

Carollo Engineers, Inc.

WORK ORDER INITIATION FORM for the CITY OF CLEARWATER

Date:	6/13/19
Consultant Project Number:	(TBD)
City Project Number:	18-0034-U1
City Plan Set Number:	(TBD)

1. PROJECT TITLE:

WTP-2 System Improvements – Phase A

2. SCOPE OF SERVICES:

The WTP-2 plant was designed with three RO skids and a nameplate production capacity of 6.25 mgd. Currently, however, only one RO skid can be effectively operated at a given time reducing the actual production capacity to far less than 6.25 mgd.

The overall goal of the project is to make improvements to WTP-2 to allow to process and produce more water, addressing both water quality and water quantity. Problematic water quality issues include bromate, increasing raw water TDS, and impacts from RO1 concentrate. Regarding water quantity, additional raw water supplies are needed for operation of all three RO skids and for wellfield redundancy and reliability.

The RO1 concentrate use impacts both water quality and quantity. RO1 concentrate was designed as a supply source for RO2 plant, with the intention that it be blended with the brackish feed water. However, the use of RO1 concentrate has resulted in scaling of membranes and/or frequent replacement of cartridge filters. The WTP-2 plant does not add sulfuric acid in the RO feed. Sulfuric acid can reduce scaling potential of the membranes, and if not being currently used can be evaluated as a potential pretreatment chemical.

Additionally, there are chemical system improvements, membrane replacement, and other miscellaneous issues to be addressed as discussed in further detail below via the scoped tasks. The issues and deficiencies to be addressed include:

- Changes in raw water quality (total dissolved solids)
- Bromate level exceedance using ozone when operating more than one RO skid
- Groundwater supply shortfall
- Undersized CIP system

• Other miscellaneous deficiencies as described below

The most efficient and cost-effective way for addressing this project's overall needs is a phased approach. Phase A of the project will determine improvements to allow production with a minimum of two RO skids with the existing raw water quality and quantity. Phase A will consist of reviewing and evaluating the existing RO system and ozone system/bromate formation, followed by determining the associated recommendations for improvements. A key result from the Phase A evaluation will be whether the existing ozone system can be improved to address bromate mitigation, or if a new degasifier system will instead be required. Finally, Phase A will also include coordination with the ongoing Water Supply and Treatment Master Plan study (City project 18-0022-UT, Master Plan) to capture its conclusions, once available, pertaining to the long-term projected TDS and water supply options. Some RO system improvement recommendations that fall more into the categories of repair or maintenance fixes could be implemented by the City at the end of Phase A.

Design of improvements for the odor control system and certain other RO system improvements cannot be determined until the associated Phase A evaluations are completed, and will therefore be addressed in Phase B. Phase B of the project will be to design, permit, and construct the improvements to allow production with a minimum of two RO skids. This includes the necessary RO system improvements and, depending on the results from Phase A evaluations, either ozone system improvements (for bromate reduction) or implementation of a new degasifier system.

Longer term improvements in the context of revised projected TDS and water supply options to increase production to all three RO skids and for wellfield redundancy and reliability will be addressed in Phase C of the project.

Work associated with the different project phases will be authorized by the City in separate Work Orders.

The scope of work for this Work Order is for Phase A of the project, and has been prepared in accordance with City requirements and is presented as follows. The design plans in Phases B and C shall be compiled using the City of Clearwater CAD standards, as attached.

I. PROJECT MANAGEMENT

The Engineer's project manager will manage the efforts of the project team members, make staffing assignments, review work progress, coordinate quality assurance and review procedures, and communicate meeting schedules and progress reporting. Engineer's project manager will develop and manage the information described in the following subtasks.

Task 1.1 – Project and Quality Management Plan

Prepare a Project Management Plan including: project background and objectives; project team directory; project scope and budget; communication protocols; action item and decision log format; document standards; and change management procedures. A Quality

Management Plan will also be developed and included as part of the Project Management Plan document. A project schedule will be prepared and the initial schedule will be included in the Project Management Plan.

The Draft Project Management Plan will be prepared and submitted for review prior to the project kickoff meeting (see Task 1.4). Comments will be incorporated and a Final Project Management Plan prepared.

Task 1.2 – Progress Reports and Cost Control

Perform cost control and prepare brief monthly project status reports comparing work accomplished with scheduled activities and budgets. All project status reports will be submitted to the City's project manager with the monthly invoices.

Task 1.3 - Project Invoicing

Review and submit invoices on a monthly basis. Percent complete status will be updated and included along with the monthly invoice. Progress report will be included with the monthly invoice. Progress report will include an explanation of the work performed during the billing period.

Task 1.4 – Project Meetings

Coordinate, prepare, and conduct the following meetings at the City's offices. Associated agenda and meeting notes will be prepared along with pertinent decision and action log updates and submitted for each meeting.

- 1. Kickoff Meeting
- 2. Meeting to Review and Finalize List of Candidate Alternatives for Testing Bromate Mitigation
- 3. Review Meeting for Draft Bromate Evaluation Test Plan and Draft Data Summary Technical Memorandum (TM) for Ozone System
- 4. Review Meeting for Draft Results from RO1 Concentrate Projections and Recommendation Regarding Pilot Test and Draft Data Summary TM for RO System
- 5. Review Meeting for Draft Pilot-Scale Testing Plan for RO1 Concentrate
- 6. Meeting with FDEP and City to Discuss Full-Scale Testing Plan for Bromate Mitigation and Pilot-Scale and Full-Scale testing for RO1 Concentrate
- 7. Review Meeting for Interim Draft Results from Bromate Testing
- 8. Review Meeting for Interim Draft Results from RO Evaluations and RO1 Concentrate Pilot Testing
- 9. Review Meeting for Draft TM for Bromate Evaluation & Odor Control System Improvements
- 10. Review Meeting for Draft TM for RO1 Concentrate Pilot Testing
- 11. Review Meeting for Draft TM for RO1 Concentrate Full Scale Testing
- 12. Review Meeting for Draft TM for RO System Evaluation & Improvements

Kickoff meeting will include reviewing the project management plan, project scope, and project schedule; receiving pending previous reports, discussing pending data requirements, and identifying any additional data needs; and discussing and initiating coordination activities with City staff regarding first major milestones.

The review meetings noted above will include reviewing task results, current work efforts, and milestones; coordinating the progress and direction of the project; and reviewing budget, schedule, and other specific issues that may arise.

Task 1.5 – Schedule and Coordination

Develop the project schedule in Microsoft Project. The initial schedule will be included in the Project Management Plan and reviewed at the project kickoff meeting. The schedule will be updated and reviewed as needed.

Coordinate the efforts of the sub-consultants, including review of work progress and deliverables, invoicing and payments.

For the full-scale ozone testing, (Task 2.3), Carollo will coordinate and communicate with the equipment and chemical supplier(s) to accommodate equipment leasing and installation, schedules, budgets, invoicing and payments, etc., as required. Estimates of equipment and installation allowances are included in Task 2 budget. For injection points, Carollo will leverage existing taps to the full-scale piping to the extent possible, otherwise if needed City staff will install the chemical injection taps in the full-scale pipe. Laboratory analysis will be required for the full-scale ozone testing (Task 2.3) and/or other water quality analysis required to fill data gaps. Carollo will coordinate and communicate with the external analytical laboratory to accommodate sampling requirements, schedules, budgets, reporting requirements, invoicing and payments, etc., as required for the full-scale tests. All samples shipments/pickup with the external lab will be coordinated by Carollo, except bromate/bromide samples will be directly shipped by City to Eurofins lab.

Task 1.6 – Compile and Submit Dossier to City with Project Documents

Develop and compile a digital project "dossier" that includes the items below, as appropriate on CEI work orders:

• Files of correspondence, meeting minutes, Contract documents, deliverables, and comments, as available.

• At the conclusion of the project, ENGINEER will combine this information into a draft project dossier and submit to the City for review and comment. The project dossier will be submitted electronically on CD/DVD ROM. City comments on draft dossier will be received and incorporated, and a final project dossier will be developed and submitted.

II. BROMATE EVALUATION & ODOR CONTROL SYSTEM IMPROVEMENT RECOMMENDATIONS

Task 2.1 – Review of Existing Data and Data Summary TM for Ozone System

Request historical operational data from ozone system. Review the data from the plant relative to ozone operations including ozone dosage; raw water quality including bromide ion and H2S concentrations, temperature, and pH; and ozonated water quality including bromate ion and H2S concentrations.

Based on the review, prepare and submit draft a Data Summary TM, including identification of any data gaps and recommendations for closing the gaps, along with estimated costs to fill in the data gaps. Review the draft TM with City in a meeting. Address and incorporate City's comments received on Draft Data Summary TM and submit Final Data Summary TM. A contingency has been included in the budget estimate to address recommendations to fill data gaps, upon City's approval.

Task 2.2 – Perform Desktop Evaluation and Determine Alternative(s) for Full-Scale Testing

Based on the review of the data in Task 2.1, develop a list of candidate alternatives and perform desktop evaluation. These alternatives could include pH reduction, ozone dosage reduction, and upstream chlorine and ammonia addition. Development of the list will be based on empirical models that have been developed for bromate ion formation to determine efficacy of candidate alternatives. Based on the desktop evaluation, up to two (2) alternatives will be selected for further evaluation through full-scale testing. Review and finalize alternatives for further evaluation with City in a meeting.

Task 2.3 – Develop Test Plan

Prepare and submit draft test plans for full-scale testing of ozone system related to the selected alternative(s) (up to two) identified in Task 2.2. Review the draft test plan with City in a meeting.

Task 2.4 – Perform Full-Scale Short Term Testing

Perform short term testing of up to two alternatives. Some testing, such as ozone dosage reduction, could be performed without modification to the ozone system. Other testing may involve the addition of chemicals on a temporary basis. Assist City in reviewing test plan with FDEP and in obtaining FDEP approval for the full-scale testing with temporary ozone system modifications. Review interim/draft results from full-scale testing with City and conduct testing of a second alternative if necessary.

Carollo will coordinate and procure the necessary temporary chemicals (likely in tote tanks; with containment, if not placed into an existing containment area) and associated equipment for the full-scale testing.

Task 2.5 – Perform Full-Scale Long Term Testing (allowance)

Based on the results from the short term testing (Task 2.4), perform additional long term testing of a candidate alternative if needed.

Task 2.6 – Evaluate Alternatives

Evaluate the alternatives based on the results of Tasks 2.2 through 2.5. Propose a recommended alternative for bromate ion mitigation in the draft TM for Bromate Evaluation and Odor Control System Improvements.

Task 2.7 – Nitrogen Boost Evaluation

Evaluate the existing nitrogen boost system and make recommendations to improve performance and reliability. Include recommendations in the draft TM for Bromate Evaluation and Odor Control System Improvements.

Task 2.8 – Develop and Submit Draft TM for Bromate Evaluation and Odor Control System Improvements.

Develop and submit the Draft TM for Bromate Evaluation and Odor Control System Improvements, including the description, results, and recommendations from the bromate testing and evaluation, and the nitrogen boost evaluation. Include cost opinions for the recommended improvements. Review Draft TM results and recommendations in a meeting with City staff. Decide on a course of action, which could include design and construction of either ozone system improvements or of new degasifiers (if there are no viable bromate mitigation alternatives for the ozone system).

Task 2.9 – Develop and Submit Final TM for Bromate Evaluation and Odor Control System Improvements.

Address and incorporate City's comments received on Draft TM and submit Final TM.

III. RO SYSTEM EVALUATION AND IMPROVEMENTS

Task 3.1 – Review of Existing Data and Reports and Data Summary TM for RO System

Review available reports from previous studies to establish and confirm the project constraints and background. A preliminary list of these reports/studies is included below; this list will be refined/finalized at the project kickoff meeting. This list does not include the additional data/reports that are specifically listed to be reviewed under certain tasks discussed subsequently.

Preliminary list of reports and studies to be reviewed:

• Reverse Osmosis WTP #2 System Evaluation Summary of Findings. City of Clearwater and McKim & Creed. (March 2018).

- Reverse Osmosis WTP #2 System Evaluation Summary Report. McKim and Creed. (February 2018).
- Reverse Osmosis WTP#2 Treatment Alternative Evaluation. Reiss Engineering (November 2011).
- Impact Analysis Report. SDI Environmental Services, Inc. (March 2012).
- SEAWAT Variable-Density Groundwater Model Developed for Reservoir 2 Reverse Osmosis Feasibility Study. SDI Environmental Services, Inc. (March 2010).

Based on the review, prepare and submit draft a Data Summary TM for RO System, including identification of any data gaps and recommendations for closing the gaps, along with estimated costs to fill in the data gaps. Review the draft TM with City in a meeting. Address and incorporate City's comments received on Draft Data Summary TM and submit Final Data Summary TM. A contingency has been included in the budget estimate to address recommendations to fill data gaps, upon City's approval.

Task 3.2 - RO1 Concentrate Improvements

City noted that the use of RO1 concentrate in the RO feed increased SDI to about 5. Orthophosphate residual in RO1 concentrate (from antiscalant injection at WTP-1) resulted in precipitation of calcium phosphate and scaling in the second stage membranes. City staff reported that the second stage membranes on RO Skid #2 are badly scaled and are being replaced. The antiscalant was switched; however, new cartridge filters last only about six days when RO1 concentrate supply is turned on.

Review previous reports from pilot testing and membrane autopsies related to RO1 concentrate. Review pertinent record drawings, specifications, and submittals to evaluate RO1 concentrate design. Review WTP-2 RO operational data with and without RO1 concentrate being used as supply. Perform RO process modeling and projections to evaluate and recommend improvements needed to allow the use of RO1 concentrate. Coordinate samples and tests with chemical/antiscalant vendor for bench-scale testing by vendor. The results will be included in TM for RO System Improvements. Based on the results of Task 3.2, recommend if pilot testing (and subsequently full-scale testing) should be undertaken as the next step, upon City's approval. Task allowances are included for RO1 concentrate pilot testing under Task IV and full-scale testing under Task V.

Task 3.3 Evaluate Flow Control PLC/HMI Program & Pressure Control for RO1 Concentrate

City staff reported that the RO1 concentrate flow varies widely at RO2 in automatic control mode, when being blending for reuse and treatment at RO2. There is no pressure control at the blending point. Review pertinent record drawings, specifications, and submittals to evaluate flow control PLC/HMI program for RO1 concentrate discharge from concentrate pump station at RO1 and subsequent blending at RO2 with the raw ground water. Review PID loop and pressure control options as needed. Recommendations will be summarized in TM for RO System Improvements.

Task 3.4 – CIP System Improvements

Review pertinent record drawings, specifications, and submittals to evaluate CIP pump sizing, CIP system sizing (currently sized for only for 15 vessels), and issues with CIP fill piping layout. Determine and recommend improvements for CIP system. Recommendations will be summarized in TM for RO System Improvements.

Task 3.5 – Caustic System Improvements

Review pertinent record drawings, specifications, and submittals to evaluate caustic system pump sizing and injection point location. Discuss with City staff and review any available reports/data on scaling that had occurred post caustic injection. Review current location of injection point that was temporarily relocated by City to avoid precipitation issues. Determine and recommend improvements for caustic system pump sizing. Determine and recommend if current location is the best or should be changed. Recommendations will be included in TM for RO System Improvements.

Task 3.6 – Ground Storage Tank Improvements

Review issue with ground storage tank that causes it to not fill properly. Evaluate overflow and fill pipe elevations of both storage tanks and plant hydraulic profile and recommend improvements. Recommendations will be included in TM for RO System Improvements.

Task 3.7 - Other Miscellaneous RO System Improvements

- Review issue with cavitation of valves and back pressure of 180-190 psi causing stage one vessels to demonstrate cracks at tail end. Determine and recommend improvements and plan for vessel replacement.
- Review clearance issue with feed pumps removal. Recommend any potential improvement(s) that might be possible for better clearance.
- Review antiscalant feed pipe sizing and layout/routing. It is currently sized at 1" and is 400 feet long, resulting in long lead/dwell time to get to injection point. Evaluate and recommend improvements.
- Review permeate and concentrate valves as they don't seal well with the ARV blowing off hydrogen sulfide on the offline skid(s). Evaluate and recommend improvements.
- Verify RO permeate bypass line sizing. Evaluate and recommend if sizing should be changed.
- Review issue with backwash flow control on iron filters (original design used butterfly valves). Evaluate and recommend improvements.

Recommendations from Task 3.7 will be included in the TM for RO System Improvements.

Task 3.8 – Develop and Submit Draft TM for RO System Improvements.

Develop and submit the Draft TM for RO System Improvements including the descriptions and recommendations for various improvements identified in Tasks 3.2 to 3.7. Include cost

estimates for the recommended improvements. Review Draft TM results and recommendations in a meeting with City staff.

Task 3.9 – Develop and Submit Final TM for RO System Improvements.

Address and incorporate City's comments received on Draft TM and submit Final TM.

Task 3.10 - Coordinate with Master Plan Project Results and Team

Coordinate project and team activities with the Master Plan project. Coordinate and include data as it becomes available from the Master Plan project. Review deliverables for information purposes that relate to future WTP-2 TDS levels and water supply options to allow future operation with all three RO skids.

IV. PROGRAMMING ON EXISTING PLCS FOR FLOW PACING CHEMICALS FOR FULL SCALE TESTING (ALLOWANCE)

Upon City's approval, coordinate the programming of existing PLC/PLCs depending on which all test have been approved. This task is required to program the existing PLC(s) for flow pacing of chemicals during the full scale testing tasks. Based on discussion with City staff, it is assumed that there is enough spare I/Os in the existing PLCs, therefore budget for new field PLCs has not been included.

V. RO1 CONCENTRATE PILOT TESTING (ALLOWANCE)

Upon City's approval, coordinate the procurement and installation of RO pilot skid. The pilot study will include one month for pilot equipment mobilization, installation, startup and demobilization, and three (3) months of pilot operation. This task will include the following subtasks.

Task 5.1 - Develop Test Plan

Develop a testing plan for executing the pilot-scale test including the operational parameters and protocols for each process in the treatment train. Develop a sampling protocol to measure and establish the values for specific water quality parameters relating to the raw groundwater, RO1 concentrate, blended RO feed, and permeate waters. Develop a standard protocol that states the frequency of performance monitoring and sampling. This protocol will also specify any routine instrument calibration or verification procedures required. Develop the setup of equipment for the pilot treatment to be tested and prepare a graphical layout of necessary equipment and ancillary items for the pilot test.

Task 5.2 - Coordinate, Procure, Install, and Startup Equipment

Procure and install the appropriate temporary pilot equipment at RO2 WTP. Coordinate with team members and equipment suppliers to accommodate equipment procurement, installation, chemical requirements, and laboratory analysis. Perform and coordinate

training and startup. Perform bromate formation testing at Carollo's Water ARC[®] lab for a total of three (3) test samples/conditions.

Task 5.3 - Site Visits and Sampling

Perform site visits for pilot-scale operations 3 days per week, for a three (3) month operational period. Perform equipment monitoring, data collection, and coordination with laboratory. Perform selected water quality analyses in the field during the 3 visits per week, and contract with an external certified laboratory to analyze the remaining water quality parameters. Coordinate with external certified laboratory to provide sample containers and collect samples.

It is assumed that the remaining 4 days per week the City staff will be available to oversee basic pilot operation and perform necessary field data collection and monitoring. Sample collection will be minimized during the days that City staff are monitoring the pilot.

Task 5.4 - Data Analysis and Reporting

Analyze performance data from the pilot-scale testing on a routine basis. Compile and interpret the data and document the results. Data reports updating the results from the operations to-date will be compiled twice per month for distribution. Activities completed and results generated in the month will be summarized along with the plans for the testing in the subsequent month.

Task 5.5 - Develop and Submit Draft TM for RO1 Concentrate Pilot Testing.

Develop and submit a Draft TM including the description and results from the pilot testing. Review Draft TM results and recommendations in a meeting with City staff.

Task 5.6 - Develop and Submit Final TM for RO1 Concentrate Pilot Testing.

Address and incorporate City's comments received on Draft TM and submit Final TM.

VI. RO1 CONCENTRATE FULL-SCALE TESTING (ALLOWANCE)

Upon City's approval, coordinate the procurement and installation of temporary equipment for full scale testing of RO1 concentrate. The testing will include one month of operation.

This task will include the following elements:

Task 6.1 - Develop test plan

Develop a testing plan for executing the full-scale test including the operational parameters and protocols for each process in the treatment train. Develop a sampling protocol to measure and establish the values for specific water quality parameters relating to the raw groundwater, RO1 concentrate, blended RO feed, and permeate waters. Develop a standard protocol that states the frequency of performance monitoring and sampling.

Task 6.2 - Coordinate, Procure, Install, and Startup Equipment

Procure and install the appropriate temporary chemical feed equipment at RO2 WTP and RO1 WTP. Coordinate with team members and equipment suppliers to accommodate equipment procurement, installation, chemical requirements, and laboratory analysis. Perform and coordinate training and startup.

Task 6.3 - Site Visits and Sampling

Perform site visits for full-scale operations 3 days per week, for a one (1) month operational period. Perform equipment monitoring, data collection, and coordination with laboratory. Perform selected water quality analyses in the field during the 3 visits per week, and contract with an external certified laboratory to analyze the remaining water quality parameters. Coordinate with external certified laboratory to provide sample containers and collect samples.

It is assumed that the remaining 4 days per week the City staff will be available to oversee basic test operation and perform necessary field data collection and monitoring. Sample collection will be minimized during the days that City staff are monitoring the full-scale test.

Task 6.4 - Data Analysis and Reporting

Analyze performance data from the full-scale testing on a routine basis. Compile and interpret the data and document the results. Data reports updating the results from the operations to-date will be compiled once per week for distribution. Activities completed and results generated in the week will be summarized along with the plans for the testing in the subsequent week.

Task 6.5 - Develop and Submit Draft TM for RO1 Concentrate Full-Scale Testing.

Develop and submit a Draft TM including the description and results from the full-scale testing. Review Draft TM results and recommendations in a meeting with City staff.

Task 6.6 - Develop and Submit Final TM for RO1 Concentrate Full-Scale Testing.

Address and incorporate City's comments received on Draft TM and submit Final TM.

Assumptions:

- The ENGINEER shall complete the services required hereunder in accordance with the prevailing engineering standard of care by exercising the skill and ability ordinarily required of engineers performing the same or similar services, under the same or similar circumstances, in the State of Florida.
- 2) The CITY shall furnish the ENGINEER available studies, reports and other data pertinent to the ENGINEER 's services; obtain or authorize the ENGINEER to obtain or provide additional reports and data as required; furnish to the ENGINEER services of others required for the performance of the ENGINEER 's services hereunder, and the ENGINEER shall be entitled to

use and rely upon all such information and services provided by the CITY or others in performing the ENGINEER 's services under this Scope of Work, in accordance with the standard of care.

3) In providing opinions of cost, financial analyses, economic feasibility projections, and schedules for potential projects, the ENGINEER has no control over cost or price of labor and material; unknown or latent conditions of existing equipment or structures that may affect operation and maintenance costs; competitive bidding procedures and market conditions; time or quality of performance of third parties; quality, type, management, or direction of operating personnel; and other economic and operational factors that may materially affect the ultimate project cost or schedule. Therefore, the ENGINEER makes no warranty that the City's actual project costs, financial aspects, economic feasibility, or schedules will not vary from the ENGINEER's opinions, analyses, projections, or estimates.

3. PROJECT GOALS:

The following work products will be submitted during the project:

- Project Management Plan
 - Draft: electronic PDF copy, Word file
 - Final: electronic PDF copy, 4 hard copies
- Test Plans (as defined in Scope of Services)
 - Draft: electronic PDF copy, Word file
 - Final: electronic PDF copy, 4 hard copies
- TMs (as defined in Scope of Services)
 - Draft: electronic PDF copy, Word file
 - Final: electronic PDF copy, 4 hard copies
- Meeting Agendas and Notes; electronic PDF copy
- Progress Reports and Invoices; electronic PDF copy
- Draft and Final Project Dossier; electronic PDF copy on CD/DVD ROM

4. **BUDGET**:

See Attachment "B".

This price includes all labor and expenses anticipated to be incurred by Carollo Engineers, Inc., for the completion of these tasks in accordance with Professional Services Method "A" – Cost Times Multiplier Basis, for a fee not to exceed One Million Five Hundred and Thirty One Thousand and Three Hundred and Fifty One Dollars (\$1,531,351).

Permit fees are not expected in Phase A of the project.

5. SCHEDULE:

We understand the urgency of completing this Phase A evaluation so that the RO2 improvements can be designed in Phase B and the second RO skid be put into operation. Phase A tasks can be completed in 58 weeks (approximately 14 months) from issuance of notice-to-proceed and receipt of all data. A breakdown of the schedule and the phasing of the project deliverables are as follows:

Draft Test Plan for RO1 Concentrate Pilot Test	9 weeks
Draft Test Plan for Full-Scale Bromate Testing	12 weeks
Draft TM for Ozone Data Summary	12 weeks
Draft TM for Bromate/Ozone Improvements	30 weeks
Final TM for Bromate/Ozone Improvements	36 weeks
Draft TM for RO1 Concentrate Pilot Test	36 weeks
Draft Test Plan for RO1 Concentrate Full-Scale Test	38 weeks
Draft TM for RO1 Concentrate Full Scale Test	50 weeks
Draft TM for RO Improvements	56 weeks
Final TM for RO Improvements	58 weeks

6. **STAFF ASSIGNMENT:**

Engineer's Key Staff

City's Staff:

Jeff Walker, PE - Project Manager

John Conyers - Public Utilities Site Representative (RO2 Chief Operator)

Fred Hemerick - Public Utilities Liaison (Water Production Coordinator)

Glenn Daniel - Public Utilities Manager

Jeremy J. Brown, PE - Utilities Engineering Manager

Richard G. Gardner, PE - Public Utilities Assistant Director

7. CORRESPONDENCE/REPORTING PROCEDURES:

ENGINEER's project correspondence shall be directed to: Sandeep Sethi, PhD, PE with copy to Jennifer Stokke Nyfennegger, PhD, PE. All City project correspondence shall be directed to the Project Manager, with copies to the Utilities Engineering Manager and Public Utilities Assistant Director.

ENGINEER shall provide a minimum of forty-eight (48) hours' notice prior to conducting fieldwork/site visits. ENGINEER shall provide a minimum of seven (7) days notification for site visits requiring the assistance of City Operations and Maintenance personnel.

ENGINEER acknowledges that all City directives shall be provided by the City Project Manager.

In addition to the original copies delivered as stated in the scope of work, all project deliverables will be submitted in electronic format on CD or other City approved device prior to approval of final invoice.

8. INVOICING/FUNDING PROCEDURES:

For work performed, invoices shall be submitted monthly to the:

City of Clearwater, Engineering Department Attention: Veronica Josef, Senior Staff Assistant PO Box 4748 Clearwater, Florida 33758-4748.

Contingency services will be billed as incurred only after written authorization provided by the City to proceed with those services.

City Invoicing Code: 3217321-530100-96767

9. INVOICING PROCEEDURES

At a minimum, in addition to the invoice amount(s) the following information shall be provided on all invoices submitted on the Work Order:

- A. Project Name and Project Number.
- B. Purchase Order Number, Invoice Number, and Contract Amount.
- C. The time period (begin and end date) covered by the invoice.
- D. A descriptive summary of activities completed in the time period
- E. Contract billing method Lump Sum or Cost Times Multiplier
- F. If Lump Sum, the percent completion, amount due, previous amount earned and total earned to date for all tasks (direct costs, if any, shall be included in lump sum amount).
- G. If Cost Times Multiplier, hours, hourly rates, names of individuals being billed, amount due, previous amount earned, total earned to date for each task and other direct costs (receipts will be required for any single item with a cost of \$50 or greater or cumulative monthly expenses greater than \$100), and budget remaining.
- H. If the Work Order is funded by multiple funding codes, an itemization of tasks and invoice amounts by funding code.

10. SPECIAL CONSIDERATIONS:

The consultant named above is required to comply with Section 119.0701, Florida Statutes (2013) where applicable.

PREPARED BY:

APPROVED BY:

Sandeep Sethi Vice President Carollo Engineers, Inc.

Date

Tara Kivett, PE City Engineer City of Clearwater

Date

Attachment "A"



CITY OF CLEARWATER ENGINEERING DEPARTMENT

WORK ORDER INITIATION FORM CITY DELIVERABLES

1. FORMAT

The design plans shall be compiled utilizing the following methods:

- 1. City of Clearwater CAD standards.
- 2. Datum: Horizontal and Vertical datum shall be referenced to North American Vertical Datum of 1988 (vertical) and North American Datum of 1983/90 (horizontal). The unit of measurement shall be the United States Foot. Any deviation from this datum will not be accepted unless reviewed by City of Clearwater Engineering/Geographic Technology Division.

2. **DELIVERABLES**

The design plans shall be produced on bond material, $24" \times 36"$ at a scale of 1" = 20' unless approved otherwise. Upon completion the consultant shall deliver all drawing files in digital format with all project data in Autodesk Civil 3D file format. If not available Land Desktop files are still acceptable, however the City or Clearwater is currently phasing out Land Desktop.

NOTE: If approved deviation from Clearwater CAD standards are used the Consultant shall include all necessary information to aid in manipulating the drawings including either PCP, CTB file or pen schedule for plotting. The drawing file shall include only authorized fonts, shapes, line types or other attributes contained in the standard release of Autodesk, Inc. software. All block references and references contained within the drawing file shall be included. Please address any questions regarding format to Mr. Tom Mahony, at (727) 562 4762 or email address Tom.Mahony@myClearwater.com.

All electronic files must be delivered upon completion of project or with 100% plan submittal to City of Clearwater.

Attachment "B"

Carollo Engineers, Inc. WTP-2 System Improvements – Phase A City Project No. 18-0034-UT

WORK ORDER INITIATION FORM PROJECT BUDGET

Task	Description	Subconsultant	Labor	Total		
		Services				
1.0	Project Management					
1.1	Project and Quality Management Plan	\$0	\$4,900	\$4,900		
1.2	Progress Reports and Cost Control	\$0	\$14,390	\$14,390		
1.3	Project Invoicing	\$0	\$5,250	\$5,250		
1.4	Project Meetings (up to 12)	\$6,068	\$87,580	\$93,648		
	(Prepare/Attend/Develop Notes)					
1.5	Schedule and Coordination	\$0	\$25,770	\$25,770		
1.6	Compile Summary Log for City Comments (12	\$0	\$46,900	\$46,900		
	mtgs + 8 delv.) and Draft/Final Project Dossier					
	Task Subtotal	\$6,068	\$184,790	\$190,858		
2.0	Bromate Evaluation & Odor Control System Im	provements				
2.1	Review of Existing Data and Draft/Final Data	\$0	\$24,530	\$24,530		
	Summary TM					
2.2	Perform Desktop Evaluation and Develop	\$0	\$12,510	\$12,510		
	Alternative(s) for Full-Scale Testing					
2.3	Develop Test plan)	\$0	\$20,210	\$20,210		
2.4	Perform Full-Scale Short Term Testing (up to 2	\$0	\$17,530	\$17,530		
	alternatives over total 1 week)					
2.5	Perform Full-Scale Long Term Testing (2 week	\$0	\$30,060	\$30,060		
	allowance)					
2.6	Evaluate Alternatives	\$0	\$12,160	\$12,160		
2.7	Nitrogen Boost Evaluation	\$0	\$8,150	\$8,150		
2.8	Develop and Submit Draft TM	\$0	\$18,190	\$18,190		
2.9	Develop and Submit Final TM	\$0	\$4,390	\$4,390		
	Task Subtotal	\$0	\$147,730	\$147,730		
3.0	RO System Evaluation and Improvements					
3.1	Review of Existing Data and Reports and	\$6,576	\$31,600	\$38,176		
	Drawings, and Draft/Final Data Summary TM					
3.2	R01 Concentrate Improvements Evaluation	\$0	\$12,700	\$12,700		
3.3	Evaluate Flow Control PLC/HMI Program &	\$0	\$39,230	\$39,230		
	Pressure Control for RO1 Concentrate					
3.4	CIP System Improvements	\$0	\$9,360	\$9,360		

2.5		40	60.400	60.400		
3.5	Caustic System Improvements	\$0 \$0	\$8,130	\$8,130		
3.6	Ground Storage Tank Improvements	\$0	\$17,050	\$17,050		
3.7	Other Miscellaneous RO System	\$0	\$19,940	\$19,940		
	Improvements					
3.8	Develop and Submit Draft TM	\$0	\$19,530	\$19,530		
3.9	Develop and Submit Final TM	\$0	\$6,500	\$6,500		
3.10	Coordinate with Master Plan Project Results	\$17,172	\$13,250	\$30,422		
	and Team					
	Task Subtotal	\$23,748	\$177,290	\$201,038		
4.0	Programming on Existing PLCs for Flow Pacing C	hemicals for Full So	ale Testing (Al	lowance)		
4.1	Programming (on existing PLC at RO2) for Flow	\$0	\$29,740	\$29,740		
	Pacing Chemical - Ozone Testing					
4.2	Programming (on existing PLC at RO2) for Flow	\$0	\$29,740	\$29,740		
	Pacing Chemical - RO1 Conc. Testing					
4.3	Programming (on existing PLC at RO1) for Flow	\$0	\$29,740	\$29,740		
	Pacing Chemical - RO1 Conc. Testing					
	Task Subtotal	\$0	\$89,220	\$89,220		
5.0	RO1 Concentrate Pilot Testing (3 month operati	on + 1 month insta	ll/startup/dem	nob)		
	(Allowance)					
5.1	Develop Test Plan	\$0	\$16,410	\$16,410		
5.2	Coordinate, Procure, Install, and Startup	\$0	\$41,000	\$41,000		
	Equipment					
5.3	Site visits & sampling (3 months; 3/wk field	\$0	\$77,940	\$77,940		
	engr, 1/wk PE, 1/mo PM)					
5.4	Data Analysis and Reporting	\$0	\$37,430	\$37,430		
5.5	Develop and Submit Draft TM	\$0	\$28,310	\$28,310		
5.6	Develop and Submit Final TM	\$0	\$8,860	\$8,860		
	Task Subtotal	\$0	\$209,950	\$209,950		
6.0	RO1 Concentrate Full Scale Test (1 month)					
6.1	Develop Test Plan	\$0	\$10,940	\$10,940		
6.2	Coordinate, Procure, Install, and Startup	\$0	\$23,660	\$23,660		
	Equipment					
6.3	Site Visits & Sampling (1 month)	\$0	\$42,710	\$42,710		
6.4	Data Analysis and Reporting	\$0	\$26,080	\$26,080		
6.5	Develop and Submit Draft TM	\$0	\$19,630	\$19,630		
6.6	Develop and Submit Final TM	\$0	\$7 <i>,</i> 630	\$7,630		
	Task Subtotal	\$0	\$130,650	\$130,650		
Subtotal, Labor and Subcontractors						
Permit Review Fees						
Contingency						
Other	Direct Costs (prints, photocopies, postage, out of	state travel, equip	ment, etc.)	\$390,873		
Grand Total						