turbine flocculators, vertical paddle wheel flocculators, and horizontal paddle wheel flocculators. The current walking beam flocculators cause operational issues, are maintenance intensive, and do not provide adequate mixing at higher flows so they are not considered for this evaluation. ENGINEER will facilitate a workshop to summarize and present the results of the preliminary alternative screening. The alternatives will be preliminary screened based on floc particle quality, operational flexibility, redundancy, maintenance, and basin modifications.

The list of alternatives will be narrowed to two technologies to complete a detailed evaluation consisting of conceptual layouts, CFD modeling and simulation scenarios, planning level capital cost improvements, and other criteria confirmed by the City to make a final selected technology to proceed with preliminary and detailed design. A technical memorandum will be developed to summarize the results of Part A. The technical memorandum will include, but is not limited to, the following:

- Preliminary condition and operational evaluation of all mechanical, structural, electrical, and instrumentation assets of the flocculator system
- Evaluation of future capacity requirements related to flexibility of flocculator technology.
- Considerations of impacts from operation with two different coagulants – aluminum sulfate (alum) and polyaluminum chloride (PACL)
- Alternative technology assessment of flocculator technologies
- Conceptual layouts of the two selected alternative layouts
- Identification of other projects at ONSWTP that will impact or be impacted by the proposed technologies
- Planning-level cost estimates of the two selected alternatives
- Conceptual project schedule

Additional services have been provided if a third alternative is selected as part of the screening phase.

### Scope Item Assumptions:

- Design drawings and specifications will be provided during the design phase

- Detailed cost estimates will be provided during the design phase
- Preliminary Design Report (PDR) will be provided during the design phase
- CFD modeling will incorporate ported baffle wall improvements proposed as a part of RWI & CFI Improvements project (City Project No. E17047) as well as all other proposed or ongoing work that may impact sedimentation basin modeling
- Does not include hydraulic evaluation to determine maximum hydraulic throughput of the sedimentation basins nor the entire plant.

#### **Meetings:**

- One (1) two-hour kickoff meeting with agenda and minutes
- One (1) two-hour alternative analysis meeting with agenda and minutes
- One (1) two-hour draft memorandum submittal workshop and final alternative selection with agenda and minutes

#### **Deliverables:**

- Meeting Minutes
- Preliminary alternative analysis screening workshop PowerPoint presentation
- Memorandum summarizing the results of the analysis and the recommended option to be carried into the design phase

## **PART B – BAFFLE WALL PRELIMINARY ANALYSIS**

ENGINEER will perform a preliminary condition evaluation of the Plant 1 sedimentation basin secondary basins and any associated appurtenances. ENGINEER will consider potential future expansions or modifications to the existing basins to meet future flow conditions. ENGINEER will perform an alternatives analysis of various plug flow and baffling conditions.

ENGINEER will develop baffle port and layout alternatives to provide even flow distribution. CFD modeling will be performed to ensure the proposed baffle wall exhibits plug flow qualities. Planning level costs will be estimated for feasible baffle wall alternatives. A technical memorandum will be developed to summarize the results of Part B and included as part of the Part A technical memorandum. The summary of results of this analysis will include, but is not limited to, the following:

- Preliminary condition evaluation of secondary sedimentation basin
- Evaluation of future expansion requirements related to flexibility of baffle wall and mixing conditions
- Identification of other projects at ONSWTP that will impact or be impacted by the proposed technology
- Alternative analysis summary of baffling layouts and materials considered
- Planning-level cost estimates
- Conceptual project schedule

**Scope Item Assumptions:**

- Design drawings and specifications to be provided during the design phase
- Detailed cost estimates to be provided during the design phase
- PDR to be provided during the design phase
- Work will coincide and run parallel to Part A
- Summary of results to be included in technical memorandum described in Part A
- Condition assessment will coincide with Part A
- All meetings will coincide with Part A, including the workshop to present alternatives
- CFD modeling will incorporate flocculation ported wall improvements proposed as a part of RWI & CFI Improvements project (City Project No. E17047) as well as all other proposed or ongoing work that may impact sedimentation basin modeling

**Meetings:**

- Refer to Part A – all meetings for Part B will coincide with Part A

**Deliverables:**

- Meeting Minutes
- Pertinent sections in the technical memorandum

**PART C – FLOCCULATOR SYSTEM REPLACEMENT AND BAFFLE WALL DESIGN, BID AND CONSTRUCTION PHASE SERVICES****1. Preliminary Design Services****1.01 Project Progress Meetings and Minutes**

ENGINEER will coordinate the kick-off meeting and regular progress meetings. These meetings shall be used to coordinate ongoing issues, discuss project status, and obtain input from the City. ENGINEER will prepare meeting minutes and finalize and distribute after review by the City's staff.

**Scope Item Assumptions:**

- Meetings will be held at the Corpus Christi Utilities building or ONSWTP.
- Utilities and Engineering Services Staff will attend progress meetings.
- ENGINEER's staff working on the project remotely will dial in by phone, as necessary

**Meetings:**

- One (1) two-hour kickoff meeting
- Three (3) two-hour progress meetings (monthly) with utility and engineering services staff

**Deliverables:**

- Meeting Minutes and sign-in sheet

**1.02 Project Coordination**

ENGINEER will coordinate the work of all subconsultants, including the leading of meetings with subconsultants to coordinate completion of work and adherence to schedules. ENGINEER will coordinate with the City's utilities staff for data requests and operations questions. ENGINEER will coordinate with Engineering Services regarding historical document and drawings requests. ENGINEER will coordinate with other on-going projects at ONSWTP that have overlapping project drivers.

**1.03 Detailed Project Schedule and Updates**

ENGINEER will prepare a project schedule that summarizes all major tasks of the project and the critical path of the project. ENGINEER will update the project schedule monthly as the project progresses or changes occur.

**1.04 Site Survey and Coordination**

ENGINEER will review historical drawings. ENGINEER will also identify aboveground and underground utilities to identify easements and conflicts.

**1.05 Preliminary Design Report**

ENGINEER will further develop the assumptions from Part A and Part B to 30% level of design for the selected alternatives (flocculator technology and secondary basin baffling), refining the basin layouts and operating parameters. Design documents and list of specifications will be prepared and submitted to the City with certain disciplines advanced beyond others, but overall 30% completion. ENGINEER will prepare preliminary process, mechanical, structural, electrical, and instrumentation and control drawings and present them in a PDR. The PDR will include the following:

- Description of the final process, modifications to existing facilities, and the major equipment functions. Unit sizing, unit quantities, and redundancy will be addressed. The unit and equipment sizing will be based on design criteria presented in the Alternatives Assessment Memorandum.
- Process schematics and description of proposed flocculator system.
- General facility arrangement layout drawings. These drawings will present area requirements for process equipment and support areas.
- General site plan presenting the arrangement of the new equipment on site.
- Description of construction for the structures that will house the new equipment. Sketches presenting the facility elevations will also be included.
- General construction sequencing and connections to existing facilities.
- Overall process control strategy.

- Preliminary instrumentation block diagram drawing presenting the general instrumentation system controls.
- Description of the interface between the existing instrumentation system and the proposed facilities, along with upgrades to the existing SCADA.
- Preliminary proposed single line diagrams
- Opinion of construction costs corresponding to 30% design completion. AACE Class 4 estimate will be performed.
- Schedule for permitting, final design, bidding and award, construction, and start-up.

**Scope Item Assumptions:**

- PDR will contain the technical memorandum developed in Part A and B as an appendix. The results of Part A and B will be summarized in a section of the PDR.

**Deliverables:**

- PDR and 30% design drawings (PDF) and list of major mechanical specifications (PDF).
- Opinion of probable construction costs
- Project schedule

**1.06 QA / QC**

ENGINEER will document internal Quality Assurance review comments on the conceptual design layout drawings, specifications, and PDR. ENGINEER will address internal Quality Assurance review comments.

**1.07 Preliminary Design Report Workshop**

ENGINEER will prepare a MS PowerPoint presentation for the Preliminary Design Workshop.

ENGINEER will lead Preliminary Design Workshop to discuss the PDR. ENGINEER will incorporate comments from the City into the final PDR, as detailed in 1.05 Preliminary Design.

**Scope Item Assumptions:**

- City staff will provide comments to ENGINEER on the PDR
- City staff will attend the Preliminary Design Submittal Workshop.

**Meetings:**

- One (1) four-hour Preliminary Design Client Review Workshop



**Deliverables:**

- PowerPoint presentation for the Preliminary Design Submittal Workshop

**2. Detailed Design Services****2.01 Project Progress Meetings and Minutes**

ENGINEER will coordinate regular progress meetings. These meetings shall be used to coordinate ongoing issues, discuss project status, and obtain input from the City. ENGINEER will prepare meeting minutes and will finalize and distribute after review by the City's staff.

**Scope Item Assumptions:**

- Meetings will be held at the Corpus Christi Utilities building or ONSWTP.
- Utilities and Engineering Services Staff will attend progress meetings.
- ENGINEER's staff working on the project remotely will dial in by phone, as necessary.

**Meetings:**

- Eight (8) two-hour progress meetings (monthly) with Utility and Engineering Services staff

**Deliverables:**

- Meeting Minutes and sign-in sheet.

**2.02 Project Coordination**

ENGINEER will coordinate the work of all subconsultants, including the leading of meetings with subconsultants to coordinate completion of work and adherence to schedules. ENGINEER will coordinate with the City's utilities staff for data requests and operations questions. ENGINEER will coordinate with Engineering Services regarding historical document and drawings requests. ENGINEER will coordinate with other on-going projects at ONSWTP that have overlapping project drivers.

**2.03 Detailed Project Schedule and Updates**

ENGINEER will prepare a project schedule that summarizes all major tasks of the project and the critical path of the project. ENGINEER will update the project schedule as the project progresses or changes occur (estimated monthly).

**2.04 60%, Pre-final (90%), and Final Design**

Upon authorization by the City, ENGINEER will perform final design of the new flocculator system and secondary sedimentation basin baffle wall at Plant 1. The design will involve development of a set of contract documents, which will include construction plans, details, specifications, and other documents to establish and depict the size, character, and extent of the entire project with respect to structural, site work, mechanical, instrumentation and electrical systems, and such other elements as may be appropriate.

All contract plans will be prepared using the latest version of AutoCAD. As part of final design, ENGINEER will develop contractual conditions and instructions to bidders and will also update the project cost estimates and construction schedule, to reflect the level of design completion.

As part of preparing the final design, ENGINEER will conduct an internal constructability review. This review will focus on the ease with which the system can be constructed at the selected site, be integrated with existing facilities, and avoid interferences and other obstacles that could cause construction delays or difficulties. The ability to maintain existing facilities in service throughout construction will also be examined as part of the constructability review.

Design documents will be submitted to the City at various stages during final design. The following deliverables have been established for final design, which will be provided at the 60% and 90% design completion points, respectively:

#### Deliverables for 60% Design Completion

- Updated mechanical plans and specifications
- Plans, Sections, and details for all disciplines
- Updated cost estimate and schedule

#### Deliverables for 90% Design Completion

- Updated Plans, Sections, and details for all disciplines
- Complete specifications
- Updated cost estimate and schedule

The 90% documents will be submitted to the City for approval. Upon receipt of the City's comments on the Pre-final (90%) deliverables, ENGINEER will revise the set and issue Final, bid-ready (100% complete) documents, which will include the "front-end" documents, along with the design drawings and technical specifications.

#### **Scope Item Assumptions:**

- The City standard front end (general and supplemental conditions and Division 1 specifications) documentation for inclusion into the contract documents will be obtained from <https://www.cctexas.com/promo/standards-contracts>
- The City staff will provide comments to ENGINEER on the drawings and specifications.

- It is anticipated the City will competitively bid the flocculator system and secondary basin baffle wall under the construction project and enter into an agreement with an outside Construction Contractor to complete the work (no vendor pre-selection).
- All permitting/plan review fees will be paid by the City.
- It is assumed there are no known hazardous waste contaminated areas, wetlands, endangered species, or other environmentally sensitive flora or fauna which may require additional efforts during design, permitting or construction management.

#### **Meetings:**

Included under subtask 2.06.

#### **Deliverables:**

- 60% design review submittal
- 90% design review submittal
- 100% signed and sealed design submittal
- One pdf electronic copy of entire bid set to be submitted via ebuilder

### **2.05 QA / QC**

ENGINEER will document internal Quality Assurance review comments on the 60% and pre-final (90%) drawing and specifications. ENGINEER will address internal Quality Assurance review comments.

### **2.06 60%, Pre-final (90%) and Final Design Workshops**

ENGINEER will prepare a MS PowerPoint presentation for the 60%, Pre-final (90%), and Final Design workshops.

ENGINEER will lead workshops to discuss the drawings and specifications. ENGINEER will incorporate comments from the City into the 60%, Pre-final (90%), and Final Design.

#### **Scope Item Assumptions:**

- City staff will provide comments to ENGINEER on the drawings and specifications.
- City staff will attend the submittal workshops.

#### **Meetings:**

- One (1) two-hour 60% Design Client Review Workshop
- One (1) two-hour Pre-final (90%) Design Workshop
- One (1) two-hour Final Design Workshop

#### **Deliverables:**

- PowerPoint presentation for each of the Workshops

## **2.07 Permitting and Agency Coordination**

ENGINEER will meet with City Staff to discuss existing TCEQ permitting requirements. As needed, ENGINEER will perform the following

- Prepare letter and design submittal package to TCEQ providing notification for the recommended improvements to be performed for the solids collection system.
- Coordinate with the City and different regulatory agencies, as required, to obtain any permits for construction of the project.
- Attend phone calls or in-person meetings with TCEQ to confirm regulatory requirements and present proposed improvements.
- Address comments from TCEQ and adjust design documents as required.

### **Scope Item Assumptions:**

- The City staff will provide information regarding permitting as needed.

### **Meetings:**

- Up to two (2) one-hour conference calls with TCEQ to discuss permitting and project requirements

## **3. Bid Phase Services**

ENGINEER will assist the City in developing bid documents including contract agreement forms, general conditions and supplemental conditions, notice to bidders, instruction to bidders, insurance, bond requirements, and preparation of other contract and bid related items. ENGINEER will develop specifications and drawings to describe the size and character of the entire project, description of the materials to be utilized and such other essentials as may be necessary for construction and cost analysis. ENGINEER will assist the City during the bid period by performing the following tasks:

- Attend Pre-Bid Meeting.
- Respond to Bidder Inquiries.
- Assist in preparation of Addenda
- Attend bid opening meeting.
- Review bids and bidder references for completeness, balance of bid items and prepare a tabulation of bid prices.
- Recommend contract award, based on the lowest responsive and responsible bidder.
- Prepare a conformed set of contract documents including the issued Addenda.
- Provide support, as needed, for council approval of the construction contract.

### **Scope Item Assumptions:**

- The City will designate an individual to have responsibility, authority, and control for coordinating activities for the construction contract award.
- The City will provide the City's updated standard specifications, standard detail sheets, standard and special provisions, and forms for required bid documents.
- The City will arrange and pay for printing of all documents and addenda to be distributed to prospective bidders.
- The City will advertise the projects for bidding, maintain the list of prospective bidders, receive and process deposits for all bid documents, issue (with assistance of ENGINEER) any addenda, prepare and supply bid tabulation forms, and conduct bid opening.
- The City will receive ENGINEER's recommendation concerning bid evaluation and prepare agenda materials for the City Council concerning bid awards.
- The City will prepare, review, and provide copies of the contract for execution between the City and the Contractor.
- This Scope of Services does not include time for ENGINEER to assist the City in the event of bid protests.

#### **Meetings:**

- One (1) two-hour Pre-bid Meeting
- One (1) two-hour bid opening meeting
- One (1) two-hour meeting to discuss bids with the City

#### **Deliverables:**

- Bid Documents and Addenda
- Agenda and meeting minutes for pre-bid conference
- Bid Review Form and recommendation for contract award
- Complete As-Bid Conformed Contract Documents.

## **4. Construction Phase Services (Time and Materials)**

### **4.01 Engineering Services During Construction**

ENGINEER will assist the City during the construction phase by providing the following design related services:

- General construction administration.
- Attend site visits by the Project Manager and/or appropriate Technical Specialist for participation at monthly progress meetings and inspection of construction.
- Review and approve shop drawings and maintain the shop drawing log.
- Provide interpretations and clarifications of the contract documents based on the contractor's RFIs and authorize required changes, which do not affect the contractor's price and are not contrary to the general interest of the City under

the contract. ENGINEER's effort is based on review of one RFI per sheet of the Contract Documents

- Review contractor pricing for change order requests.
- Prepare supplementary work drawings, specifications, and instructions or meetings, as necessary to interpret and resolve encountered field conditions.
- Manage and review the O&M Manual deliverables required by construction contracts and by equipment suppliers.
- Manage and review the Contractor's requirement of providing electronic record drawings.
- Make regular visits to the project site to confer with the City project inspector and contractor to observe the general progress and quality of work, and to determine, in general, if the work is being done in accordance with the contract documents. This will not be confused with the project representative observation (from the City) or continuous monitoring of the progress of construction.
- Make final inspections with City Staff and provide the City with a certificate of completion for the project.
- As applicable, review and assure compliance, with plans and specifications, the preparation of operating and maintenance manuals (by the Contractor) for all equipment installed on this project.
- Review construction "red-line" drawings, prepare record drawings of the Project as constructed (from the "red-line" drawings, inspections and the Contractor provided plans), and deliver to Engineering Services a reproducible set and electronic file of the record drawings within two (2) months of final acceptance of the project. All electronic data will be compatible with the City GIS system.

ENGINEER will also assist the City by observing work progress, quality, and compliance with contract documents. In performing these services, ENGINEER would conduct a final inspection of work with City personnel, to evaluate punch-lists of the work remaining to be completed, provide final inspection of the completed punch-list items, and recommend the release of retained funds, as appropriate.

#### **Scope Item Assumptions:**

- City to arrange for a site inspector for continuous monitoring of the progress of construction.
- ENGINEER to provide regular construction administration and site visits to ensure conformance with design.
- The City will assist with the integration of the control systems with input from ENGINEER.
- ENGINEER will maintain the punch-list of final construction items.
- The City will conduct the final inspection with Engineer.
- The City will provide meeting minutes from the monthly progress meetings
- The City will review the payment applications/estimates
- Level of effort is based on an 18-month construction duration

**Meetings:**

- One (1) two-hour pre-construction meeting
- Eighty (80) hours for specialty discipline inspections
- Eight (8) one-hour monthly progress meetings (can be held on same day as discipline site visits)
- Two (2) two-hour punch list walkthrough meetings

**Deliverables:**

- RFIs
- Change orders (as needed)
- Shop Drawing reviews
- Record Drawings

**4.02 Start-up Services**

ENGINEER shall monitor startup activities and participate during the startup phase of the project. Participation shall include the following:

ENGINEER will perform the following:

- Assist the City in start-up testing and equipment troubleshooting of the new flocculator systems. Two staff will be available for up to two days of start-up assistance.
- Compile the operations and maintenance manuals for the City and confirm operation and maintenance requirements.
- Review of as-built documentation prior to startup.

**Scope Item Assumptions:**

- Contractor is responsible for preparing, testing, calibrating, and cleaning equipment prior to start-up as detailed in the project specifications.
- Contractor to prepare start-up checklist
- Engineer to maintain start-up checklist
- One (1) start-up phase included in construction contract

**Meetings:**

- Two (2) eight-hour site visits for two staff to assist in start-up, calibration, testing, and troubleshooting of the flocculator systems.

**Deliverables:**

- Compiled Operations and Maintenance Manuals
- Start-up Checklist

#### **4.03 SCADA / Control System Integration**

ENGINEER will provide system integration services to integrate the new flocculators into the existing SCADA system. The system integration will include the following services:

##### **4.03.1 Detailed Design Services**

ENGINEER will develop the control strategy in coordination with ONSWTP engineering and operation staff. PLC I/O assignment will be done for the new input/output signals to a new PLC Panel.

New HMI graphic pages will be developed for the flocculators. The remote monitoring and control requirements will be reviewed with the ONSWTP in two HMI workshops to make sure all operational and control requirements are met and ready for the construction/start-up phase.

##### **Scope Item Assumptions:**

- The City will provide existing PLC programs, HMI database and graphics and access to the SCADA servers as requested. The HMI database will be obtained from the FactoryTalk View tag database, which can be exported from the existing database into CSV files.

##### **4.03.2 Programming and Configuration Services**

ENGINEER will provide the following:

- Modify existing PLC programs at PCR-4 according to the City standards to include monitoring, interlocks, protections, and controls for the new flocculators.
- Finalize HMI graphic pages and popup controls for the flocculators
- Configure the tags between PLC and HMI
- Test the PLC program and HMI graphics in emulation mode
- Developing start-up testing procedures for the new PLC program routines and HMI graphics pages

##### **4.03.3 Start-up Services During Construction Phase**

ENGINEER will provide the following:

- Download the new PLC program to the existing PLC
- Configure the SCADA database and add new I/O tags. The FactoryTalk View tag database will be modified to include the new tags.
- Coordinate with the Contractor to attend the loop testing process. The loop testing process shall be completed by the Contractor. ENGINEER will be



responsible for checking off the loop continuity at the PLC I/O modules and HMI graphic screens.

- Configure the existing Historian to include required tags for the new flocculators
- Perform operational readiness test for the new flocculators in cooperation with the Contractor
- Perform functional demonstration test for the new flocculators in cooperation with the Contractor

#### **4.03.4 Training**

ENGINEER will provide two (2) four-hour training sessions to cover the new HMI graphic screens and PLC routines.

## **ADDITIONAL SERVICES**

This section defines the scope of additional services that may be included as part of this contract if authorized by the Director of Engineering Services. ENGINEER may not begin work on any services under this section without specific written authorization by the Director of Engineering Services. Fees for Additional Services are an allowance for potential services to be provided and will be negotiated by the Director of Engineering Services as required. ENGINEER shall, with written authorization by the Director of Engineering Services, perform the following:

### **5. Topographic Survey**

ENGINEER shall provide a site survey of the entire Plant 1 flocculator limits. The Surveyor will perform a boundary and topographic survey of the project area, including all major features and structures at the plant and tie all survey work to the plant's existing horizontal and vertical coordinate system. Results of this task will be presented in AutoCAD drawings which can be used as backgrounds. All work will be tied to and conform with the City's Global Positioning System (GPS) control network and comply with Category 6, Condition I specifications of the Texas Society of Professional Surveyors' Manual of Practice for Land Surveying in the State of Texas, Ninth Edition.

In addition, the Surveyor will set two (2) permanent horizontal control points/benchmarks on the site that will be used for the entire design and construction work.

Deliverables:

- AutoCAD files with all spot elevations
- Two permanent survey control markers

### **6. Tracer Study and Concentration Time (CT) Study Update**

TCEQ grants certain baffling factors for sedimentation basins based on facility designs as defined in Table 1 of *TCEQ Regulatory Guidance Water Supply Division RG-559*. CFD modeling in Part A and B can be used to determine potential baffling factors to improve CT credits in the sedimentation basins (primary and secondary). If results of the CFD modeling performed in Part A and B indicate the ability to increase the baffling factor to a greater value than defined by Table 1 in *TCEQ Regulatory Guidance Water Supply Division RG-559*, then a tracer study must be completed to obtain that increased baffling factor to use in an updated CT Study.

Should the City wish to obtain the additional baffling credit, ENGINEER will complete a tracer study using the hydrofluosilicic acid step feed method. Using this method, the T10 value can be determined, and a resultant baffling factor can be calculated. Work can be completed and added as part of the construction phase services post start-up. This task includes the following:

- Meeting to coordinate planning and set-up of the tracer study

- Test plan development
- Coordination with TCEQ
- On-site tracer testing
- Summary workshop to review results
- Technical letter report summary for TCEQ approval

Following the approval from TCEQ on a new baffling factor, ENGINEER will prepare and submit an updated CT study and necessary documentation for TCEQ review and approval during construction phase. ENGINEER will coordinate and attend up to two (2) meetings with TCEQ and City as needed to get necessary approvals.

#### **Scope Item Assumptions:**

- The City will be responsible for providing temporary hydrofluosilicic acid piping to the rapid-mix basin.
- The City will operate all equipment needed for flow to a basin and fluoride dosing adjustment. ENGINEER and the City will coordinate adjustment of stepwise doses as agreed upon in the plan
- The City will provide, at a minimum, fluoride analytical method, including all reagents and analyzers needed to analyze the collected water samples.

## **7. Capacity and Hydraulic Evaluation**

Several major improvements are currently being either planned or constructed at ONSWTP to increase the plant's capacity to 200 mgd. Prior to initiation of this task, the City and ENGINEER will meet to discuss the operational flexibility requirements and needs to evaluate increasing the design flow rate of each sedimentation basin in Plant 1 to greater than 50 mgd. If 50 mgd per basin is selected this additional service will not be required. If it is decided to evaluate installing a flocculation system and baffle wall at a design flow rate greater than 50 mgd, this additional service will be required to define the design flow rate for both the flocculators and the baffling wall.

Revised hydraulic calculations will be performed to prepare a new hydraulic grade line for existing and proposed future conditions to identify any hydraulic bottlenecks. This evaluation will be completed from raw water to the clearwell weirs. This evaluation will also identify process capacity constraints and recommendations. ENGINEER will coordinate with the City to incorporate future conditions (projects anticipated within next 5-10 years) for the hydraulic evaluation. The results for this evaluation will be presented to the City in meetings and deliverables for Part A and Part B scope items under this project.

## **8. Third Flocculator Technology Detailed Alternative Analysis**

The first Part A screening workshop may determine the need to evaluate three flocculator technologies for detailed analysis in Part A, as opposed to the two currently defined in the scope

of services. This fee includes the level of effort required to complete the additional analysis of the third flocculator technology.

## **9. Detailed Design Effort for Vertical Flocculator System**

The alternatives analysis may result in the selection of a more design-intensive flocculator technology alternative such as a vertical flocculator system. The fee includes the level of effort required to complete the additional tasks. The additional tasks because of this selection may include, but is not limited, to the following:

- Additional mechanical design required due to an increased number of mechanical equipment and moving parts
  - Additional sheets and coordination with disciplines
- Additional structural design required due to modifications required to the basin for the selected alternative
  - Additional sheets and coordination with other disciplines
- Instrumentation architecture and number of sheets tied to increase in mechanical equipment
  - Additional sheets and coordination with other disciplines included
  - Additional effort for Task 4.03 SCADA and Control System Integration
- Electrical load analysis because of an increase in quantity of motors tied to an increase in mechanical equipment
  - Additional sheets may be required

## **10. Specialized Construction Inspections**

There may be a requirement for ENGINEER to visit the construction site and perform special inspections. This includes providing a part time project representative for specialized inspection for up to 80 hours during construction.

## **11. Warranty Phase**

Project Team members will provide services after completion of the construction phase, such as inspections during the 12-month warranty period, reporting observed discrepancies under guarantees called for in the construction documents, and provide assistance for resolution of defects to be corrected under warranty. The correction of any defects observed in the inspections is the responsibility of the Contractor and their subcontractors and suppliers. This scope assumes that such services may be required for up to 52 hours per 12-month warranty period.

### **Deliverables:**

- Correspondence with Contractor and equipment manufacturers
- Reports on warranty inspections

## SCHEDULE

The following figure summarizes the planned project schedule. The following proposed schedule is provided to delineate the critical path tasks.

### PART A & B – Flocculator Alternatives Selection and Analysis & Baffle Wall Analysis

<b>Date</b>	<b>Activity</b>
-	Large AE Contract Approval/NTP
0.5 Months after NTP	Kick-off Meeting
2.0 Months after NTP	Alternative Analysis Workshop
3.0 Months after NTP	DRAFT Memorandum
3.5 Months after NTP	City Review and Comments
4.0 Months after NTP	FINAL Memorandum

### PART C – Flocculator System Replacement and New Baffle Wall Design, Bid and Construction

<b>Date</b>	<b>Activity</b>
7 Months after NTP	Flocculator System and Baffle Wall Preliminary Design
10 Months after NTP	Flocculator System and Baffle Wall 60% Submittal
13 Months after NTP	Flocculator System and Baffle Wall 90% Submittal
15 Months after NTP	Flocculator System and Baffle Wall Final Submittal
17 Months after NTP	Construction Package Advertising
18 Months after NTP	Construction Package Bid Opening
20 Months after NTP	Construction NTP
38 Months after NTP	Flocculator System and Baffle Wall Construction Completion

## FEE

1. **Fee for Basic Services.** The City will pay the ENGINEER a fixed fee for providing all “Basic Services” as authorized as per the table below. The fees for Basic Services will not exceed those identified and will be full and total compensation for all services outlined in Part A through C above, and for all expenses incurred in performing these services. For services provided in Part A through C, the ENGINEER will submit monthly statements for basis services rendered. For Part A, B, and C1, C2, and C3, the statement will be based on the ENGINEER's estimate (and City Concurrence) of the proportion of total services actually completed at the time of billing. For services provided in Part C4, the City will pay the ENGINEER a not-to-exceed fee as per the table below.
2. **Fee for Additional Services.** For services authorized the Director of Engineering Services Under Section “Additional Services”, the City will pay the ENGINEER a not-to-exceed fee as per the table below:
3. **Summary of Fees.**

<b>Fee for Basic Services</b>	
PART A & B	\$233,318
PART C1, C2, AND C3	\$806,026
PART C4 (T&M – 18 Months)	\$361,282
<b>Subtotal of Basis Services Fees</b>	<b>\$1,400,626</b>
<b>Fees for Additional Services (Allowance)</b>	
Topographic Survey	\$10,273
Tracer Study and CT Study Update	\$29,464
Capacity and Hydraulic Evaluation	\$43,667
Third Flocculator Technology Detailed Alternative Analysis	\$28,976
Detailed Design Effort for Vertical Flocculator System	\$116,500
Specialized Construction Inspections	\$16,320
Warranty Phase	\$19,796
<b>Subtotal Additional Services Fees Authorized</b>	<b>\$264,996</b>
<b>Total Authorized Fee</b>	<b>\$1,665,622</b>

Invoices will be submitted to the City on a monthly basis as a percentage complete based on project progress. Invoices will be provided with a cover letter summarizing the actions and meetings performed during the invoice period.

If you have any questions or if you would like to discuss in more detail, please feel free to call me at 469-250-3782.

Sincerely,

Hazen and Sawyer  
TBPE Firm No. F-13618

A handwritten signature in black ink, appearing to read "Ken C. Hall". The signature is fluid and cursive, with the first name "Ken" being more prominent.

Ken Hall, P.E.  
Vice President

A handwritten signature in black ink, appearing to read "Tyler Hudson". The signature is fluid and cursive, with the first name "Tyler" being more prominent.

Tyler Hudson, PE  
Principal Engineer