WORK ORDER INITIATION FORM
for the CITY OF CLEARWATER

Date: **11/15/2018**

M&C Project Number: **0992-0245**

City Project Number: **18-0022-UT**

1. PROJECT TITLE:

Water Supply and Treatment Master Plan

2. SCOPE OF SERVICES:

The City of Clearwater has identified the need to develop a Water Supply and Treatment Master Plan (Master Plan) to plot the course of the City's water supply, treatment and key distribution systems for the next 30 years. The work associated with the Master Plan will include the evaluations of hydrogeologic conditions within the City service area, raw and finished water systems for future water supply scenarios, water treatment facilities, wellfields and groundwater replenishment. A 30-Year Master Plan will be developed and will include recommendations focused on meeting long term water supply needs, water quality goals and system reliability. The Master Plan will also consider potential sea-level rise impacts on water supply and treatment facilities. The Master Plan will include prioritized listings of recommend capital improvement projects. One of the main project goals is to identify the highest water quality available that can be cost-effectively delivered to each treatment facility and the City's utility customers. The Master Plan will also include planning level costs that will be used to establish water supply and treatment system capital improvement projects to aid in the City's budgeting efforts.

The Water Supply and Treatment Master Plan will be developed using a series of tasks as follows:

TASK 1: PROJECT MANAGEMENT, ADMINISTRATION AND MEETINGS

This task includes project setup and project management plan, kickoff meetings, general communications and coordination, management of a project information website, monthly progress reports and invoicing, and project close-out, including delivery of electronic data and records obtained and produced during the project, in an organized file structure that can be used by the City for future projects. This task also includes monthly project meetings with the City to discuss project status, schedule and upcoming issues and needs. Additionally, McKim & Creed will prepare materials and attend up to three (3) meetings with City Manager and/or City Council members. Also, we will prepare for and attend a meeting with the City and the Southwest Florida Water Management District (SWFWMD) to review and discuss viable water supply alternatives.

TASK 2: DATA COLLECTION, DATA REVIEW AND HYDROGEOLOGICAL STUDY PLAN

McKim & Creed will coordinate and meet with City staff and our subconsultants, WSP and Applied Drilling Engineering, Inc. (ADE), to collect, organize and review existing data relevant to the Project. The data will be organized in an electronic file structure that will be provided to the City for use on future projects. A preliminary listing of project data needs has been provided to the City and the list will be updated following authorization. This task also includes a limited evaluation of a possible artisan spring at Harborview Center, addressing its possible use for water supply or for local aesthetic features in redevelopment.

Task 2.1 – Data Gaps Memorandum

Prepare Technical Memorandum (TM) #1 to identify critical data gaps and to provide recommendations to resolve the data gaps. Three (3) copies of the draft memorandum will be submitted to the City along with an electronic (PDF and MS Word format) version via e-mail. A review meeting will be held with the City to develop a plan of action to obtain critical missing information. The memorandum will be updated while Task 3 activities are performed, and the final memorandum will be prepared to document and summarize the data collection activities, findings and assumptions that will be used to supplement missing data. Three (3) copies of the final memorandum will be submitted to the City along with electronic (PDF and MS word format) versions. It is understood that the assumptions used for the remainder of the project shall be jointly agreed upon by the City and McKim & Creed. Additionally, it is understood that the City will have the opportunity to provide additional information for data gaps, as needed, using other means available to the City.

Task 2.2 – Hydrogeologic Study Plan

McKim and Creed will coordinate with our subconsultant, WSP to prepare a Hydrogeologic Study Plan for the relevant project components. The plan will generally discuss / describe the following:

1. Planned physical well evaluation activities described in Task 3, including a discussion of the information that will be collected and how the information will be used to evaluate the physical and water-quality properties of the respective wells.
2. How the physical information obtained in Task 3 will be used to assess potential well maintenance or modifications to improve well performance.
3. Statistical methods that will be used to evaluate water-quality trends, projections and optimal production rates for each well.
4. GIS statistical methodology that will be used to examine spatial distribution of water quality across the service area.
5. Mass-flow balance methodology that will be used to estimate the net water-quality and flow rates delivered to each water treatment plant.
6. Integration of the results of the analyses between the hydrogeologic and engineering tasks as the project progresses.

The draft plan will be summarized in TM #2 that will be peer reviewed by Dr. Richard Spruill prior to using the results in subsequent tasks. Three (3) copies of the peer review comments and recommendations, along with three (3) copies of the draft memorandum will be submitted to the City along with e-mail electronic (PDF and MS Word) copies. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form assigned to this project. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

TASK 3: WATER SUPPLY AND TREATMENT SYSTEM EVALUATION

This task includes evaluations for the existing supply and treatment system and the identification of improvements that may be needed during the 30-year planning period.

Task 3.1 – Well Evaluation, Testing and Acidization

Included in this task is a well evaluation/testing program to evaluate the condition, productivity, and water-quality profile of a statistically significant sample size of up to twenty-two (22) production wells. Additionally, this task includes the acidization and additional specific capacity testing of up to six (6) wells. The well testing activities will be performed by ADE, with our hydrogeologist team member, WSP providing oversight of the testing, data compilation and interpretation. Well evaluations will include the following steps:

1. Coordinate with City staff to identify and select up to twenty-two (22) wells.
2. With prior City approval, perform a specific capacity test using the production pump, when possible. A temporary test pump will be used when an existing pump is unavailable.
3. Remove and inspect the production pump. Damaged or degraded components will be noted for future repair.
4. Perform geophysical and in-situ data collection for a suite of borehole geophysical logs including:
   a. Long-short normal resistivity.
   b. Vertical extent of the confining and other clayey low permeability layers in the Upper Floridan aquifer (gamma log).
   c. Borehole diameter and location(s) of fractures/solution cavities (caliper).
   d. Temperature.
   e. Fluid resistivity and flow under static (no pumping) conditions.
   f. Temperature, fluid resistivity and flow under dynamic (pumping) conditions.
   g. Video survey of the well.
5. Four (4) of the existing WTP-2 brackish wells (2-1, 2-5 or 2-6, 2-10 and 2-12) have been reported to have loss of productivity since the start of operation. These wells, along with up to two (2) additional wells that will be identified during the project, will be acidized by ADE using a food grade, low strength acidization technique that does not require the acid to be pumped out and disposed.

6. Upon completion of the acidization, the production pump will be reinstalled, and a post-acidization specific capacity test will be performed to evaluate the benefit.

We will coordinate with the City GIS department, IT department and project team to develop forms that will used to document the well evaluation, testing and acidization activities, capture asset data (attributes) and performance indicators. The forms and relevant information will be uploaded to OWAM/GIS.

Data collected in the field, including geophysical logs, video logs, specific capacity test data, and observations of the pumping equipment will be reviewed and used with existing geologic and water-quality data to evaluate the following:

1. Physical condition of the well casings, boreholes, and pump equipment.
2. Local geology.
3. Production capability and producing zone profile.
4. Water-quality characteristics.

Information obtained during this task will be used to develop recommendations for future well improvements.

Task 3.2 – Develop and Confirm City Water Quality Goals

McKim & Creed will perform research on upcoming/future regulations and will meet with City staff to discuss and identify both short and long-term City water quality goals. Long-term goals will need to consider increased TDS levels with respect to potable water treatment requirements. Additionally, the water quality goals for Pinellas County Utilities and Tampa Bay Water will be considered. Water quality goals will also consider impacts to capital and operational costs for the City's water infrastructure, so an appropriate balance can be achieved.

Task 3.3 – Above-Ground Well Evaluations

This task includes a planning-level evaluation of the above-ground components of the existing production wells. McKim & Creed engineers from applicable disciplines will conduct site visits at the existing wells to review and document components or systems needing repair or replacement. The main goal of this task is to identify and document issues with major equipment at the selected wells that may need to be replaced as part of a future CIP project. Additionally, this task will consider the use of permanent and/or temporary backup power at select wells and a review of potential flood impacts from future floods including storm surges Planning level assessments will be provided for the following:

1. Condition of piping, electrical and instrumentation systems.
2. Anticipated useful life remaining for the referenced systems.
3. Damaged or degraded components will be noted for future repair.
4. Potential improvements needed to protect the wells from flooding.

Task 3.4 – Water Treatment Facility Condition Evaluations

This task includes a planning-level assessment of the conditions at the three (3) existing City water treatment facilities. McKim & Creed engineers from applicable disciplines will conduct site visits at the existing treatment facilities to review and document the major system needs and will interview City staff assigned at each facility as part of this task. The main goal of this task is to identify and document issues with major equipment at the treatment plants that may need to be replaced as part of a future CIP project. Planning level assessments will be provided for the following:

1. Condition of major mechanical, treatment process, electrical, structural, instrumentation and piping systems.
2. Anticipated useful life remaining for major systems.
3. Rehabilitation and replacement requirements for major equipment within the 30-year planning period.

Task 3.5 – Water Treatment Process Alternative Evaluations

McKim & Creed will evaluate, compare and recommend treatment process improvements needed for each of the City's three (3) WTPs for the 30-year planning period. The alternatives and evaluations may consider the following:

1. Update recommendations from the *WTP-2 System Evaluation Summary Report (McKim & Creed, Inc., 2018)* based on findings of quality/quantity projected for raw water supply to the plant.
2. Projected supply water quality and quantity.
3. Regulatory considerations.
4. City water quality goals.
5. Alternatives to address declining supply water quality over the planning period (may consider phased improvements at each facility).
6. Potential advances in water treatment process technology (e.g., more efficient membranes with lower fouling potential).
7. Treatment process optimization (e.g., chemical dosages, system hydraulics, membrane selection).
8. New water treatment facility.

The task will consider long-term sustainability, viability and effectiveness of each of the three (3) existing water treatment facilities and a potential new treatment facility.

Task 3.6 – Water Supply and Treatment Cost Analysis

McKim & Creed will develop planning level costs for potential water supply, treatment and transmission main scenarios and integrate these costs with those of currently planned CIP projects. The cost analysis will include calculated unit costs of City water production for the existing infrastructure that will be used to compare against other options. It is anticipated that the City will provide current operational costs and

projected rates from Pinellas County Utilities. Capital, O&M and present worth will be calculated for the viable City options and will be used for the comparisons.

Task 3.7 – Water Supply and Treatment System Evaluation Memorandum

Results from Task 3 will be summarized in TM #3 and will be peer reviewed by Dr. Richard Spruill prior to submitting to the City. Three (3) copies of the peer review comments, along with three (3) copies of the draft memorandum will be submitted to the City along with e-mail electronic (PDF and MS Word) copies. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The memorandum will be updated and reviewed by Dr. Richard Spruill. Three (3) copies of the peer review comments along with three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

TASK 4: HYDROGEOLOGICAL EVALUATIONS

McKim & Creed will coordinate with WSP to perform evaluations on the City's existing and future projected hydrogeological conditions. The evaluations will consider the following elements:

1. Current and projected water-quality trends.
2. Well production capacity.
3. Identification of potential new well sites.
4. Existing abandoned well sites with easements suitable for well construction.
5. Wellfield expansion alternatives.
6. Wellfield monitoring program.
7. Wellfield management plan.
8. Water use permit status and conditions compliance.
9. Integration of the planned Groundwater Replenishment (GWR) project.
10. Projected sea-level rise.

Task 4.1 – Statistical Analysis

Regression analysis using available water-quality data for the production, monitoring and abandoned wells will be performed to evaluate trends in water quality concentrations, and to project future concentrations based on current trends. Upon completion of the trend analysis, a correlation analysis will be performed to evaluate the relationship between monthly water quality concentrations (TDS and chlorides) and production quantity. The correlation coefficient and scatter plot analysis will be used to estimate the optimum pumping rate for each existing well with respect to managing water quality in the well.

The projected pumping rates and water quality from the statistical analyses will be used in a mass balance calculation to calculate the total production quantity and water quality going to each water plant with the

existing wells and wellfield configuration. The results of this analysis will provide an initial assessment of the quantity and quality of new water sources that will be required to meet the City's demands and water treatment infrastructure.

The statistical analysis will also include GIS statistical methods to examine the spatial distribution of water quality across the City's service areas. The analysis will be performed using data from production and monitoring wells to map the distribution of water quality in upper and lower Zone A within the City. The results of this analysis will be used in subsequent tasks.

A description of the statistical analysis methodology and the results of the analyses will be described in a technical memorandum that will include the projected water quality for the City's existing wells. Results will be summarized in TM #4 that will be peer reviewed by Dr. Richard Spruill prior to using the results in subsequent tasks. Three (3) copies of the peer review comments and recommendations, along with three (3) copies of the draft memorandum will be submitted to the City along with e-mail electronic (PDF and MS Word) copies. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form assigned to this project. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

Task 4.2 – Evaluate Sites for New Wells

Our team will identify and evaluate potential sites for new wells to provide additional supply as needed in the existing wellfields. The initial site investigations will include City-owned properties, former (abandoned) wells sites, and co-location at existing well sites. These sites will be evaluated based on current land use, regulatory setbacks, and existence of usable easements. Each potential site will then be evaluated for water quality using the results of the statistical analysis. Regression analysis results from nearby existing wells will be used to help estimate projected water quality concentrations from potential new well sites. The spatial water-quality analysis will be used to estimate current water quality in upper and lower Zone A, and to evaluate which zone(s) to consider for new production wells. We will also assess the potential for constructing Upper "Zone A" wells in areas with existing Lower "Zone A" wells to provide fresher water that could be used, for example, for blending to reduce TDS levels in the RO WTP #2 feed water if compliant with WTP-2 permit.

Upon selection of potential well sites, the mass balance calculations will be updated using proposed and existing wells to recalculate the projected quantity and quality. Existing groundwater models will be reviewed and updated to assess projected groundwater levels in the project area that will be used with the statistical analyses to estimate the safe yield for the area and to provide the basis for the 30-year projected water quantity and quality for the City.

A description of the new well site evaluation methodology and the results of the analyses will be described in TM #5 that will be peer reviewed by Dr. Richard Spruill prior to using the results in subsequent tasks.

Three (3) copies of the draft memorandum will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

Task 4.3 – Wellfield Management Plan Update

Based on the results of the well evaluation activities in Task 3 and the water quality and production rate projections from Task 4.1, we will update the City's Wellfield Management Plan. The plan will be updated and expanded to include recommended well operating parameters to optimize production rates and water-quality, recommended well maintenance activities and changes to the monitoring plan that may be needed based on new production well locations. The goal of the updated plan is to provide the water plant operations staff with guidelines to assist them in operating the wells and wellfields in an efficient and sustainable fashion. This revised plan will also be a key element to support any associated modification of the WUP. Elements in the updated Wellfield Management Plan include:

1. Service area background and description.
2. Wellfield descriptions.
3. Hydrogeologic description of zones within the aquifer.
4. Production well descriptions, including diagrams and details, as required. The wellfield map provided by the City (City of Clearwater Well Locations – Inactive Production and Active Production and Monitoring Wells) will be utilized and confirmed by McKim & Creed as part of this task.
5. Monitoring wells description.
6. Monitoring plan.
7. Wellfield operations and management plan that will include an action plan if chloride limits are exceeded on a monitoring well.
8. Description of City's water conservation plan required by the SWFWMD.

The updated Wellfield Management Plan will be included as part of the Water Use Permit Modification (Task 5).

Task 4.4 – Evaluate Integration with the Planned GWR Project

Based on recent discussions between the City and the SWFWMD, we understand there may be opportunities to incorporate the planned GWR project into the City's overall water supply strategy. For the option of supply wells in proximity of the GWR facility, the primary task will be to use the groundwater flow and particle tracking model developed for the GWR project to identify potential supply well locations and evaluate the travel time for water from the GWR recharge wells to reach the proposed supply wells. The modeling would also be used to evaluate the net impact on water levels in the Upper Floridan aquifer resulting from recharge and new withdrawal. For the option of additional freshwater withdrawal for other parts of the City with GWR used as an offset, groundwater flow modeling will be performed to evaluate

the net benefit of GWR recharge and new withdrawal regarding its measurable benefit. This task includes one (1) meeting with the SWFWMD and one (1) meeting with the FDEP to discuss these options.

A description of the conceptual use of GWR recharge to support additional withdrawals and the groundwater modeling analyses will be described in TM #6. Three (3) copies of the draft memorandum will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

TASK 5: WATER USE PERMIT MODIFICATION

Our Team will assist the City with modifying the existing water use permit (WUP) so that alternative and additional supplies can be developed and utilized. For the WUP modification, a description of the purpose for the modification will be provided along with the permitting requirements. The requested changes will be described in the WUP modification description with the necessary supporting information. This task includes the following services:

1. Meeting with City staff to discuss the WUP modification.
2. Prepare agenda and attend a pre-application meeting with the SWFWMD permitting staff to discuss items such as projected demands, permit duration and the amount / type of supporting information such as hydrologic analyses. Modifications to the existing environmental management plan will also be discussed.
3. Impact analysis to include preparation of a groundwater flow model(s) to assess the change in drawdown between the existing and proposed permitted withdrawals. Drawdowns will be modeled based on average annual withdrawal for one year and peak month withdrawal for 90 days as required by the SWFWMD. The modeling will be performed using the SWFWMD District-Wide Regulatory Model, which is used to address drawdown impacts for WUP applications developed by the SWFWMD. An Impact Analysis Report will be prepared and will include a summary of the area hydrogeology, a description of the methodology and results of the wellfield groundwater flow model, and will also include supporting figures, maps and tables.
4. Assist the City with the evaluation and revision of the existing Environmental Management Plan (EMP). We will provide documentation to support requested EMP modifications, including maps and site-specific data. Attend one (1) site meeting with the SWFWMD staff to review field conditions and discuss proposed modifications.
5. Prepare draft WUP application and supporting documents and meet with City.
6. Update draft WUP application to address City Comments and prepare WUP application on-line using the SWFWMD's Water Management Information System (WMIS). The WUP application will be signed and sealed by a Professional Geologist licensed in the state of Florida as required by the SWFWMD.
7. Assist the City with the preparation of up to two (2) Requests for Additional Information (RAIs). Attend meeting with City and SWFWMD staff, if necessary. The current RAI response procedure allows for

submittal of partial responses for review by SWFWMD staff so that the final response meets their approval. We will prepare the responses and submit to the City for review prior to submittal to the SWFWMD.

TASK 6: EVALUATE WATER SUPPLY OPTIONS

Evaluate and identify sources that would be best used to supply the City's treatment facilities. One of the keys for this task will be the consideration of partially integrating the City's three (3) existing wellfields for interconnectivity and to improve reliability/operations. The following items will be considered:

1. Additional wells sites.
2. Utilize abandoned wells with existing easements.
3. Co-locating at existing well sites (using upper and lower "Zone A" at the same site).
4. Integration of the City's three (3) wellfields.
5. Wholesale purchase from Pinellas County.
6. Expansion of supply and treatment capability.
7. Indirect potable reuse.

This task includes a financial feasibility analyses and a regulatory review for viable supply options. A weighted matrix will be developed to review and evaluate potential supply alternatives. The regulatory review includes a meeting with the SWFWMD to review policies and potential funding opportunities. Viable water sources for this task will include consideration of other items such as quantity, quality, and site / environmental impacts. A sustainability review will be performed for viable sources to help establish and recommend modifications to existing water supplies and to ensure future water supplies are sustainable

Three (3) copies of TM #7 will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form assigned to this project. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

TASK 7: FUTURE WATER DEMAND PROJECTIONS

Task 7.1 – Existing Water Demands

The existing water demands, average daily demands, peak day and peak hour will be developed. The existing water demands will be stratified into categories or types of use as needed.

Task 7.2 – Future Water Demand Projections

McKim & Creed will coordinate with City long-range planning staff and will calculate the projected future water demands for the City's water system using information, such as GIS data, from the City and other

sources. Demand projections will consider the projected population and an average per capita water usage for residential customers, plus typical water usage data for institutional, commercial and industrial users. The City's Annual Water Reports and the Comprehensive Plan will also be reviewed and considered for the projected demands. Additionally, we will review recent reclaimed water activities to potentially expand or offset potable demands from reclaimed water system expansion. Special focus will be given to the Downtown Development Area, on beaches and along the US 19 corridor where re-development is occurring. We will confirm that planning forecasts have these re-development areas factored into demands.

Task 7.3 – Water Balance Calculation

Utilizing data provided by the City, McKim & Creed will perform one (1) water balance calculation for the "unaccounted for water" in accordance with AWWA M36 – "Water Audits and Loss Control Programs." The results of these demand and water loss calculations will aid in developing the baseline for developing future water demand projections.

Task 7.4 – Future Water Demands Summary Memorandum

Three (3) copies of TM #8 will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form assigned to this project. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

TASK 8: HYDRAULIC MODELING AND ELEVATED TANK EVALUATION

McKim & Creed will perform hydraulic modeling of the City's existing and future (30-year) raw water and finished water distribution system with regard to the impacts of projected system growth and changes in operation and/or capacity of other elements identified as part of Master Plan. Additionally, this task includes hydraulic evaluations needed to determine if the City's two (2) existing elevated storage tanks are needed. The hydraulic modeling effort will be focused on identifying large diameter transmission mains that may need to be upsized to handle future flow increases.

Task 8.1 – Update Current Hydraulic Model

McKim & Creed will coordinate with the City GIS division and will utilize the City's current (2011) model created using Innovyze's InfoWater software and other information provided by the City (e.g., GIS information, Record Drawings, maps, reports, etc.) to update pipelines in the model. Existing facility data relevant to the model (e.g., pump curves) will be verified and updated as needed.

1. Compare current model to City GIS data.
2. Prepare map of comparison and meet with City to review and update current model.

3. Verify existing major facilities within the current model. This includes comparing Record Drawings and other data (e.g., O&M manuals) of relevant water facilities and systems.
4. Extract the current hydraulic model controls (pump and tank settings, etc.) and meet with City operators to confirm the model controls match the existing conditions. Controls will also be confirmed with detailed SCADA information that will be obtained from the City.
5. Update/verify current diurnal curve pattern applied in the hydraulic model. Download past 5-years of detailed SCADA data for water plants, interconnections, and storage tanks to evaluate a system-wide 24-hr diurnal curve pattern to apply to the demands for an extended period scenario (EPS).

Task 8.2 – Develop and Update Demand Scenarios: Demand scenarios will be developed for two (2) demand scenarios including the current and future (30-year planning period) to confirm base model conditions for the following:

1. Average day demands.
2. Peak day demands.
3. Peak day + fire flow demands.

Task 8.3 – Model Calibration: Utilizing information from the previous tasks, the model will be calibrated. The following work is included with this task:

1. Develop an EPS scenario.
2. Compare tank levels from SCADA with model to determine accuracy of calibration to new updated model.
3. Coordinate with City staff to determine strategic locations for field testing (e.g., fire hydrant flow tests) to obtain data to compare with hydraulic model simulations. Confirm results from field testing with modeling calculations.
4. Meet with City and review areas where field results do not resemble modeling predictions. Identify areas for additional field testing and/or confirmation of valve positioning to refine model calibration.

Task 8.4 – Hydraulic Modeling and Storage Analysis: Task includes an empirical analysis of the existing storage capacity compared to existing and future demands. This generally includes the following:

1. Run Scenarios to evaluate and compare system pressures and fire flows with and without the two existing tanks.
2. Evaluate the average day, max day and peak day fire flow availability.
3. Provide summarized results for each of the following scenarios:
    a. Scenario 1: Baseline existing conditions (with tanks).
    b. Scenario 2: Evaluate system with tanks offline.
    c. Scenario 3: Evaluate system with one tank offline (2 scenarios).

Task 8.5 – Raw Water System Hydraulic Evaluation

McKim & Creed will develop a hydraulic model of the existing raw water supply system that includes utilizing well pump curves well draw-down information, where available, to establish supply pressures for

the model. This task includes conceptual hydraulic modeling for the raw water piping network to simulate hydraulic impacts and pipe sizing associated with new wells and/or interconnections between the wellfields, new wells and increased supplies.

Task 8.6 – Pinellas County Utilities Interconnect Alternatives

The system will be evaluated to consider system impacts for options/scenarios that propose to alter the supply from County interconnections directly to the distribution system. This Task includes the development and modeling of up to five (5) interconnect scenarios.

Task 8.7 – Hydraulic Modeling and Elevated Tank Evaluation Summary Memorandum

Results and recommendations for Task 8 task will be summarized in TM #9 that will include recommendations for the elevated tanks and for improvements that may be needed to address system hydraulics for the raw and potable water transmission systems. Three (3) copies of the draft memorandum will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix that will be referenced within the Master Plan. Additionally, the final hydraulic model will be provided to the City upon completion of this task. The hydraulic model will be provided in a format compatible with the software selected in task 8.8.

Task 8.8 – Hydraulic Modeling Software Evaluation

The City plans on obtaining a one-seat or user license for a pressurized pipe hydraulic modeling software package. Based on our experience with hydraulic modeling software, McKim & Creed recommends that an evaluation of up to three (3) hydraulic modeling software applications be performed. The modeling software will be evaluated for the following parameters:

- Ability to integrate with City GIS system
- Ease of implementation and use
- Compatibility with existing hardware and software
- Functionality and performance
- Cost (including licensure, staff training and maintenance)
- Likely compatibility with future operating systems

McKim & Creed will develop a questionnaire for the parameters and will obtain input from potential City modeling software users. A summary of the evaluation and our recommendations will be summarized in TM #10. Three (3) copies of the draft memorandum will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final

memorandum will be incorporated into the Master Plan as an appendix that will be referenced within the Master Plan.

Task 8.9 – Hydraulic Modeling Software Training

McKim & Creed will provide City staff with the training to operate and perform basic features within the modeling software selected in Task 8.8 so that the City can operate the updated model that we will provide when Task 8 is completed. Live training will be limited to one (1) day in a setting at a City office or at McKim & Creed's Clearwater office.

TASK 9: CAPITAL IMPROVEMENT PLAN

Each recommended project for the 30-year planning period will be described and presented in the City's CIP format using Microsoft Excel. The CIP scoring currently used by the City will be used as a basis and will be reviewed and/or improved upon. Factors such as costs, regulatory considerations, available quantity, water quality, environmental impacts and siting considerations will be used to help develop priorities. These factors will be further developed and refined while working with the City using the City's standard CIP ranking system. The recommended projects will include budgetary costs and estimated design/construction duration that will be used to develop CIP projects for the water supply, treatment and distribution systems for inclusion in the Master Plan. Additionally, the currently planned water supply and treatment CIP projects will be integrated into the recommendations.

Three (3) copies of the draft CIP will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The CIP will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final CIP will be incorporated into the Master Plan as an appendix that will be referenced within the Master Plan.

TASK 10: WATER SUPPLY AND TREATMENT MASTER PLAN

The information and memoranda from the previous tasks will be consolidated and used to prepare the Water Supply and Treatment Master Plan. The Plan will include an executive summary, introduction, prioritized CIP projects, and summary / recommendations. Technical memoranda from previous tasks will be referenced within the Master Plan and included in the Appendix.

Task 10.1 – Draft Master Plan

McKim & Creed will develop the draft Master Plan and will submit three (3) copies of the draft Master Plan to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions.

Task 10.2 – Revised Draft Master Plan

Address City comments from the draft Master Plan review meeting using the City's standard comment/response form. The draft Master Plan will be updated and three (3) copies of the revised draft Master Plant will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. A review meeting will be held with the City to review, discuss and address City comments and questions.

Task 10.3 – Final Master Plan

Address City comments from the revised draft Master Plan review meeting using the City's standard comment/response form. The revised draft Master Plan City comments will be addressed using the City's standard comment/response form. The final Master Plan will be developed and three (3) signed and sealed copies will be submitted to the City along with three (3) electronic (PDF) copes on DVD-ROM media.

TASK 11: CONTINGENCY

A contingency budget of $90,000 (approximately 5%) is included in the Work Order budget for unforeseen additional services that may be needed for the completion of the Water Supply and Treatment Master Plan (e.g., assisting with public meetings, potential coordination with WTP-2 Improvements Project, etc.). The contingency will used only upon written authorization from the City.

ADDITIONAL INFORMATION

1. A health and safety plan will be prepared, submitted, and approved by the City Project Manager prior to performing the Task 3 well evaluations. The plan will include each well site that will be evaluated (specific capacity testing, geophysical logging, or acidization).
2. McKim & Creed has provided the City with a preliminary list of data needs for the project. The list will be updated after authorization.
3. This scope includes $300 for the Water Use Permit application fee included with Task 5. City will issue payment for any other permitting fees required.
4. Rate studies are not included in this scope of work.
5. One (1) Wellfield Management Plan is included and will be based on the proposed future wellfield configuration.
6. Test well construction is unnecessary for the scope of services presented herein and is not included.
7. Review meetings will be held within 3-weeks of submittal.
8. Long-term source water quality projections will be completed within 12-months of authorization.
9. Pipeline conditions assessments are not included in this scope of services. These services and commensurate fees can be performed upon written authorization by the City.
10. Hydraulic modeling will utilize the Innovyze® InfoWater® ArcGIS hydraulic modeling software (currently InfoWater for ArcGIS 10.1-10.6).
11. M&C will utilize City provided GIS data to calibrate the City's 2011 hydraulic model.
12. Travel time modeling is included for the GWR evaluation; variable density water quality modeling is not required and is not included in this scope of services.

13. It is anticipated that monthly status meetings will be scheduled with deliverable review meetings, when possible.

3. PROJECT GOALS:

The main goal project goal is to identify and establish City water supply and treatment system needs for the 30-year planning period. Additionally, the intent will be to utilize the highest quality water that can be cost-effectively supplied to each treatment facility and to the City's potable water customers.

Deliverables for the project will include the following:

TASK 1: PROJECT MANAGEMENT, ADMINISTRATION AND MEETINGS

1) Meeting minutes.
2) Monthly invoices/status letters.
3) Electronic data and records, obtained and produced during the course of the project, in an organized file structure that can be used by the City for future projects.

TASK 2: DATA COLLECTION, DATA REVIEW AND HYDROGEOLOGICAL STUDY PLAN

1) Draft and final Data Gaps Summary memorandum (TM #1).
2) Draft and final Hydrogeologic Study Plan memorandum with peer review comments (TM #2).

TASK 3: WATER SUPPLY AND TREATMENT SYSTEM EVALUATION

1) Draft and final Water Supply and Treatment System Evaluation Summary memorandum with peer review comments (TM #3).

TASK 4: HYDROGEOLOGICAL EVALUATIONS

1) Draft and final Statistical Analyses memorandum with peer review comments (TM #4).
2) Draft and final technical memorandum for the Evaluation of New Well Sites with peer review comments (TM #5).
3) Draft and final Integration of Groundwater Replenishment memorandum (TM #6).

TASK 5: WATER USE PERMIT MODIFICATION

1) Draft and final WUP application with Wellfield Management Plan.
2) Water use permit.

TASK 6: EVALUATE WATER SUPPLY OPTIONS

1) Draft and final Water Supply Options memorandum (TM #7).

TASK 7: FUTURE WATER DEMAND PROJECTIONS

1) Draft and final Future Water Demand Projections memorandum (TM #8).

TASK 8: HYDRAULIC MODELING AND ELEVATED TANK EVALUATION

1) Draft and final Hydraulic Modeling and Elevated Tank Evaluation memorandum (TM #9).
2) Draft and final hydraulic modeling software evaluation memorandum (TM #10).
3) Hydraulic model(s).

TASK 9: CAPITAL IMPROVEMENT PLAN

1) Draft and final CIP.

TASK 10: WATER SUPPLY AND TREATMENT MASTER PLAN

1) Draft, revised draft and final Master Plan.

4. BUDGET:

See Attachment "B"

This price includes all labor and expenses anticipated to be incurred by McKim & Creed for the completion of these tasks in accordance with Professional Services Method "A" – Cost Times Multiplier, **for a fee of Two Million, Ninety Thousand, Four Hundred Seventy-Three Dollars ($2,090,473.00)**.

5. SCHEDULE:

Project schedule will commence upon receipt of written authorization from the City. The project is to be completed within **540 calendar days** from issuance of notice-to-proceed. The main project deliverables are identified below. Refer to the attached MS Project schedule for a listing of projected deliverables/submittal dates. The schedule will be updated during the project, if necessary, upon agreement between the City and M&C.

Future Water Quality Projections (TM #5):	**365 calendar days**
Draft Water Supply and Treatment Master Plan:	**460 calendar days**
Revised Draft Water Supply and Treatment Master Plan:	**500 calendar days**
Final Water Supply and Treatment Master Plan:	**540 calendar days**

6. STAFF ASSIGNMENTS:

City's Staff:

Lan-Anh Nguyen, PE	Project Manager
Jeremy J. Brown, PE	Utilities Engineering Manager
Richard G. Gardner, PE	Public Utilities Assistant Director

McKim & Creed Team's Key Project Staff

Street Lee, PE	Principal-In-Charge
Phil Locke, PE	Project Manager
Dave Wiley, PG	Principal Hydrogeologist (WSP)
Jeff Trommer, PG	Hydrogeologist (WSP)
Dr. Richard Spruill, PG	Peer Review
Mitch Chiavaroli, PE	Capital Improvement Plan Development
Mike Jankowski, PE	Hydraulic Modeling
Joseph Viciere, PE, BCEE	Water Treatment Process

7. CORRESPONDENCE/REPORTING/COMMUNICATION PROCEDURES:

ENGINEER's project correspondence shall be directed to Lan-Anh Nguyen, 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/DVD ROM 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.

City Invoicing Code: **3277327-561300-96785**

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. City Project Number, Purchase Order Number and Contract Amount.
B. The time period (begin and end date) covered by the invoice.
C. A short narrative summary of activities completed in the time period
D. Contract billing method – Lump Sum or Cost Times Multiplier
E. 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).
F. 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).
G. 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:

_____

A. Street Lee, PE
Senior Vice-President
McKim & Creed, Inc.

_____

Date

APPROVED BY:

_____

D. Scott Rice, PE
City Engineer
City of Clearwater

_____

Date

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" x 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.

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

WATER SUPPLY AND TREATMENT MASTER PLAN

PROJECT BUDGET

Task	Description	Subconsultant Services (Attachments C & D)	Labor	Total
1	**Project Management, Administration and Meetings**			
A.	Set-up and Project Management Plan	$0	$5,353	$5,353
B.	Monthly Invoicing and Status Reports	$6,420	$20,664	$27,084
C.	General Project Management and Communications	$23,440	$114,096	$137,536
D.	Monthly Meetings	$30,448	$31,557	$62,005
E.	Kick-Off, SWFWMD & City Manager/Council Meetings	$11,216	$31,719	$42,935
			Task 1 Total	**$274,913**
2	**Data Collection, Data Review and Hydrogeological Study Plan**			
2.1	Data Gaps Memorandum	$9,224	$37,048	$46,272
2.2	Hydrogeologic Study Plan	$20,466	$10,259	$30,725
			Task 2 Total	**$76,997**
3	**Water Supply and Treatment System Evaluation**			
3.1	Well Evaluation, Testing and Acidization	$717,154	$59,246	$776,400
3.2	Develop and Confirm City Water Quality Goals	$0	$9,318	$9,318
3.3	Above-Ground Well Evaluations	$0	$27,889	$27,889
3.4	Water Treatment Facility Condition Evaluations	$0	$44,620	$44,620
3.5	Water Treatment Process Alternative Evaluations	$0	$19,878	$19,878
3.6	Water Supply and Treatment Cost Analyses	$0	$15,155	$15,155
3.7	Water Supply and Treatment System Evaluation Memorandum	$5,116	$25,220	$30,336
			Task 3 Total	**$923,596**
4	**Hydrogeological Evaluations**			

4.1	Statistical Analysis	$63,120	$16,980	$80,100
4.2	Evaluate Sites for New Wells	$62,960	$20,595	$83,555
4.3	Wellfield Management Plan Update	$29,980	$11,011	$40,991
4.4	Evaluate Integration with the Planned GWR Project	$25,088	$17,037	$42,125
			Task 4 Total	**$246,771**
5	**Water Use Permit Modification**			
A.	Permit Modification	$45,501	$7,257	$52,758
B.	Application, RAIs and Obtain Permit	$11,699	$6,661	$18,360
			Task 5 Total	**$71,118**
6	**Evaluate Water Supply Options**			
A.	Water Supply Evaluations	$9,070	$53,303	$62,373
B.	Task 6 Memorandum and Review Meeting	$2,935	$13,391	$16,326
			Task 6 Total	**$78,699**
7	**Future Water Demand Projections**			
7.1	Existing Water Demands	$0	$9,831	$9,831
7.2	Future Water Demand Projections	$0	$19,703	$19,703
7.3	Water Balance Calculation	$0	$12,222	$12,222
7.4	Future Water Demands Summary Memorandum	$0	$8,647	$8,647
			Task 7 Total	**$50,403**
8	**Hydraulic Modeling and Elevated Tank Evaluation**			
8.1	Update Current Hydraulic Model	$0	$9,488	$9,488
8.2	Develop and Update Demand Scenarios	$0	$7,638	$7,638
8.3	Model Calibration	$0	$14,602	$14,602
8.4	Hydraulic Modeling and Storage Analysis	$0	$19,073	$19,073
8.5	Raw Water System Hydraulic Evaluation	$0	$11,011	$11,011
8.6	Pinellas County Utilities Interconnect Alternatives	$0	$20,020	$20,020
8.7	Hydraulic Modeling and Elevated Tank Evaluation Summary Memorandum	$0	$20,042	$20,042
8.8	Hydraulic Modeling Software Evaluation	$0	$12,391	$12,391
8.9	Hydraulic Modeling Software Training	$0	$4,203	$4,203
			Task 8 Total	**$118,468**

9	**Capital Improvement Plan**			
A.	Develop Draft Plan	$3,098	$37,228	$40,326
B.	Review Meeting with City	$693	$2,753	$3,446
C.	Address Comments and Develop Final CIP	$1,121	$22,709	$23,830
			Task 9 Total	**$67,602**
10	**Water Supply and Treatment Master Plan**			
10.1	Draft Master Plan	$10,476	$46,514	$56,990
10.2	Revised Draft Master Plan	$5,238	$18,283	$23,521
10.3	Final Master Plan	$3,098	$7,997	$11,095
			Task 10 Total	**$91,606**
11	**Contingency**	$0	$90,000	$90,000
			Task 11 Total	**$90,000**
			Subtotal, Labor and Subcontractors	**$2,090,173**
			Water Use Permit Application	$300
Grand Total				**$2,090,473**

Attachment C

Applied Drilling - Well Evaluation Proposal

Applied
DRILLING
Engineering, Inc.

McKim & Creed
1365 Hamlet Avenue
Clearwater, Florida 33756

November 15, 2018

Attention: Mr. Phillip J. Locke, P.E.
Regarding: Evaluate wells for the City of Clearwater

Phil,

Please find below a proposal to evaluate 22 wells for the City of Clearwater and an option to acidize 6 wells.

Well Evaluation	$24,847.00 Lump Sum Each	22 Wells = $ 546,634.00

Mobilize to Site
Conduct a Pumping Test with the Existing Pump
Pull the Pump
Run Static and Dynamic logs (using our pump)
Run a Downhole Video
Reset existing pump
Chlorinate Well (BacTs by the City)
Demobilize

Acidization Option	$9,900.00 Lump Sum Each	6 Wells = $ 59,400.00

Mobilize Acid Equipment
Acidize the Well *
Conduct a Post Acid Pump Test

Total Cost: $ 606,034.00

* Provide 250 gallons of 32% food grade inhibited HCL and then dilute it down to 8%. Pump the 8% acid into the well's annular space followed by 3+ well volumes of water, monitoring all wellhead pressures. Once completed, use the existing well pump to develop the well to waste measuring flowrate and drawdown.

If you have any questions or need any clarifications, I am always available via my cell phone: (813) 385-7171.

Sincerely,

Stuart C. Anderson
President

Attachment D-

WSP- Hydrological Assistance Proposal

October 22, 2018

PUBLIC

Mr. Phil Locke, P.E.
McKim & Creed
1365 Hamlet Avenue
Clearwater, Florida 33756

Subject: **Proposal to Provide Hydrogeologic Services For City of Clearwater Master Water Supply Plan**

Dear Mr. Locke:

WSP USA, INC. (WSP) is pleased to provide this proposal to provide hydrogeologic consulting services as part of McKim & Creed's contract to develop a Master Water Supply Plan for the City of Clearwater. The following scope of services was prepared to sync with the task structure of the City of Clearwater Work Order Initiation Form prepared by McKim & Creed.

SCOPE OF SERVICES

Task 1 – Project Management, Administration and Meetings

This task includes project setup and project management plan, kickoff meetings, general communications and coordination, monthly progress reports and invoicing. This task also includes monthly project meetings with the City to discuss project status, schedule and upcoming issues and needs. Also, we will prepare for and attend a meeting with the City and the Southwest Florida Water Management District (SWFWMD) to review and discuss viable water supply alternatives.

Task 2 – Data Collection, Data Review and Hydrogeological Study Plan

WSP will coordinate with McKim & Creed and City staff, to meet with City staff to collect, organize and review existing well field and hydrogeologic data relevant to the Project. This data will include well locations and construction, pumpage, water quality, water levels and any other well field related data.

Task 2.1 – Data Gaps Memorandum

Upon review of the available data, WSP will work with McKim to identify data gaps and provide recommendations to resolve the data for inclusion into the Data Gaps Memorandum prepared by McKim & Creed.

Task 2.2 – Hydrogeologic Study Plan

WSP will prepare a Hydrogeologic Study Plan for the relevant project components. The plan will generally discuss / describe the following:

1. Planned physical well evaluation activities described in Task 3, including a discussion of the information that will be collected and how the information will be used to evaluate the physical and water-quality properties of the respective wells.
2. How the physical information obtained in Task 3 will be used to assess potential well maintenance or modifications to improve well performance.
3. Statistical methods that will be used to evaluate water-quality trends, projections and optimal production rates for each well.

4. GIS statistical methodology that will be used to examine spatial distribution of water quality across the service area.
5. Mass-flow balance methodology that will be used to estimate the net water-quality and flow rate delivered to WTP-2.
6. Groundwater modeling for impact analysis to address potential drawdown effects for future water supply options.
7. Description of specific existing production well evaluations to be conducted.
8. Integration of the results of the analyses between the hydrogeologic and engineering tasks as the project progresses.

The draft plan will be summarized in TM #2 that will be peer reviewed by Dr. Richard Spruill prior to using the results in subsequent tasks. Three (3) copies of the peer review comments and recommendations, along with three (3) copies of the draft memorandum will be submitted to McKim & Creed, along with e-mail electronic (PDF and MS Word) copies. WSP will attend a review meeting with the City to review, discuss and address City comments and questions. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy.

Task 3 Water Supply and Treatment System Evaluation

Task 3.1 Well Evaluation, Testing, and Acidization

WSP will coordinate with McKim & Creed, the City, and Applied Drilling engineering (ADE to implement a well evaluation, testing and acidization program on up to 22 wells. WSP will coordinate with McKim & Creed and the City to identify the 22 wells to be included in the program. We will then coordinate with the City and ADE to schedule the evaluation activities at each well, identify a suitable location for discharge of the test water, obtain generic permits for discharge of produced groundwater from the FDEP where required, and provide oversight of the testing and acidizing activities.

Data collected in the field, including geophysical logs, video logs, specific capacity test data, and observations of the pumping equipment will be reviewed and used with existing geologic and water-quality data to evaluate the following:

1. Physical condition of the well casings, boreholes, and pump equipment.
2. Local geology.
3. Production capability and producing zone profile.
4. Water-quality characteristics.

WSP will prepare a technical memorandum detailing the testing, evaluation, and acidizing activities, along with any recommendations and provide the memorandum to McKim & Creed for inclusion in TM#3.

Task 3.7 – Water Supply and Treatment System Evaluation Memorandum

WSP will assist McKim & Creed with integration of our technical memorandum prepared in Task 3.1 into TM#3. WSP will attend a review meeting with the City to review, discuss and address City comments and questions. WSP will update the memorandum as needed, and provide three (3) copies of the signed and sealed final memorandum for inclusion in TM#3.

Task 4 – Hydrogeologic Evaluations

Task 4.1 – Statistical Analysis

Regression analysis of existing water-quality data for each production and monitoring well will be performed to evaluate trends in water quality concentrations, and to project future concentrations

based on current trends. Upon completion of the trend analysis, a correlation analysis will be performed to evaluate the relationship between monthly water quality concentrations (TDS and chlorides) and production quantity. The correlation coefficient and scatter plot analysis will be used to estimate the optimum pumping rate for each existing well with respect to managing water quality in the well.

The projected pumping rates and water quality from the statistical analyses will be used in a mass balance calculation to calculate the total production quantity and water quality going to each water plant with the existing wells and wellfield configuration. The results of this analysis will provide an initial assessment of the quantity and quality of new water sources that will be required to meet the City's demands and water treatment infrastructure.

The statistical analysis will also include GIS statistical methods to examine the spatial distribution of water quality across the City's service areas. The analysis will be performed using data from production and monitoring wells to map the distribution of water quality in upper and lower Zone A within the City. The results of this analysis will be used in subsequent tasks.

A description of the statistical analysis methodology and the results of the analyses will be described in a technical memorandum that will include the projected water quality for the City's existing wells. Results will be summarized in TM #4 that will be peer reviewed by Dr. Richard Spruill prior to using the results in subsequent tasks. Three (3) copies of the peer review comments and recommendations, along with three (3) copies of the draft memorandum will be submitted to the City along with e-mail electronic (PDF and MS Word) copies. WSP will attend a review meeting with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form assigned to this project. The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy.

Task 4.2 – Evaluate Sites for New Wells

WSP will assist McKim& Creed to identify and evaluate potential sites for new wells to provide additional supply as needed in the existing wellfields. The initial site investigations will include City-owned properties, former (abandoned) wells sites, and co-location at existing well sites. These sites will be evaluated based on current land use, regulatory setbacks, and existence of usable easements. Each potential site will then be evaluated for water quality using the results of the statistical analysis. Regression analysis results from nearby existing wells will be used to help estimate projected water quality concentrations from potential new well sites. The spatial water-quality analysis will be used to estimate current water quality in upper and lower Zone A, and to evaluate which zone(s) to consider for new production wells. We will also assess the potential for constructing Upper "Zone A" wells in areas with existing Lower "Zone A" wells to provide fresher water that could be used, for example, for blending to reduce TDS levels in the RO WTP #2 feed water if compliant with WTP-2 permit as "alternative source."

Upon selection of potential well sites, the mass balance calculations will be updated using new and existing wells to recalculate the projected quantity and quality. Existing groundwater models will be reviewed and updated to assess projected groundwater levels in the project area that will be used with the statistical analyses to estimate the safe yield for the area and to provide the basis for the 20-year projected water quantity and quality for the City.

A description of the new well site evaluation methodology and the results of the analyses will be described in TM #5 that will be peer reviewed by Dr. Richard Spruill prior to using the results in subsequent tasks.

Three (3) copies of the draft memorandum will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. WSP will attend a review meeting with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form. The memorandum will be updated and three (3) copies of the

signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy.

Task 4.3 – Well Field Management Plan Update

Based on the results of the well evaluation activities in Task 3 and the water quality and production rate projections from Task 4.1, we will update the City's Well Field Management Plan. The plan will be updated and expanded to include recommended well operating parameters to optimize production rates and water-quality, recommended well maintenance activities and changes to the monitoring plan that may be needed based on new production well locations. The goal of the updated plan is to provide the water plant operations staff with guidelines to assist them in operating the wells and well fields in an efficient and sustainable fashion. This revised plan will also be a key element to support any associated modification of the WUP. Elements in the updated Well Field Management Plan include:

1. Service area background and description.
2. Wellfield descriptions.
3. Hydrogeologic description of zones within the aquifer.
4. Production wells description, diagrams and details, as required.
5. Monitoring wells description.
6. Well field operations.
7. Monitoring plan.
8. Wellfield operations and management plan. Will include description of action plan addressing chloride concentration limits at existing monitoring wells and recommend any need modifications.
9. Description of City's water conservation plan required by the SWFWMD.
10. Copy of Existing WUP

The updated Well Field Management Plan will be included as part of the Water Use Permit Modification (Task 5).

Task 4.4 – Evaluate Integration with Groundwater Replenishment

Based on recent discussions between the City and the SWFWMD, we understand that the concept of using the Groundwater Replenishment (GWR) project as source of water either for withdrawal from new supply wells in the proximity of the GWR facility or as an offset for withdrawal of additional fresh water from other areas of the City to supplement WTP-2 may be viable.

For the option of supply wells in proximity of the GWR facility, the primary task will be to use the groundwater flow and particle tracking model developed for the GWR project to identify potential supply well locations and evaluate the travel time for water from the GWR recharge wells to reach the proposed supply wells. The modeling would also be used to evaluate the net impact on water levels in the Upper Floridan aquifer resulting from recharge and new withdrawal.

For the option of additional freshwater withdrawal for other parts of the City with GWR used as an offset, groundwater flow modeling will be performed to evaluate the net benefit of GWR recharge and new withdrawal regarding its measurable benefit. This task includes one (1) meeting with the SWFWMD and one (1) meeting with the FDEP to discuss these options.

A description of the conceptual use of GWR recharge to support additional withdrawals and the groundwater modeling analyses will be described in TM #6. Three (3) copies of the draft memorandum will be submitted to the City along with an e-mail electronic (PDF and MS Word) copy. WSP will attend a review meeting with the City to review, discuss and address City comments and questions. City comments will be addressed using the City's standard comment/response form.

The memorandum will be updated and three (3) copies of the signed and sealed final memorandum will be submitted to the City along with an e-mail electronic (PDF) copy. The final memorandum will be incorporated into the Master Plan as an appendix and will be referenced in the Master Plan.

Task 5 - Water Use Permit Modification

WSP will provide services to modify the existing water use permit (WUP) so that alternative and additional supplies can be developed and utilized. For the WUP modification, a description of the purpose for the modification will be provided along with the permitting requirements. The requested changes will be described in the WUP modification description with the necessary supporting information. This task includes the following services:

1. Meeting with McKim & Creed and City staff to discuss the WUP modification.
2. Prepare agenda and attend a pre-application meeting with the SWFWMD permitting staff to discuss items such as projected demands, permit duration and the amount / type of supporting information such as hydrologic analyses. Modifications to the existing environmental management plan will also be discussed.
3. Impact analysis to include preparation of a groundwater flow model(s) to assess the change in drawdown between the existing and proposed permitted withdrawals. Drawdowns will be modeled based on average annual withdrawal for one year and peak month withdrawal for 90 days as required by the SWFWMD. The modeling will be performed using the SWFWMD District-Wide Regulatory Model, which used to address drawdown impacts for WUP applications developed by the SWFWMD. An Impact Analysis Report will be prepared and will include a summary of the area hydrogeology, a description of the methodology and results of the wellfield groundwater flow model, and will also include supporting figures, maps and tables.
4. Evaluate and revise as required the existing Environmental Management Plan (EMP). We will provide documentation to support requested EMP modifications, including maps and site-specific data. Attend one (1) site meeting with the SWFWMD staff to review field conditions and discuss proposed modifications.
5. Prepare draft WUP application and supporting documents and meet with City.
6. Update draft WUP application to address City Comments and prepare WUP application on-line using the SWFWMD's Water Management Information System (WMIS). The WUP application will be signed and sealed by a Professional Geologist licensed in the state of Florida as required by the SWFWMD.

Assist the City with the preparation of up to two (2) Requests for Additional Information (RAIs). Attend meeting with City and SWFWMD staff, if necessary. The current RAI response procedure allows for submittal of partial responses for review by SWFWMD staff so that the final response meets their approval. We will prepare the responses and submit to the City for review prior to submittal to the SWFWMD.

Task 6 – Evaluate Water Supply Options

WSP will provide technical support and review of McKim & Creeds evaluation of water supply options. The support is related to coordination of the hydrogeologic aspects of groundwater sources with the engineering aspects of bringing new sources into the system, or interconnection of the existing systems. We will review the groundwater source related portions of TM#7 prepared by McKim & Creed, and attend a review meeting with the City.

Task 9 – Capital Improvement Plan

WSP will provide technical support and review of McKim & Creeds capital improvement plan (CIP). The support is related to preparation of costs for proposed new wells, well modifications, and well maintenance. We will review the groundwater source related portions of the CIP prepared by McKim & Creed, and attend a review meeting with the City.

Task 10 Water Supply and Treatment Plan

WSP will provide technical support to McKim & Creeds during preparation of the Water Supply and Treatment Plan. The support will include review and revisions of hydrogeologic evaluation portions of the report, and attendance of two review meetings with the City.

WSP will provide these services on a time and material basis for a total of $491,527. A task breakdown of this fee is provided on the attached table.

We appreciate the opportunity to provide this proposal to McKim & Creed, and look forward to being part of the team to implement this key project for the City of Clearwater.

Kind regards,

Jeffrey Trommer
Lead Hydrogeologist

Reviewed By

David A. Wiley P.G.
Supervising Hydrogeologist

XX/xx
Encl.
cc:

Project Cost Breakdown

Task No.	Task Description	Fee
1	Project Management, Administration and Meetings	$71,524
2	Data collection, Review, and Hydrogeologic Study Plan	
2.1	Data Gaps Memorandum	$9,224
2.2	Hydrogeologic Study Plan	$20,466
3	Water Supply and Treatment System Evaluation	
3.1	Well Evaluation, Testing and Acidization	$111,120
3.7	Water Supply and Treatment System Evaluation Memorandum	$5,116
4	Hydrogeologic Evaluations	
4.1	Statistical Analysis and TM	$63,120
4.2	Evaluate New Well Sites and TM	$62,960
4.3	Well Field Management Plan Update	$29,980
4.4	Evaluate Integration with Groundwater Replenishment and TM	$25,088
5	Water Use Permit Modification	$57,200
6	Evaluate Water Supply Options	$12,005
9	Capital Improvement Plan	$4,912
10	Water Supply and Treatment Master Plan	$18,812
TOTAL		$491,527