

**AGREEMENT BETWEEN THE REGENTS OF THE UNIVERSITY OF MICHIGAN
AND THE CITY OF ANN ARBOR FOR PILOT PLANT OPERATIONAL ASSISTANCE
AND RESEARCH**

This Agreement (“Agreement”) is made this ____ day of _____, 2023, by and between The Regents of the University of Michigan (“University”), a Michigan constitutional corporation with offices located at c/o Office of Research and Sponsored Projects, 3003 South State Street, 1st Floor, Ann Arbor, MI 48109-1274, and the City of Ann Arbor (“City”), a Michigan municipal corporation with offices located at 301 E. Huron Street, Ann Arbor, MI 48104 (collectively “the Parties”).

WHEREAS, City will be constructing and operating a pilot plant as part of the Water Treatment Plant (WTP) Facility Plan Project to test the performance and reliability of single stage softening and other operational changes prior to constructing at full scale;

WHEREAS, City is contracting with AECOM for design, construction, management and supervision of the pilot plant;

WHEREAS, City wishes to use a University postdoc, student, or students to conduct operational assistance, data collection, analysis and reporting services;

WHEREAS, the operational assistance and research contemplated by this Agreement is of mutual interest and benefit to University and City, will further the instructional and research objectives of University in a manner consistent with its status as a non-profit, tax-exempt, educational institution, and may derive benefits for both City and University through inventions, improvements, or discoveries; and

WHEREAS, City understands and accepts that research by its nature is to explore, examine, and test ideas, hypotheses and/or theories and the outcome of a research effort is inherently uncertain; and

WHEREAS, the University shall apply for additional project funding in the form of a grant from the Water Research Foundation (WRF) to conduct research and continued operation.

NOW, THEREFORE, in consideration of the above assumptions and the promises and mutual covenants below, the parties agree to the following:

I. Definitions

- a. “Project” means the operational assistance and research being undertaken by University and City regarding the WTP Facility Plan pilot plant.
- b. “Team” refers collectively and individually to the University student or students who will conduct the Project funded in part by the City and later in part by the WRF grant application.

II. Work

University and City will use reasonable efforts to perform the Project substantially in accordance with the terms of this Agreement.

III. Term

- a. The term of this Agreement is for 18 months as described in Exhibit A (Introduction and Overview) unless written notice of termination is given by either party. The term will commence on April 1, 2023 unless City provides written notice of an earlier commencement date.
- b. Termination of this Agreement shall not affect the obligations of either party incurred during the term of this Agreement.
- c. Either party may terminate this Agreement by giving thirty (30) days advance written notice to the other party of its intent to terminate.
- d. In the event of early termination of the Project by City, City will pay all costs accrued by University as of the date of termination, including non-cancelable obligations, such as non-cancelable contracts and fellowships or postdoctoral associate appointments pursuant to the Project. Any obligation of City for fellowships or postdoctoral associates ends at the end of University's academic year during which the termination occurs, or two months, whichever period is shorter.
- e. If either party breaches or defaults on any of the terms or conditions of this Agreement, and fails to remedy the default or breach within ninety (90) days after receipt of written notice of it from the other party, the party giving notice may, at its option and in addition to any other remedies which it may have at law or in equity, terminate this Agreement by sending notice of termination in writing to the other party. The termination shall be effective as of the date of the receipt of the notice or three (3) days after sending, whichever occurs first.
- e. No termination of this Agreement, however effectuated, shall release the Parties from their rights and obligations accrued prior to the effective date of termination.

IV. Services

- a. University will provide the services of the Team that may include a post doc student or any other University student assigned to this Project, to City to conduct operational assistance and research as described in Exhibit A attached. The Team will work at the City Water Treatment Plant as described in Exhibit A. The Team will serve in and under the direction of AECOM and City Water Treatment Plant Staff during those periods in which he/she/they is/are working at the Water Treatment Plant. University will cooperate with AECOM, City and City Water Treatment Plant on all matters related to the Team's services at the Water Treatment Plant.

- b. City will have the opportunity to meet, interview and provide input on University's choice of Team based upon mutual interest and the ability to perform services specified under this Agreement.
- c. University will provide the Team with the use of lab space or other facilities to perform his/her/their services in conjunction with this Agreement. Similarly, City will provide the Team with an appropriate space at the Water Treatment Plant or other City locations necessary to carry out the Team's services.
- d. University and City shall comply with all applicable requirements of this Agreement, and any other applicable grants or agreements arising from WRF approval.
- e. AECOM and City will be responsible for the supervision and direction of the Team while at the Water Treatment Plant.
- f. The Team shall comply with all policies, procedures, and rules and regulations of the Water Treatment Plant while at the Plant.
- g. City will provide to University written statements of its policies that are applicable to the Team while providing services to City under this Agreement. Such policies will comply with all federal, state and local governmental laws and regulations.
- h. If the Team is required, in their course of his/her/their duties, to deal with confidential information, or high value items of City, City will institute procedures to safeguard such items, including but not limited to non-disclosure agreements. It shall be the sole responsibility of City and not University to protect such valuables.
- i. The Team will at all times remain an employee(s) of University and will have no employment relationship with City.

V. Costs, Billings, and Other Support

- a. City will compensate University as described in Exhibit B attached.
- b. University will compensate the Team, maintain all required human resources and compensation records, compute the Team's compensation and withhold and pay all required employment taxes, pay all required worker's compensation, unemployment compensation, overtime and fringe benefits required by law or pursuant to University policy. University will also perform such other duties and obligations as required to comply with any and all applicable federal, state and local statutes, ordinances, rules and regulations, including, without limitation, the maintenance of appropriate worker's compensation insurance.
- c. University will invoice City on a monthly basis for all charges related to the Agreement. Payment will be made by City within thirty (30) days of receipt of an invoice. Notice of any dispute regarding the charges in an invoice must be provided

in accordance with Article XIII and include a description of the item(s) in dispute and a reasonably detailed explanation of the reason for the dispute.

- d. Subject to the terms of the Agreement, University will retain title to any equipment that it purchases in relation to this Project. City will retain title to any equipment that it purchases in relation to this Project.

VI. Publicity

City will not use the name of University, nor of any member of University's Project staff, in any advertising, news release or other promotional activity without the prior written approval of an authorized representative of University. University will not use the name of City, nor any employee of City, in any advertising or other promotional activity without the prior written approval of City. Both Parties retain the right to disclose the existence of this Agreement, the identity of the Parties, or the nature and scope of the Project.

VII. Publications

- a. Subject to the following terms, University has the right to publish, publicly present, or otherwise make available to the public the results, analysis, and methods relating to the Project (a "Disclosure of Results"). University will notify City at least twenty (20) days in advance of the earlier of either (a) the submission to a third party, such as a journal, of a proposed publication or public presentation that would include a Disclosure of Results or (b) other public Disclosure of the Results, and furnish a description of the content therein.
- b. Subject to the following terms, City has the right to publish, publicly present, or otherwise make available to the public the results, analysis, and methods relating to the Project (a "Disclosure of Results"). City will notify University at least twenty (20) days in advance of the earlier of either (a) the submission to a third party, such as a journal, of a proposed publication or public presentation that would include a Disclosure of Results or (b) other public Disclosure of the Results, and furnish a description of the content therein.
- c. If the content would contain either (a) patentable subject matter that is Intellectual Property of any party or (b) Confidential Information disclosed pursuant to Article IX, then City or University has the right to object in writing to the Disclosure of the Results within twenty (20) days after the publishing party furnishes such description. If the non-publishing party makes a timely objection, then the publishing party will refrain from the Disclosure of the Results until the non-publishing party files patent or sixty days from the date of the objection, whichever is earlier. If the non-publishing party makes a timely objection then the publishing party will comply with the reasonable request to delete or modify information that is Confidential Information, giving due recognition to publishing party's missions and interests in publishing the result of such projects.

VIII. Reports

- a. During the term of this Agreement, representatives of the University and City will meet virtually or at the Water Treatment Plant at least monthly, at a time to be mutually agreed upon, to discuss the progress and results as well as ongoing plans, or changes in the Project. Additionally, the Team and AECOM will meet more frequently and as needed under the direction from AECOM.

IX. Confidentiality

- a. University and City agree to use confidential or proprietary information and data acquired from the other and identified as confidential or proprietary at the time of disclosure ("Confidential Information") only in performing the services of this Agreement and not to disclose to any third party any Confidential Information during and for a period of five (5) years from the date of disclosure, provided that if Confidential Information is disclosed orally or in other non-tangible form, the disclosing party will supply the other party in writing a general description of the Confidential Information and confirmation of its confidential or proprietary status within twenty (20) working days of disclosure.
- b. The obligation to protect Confidential Information shall not apply to any information that: (1) is already in the possession of, or is independently developed by, University or City; (2) becomes publicly available other than through breach of this provision; (3) is received by University or City from a third party with authorization to make the disclosure; (4) is released with the other party's written consent; or (5) is required to be released by legal process or other legal authority.
- c. Any disclosures made to City by the Team, arising out of or in connection with the Project, whether verbally or in written or tangible form, shall be considered as having been disclosed to and received by City on a non-confidential basis and shall not be construed to create or imply any obligation on the part of City except as otherwise agreed in this Agreement between the parties.
- d. Any disclosures made to University by employees or representatives of City, arising out of or in connection with the Project, whether verbally or in written or tangible form, shall be considered as having been disclosed to and received by University on a non-confidential basis and shall not be construed to create or imply any obligation on the part of University except as otherwise agreed in this Agreement.

X. General Responsibilities of the Parties

- a. City agrees to comply at its expense with all safety, health and work laws, regulations, directives and rules. City will also ensure compliance with safe work practices and use of protective equipment imposed by controlling federal, state and local government. All accidents and incidents involving the Team will be reported immediately to University by City. City and University will both cooperate with the other party's insurance carriers who shall have the right to inspect City's work location.

- b. The performance by the Team working with City and the Water Treatment Plant is an integral part of City's business and that of the Water Treatment Plant. Therefore, in addition to the provisions of this Agreement, the parties specifically agree that where necessary to control the quality of City services, to protect its reputation, or to ensure the safety of individuals within its employ or public safety, City and/or the Water Treatment Plant may take whatever action it deems necessary to modify or control the performance of the Team at the Water Treatment Plant and it may reject and/or return the Team or any member and remove them/him/her from the Project.
- c. All documents related to Water Treatment Plant business developed as a result of this Agreement, are the property of City. The information contained in such documents may be freely used by either party, subject to the provisions of Article VII.
- d. Neither party is authorized or empowered to act as agent for the other for any purpose and may not on behalf of the other enter into any contract, warranty or representation on any matter. Neither shall be bound by the act or conduct of the other.

XI. Insurance and Indemnification

- a. University warrants and represents that it has adequate liability insurance applicable to officers, employees, and agents while acting within the scope of their employment by University. University liability insurance policies do not extend protection to any other person.
- b. Each party assumes all risks of personal injury and property damage attributable to the negligent acts or omissions of its own officers, employees, and agents. To the extent permitted by law, University shall be responsible for any costs incurred by City that result from the Team's negligence, willful misconduct, or breach of the obligations imposed by this Agreement or by applicable regulations and policies of City. Nothing in this Section XI waives or limits, or shall be construed to waive or limit, the governmental immunity of a party.
- c. City understands that University is an educational institution created under Article 8, Section 5 of the State of Michigan Constitution of 1963. University, as a state institution, has strict limitations imposed upon its use of assets and consequently the University does not and cannot pay for any claims against City brought by third parties related to this Agreement.

XII. Governing Law

This Agreement shall be governed and construed in accordance with the laws of the State of Michigan without regard for principles of choice of law. Any claims, demands, or actions arising from this Agreement shall be brought in the state of Michigan, County of Washtenaw.

XIII. General Provisions

- a. This Agreement is the entire Agreement regarding the Project between City and University and supersedes all prior representations, negotiations or agreements, whether written or oral.
- b. This Agreement may not be altered or amended except by written agreement. The provision of this Agreement shall be binding upon the Parties hereto and their respective heirs, executors, administrators, legal representatives, successors and assigns.
- c. This Agreement may be executed in several counterparts, each of which shall be deemed original. Such counterparts shall together constitute but one and the same Agreement.
- d. The headings of the paragraphs of this Agreement are inserted solely for the convenience of reference. They shall in no way define, limit, extend or aid in the construction of the scope, extent or intent of this Agreement.
- e. In the event that any provision contained in this Agreement is held unenforceable by a court of competent jurisdiction, the remaining provisions shall continue. In the event that a portion of any provision is held unenforceable, the remaining portion or such provision shall nevertheless be carried into effect.
- f. The failure of a party to enforce at any time the provision of this Agreement shall not be construed as a waiver of any provision or of the right of such party thereafter to enforce each and every provision of this Agreement.
- g. Neither party shall transfer or assign the Agreement without the written consent of the other party.
- h. Any notice, request, demand, or other communication required or permitted thereunder shall be deemed properly given when placed in writing and deposited in the United States Postal Service, postage prepaid:
 - i. To City as listed above, or such other address as provided by City, with a copy to:

Manager of Water Treatment Plant
919 Sunset Rd
Ann Arbor, MI 48103
 - ii. To University as listed above or such other address as provided by University.

- i. Provisions surviving termination or expiration of this Agreement are those that on their face affect rights and obligations after termination or expiration, including provisions concerning indemnification, confidentiality, warranty and choice of law and venue.

CITY OF ANN ARBOR, a Michigan
municipal corporation

By _____
Christopher Taylor, Mayor

By _____
Jacqueline Beaudry, City Clerk

Approved as to substance

Milton Dohoney Jr.
City Administrator

Brian Steglitz, PE, Public Services
Area Administrator

Approved as to form and content

Atleen Kaur, City Attorney

THE REGENTS OF THE UNIVERSITY
OF MICHIGAN, a Michigan constitutional
corporation

By _____
Peter J. Gerard
Its: Grants and Contracts Associate Director

**EXHIBIT A
SCOPE OF SERVICES**

1.0 Introduction and Overview

The following describes the scope of services for pilot plant operations to be performed by the University of Michigan (UM) as part of the City of Ann Arbor's (City's) Water Treatment Plant Facility Plan project. Elements of this scope will be conducted both at the City's Water Treatment Plant and at UM. The main objectives for the pilot test to ensure adequate information is gathered for long-term treatment planning at the City's Water Treatment Plant facility.

The purpose of the City's pilot study is to evaluate treatment alternatives to:

1. Meet City's drinking water quality objectives.
2. Determine design and operating criteria for implementation at the full-scale water treatment plant.

In summary, the scope of service includes:

1. Lab and analytical support (at the pilot plant and external labs).
2. Operational support for operation of the pilot plant.
3. Management support for operations and lab testing as noted.

The pilot plant will be operated for a period of 18 months, with commissioning and start-up activities planned for May 2023. The contract is expected to start in April 2023 to allow for initial training of the operator and finalization of the sampling plan.

It has been agreed upon by the City and UM that the pilot facilities may be available for other UM objectives including research opportunities. The use of the equipment for other research would be secondary to the required pilot testing work noted herein and costs for operation, testing, and ancillary items for other research would remain the responsibility of the UM.

2.0 Project Objectives

Specifically, the pilot study aims to evaluate single-stage softening with various treatment alternatives to determine the most effective means to address the various contaminants present in the raw water. The pilot study is conducted to address the following treatment needs:

1. Hardness removal with single-stage softening using lime and sodium hydroxide (or soda ash).
2. Organic carbon removal with single-stage softening including potential coagulants and their impact on the settleability and filterability of the organics.
3. Sustainability of filter operations to meet water quality objectives with single-stage softening.
4. 1,4-dioxane removal.
5. Evaluation of disinfection byproduct (DBP) formation (at pilot scale) and formation potential (at lab scale) during treatment.
6. Evaluation of the behavior of per- and poly- fluoroalkyl substances (PFAS) during treatment.
7. Evaluation of the behavior of optional additional contaminants. These contaminants would be assessed if time and budget allow, and are not included within this scope of work.

To address the treatment needs, the following process units are included in the pilot plant:

- Single stage solids contactor for softening including clarification and recarbonation.
- Ozonation with flexibility to operate in the advanced oxidation process (AOP) mode.
- GAC filter adsorbers.

Bench-scale testing supplements pilot testing and is used to evaluate treatment needs and impacts downstream of filtration. Post-filter treatment is not provided in the pilot plant; as an example, any evaluation of disinfection byproduct formation is performed at bench-scale.

Jar testing will be completed to determine chemical selection and dosages prior to pilot testing by AECOM to address the softening chemistry and blending targets. Jar testing will be completed by UM as part of routine pilot plant operations to confirm dosing setpoints for changing water quality conditions in raw water during testing (see operational support for more details) .

The impact of solids deposition and scaling attributable to single-stage softening will be evaluated through qualitative (and where possible quantitative) observations of the processes used after softening, including cleaning needs and filter impacts.

The pilot study will measure 1,4-dioxane removal with and without advanced oxidation using hydrogen peroxide and ozone treatment.

3.0 Overview of the Pilot Plant Facilities

A process flow drawing is provided at the end of this memo (Figure 1).

Raw water flowrates from the well supply and surface supply is monitored with two flowmeters (0-150 gpm). A recycle water supply is monitored with one flowmeter (0-20 gpm). A sample port is available on each water supply line, along with a manual needle valve for flow modulation. After blending, the raw water is monitored with online analyzers for critical water quality[1] data. The softened water inlet is provided with multiple flush ports to accommodate maintenance and manage any scaling that occurs in the line. The softened water is monitored for critical water quality data with online analyzers. Sample taps are available on the blended water line and softened water line. Chemical feeds prior to the clarifier are flow paced based on the total flow to the clarifier as measured by the flowmeters on this skid.

Clarification equipment includes a single stage softener constructed to mimic the Suez / Veolia Accelerator Solids Contact Clarifier style of circular flocculation clarification equipment with a solids contact zone. The clarification equipment is used to test single stage softening with lime and sodium hydroxide. The equipment can operate up to 137 gpm or an equivalent loading rate of 1.75 gallons per minute per square foot (gpm/ft²). Excess softened water is discharged to the full-scale filter backwash waste facilities for blending with plant waste filter backwash and reclaim to the head of the treatment process. Solids shall be discharged periodically in a blowdown process and shall be discharged to the same disposal location. A smaller effluent stream of 20 gpm shall continue to the recarbonation system.

The re-carbonation equipment includes a feed pump, saturation pump, and two re-carbonation contactors. The re-carbonation equipment for the pilot plant provides a contact time of 20 minutes and is field adjustable. The system is designed for a flow rate of 20 gpm, and the 20 gpm effluent stream is conveyed to the downstream ozonation module.

Ozonation is achieved in two 10 gpm modules which provides two parallel trains for testing. Each module includes an ozone feed pump, flow meter, and sampling taps before and within the contactor. A chemical feed system for hydrogen peroxide injection for pre and post ozone addition is included, for advanced oxidation and residual quenching respectively. Within the contactor, two movable ozone monitors are available to characterize the residual profile. Two sampling locations to measure the oxidation-reduction potential (ORP) are included in the ozone module, to measure ORP prior to the contactor and another will be movable and generally located after the ozone contactor. Lastly, an ozone sampler at the end of the contactor is included to confirm that no ozone residual leaves the contactor and is carried to the filters. Excess water will be discharged to the filter backwash waste channel for blending with filter backwash and reclaim to the head of the treatment process; excess water is wasted in all tests involving the deliberate introduction of a contaminant (such as 1,4-dioxane spiking). Any excess flow from the ozone testing module is wasted prior to reaching the filtration pilot system.

The existing filters are dual media with average of 24 inches of granular activated carbon (GAC) and 2 inches of silica sand. The pilot filtration system is located in the full-scale plant's filter gallery and includes six columns arranged in two trains of three filters and each filter column is designed for a filter loading rate of 3 gpm/ft². The specific media depth and type to be confirmed before start-up (for example, to replicate a condition with maximum possible depth of GAC at the full-scale plant, and to mimic the two different media configurations installed at the plant).

With the exception of the filter columns, the pilot treatment system is enclosed in a heated and insulated facility separate from the existing full-scale water treatment plant. The pilot facility is intended to operate continuously for extended periods and is provided with automated alarms and may shut-down systems automatically or require an operator to address the alarms.

4.0 Scope of Services

4.1 Lab and Analytical Support

UM will provide laboratory support for pilot testing water quality evaluation including lab quality control samples and sample bottle provision.

1. Create spiking solutions for 1,4-dioxane.
2. Complete routine analyses associated with running the pilot plant: total organic carbon, total inorganic carbon, dissolved inorganic carbon, dissolved organic carbon. The following analyses are expected to be completed on-site: particle size characterization, turbidity, alkalinity, hardness, total organic nitrogen, total suspended solids (TSS), UV-254 absorbance, calculate SUVA, ammonia, iron (total/dissolved), manganese (total/dissolved), calcium, magnesium, nitrate, nitrite, ammonia, aluminum, bromine, and phosphate. These analyses will be conducted on a twice a week/weekly/monthly basis as part of the pilot plant operators duties (see operational support section).
3. Complete analyses for the following contaminants on a “challenge test” basis. There will be three-four challenge tests throughout pilot plant operation: 1,4-dioxane, regulated and unregulated DBP concentrations and formation potential, and PFAS analyses. Regulated DBPs will include bromate, four trihalomethanes, and five haloacetic acids. Unregulated DBPs will include compounds that have been identified as posing the biggest risks in drinking water systems, and will include *N*-nitrosodimethylamine (NDMA) and four haloacetonitriles amongst others. Challenge tests will be collaboratively designed by UM senior staff, graduate student, AECOM, and the City, and performed by the graduate student with the help of the pilot plant operator.
4. UM may aid sample collection for additional analyses, but these analyses will not be part of UM's scope of work.

If unable to complete lab analysis, certified labs can be contracted to perform the analysis. Additional analyses may be supported by UM (ex/ zeta potential), but will be performed only when the City, UM, and AECOM agree that they are needed and are within the scope of work.

4.2 Operational Support

AECOM will provide training to staff at the process start and for one additional training period, including O&M manuals. On site staff training by AECOM is anticipated twice within the operating period to accommodate staff changes within the operating period. AECOM will

provide technical direction and support for all pilot and bench-scale testing. AECOM technical support will be available every business day by virtual communication. UM staff will be required to comply with the most restrictive health and safety requirements as established for the location (UM and City of Ann Arbor safety requirements for example).

1. Provide qualified staff for pilot operations.

Qualified shall include but not be limited to:

- a. Ability to perform field water quality testing, temperature, pH, dissolved oxygen (DO), ozone residual and hydrogen peroxide in water.
 - b. Modify water flowrates using pilot equipment.
 - c. Add spiking chemicals per testing protocol.
 - d. Ability to understand the process flow and the generalized impact of process modifications to the water quality.
 - e. Ability to modify chemical feed rates and doses and complete typical calculations associated with chemical feed systems.
 - f. Ability to climb ladder up 15 feet and lift up to 30 lbs.
 - g. Maintain system through water flushing process, backwash and flush of system, solids draining.
 - h. Complete laboratory testing at the onsite lab.
 - i. General knowledge of standard computer systems and software necessary for data collection, documentation, organization, and communication.
 - j. Ability to troubleshoot typical operational issues that may be associated with pilot testing.
 - k. Calibrate and general maintenance of chemical metering systems.
 - l. Perform typical online analyzer calibration including pH and turbidity.
 - m. Collect water samples for off-site laboratory analysis.,
 - n. Conduct bench scale testing for disinfection byproduct formation potential.
 - o. Conduct jar-testing as directed.
2. Maintain daily operational logs to document pilot operations including:
- p. Significant weather events.
 - q. Water quantity and blend of surface water to well water used; the identity of the duty wells supplying the plant on any given day can be obtained from SCADA and/or operational logs for the full-scale WTP.
 - r. Water quality per the data collection log sheet.
 - s. Process modifications, such as the choice of chemical and dose, filter backwashing schedule, or when a process unit is out-of-service.
 - t. General pilot documentation per the data collection log sheet.

AECOM will provide a data collection log that will detail the items to be documented.

3. Provide photos, spreadsheets, and data logging summaries (raw data from equipment or field logs).
4. Optional: Observe start-up and commissioning efforts as available (scheduled for the latter half of April 2023).
5. Participate in training provided by AECOM (scheduled for May 2023).
6. Provide operational support from May 2023 through April 2024 with weekly or monthly costs provided and assumption of four weeks of inactivity at the site (40 weeks of activity).
 - u. Respond to emergency calls associated with the pilot equipment and troubleshoot issue on a 24/7 basis. We will target call response time to be within 2 hours.
 - v. Provide field work a minimum of 5 days per week to complete water quality samples, data logging, and general system operation and maintenance, unless the pilot system operation is paused. System will continue to operate unstaffed around the clock, seven days a week.
 - w. Hours for on-site lab testing must match hours of operation for onsite lab (7 AM – 3:30 PM, weekdays only).
7. Provide weekly status email reports to AECOM for sharing with the City.
8. Attend weekly status meetings (virtual) with the City and AECOM. Only one pilot plant operator would be required at the weekly meeting.
9. Provide up to 10 tours (approximately one per month) of the pilot process upon request, as approved by City. Tours to be supported by AECOM as well as appropriate. Tours would be conducted during normal operating hours and less than 1 hour in duration.
10. Support the compilation of the Pilot Study Report, by organizing data for documentation, graphs, tables, and text to summarize operations and data collected. Confirm templates for data recording and presentation with AECOM.
 - x. Present data for raw water characterization, using sampling at the pilot plant as well as data obtained from full-scale sampling (from SCADA, Operator log sheets, and grab sampling, for example hardness and alkalinity in raw water).
 - y. Compile data for full-scale water treatment plant performance (while operating two-stage and single-stage softening) for comparison to pilot plant performance.

An example sample summary of the analyses for pilot plant operation and expected to be run by the pilot plant operator is provided in Table 1. The frequency and nature of these may change as a result of running the pilot, and will be discussed with UM, AECOM, and the City. A new HACH unit, pH meter probe, dissolved oxygen meter, ambient ozone meter and ORP meter will be purchased by AECOM and kept in the pilot building for the duration of the tests. Reagents (brand optional) and additional consumables will be supplied by UM for these tests.

The nature of challenge tests will be discussed with AECOM, the City, and UM to maximize knowledge gained given limited resources. A sample challenge test is included for 1,4-dioxane in table 2, however, experimental plans will be finalized with input from the City, AECOM, and UM during pilot plant operations.

Additionally, the pilot plant operator will perform limited jar testing, designed with the help of AECOM personnel, to confirm chemical dosing and evaluating treatment strategies. Jar tests will take place at:

- 1) The beginning of changes in seasonal water conditions to evaluate changes in operating strategies:
 - a) Different blend ratios with groundwater (one jar testing event to run five conditions, cold water conditions, measuring hardness in addition to turbidity; assume tests are conducted in one week period, assume 2 to 4 hrs for each condition)
 - b) Hexahydrate formation (three jar testing events each up to two weeks of part time activity with jar testing)
 - c) 100% river water (one jar testing event, warm water conditions, assume less than 4 hrs)
- 2) Throughout operations to confirm chemical dosing. These jar tests will be performed on a monthly basis, and are expected to take < 2 hrs per test.

UM will maintain qualified staff for pilot system operations and provide continuity in staffing such that at least one person is responsible throughout the operational period and field staff are continuous throughout a semester at a minimum.

UM will meet with the pilot testing team on a weekly basis for a status update.

UM will provide monthly schedule and budget updates to the City.

UM will create a health and safety plan for UM staff (only) at the site. Chemical hazards may include:

- Various contaminants that may be spiked into the pilot plant for challenge testing (1,4-dioxane) with additional contaminants potentially added at the request of the City or as proposed by UM
- Lime
- Caustic soda
- Soda ash
- Aluminum sulfate
- Ferric sulfate
- Carbon dioxide
- Ozone
- Hydrogen peroxide
- Filter aid polymers (ClariFLOC)
- Aluminum Chlorohydrate (ACH)
- Sodium hexametaphosphate

Consideration will be given to all other anticipated hazards beyond chemicals as determined by UM review (i.e., chlorine and ammonia used in bench-scale testing performed by UM).

Table 1 – Example Sampling Plan for Pilot Plant – Online and Onsite Sampling

Source Water	Test Parameter	Sampling Type / Frequency
Raw Water	Turbidity	Online /Grab Sample / Daily (Operator) ^b
	Temperature	Online
	pH	Online / Grab Sample / Daily (Operator) ^b
	ORP	Grab Sample / Daily (Operator) ^b
	Alkalinity	Grab Sample / Bi-weekly (Operator) ^b And operational data from the plant
	Hardness (Ca and Mg and carbonate and non-carbonate)	Grab Sample / Bi-weekly (Operator) ^b And operational data from the plant
	Bromide	Weekly during critical testing and once a month (mid-month) at other times.
	Nitrite / Ammonia	Colorimetric
	Total N and Nitrate	HACH portable unit
	Total Phosphorus/Orthophosphate	Grab Sample / Bi-weekly (Operator)
	UV absorbance/ UV transmittance (UVA/UVT)	Grab Sample / Weekly (Operator)
	Particle Count and Size	Grab Sample / Weekly (Operator)
	Dissolved Organic Carbon / Inorganic Carbon (DOC/ IC), Total Organic Carbon / Inorganic Carbon (TOC/TIC)	Grab Sample / Bi-weekly (Operator)
	Flow	Online
Dissolved Oxygen	Online	

	Conductivity	Online
	Turbidity	Online/Grab Sample as Needed
	ORP	Grab Sample / Daily (Operator)
Softener Effluent	pH	Online /Grab Sample / Daily (Operator)
	DO	Grab Sample
	Alkalinity	Grab Sample / Bi-weekly minimum (Operator)
	Hardness (Ca and Mg and carbonate and non-carbonate)	Grab Sample / Bi-weekly minimum (Operator)
	Particle Count and Size	Grab Sample / Weekly (Operator)
	Pressure	Online
	Flow	Online
Recarbonation	pH	Online
	Temperature	Online
	ORP	Online
	CO ₂	
	Particle Count, Particle Size	Grab Sample / Weekly (Operator)
	Flow	Online
	Pressure	Online
	<i>Chemical Feed Cabinet</i>	
	Tank Level	Online

	Dissolved Organic Carbon / Inorganic Carbon (DOC/IC), Total Organic Carbon / Inorganic Carbon (TOC/TIC)	Grab Sample / Bi-weekly (Operator)
	Flow	Online
	Inline Filter Weight	Periodic
	TOC and DOC	Bi-weekly
	UV absorbance/ UV transmittance (UVA/UVT)	Grab Sample / Weekly (Operator) ^b
	Pressure	Online
	Flow	Online
Ozonation	pH	Online
	Ozone	Online
	Ambient Ozone	Online
	ORP (2 locations)	Online
	<i>Oxygen Concentration Panel</i>	
	Pressure	Online
	Flow	Online
	Temperature	Online
	Oxygen	Online
	<i>Ozone Generation Panel</i>	
	Pressure	Online
	Flow	Online

	Ozone	Online
	Temperature	Online
	<i>Chemical Feed Cabinets</i>	
	Flow	Online
	Tank Level	Online
	Dissolved Organic Carbon / Inorganic Carbon (DOC/IC), Total Organic Carbon / Inorganic Carbon (TOC/TIC)	Grab Sample / Bi-weekly (Operator)
	Particle Count, Particle Size	Grab Sample / Weekly (Operator) ^b
	Inline Filter Weight	Periodic
	Ozone Residual	Grab Sample / Bi-weekly minimum (Operator) ^b
	UV absorbance/ UV transmittance (UVA/UVT)	Grab Sample / Weekly (Operator) ^b
	Headloss on Each Filter (6 total)	Online
	Flow to each filter (6 total)	Online
	Turbidity after each filter (6 total)	Online
Filtration	Applied water turbidity	Online
	Backwash turbidity	Online
	Backwash flow	Online
	UV absorbance/ UV transmittance (UVA/UVT)	Grab Sample / Weekly (Operator) ^b
	Particle Count, Particle Size	Grab Sample / Weekly (Operator) ^b

Nitrate / nitrite / ammonia / total N	Weekly
Dissolved Organic Carbon / Inorganic Carbon (DOC/IC), Total Organic Carbon / Inorganic Carbon (TOC/TIC)	Grab Sample / Bi-weekly (Operator)
ATP (check in the WRF report)	Weekly – in house lab
Media effective Size, Specific gravity, and uniformity coefficient	Pre-testing and after 6 or more operating months.
Temperature	Grab Sample / Daily (Operator)
pH	Grab Sample / Daily (Operator) ^b
ORP	Grab Sample / Daily (Operator) ^b

Table 2. Example sample plan for 1,4-dioxane spiking event.

1,4-D – additional testing during a spiking event

- o The spiking event is expected to last up to three days to clear through the different influent conditions

Influent Concentration (to be confirmed)	AOP dose conditions 1	AOP dose condition 2	AOP dose condition 3
	Raw water before test	Raw water before test	Raw water before test
10 (or 20) ug/L	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate
5 ug/L	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate
2 ug/L	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate
1 ug/L	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate
0.4 ug/L	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate	Ozone contactor effluent in duplicate
	Raw water after test	Raw water after test	Raw water after test
TOTAL SAMPLES PER AOP CONDITION	12	12	12

- o Based on the table, assume 36 + 10% spare or 40 1,4-D samples per spiking event
- o Note that we are not sampling from the ozone only train during the spiking event

5.0 Schedule

The schedule in Table 3 is provided for a reference of the testing plans for the pilot study. This is provided for approximate guidance, and the schedule may change. Additional testing may be included at UM's request, but are not required within this scope of work.

Table 3 – Pilot Study Schedule

MONTH	ACTIVITY
January	Jar Testing (AECOM) Pilot Construction
February	Pilot Construction
March	Pilot Construction Kickoff Meeting on site with UM to discuss operations, testing plan, review SOPs (confirm timing with UM, so long as this is scheduled before May start)
April	Pilot Construction
May	Training Pilot Startup and readying pilot for summer condition testing
June	Study Validation Phase Jar testing, recurring (by UM)
July	Summer heat peak softener capacity 1,4-dioxane Test Advanced Oxidation Distribution System Water Quality (bench testing)
August	Summer heat peak softener capacity (carry over as needed) Steady State Operations Advanced Oxidation
September	Raw Water Blending Range Evaluations Steady State Operations Advanced Oxidation
October	Steady State Operations
November	Steady State I Operations Draft Report 50% submittal for review
December	Partial Holiday Shutdown
January 2024	Cold weather peak softener capacity Cold weather hexahydrate formation (Jar testing by UM)
February 2024	Cold weather peak softener capacity (carry over as needed)
March 2024	Spring Runoff peak softener capacity River Water Supply Only (Jar testing by UM)
April 2024	Spring Runoff peak softener capacity (carry over as needed) Draft Report
May 2024	Final Report

NOTE: The testing schedule and scope is subject to change in response to conditions in the field and testing results. The above schedule reflects approximately 12 months less a shutdown in Dec. 2023/Jan. 2024 to capture the holiday period.

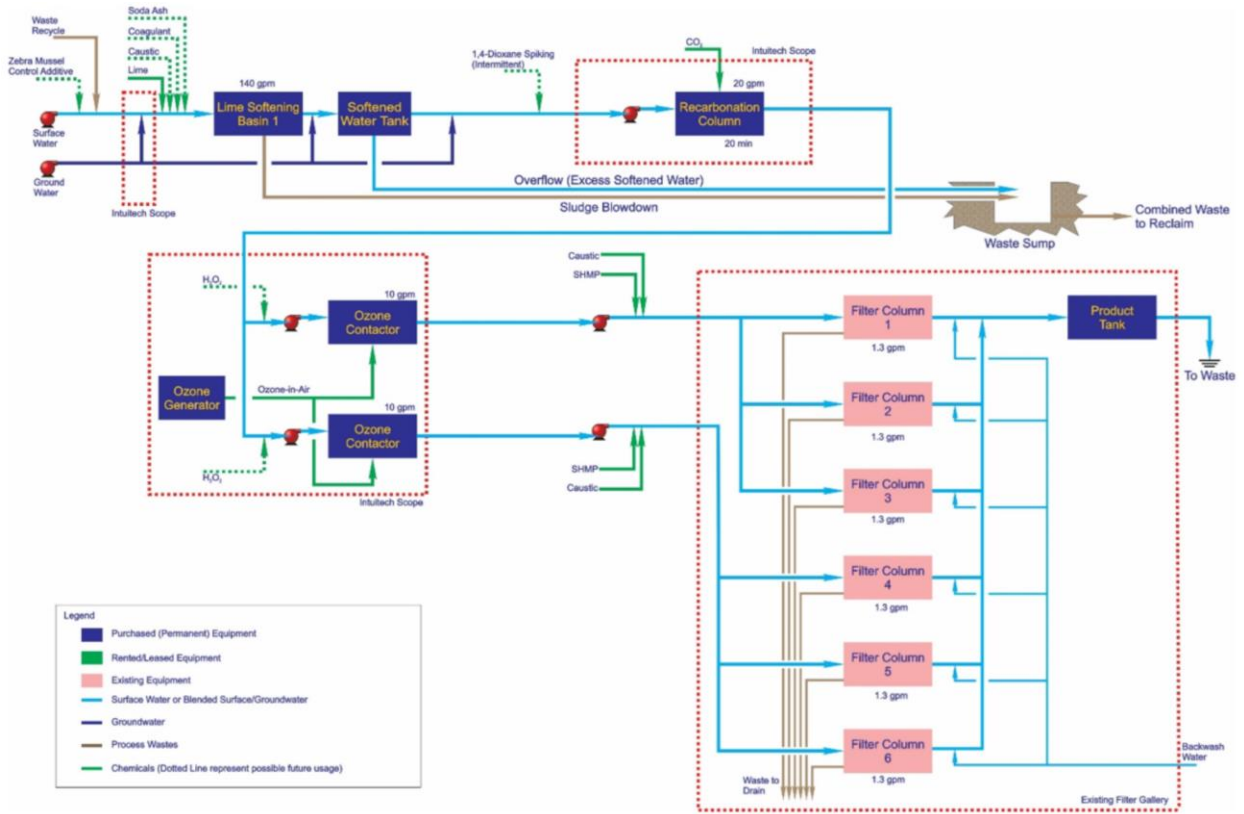


Figure 1 - Process Flow Diagram of the Pilot Treatment System

**EXHIBIT B
COMPENSATION**

General

University shall be paid for those Services performed pursuant to this Agreement in accordance with the terms and conditions herein. The Compensation Schedule below/attached states nature and amount of compensation University may charge the City.

(insert/Attach Fee Arrangement)

UM Proposed Budget

For the purposes of this proposal, the budget has been divided into two work items, Item#1 and Item#2, described below. In general, work items include the following cost elements:

Item 1: GSRA (with tuition), Technical Staff (UM's Onsite Manager), Materials & Supplies, Salary Related Costs and Overhead.

Item #2: Senior Staff, Student Support (hourly Temporary Research Assistants), Travel, Materials & Supplies, Shipping, Commercial Lab Analysis, Salary Related Costs and Overhead.

UM Proposed Budget with the City of Ann Arbor Lead PI: Aleksandra Szczuka Title: Feasibility of single-stage softening during water treatment: a pilot scale assessment Item #1		
BUDGET CATEGORIES	TYPE	TOTAL
PERSONNEL		
Name	Person-Months/Effort	Amount
PI: Aleksandra Szczuka	0.50 summer-month (20% effort)	\$0
Co-PI: Lutgarde Raskin	0.25 summer-month (10% effort)	\$0
GSRA	18-months at a 50% appt.	\$53,024
Program Mgr.: Curt Wolf	5% effort	\$0
Technical Staff (UM's on site manager)	18-months (100%)	\$109,323
Temporary Research Assistants (2)	\$18/HR for an estimated 1,920 hours	\$0
FRINGE BENEFITS		
Name	Rate	Amount
PI: Aleksandra Szczuka	28%	\$0
Co-PI: Lutgarde Raskin	28%	\$0

GSRA	18%	\$9,544
Program Mgr.: Curt Wolf	28%	\$0
Technical Staff	30%	\$32,797
Temporary Research Assistants (2)	7.65%	\$0
EQUIPMENT		
Not Applicable		\$0
TRAVEL		
Domestic		\$0
PARTICIPANT SUPPORT COSTS		
Not Applicable		\$0
OTHER DIRECT COSTS		
Materials & Supplies		\$10,000
Tuition	Pre-candidate (1 academic term) Candidate (1 academic term)	\$31,457
TOTAL DIRECT COSTS	Total of all budget categories	\$246,146
BASE FOR IDC (MTDC)	<i>MTDC=equipment, participant support costs, subk over \$25K, and tuition costs</i>	\$214,688
F&A/INDIRECT COSTS	26% *off-campus rate	\$55,819
TOTAL PROJECT COSTS	18 Month Project Costs	\$301,964

U-M Proposed Budget with the City of Ann Arbor
Lead PI: Aleksandra Szczuka
Title: Feasibility of single-stage softening during water treatment: a pilot scale assessment
Item #2

BUDGET CATEGORIES	TYPE	TOTAL
PERSONNEL		
Name	Person-Months/Effort	Amount
PI: Aleksandra Szczuka	0.50 summer-month (20% effort)	\$8,929
Co-PI: Lutgarde Raskin	0.25 summer-month (10% effort)	\$10,230
GSRA	18-months at a 50% appt.	\$0
Program Mgr.: Curt Wolf	5% effort	\$12,464
Technical Staff	18-months (100%)	\$0
Temporary Research Assistants (2)	\$18/HR for an estimated 1,920 hours	\$34,560
FRINGE BENEFITS		
Name	Rate	Amount
PI: Aleksandra Szczuka	28%	\$2,132
Co-PI: Lutgarde Raskin	28%	\$2,457
GSRA	18%	\$0
Program Mgr.: Curt Wolf	28%	\$3,072
Technical Staff	30%	\$0
Temporary Research Assistants (2)	7.65%	\$2644
EQUIPMENT		
Not Applicable		\$0

TRAVEL		
Domestic & Foreign		\$12,000
PARTICIPANT SUPPORT COSTS		
Not Applicable		\$0
OTHER DIRECT COSTS		
Materials & Supplies		\$20,000
Shipping		\$2,000
Commercial Lab Analysis		\$7,000
Tuition	Pre-candidate (1 academic term) Candidate (1 academic term)	\$0
TOTAL DIRECT COSTS	Total of all budget categories	\$117,488
BASE FOR IDC (MTDC)	<i>MTDC=equipment, participant support costs, subk over \$25K, and tuition costs</i>	\$117,488
F&A/INDIRECT COSTS	26% *off-campus rate	\$30,547
TOTAL PROJECT COSTS	18 Month Project Costs	\$148,036

<p>UM Proposed Budget with the City of Ann Arbor Lead PI: Aleksandra Szczuka Title: Feasibility of single-stage softening during water treatment: a pilot scale assessment</p> <p style="font-size: 24pt; font-weight: bold; margin: 0;">Total</p>		
ITEM #1	18 Month Project Costs	\$301,964
ITEM #2	18 Month Project Costs	\$148,036
TOTAL PROJECT COSTS	18 Month Project Costs	\$450,000