OVERVIEW OF PROJECT

The City of Durham (Owner) is upgrading the North Durham Water Reclamation Facility (NDWRF) and South Durham Water Reclamation Facility (SDWRF) to provide a variety of treatment facilities improvements as identified in the 2011 Master Plan for the North Durham Water Reclamation Facility dated May 2012 and the 2011 Master Plan for the South Durham Water Reclamation Facility dated May 2012. The Owner has selected Hazen and Sawyer (Engineer) to complete the professional engineering services for these improvements. Generally, this agreement includes development of preliminary engineering reports for FY14 Water Reclamation Facilities Improvements as described herein.

It is the City’s intent at the completion of this scope of services to amend this agreement to include detailed design and bid period services and subsequently to execute an amendment to include construction management and resident project representative services for the period of construction of the proposed improvements. The detailed requirements for these future scopes of work are not included in this agreement at this time.

The Scope of Services below is presented as follows:

A. Scope of Services
   1. General Requirements
   2. Preliminary Engineering Report
   3. Surveying Services
   4. Geotechnical Services

B. Project Schedule

C. Project Deliverables

The Engineer shall provide the following professional services for the orderly development of the Project:

A. SCOPE OF SERVICES:

1. GENERAL REQUIREMENTS

   The Engineer shall provide preliminary design for the FY14 Water Reclamation Facilities Improvements.

   a. General

      1) In general, design criteria listed herein is based upon previous recommendations of the Engineer from work under the WRF Master Plans except as specifically addressed. While criteria have been accepted in good faith by the Owner, the Engineer remains responsible for design of an effective and complete project to meet the objectives of the Owner. Engineer also remains responsible for providing a cost effective design for the Owner and is encouraged to propose changes to criteria when more cost effective criteria are
identified. Proposed changes that are agreed to by the Owner may require formalization through amendment to this Agreement.

2) Notwithstanding the statement of any design criteria within this Agreement, it is the responsibility of the Engineer to provide a design in accordance with all written federal, state, and local laws and regulations in effect as of the date of this Agreement.

b. Project Management

1) Provide general contract management, invoicing, activity coordination for all disciplines and sub-consultant work efforts, schedule management, meeting management, staff/personnel administration, monthly progress meetings/reports, and sub-contracting and management.

2) Provide a decision-making log for all decisions that must be made in the course of completing the work, identifying the decision to be made, decision-making responsibility, date the decision need is first identified, date the decision is made. Provide an update to this log at the beginning of each meeting and identify critical path issues. Assist the Owner in developing a plan for issue resolutions to maintain the project schedule. Conduct bi-monthly conference calls with the Owner to address outstanding items on the register.

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

2. PRELIMINARY ENGINEERING REPORT (PER)

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

A. Technical Evaluations for NDWRF

A. Basic Design Criteria – Document assumptions concerning flows and loads for each area of the planned improvements at the NDWRF. This will include analysis of peak flow data provided by the Owner from on-going collection system studies.

B. Conversion of Plant A Clarifiers to Equalization – Develop preliminary design approach to convert the three existing
Plant A secondary clarifiers for use for equalization. Evaluate the pros and cons of retaining the existing clarifier mechanisms to assist in solids removal versus removal of the mechanisms and installation of mixing equipment. Evaluate options for pumping flow from the clarifier underdrains back to the treatment process, including conversion of the existing drain pumping station, diversion of flow to the Camden Road Pump Station, and construction of a new dedicated pump station. For the Camden Road Pump Station, take into account the previous condition assessment completed by others. Address the current system limitations that allow flow from the Camden Road Pump Station to enter the Plant A clarifier scum pipes at high flows. For each of the options, identify the probable costs for upgrading the pump station to serve the needs for the equalization basins. Conduct a thorough condition assessment of all existing equipment, pumps, piping, instrumentation, power, and structural elements, and recommend improvements as needed for these facilities. Develop plan and construction costs for demolition of abandoned facilities adjacent to the Plant A clarifiers, including the Plant A effluent screw pumps and chemical storage facilities.

C. Equalization Tank Mixing – Evaluate and recommend mixing equipment for the existing 4MG equalization tank. Evaluate mixing equipment types, including floating mixers, big bubble mixers, submersible propeller mixers and jet mixers. Develop operational and maintenance approaches including equipment removal and routine maintenance.

D. Aeration Fine Bubble Diffuser Upgrade – Evaluate and recommend equipment replacement for the fine bubble aeration system in the NDWRF aeration basins. New aeration grids are required for aeration basins 1-5. The grid in aeration basin 6 is already installed with the appropriate diffuser holder density and will not require replacement. Recommend the diffuser membranes replacement in all six aeration basins with an appropriate diffuser density and taper to minimize energy requirements while maximizing treatment using dual zone DO control. Develop maintenance approaches including access or other solutions for annual cleaning of diffusers and approaches for aeration tank washdown. Potential approaches to be evaluated include sloping of the aeration tank floors with trenches along the side walls, improved washing access from the top of the tanks, and washdown headers in the tanks.

E. Odor Control Rehabilitation – Evaluate the existing odor control facilities for both Plant A and Plant B facilities at the NDWRF, including overall facility control strategies. Evaluate the existing bioxide feed in the collection system
and its effectiveness in controlling odors in the plant. Recommend whether adjustments to the bioxide feed rates may impact the odor control renovations needed at the plant. The Plant A Odor Control Facility was originally designed to handle foul air from the preliminary treatment facility, primary settling tanks and the Solids Handling Building. The Owner has removed the covers from the primary settling tanks, and may or may not replace these covers with new covers in the future. Identify the pros and cons of cover replacement versus leaving this portion of the NDWRF open to atmosphere. The proposed filtrate equalization tankage associated with the anammox sidestream treatment facilities is anticipated to be covered and odor scrubbed with this refurbished odor scrubber system. Evaluate the capacity of the Plant A Odor Control Facility to meet this additional scrubbing requirement. Evaluate and recommend improvements to the odor control system including additional ductwork, caustic and hypochlorite chemical systems, media replacement, replacement components as needed to result in a complete, reliable upgraded odor control system. The Plant B Odor Control Facility serving the Plant B preliminary treatment facility and primary clarifiers shall also be evaluated and recommendations made for complete system refurbishment. The proposed Plant B Influent Screening Facility will require odor control. Evaluate the potential for the Plant B Odor Control Facility to meet this requirement. Evaluate and recommend improvements to the odor control system including additional ductwork, caustic and hypochlorite chemical systems, media replacement, replacement components as needed to result in a complete, reliable upgraded odor control system.

F. Plant A Primary Settling Tank Improvements – Evaluate and recommend replacement sludge scraper/withdrawal mechanisms for the Plant A Primary Settling Tanks, taking into account that some of this equipment has been recently upgraded. The Plant A primary settling tanks perform poorly compared to the Plant B primary clarifiers. Develop a CFD evaluation of the Plant A primary settling tanks to determine whether inlet or tank configuration conditions may be modified to allow improved solids removal and make specific recommendations for any configuration or hydraulic improvements that should be incorporated into the upgrade design. Develop preliminary design for a primary effluent emergency pumping connection to allow the Owner to connect temporary pumping facilities to the Low Lift Pump Station discharge force main for use if the Low Lift Pump Station is out of service.

G. Plant B Influent Screening Facilities – Assist the Owner in evaluation of screening technologies, including chain and
rake screens, drum screens, band screens and step type screens. Develop the conceptual design of a new Plant B screening facility, with a capacity to be determined using flow information provided by the Owner. Develop preliminary layout of the facility using 3D CAD modeling software to facilitate the Owner's input into the preliminary layout. Develop concept for minimum number of duty screens, bypass channel, influent flow measurement, screenings washing/dewatering and conveyance equipment, odor control, and the building/structural approach. Include a condition assessment of the Plant B Grit Removal Facilities and recommend any needed improvements that should be incorporated into the work in light of the planned construction of the Influent Screening Facilities. Specifically address the grit facility drain piping. Address operational flexibility and accessibility, and mechanical, electrical, and instrumentation issues. Develop approach for equipment installation and removal, and ease of routine maintenance. Develop approach for maintenance of plant operations during construction, including yard piping modifications.

H. Secondary Clarifiers and Polymer Feed Improvements – Evaluate and recommend facilities for two new 160' diameter secondary clarifiers. Evaluate and recommend RAS pumping equipment as needed for these clarifiers and address any equipment, piping, mechanical, electrical and instrumentation issues related to incorporating this capacity into the existing Plant B RAS Pump Station. Develop preliminary design for flow distribution boxes at the existing aeration basin effluent channel to proportionately distribute flow to all in-service clarifiers. Evaluate and recommend clarifier mechanism type, sludge withdrawal equipment configuration, secondary scum removal mechanism and scum pumping facilities, mechanical, electrical and instrumentation for a complete operational design. Develop approach for equipment installation and removal, and ease of routine maintenance. Develop concept for yard piping to extend polymer feed from polymer pumping equipment (to be provided in the Chemical Systems and Nutrient Related Improvements project) to the injection points upstream of the new secondary clarifiers. Develop concept for alum yard piping and pumping to the injection points downstream of the new secondary clarifiers. Evaluate potential to incorporate the addition of alum pumps and interior piping modifications as a change order to Chemical Systems Project. Address providing the effluent troughs with covers to limit algae growth and weir cleaning requirements. The site for the new secondary clarifiers is in the area of the existing sand drying beds. Develop site improvements concepts to provide ease of access to the clarifiers while retaining, to
the extent practical, the functionality of a portion of the existing sand drying beds.

I. **Sidestream Nutrient Removal Facilities** – Evaluate the Kruger AnitaMox and the World Water Works Demon anammox sidestream treatment processes to determine the best application for the existing NDWRF tankage. Consider feasibility of utilizing existing Plant A Intermediate Settling Tanks and/or Plant A Aeration Tanks to serve as equalization and treatment tanks for this process. Evaluate the potential for sidestream treatment to reduce the struvite issues currently experienced with the dewatering equipment at the NDWRF. Conduct a thorough condition assessment of all existing equipment, pumps, piping, instrumentation, power, and structural elements, and recommend improvements as needed for these facilities. Develop approach for equipment installation and removal, and ease of routine maintenance. Evaluate potential for process air to be provided from the main blower facilities at Plant B or from a separate dedicated blower system. Determine the best alternative for delivering flow to and from the process, including modifying piping at the existing belt filter presses to capture the filtrate separate from the belt filter press washwater. Address equalization requirements and recommend approach for odor control for these facilities. Assist the Owner in developing documentation to solicit and negotiate a sole source procurement of the specialized anammox treatment equipment package for these facilities.

J. **Solids Handling and Polymer Feed Improvements** – Conduct a detailed condition assessment on the existing polymer feed equipment and existing belt filter press control panels to determine the extent of needed upgrades and replacement. Develop approach to address current inability to use liquid polymer, handling issues with dry polymer preparation system and outdated equipment and controls. Evaluate and recommend equipment upgrades and/or replacement, mechanical, electrical and instrumentation for a complete operational design. Develop approach for equipment installation and removal, and ease of routine maintenance.

K. **Tertiary Filter Facility Upgrade** – Evaluate the existing tertiary filter facility to determine the requirements to convert the filters to a deep bed mono-media sand media. Develop conceptual requirements for solids removal filtration and for denitrification filtration that may be deployed in the future. The anticipated media change would significantly reduce the frequency of backwash, the backwash flowrate and the total backwash volume. Determine how the backwash reductions may positively
impact the rest for the NDWRF, particularly backwash reclaim operation and ability to more rapidly backwash all filters when conditions so require. Identify media replacement requirements and programming changes that would be needed to convert the existing filters to deep bed mono-media and determine future requirements to allow denitrification operation. Evaluate and recommend equipment upgrades and/or replacement, mechanical, electrical and instrumentation for a complete operational design. Develop approach for equipment installation and removal, and ease of routine maintenance.

L. Stormwater Management and Site Considerations –
Develop a preliminary stormwater management design in those areas modified or impacted by new facilities, including plan to address peak stormwater flows entering the NDWRF from the existing sand drying bed area. Develop options to reduce and/or redirect flow from drying bed roof that currently is piped to WRF influent. Where stormwater modifications are required, recommend BMPs for the Owner’s review. Specifically address needed improvements at the Administration Building parking lot.

M. Floodplain Development Considerations – The NDWRF is located at the confluence of Ellerbe Creek and Goose Creek, both of which were studied by the North Carolina Floodplain Management Program (NCFMP) using detailed methods and are designated as Zone AE special flood hazard areas with floodways. A flood protection berm was constructed on the NDWRF Plant A site and is not reflected on the current FEMA maps, resulting in inaccurate representation of flooding risk to the project site. Durham may want to update the FEMA maps to alleviate the requirement of unnecessary flood protection measures for future improvements to the facility. The City wishes to compare the costs and efforts associated with maintaining a qualifying flood protection berm with the benefits of not having to design future facilities for operation in the flood plain. The Engineer shall perform the following efforts;

a. Levee Certification Investigation to determine whether the existing berm is in compliance with 44 CFR 65.10 for levee certification;

b. Project site field reconnaissance to verify the existing conditions and to identify any stream and floodplain features that require additional field surveying;

c. Geotechnical investigation of the structural integrity of the berm. Identify any improvements that may be required to allow levee certification;
d. Develop a Duplicate Effective Model (DEM) for the portion of Ellerbe and Goose Creeks in the vicinity of the project using hydraulic model data provided by the NCFPM. It is assumed that a hydrologic study will not be required and that peak flows found in the approved Flood Insurance Study (FIS) will be used for the flood study;

e. Develop a Corrected Effective Model (CEM) that refines the topography with all changes since the date of the “older” model and corrects any errors;

f. Recommend to the Owner whether it is appropriate to proceed with the CLOMR/LOMR application process to the NCFMP. If determined to be appropriate, the CLOMR/LOMR(?) application process may be added to this scope of services by amendment;

N. Electrical and Control System Considerations – Evaluate and identify the need for electrical and/or instrumentation and controls upgrades in the areas of planned improvements at the NDWRF. Conduct condition assessments for major electrical gear and recommend needed replacements. Specifically address the condition and potential need for replacement of existing problematic variable frequency drives. Specifically address the capacity of the existing 600 kw generator at the Blower Building to start and operate additional loads associated with the new clarifiers. Develop approach for equipment installation and removal, and ease of routine maintenance.

B. Technical Evaluations for SDWRF

A. Basic Design Criteria – Document assumptions concerning flows and loads for each area of the planned improvements at the SDWRF. This will include analysis of peak flow data provided by the Owner from on-going collection system studies.

B. Dewatering Capacity and Polymer Feed Improvements – Evaluate the options for the Owner to upgrade or replace the existing non-functional belt filter press to provide redundancy of dewatering equipment at the SDWRF. Determine layout and operational implications and recommend a belt filter press equipment upgrade to meet the Owner’s requirements. Conduct a detailed condition assessment on the existing polymer feed equipment and existing belt filter press control panels to determine the extent of needed upgrades and replacement. Develop approach to address current inability to use liquid polymer, handling issues with dry polymer preparation system and outdated equipment and controls. Evaluate and
recommend equipment upgrades and/or replacement, mechanical, electrical and instrumentation for a complete operational design. Develop approach for equipment installation and removal, and access for ease of routine maintenance.

C. Equalization Facilities – Assist the Owner in evaluation of new equalization facilities at the SDWRF, including confirmation of volume requirements using flow information provided by the Owner, siting considerations, and major piping to and from the facility. Evaluate hydraulic considerations including draining by gravity to influent pump station or construction of an equalization pump station to the main treatment process. Consider various types of mixing equipment, including floating mixers, big bubble mixers, submersible propeller mixers and jet mixers. Address wash down and clean up alternatives. Develop alternatives for this equalization facility to be covered or uncovered as it relates to potential for odor generation. Develop approach for using the equalization volume for ammonia load based equalization when this volume is not needed for wet weather flow equalization. Address operational flexibility and accessibility, and mechanical, electrical, and instrumentation issues. Develop approach for equipment installation and removal, and ease of routine maintenance. Develop a preliminary yard piping plan for piping to and from the equalization facilities.

D. Aeration Fine Bubble Diffuser Upgrade – Evaluate and recommend equipment replacement for the fine bubble aeration system in the SDWRF aeration basins. New aeration grids are required for aeration basins 1-8 and shall be designed with the appropriate diffuser holder density to meet the Owner's near and long term needs. Recommend the diffuser membranes replacement in all aeration basins with an appropriate diffuser density and taper to minimize energy requirements while maximizing treatment using dual zone DO control. Develop maintenance approaches including access or other solutions for annual cleaning of diffusers. Potential approaches to be evaluated include sloping of the aeration tank floors with trenches along the side walls, improved washing access from the top of the tanks, washdown headers in the tanks, and stairway or ladder access directly into the tanks.

E. Influent Screening and Grit Removal Facilities – Assist the Owner in evaluation of screening technologies, including chain and rake screens, drum screens, band screens and step type screens. Perform an evaluation of grit collection technologies, including stirred vortex and forced vortex grit collectors for a new influent screening and grit removal
facility at the SDWRF. Develop the conceptual design of a combined facility, with a capacity to be determined using flow information provided by the Owner. Hydraulic evaluations shall address hydraulic capacity impacts to the Stagecoach Road Pump Station, provide for tie in of the Stagecoach Road force main, and address hydraulic impacts to the Influent Pump Station. Develop layout of the facility using 3D CAD modeling software to facilitate the Owner's input into the preliminary layout. Develop concept for minimum number of duty screens, bypass channel, influent flow measurement, screenings washing/dewatering and conveyance equipment, grit collectors, grit pumps, grit washing/concentrating and conveyance equipment, and odor control, and the building/structural approach. Address operational flexibility and accessibility, and mechanical, electrical, and instrumentation issues. Develop approach for equipment installation and removal, and ease of routine maintenance. Develop approach for maintenance of plant operations during construction, including yard piping modifications.

F. Odor Control Rehabilitation – Evaluate the existing odor control facilities for both the main SDWRF odor scrubber and the Influent Pump Station odor scrubber, including overall facility control strategies. The main Odor Control Facility was originally designed to handle foul air from the SDWRF preliminary treatment facilities, primary settling tanks, primary scum building and the solids handling buildings. Evaluate whether the existing odor control system is adequately sized to handle foul air scrubbing demands for the new influent screening and grit removal facilities and potentially from the filtrate equalization tankage associated with the anammox sidestream treatment facilities. Determine the need for additional ductwork, upgrade of chemical systems, media replacement and other equipment replacement components to result in a complete, reliable upgraded odor control system.

G. Secondary Clarifier Capacity Improvements – Due to structural and mechanical problems with the existing four 80' diameter secondary clarifiers, additional clarifier capacity is required at the SDWRF. Complete a detailed evaluation of four options to improve secondary clarifier reliability: Option 1 - rehabilitate four existing 80’ diameter secondary clarifiers and convert them from peripheral feed to center feed configuration clarifiers. Option 2 – rehabilitate four existing 80’ diameter secondary clarifiers retaining the peripheral feed configuration and installing baffling to improve performance. Option 3 - construct two new clarifiers with sufficient capacity to allow abandonment of the four 80’ diameter clarifiers. Option 4 – construct new clarifier capacity with sufficient capacity in combination with
minor mechanical improvements to the two functional 80’ peripheral feed clarifiers and construct two new secondary clarifiers. Evaluate and recommend RAS and scum pumping equipment as needed for each of these options. Determine the extent of structural, mechanical and piping modifications that would be required. Address any equipment, piping, mechanical, electrical and instrumentation issues related to incorporating improved clarifier capacity into the overall treatment train. Develop conceptual design for flow distribution boxes at the existing aeration basin effluent channel to proportionately distribute flow to all in-service clarifiers. Evaluate and recommend clarifier mechanism type, sludge withdrawal equipment configuration, secondary scum removal mechanism and scum pumping facilities, effluent trough covers, mechanical, electrical and instrumentation for a complete operational design. Develop approach for equipment installation and removal, and ease of routine maintenance.

H. Tertiary Filter Media Upgrades – Evaluate replacement of the filter media in the existing traveling bridge filters. The current media specification results in hydraulic limitations at higher plant flows and automatic bypassing of the filters. Conduct pilot scale testing of four filter media configurations for a period of six weeks to determine the recommended media selection to achieve higher flow capacity without sacrificing effluent water quality. Take into consideration the fact that the plant will be adding flow equalization and that the existing flocculation tanks may be placed into service. Recommend new media specification to maximize solids capture while also increasing hydraulic capacity through the filter media. Consideration shall be given to use of mono-media coarse sand media. Recommend modifications required for the filter backwash control sequence, frequency and duration resulting from the media change. Recommend a backwash control strategy for impending wet weather flows that would provide for pre-washing of the filters prior to a wet weather event.

I. Aeration Influent Channel Mixing Improvements – Evaluate options for replacing the existing mixing equipment in the aeration influent channel with alternative mixing equipment. Consider multiple mixing equipment types including the Invent mixer and other low energy vertical type mixer equipment manufacturers. Determine the required number of mixers, locations and other features to address operational flexibility and accessibility, and mechanical, electrical, and instrumentation issues. Develop approach for equipment installation and removal, and ease of routine maintenance.
J. **UV System PLC Replacement** – Evaluate and recommend replacement of the PLC control panel for the existing UV disinfection system.

K. **Stormwater Management, and Site Considerations** – Develop a preliminary stormwater management design in those areas modified or impacted by new facilities. Provide preliminary estimate of increase of built upon area, and evaluate strategies including constructed stormwater BMPs.

L. **Electrical and Control System Considerations** – Evaluate and identify the need for electrical and/or instrumentation and controls upgrades in the areas of planned improvements at the SDWRF. Conduct condition assessments for major electrical gear and recommend needed replacements. Specifically address the condition and potential need for replacement of existing problematic variable frequency drives. Develop approach for equipment installation and removal, and ease of routine maintenance.

2. Conduct a kickoff meeting to formally initiate the Preliminary Engineering Design study phase of the project, confirm project objectives and scope of the study, outline the project plan, present the project schedule, and identify the lines of communication. Prepare the agenda, presentation materials, and meeting minutes for the Kickoff Meeting.

3. Conduct a walk-around workshop at each of the WRFs at the beginning of the evaluations to ensure that the Engineer gains a full understanding of the plant engineering, operations and maintenance groups needs related to evaluations and upgrades to the facilities.

4. Preliminary engineering design workshops shall be incorporated to facilitate discussion of technical issues, decisions that must be made and the Engineer's recommendations for the Owner's consideration. Provide visual aids and concise data to assist the Owner in the understanding of issues and the decision-making process. It is anticipated that 6 workshops will be required. The workshops shall include two components: presentation of new material for the Owner's input and follow up discussion of topics from the previous workshops to give the Owner opportunity to review the topics internally and provide additional input. It is anticipated that the workshop topics may be adjusted from time to time within the project schedule as required; however, the following workshops and general topics for new material and for follow up discussion are initially anticipated:
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<tr>
<th>Workshop</th>
<th>Tentative Date</th>
<th>New Material Discussion</th>
<th>Follow Up Discussion</th>
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<tr>
<td>1</td>
<td>6/4/2014</td>
<td>NDWRF/SDWRF Basic Design Criteria</td>
<td>Owner data on collection system</td>
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<td>Conversion of NDWRF Plant A Clarifiers to EQ</td>
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<td>NDWRF EQ Tank Mixing</td>
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<td>6/25/2014</td>
<td>NDWRF/SDWRF Odor Control Rehab</td>
<td>NDWRF/SDWRF Basic Design Criteria</td>
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<td>NDWRF Secondary Clarifiers</td>
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<td>7/23/2014</td>
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<td>NDWRF Floodplain Considerations</td>
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<td>9/3/2014</td>
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<td>SDWRF UV PLC Replacement</td>
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5. Provide a separate draft Preliminary Engineering Report (PER) for each WRF for Owner review and prepare a final PER upon receipt of consolidated comments from the Owner. The Final PER shall address all Owner comments, as appropriate.

6. The general format of the PER shall be to provide a summary of the design criteria and recommendations of the technical evaluations along with a conceptual design level estimate of project construction budget and construction schedule. The PER shall address construction packaging options.
3. SURVEYING SERVICES
1. All surveying services proposed by Engineer to be provided by a sub-consultant to Hazen and Sawyer. Sub-consultant is proposed by Engineer to be CH Engineering, PLLC.

2. Related to the NDWRF – Perform topographic survey at the following locations:
   A. Within the existing sand drying beds where two new secondary clarifiers will be located;
   B. Adjacent to and north of the Plant B Preliminary Treatment Facility where new Plant B Screening Facilities will be located;

3. Related to the SDWRF – Perform topographic survey at the following locations:
   A. Within the existing sand drying beds where new equalization facilities will be located;
   B. Adjacent to and north of the existing Grit Removal Facilities where new Influent Screening and Grit Removal Facilities will be located;

4. Perform survey of relevant hydraulic points including weirs and pipe inverts related to the affected portion of the hydraulic profile at each facility.

5. Survey for Soil Borings: Stake proposed locations of geotechnical borings. Survey the as-built location of the borings and probes.

6. No Subsurface Utility Engineering (SUE) is included in this scope.

7. Easement Plats: No easement plats are anticipated for this project.

8. Survey work associated with the North Durham floodplain development work is included in the Preliminary Engineering Report scope above. Any additional survey work required as a result of the findings from the PER, including but not limited to new clarifiers at South Durham, stormwater flow, or other identified site concerns is not included in this scope, but may be included in the detailed design scope.

4. GEOTECHNICAL SERVICES
1. All geotechnical services shall be provided by a sub-consultant to Hazen and Sawyer. Sub-consultant proposed by the Engineer is A-1 Consulting Group, Inc.

2. Related to the NDWRF – Perform subsurface exploration including test borings for the following structures:
   A. Within the existing sand drying beds where two new secondary clarifiers will be located;
   B. Adjacent to and north of the Plant B Preliminary Treatment Facility where new Plant B Screening Facilities will be located;

3. Related to the SDWRF – Perform subsurface exploration including test borings for the following structures:
   A. Within the existing sand drying beds where new equalization facilities will be located;
   B. Adjacent to and north of the existing Grit Removal Facilities where new Influent Screening and Grit Removal Facilities will be located;
4. Geotechnical scope shall include field engineering services, laboratory testing, and geotechnical engineering analysis report.

5. Geotechnical work associated with the North Durham floodplain development work is included in the Preliminary Engineering Report scope above. Any additional geotechnical work required as a result of the findings from the PER, including but not limited to new clarifiers at South Durham is not included in this scope, but may be included in the detailed design scope.

B. PROJECT SCHEDULE
1. The Owner and the Engineer agree that time is of the essence and that delays in the design or construction may significantly impact the feasibility and/or cost of the Project.

2. The Engineer shall commence, carry on, and complete the Project with all dispatch in a sound, economical, and efficient manner, in accordance with the provisions hereof and all applicable laws. In accomplishing the Project, the Engineer shall take reasonable professional efforts to ensure that the work involved is properly coordinated with any related work being carried on by the City of Durham or its agents.

3. The following Project Schedule Table summarizes the anticipated Project Schedule to be complied with by the Engineer.

<table>
<thead>
<tr>
<th>PHASE</th>
<th>Due Date from NTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Engineering Report Draft Submittal</td>
<td>5 months</td>
</tr>
<tr>
<td>Preliminary Engineering Report Final Submittal</td>
<td>within 30 days of receipt of Owner comments</td>
</tr>
</tbody>
</table>

C. PROJECT DELIVERABLES

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

1. Technical Memoranda
2. Draft and Final Preliminary Engineering Reports
3. Decision Making Logs
4. Meeting Minutes
5. Presentations and visuals
6. Final design scope