PROFESSIONAL SERVICES AGREEMENT BETWEEN
TETRA TECH OF MICHIGAN, PC
AND THE CITY OF ANN ARBOR
FOR PROFESSIONAL SERVICES

The City of Ann Arbor, a Michigan municipal corporation, having its offices at 301 E. Huron St. Ann Arbor, Michigan 48103 ("City"), and Tetra Tech of Michigan, PC

("Contractor") a(n) Michigan (State where organized) Corporation (Partnership, Sole Proprietorship, or Corporation)
with its address at 710 Avis Drive, Ann Arbor, MI 48108
agree as follows on this 1st day of April, 2015.

The Contractor agrees to provide services to the City under the following terms and conditions:

I. DEFINITIONS

Administering Service Area/Unit means Public Services Area.

Contract Administrator means Water Treatment Services Manager, acting personally or through any assistants authorized by the Administrator/Manager of the Administering Service Area/Unit.

Deliverables means all Plans, Specifications, Reports, Recommendations, and other materials developed for and delivered to City by Contractor under this Agreement

Project means Water Treatment Plant Steere Farm Well Engines Replacement Project.
Project name

II. DURATION

This Agreement shall become effective on April 1, 20 15, and shall remain in effect until satisfactory completion of the Services specified below unless terminated as provided for in Article XI.

III. SERVICES

A. The Contractor agrees to provide Professional Consulting Engineering Services
type of service
("Services") in connection with the Project as described in Exhibit A. The City retains the right to make changes to the quantities of service within the general scope of the Agreement at any time by a written order. If the changes add to or deduct from the extent of the services, the contract sum shall be adjusted accordingly. All such changes shall be executed under the conditions of the original Agreement.

B. Quality of Services under this Agreement shall be of the level of quality performed by persons regularly rendering this type of service. Determination of acceptable quality shall be made solely by the Contract Administrator.

C. The Contractor shall perform its Services for the Project in compliance with all statutory, regulatory and contractual requirements now or hereafter in effect as may be applicable to the rights and obligations set forth in the Agreement.

D. The Contractor may rely upon the accuracy of reports and surveys provided to it by the City (if any) except when defects should have been apparent to a reasonably competent professional or when it has actual notice of any defects in the reports and surveys.

IV. INDEPENDENT CONTRACTOR

The Parties agree that at all times and for all purposes under the terms of this Agreement each Party's relationship to any other Party shall be that of an independent contractor. Each Party will be solely responsible for the acts of its own employees, agents, and servants. No liability, right, or benefit arising out of any employer/employee relationship, either express or implied, shall arise or accrue to any Party as a result of this Agreement.

V. COMPENSATION OF CONTRACTOR

A. The Contractor shall be paid in the manner set forth in Exhibit B. Payment shall be made monthly, unless another payment term is specified in Exhibit B, following receipt of invoices submitted by the Contractor, and approved by the Contract Administrator.

B. The Contractor will be compensated for Services performed in addition to the Services described in Section III, only when the scope of and compensation for those additional Services have received prior written approval of the Contract Administrator.

C. The Contractor shall keep complete records of work performed (e.g. tasks performed/hours allocated) so that the City may verify invoices submitted by the Contractor. Such records shall be made available to the City upon request and submitted in summary form with each invoice.

VI. INSURANCE/INDEMNIFICATION

A. The Contractor shall procure and maintain during the life of this contract such insurance policies, including those set forth in Exhibit C, as will protect itself and the City from all claims for bodily injuries, death or property damage which may arise under this contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor, any subcontractor or anyone employed by them directly or indirectly. In the case of all contracts involving on-site work, the

Contractor shall provide to the City, before the commencement of any work under this contract, documentation satisfactory to the City demonstrating it has obtained the policies and endorsements required by Exhibit C.

B. Any insurance provider of Contractor shall be admitted and authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company's Key Rating Guide of "A-" Overall and a minimum Financial Size Category of "V". Insurance policies and certificates issued by non-admitted insurance companies are not acceptable unless approved in writing by the City.

C. To the fullest extent permitted by law, Contractor shall indemnify, defend and hold the City, its officers, employees and agents harmless from all suits, claims, judgments and expenses, including attorney's fees, resulting or alleged to result, from any acts or omissions by Contractor or its employees and agents occurring in the performance of or breach in this Agreement, except to the extent that any suit, claim, judgment or expense are finally judicially determined to have resulted from the City's negligence or willful misconduct or its failure to comply with any of its material obligations set forth in this Agreement.

VII. COMPLIANCE REQUIREMENTS

A. Nondiscrimination. The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of the Ann Arbor City Code and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.

B. Living Wage. If the Contractor is a "covered employer" as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the City under this Agreement a "living wage," as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the City of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Agreement are working; to maintain records of compliance; if requested by the City, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

VIII. WARRANTIES BY THE CONTRACTOR

A. The Contractor warrants that the quality of its Services under this Agreement shall conform to the level of quality performed by persons regularly rendering this type of service.

B. The Contractor warrants that it has all the skills, experience, and professional licenses necessary to perform the Services specified in this Agreement.

C. The Contractor warrants that it has available, or will engage, at its own expense, sufficient trained employees to provide the Services specified in this Agreement.

D. The Contractor warrants that it is not, and shall not become overdue or in default to the City for any contract, debt, or any other obligation to the City including real and personal property taxes.

E. The Contractor warrants that its proposal for services was made in good faith, it arrived at the costs of its proposal independently, without consultation, communication or agreement, for the purpose of restricting completion as to any matter relating to such fees with any competitor for these Services; and no attempt has been made or shall be made by the Contractor to induce any other perform or firm to submit or not to submit a proposal for the purpose of restricting competition.

IX. OBLIGATIONS OF THE CITY

A. The City agrees to give the Contractor access to the Project area and other City-owned properties as required to perform the necessary Services under this Agreement.

B. The City shall notify the Contractor of any defects in the Services of which the Contract Administrator has actual notice.

X. ASSIGNMENT

A. The Contractor shall not subcontract or assign any portion of any right or obligation under this Agreement without prior written consent from the City. Notwithstanding any consent by the City to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under the Agreement unless specifically released from the requirement, in writing, by the City.

B. The Contractor shall retain the right to pledge payment(s) due and payable under this Agreement to third parties.

XI. TERMINATION OF AGREEMENT

A. If either party is in breach of this Agreement for a period of fifteen (15) days following receipt of notice from the non-breaching party with respect to a breach, the non-breaching party may pursue any remedies available to it against the breaching party under applicable law, including but not limited to, the right to terminate this Agreement without further notice. The waiver of any breach by any party to this Agreement shall not waive any subsequent breach by any party.

B. The City may terminate this Agreement, on at least thirty (30) days advance notice, for any reason, including convenience, without incurring any penalty, expense or liability to Contractor, except the obligation to pay for Services actually performed under the Agreement before the termination date.

C. Contractor acknowledges that, if this Agreement extends for several fiscal years, continuation of this Agreement is subject to appropriation of funds for this Project. If funds to enable the City to effect continued payment under this Agreement are not appropriated or otherwise made available, the City shall have the right to terminate this Agreement without penalty at the end of the last period for which funds have been appropriated or otherwise made available by giving written notice of termination to Contractor. The Contract Administrator shall give Contractor written notice of such non-appropriation within thirty (30) days after it receives notice of such non-appropriation.

D. The provisions of Articles VI and VIII shall survive the expiration or earlier termination of this Agreement for any reason. The expiration or termination of this Agreement, for any reason, shall not release either party from any obligation or liability to the other party, including any payment obligation that has already accrued and Contractor's obligation to deliver all Deliverables due as of the date of termination of the Agreement.

XII. REMEDIES

A. This Agreement does not, and is not intended to, impair, divest, delegate or contravene any constitutional, statutory and/or other legal right, privilege, power, obligation, duty or immunity of the Parties.

B. All rights and remedies provided in this Agreement are cumulative and not exclusive, and the exercise by either party of any right or remedy does not preclude the exercise of any other rights or remedies that may now or subsequently be available at law, in equity, by statute, in any agreement between the parties or otherwise.

C. Absent a written waiver, no act, failure, or delay by a Party to pursue or enforce any rights or remedies under this Agreement shall constitute a waiver of those rights with regard to any existing or subsequent breach of this Agreement. No waiver of any term, condition, or provision of this Agreement, whether by conduct or otherwise, in one or more instances, shall be deemed or construed as a continuing waiver of any term, condition, or provision of this Agreement. No waiver by either Party shall subsequently effect its right to require strict performance of this Agreement.

XIII. NOTICE

All notices and submissions required under this Agreement shall be delivered to the respective party in the manner described herein to the address stated in this Agreement or such other address as either party may designate by prior written notice to the other. Notices given under this Agreement shall be in writing and shall be personally delivered, sent by next day express delivery service, certified mail, or first class U.S. mail postage prepaid, and addressed to the person listed below. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; (2) the next business day when notice is sent next day express delivery service or personal delivery; or (3) three days after mailing first class or certified U.S. mail.

If Notice is sent to the CONTRACTOR, it shall be addressed and sent to:

Tetra Tech of Michigan, PC
Attn: Brian Rubel, PE
710 Avis Drive
Ann Arbor, MI 48108

If Notice is sent to the CITY, it shall be addressed and sent to:

City of Ann Arbor
Attn: Brian Steglitz, PE
(insert name of Administering Service Area Administrator)
301 E. Huron St.
Ann Arbor, Michigan 48103

XIV. CHOICE OF LAW AND FORUM

This Agreement will be governed and controlled in all respects by the laws of the State of Michigan, including interpretation, enforceability, validity and construction, excepting the principles of conflicts of law. The parties submit to the jurisdiction and venue of the Circuit Court for Washtenaw County, State of Michigan, or, if original jurisdiction can be established, the United States District Court for the Eastern District of Michigan, Southern Division, with respect to any action arising, directly or indirectly, out of this Agreement or the performance or breach of this Agreement. The parties stipulate that the venues referenced in this Agreement are convenient and waive any claim of non-convenience.

XV. OWNERSHIP OF DOCUMENTS

Upon completion or termination of this Agreement, all documents (i.e., Deliverables) prepared by or obtained by the Contractor as provided under the terms of this Agreement shall be delivered to and become the property of the City. Original basic survey notes, sketches, charts, drawings, partially completed drawings, computations, quantities and other data shall remain in

the possession of the Contractor as instruments of service unless specifically incorporated in a deliverable, but shall be made available, upon request, to the City without restriction or limitation on their use. The City acknowledges that the documents are prepared only for the Project. Prior to completion of the contracted Services the City shall have a recognized proprietary interest in the work product of the Contractor.

Unless otherwise stated in this Agreement, any intellectual property owned by Contractor prior to the effective date of this Agreement (i.e., Preexisting Information) shall remain the exclusive property of Contractor even if such Preexisting Information is embedded or otherwise incorporated in materials or products first produced as a result of this Agreement or used to develop Deliverables. The City's right under this provision shall not apply to any Preexisting Information or any component thereof regardless of form or media.

XV. CONFLICTS OF INTEREST OR REPRESENTATION

Contractor certifies it has no financial interest in the Services to be provided under this Agreement other than the compensation specified herein. Contractor further certifies that it presently has no personal or financial interest, and shall not acquire any such interest, direct or indirect, which would conflict in any manner with its performance of the Services under this Agreement.

Contractor agrees to advise the City if Contractor has been or is retained to handle any matter in which its representation is adverse to the City. The City's prospective consent to the Contractor's representation of a client in matters adverse to the City, as identified above, will not apply in any instance where, as the result of Contractor's representation, the Contractor has obtained sensitive, proprietary or otherwise confidential information of a non-public nature that, if known to another client of the Contractor, could be used in any such other matter by the other client to the material disadvantage of the City. Each matter will be reviewed on a case by case basis.

XVII. SEVERABILITY OF PROVISIONS

Whenever possible, each provision of this Agreement will be interpreted in a manner as to be effective and valid under applicable law. However, if any provision of this Agreement or the application of any provision to any party or circumstance will be prohibited by or invalid under applicable law, that provision will be ineffective to the extent of the prohibition or invalidity without invalidating the remainder of the provisions of this Agreement or the application of the provision to other parties and circumstances.

XVIII. EXTENT OF AGREEMENT

This Agreement, together with any affixed exhibits, schedules or other documentation, constitutes the entire understanding between the City and the Contractor with respect to the subject matter of the Agreement and it supersedes, unless otherwise incorporated by reference herein, all prior representations, negotiations, agreements or understandings whether written or

oral. Neither party has relied on any prior representations, of any kind or nature, in entering into this Agreement. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Agreement, regardless of the other party's failure to object to such form. This Agreement shall be binding on and shall inure to the benefit of the parties to this Agreement and their permitted successors and permitted assigns and nothing in this Agreement, express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Agreement. This Agreement may only be altered, amended or modified by written amendment signed by the Contractor and the City. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall be deemed to be one and the same agreement.

FOR CONTRACTOR

By _____
Type Name

Its

FOR THE CITY OF ANN ARBOR

By _____
Christopher Taylor, Mayor

By _____
Jacqueline Beaudry, City Clerk

Approved as to substance

_____
Steven D. Powers, City Administrator

_____
Craig Hupy, Service Area Administrator

Approved as to form and content

_____
Stephen K. Postema, City Attorney

EXHIBIT A
SCOPE OF SERVICES

EXHIBIT A
PROJECT UNDERSTANDING AND SCOPE OF WORK
STEERE FARM ENGINE DRIVE REPLACEMENT PROJECT

Evaluate Well Pumps

Problem Statement – The existing well pumps are 50 years old. As the City is planning for a substantial investment in the well system, it is prudent planning to fully understand and invest in prolonging the life of these pumps and wells.

Approach – Tetra Tech will subcontract with Layne to perform pump testing to confirm the current pump performance. The 2006 tests show that the pumps were performing well compared to design conditions. However, it has been 8 plus years since the pumps were tested and that conclusion may change. The 2006 tests show that the well performances have decreased since construction. The reductions measured were:

21W – 53% reduced capacity from original
25W – 63% reduced capacity from original
741 – 57% reduced capacity from original

We suggest the following evaluations be made:

Pump Testing – Pump testing will be performed to determine the present capacity of each of the three well pumps. The testing will confirm the present capacity and the need for pump rehabilitation. This testing measures the pressure change and flow across the pump for a given speed. So, both flow and pressure readings will be obtained. The engines have variable speed capacity so their rotational speed will be noted. More importantly is the rotational speed at the shaft after the gear. Our subcontractor will bring a portable tachometer to measure the pump rotational speed. From this measured pump speed, affinity laws will be used to determine the flow and head at the nominal speed of 1800 RPM which can be compared to both past tests and the manufacturer's original curves.

Pump Evaluation – Pump evaluation will involve removing the pump, performing an inspection and replacing the wearing elements on the pumps. The inspection will include checking clearances of rotating elements and checking pipe and castings for erosion. Should further repairs or replacement be warranted from either the testing or this inspection, Layne will present a budget for the City's consideration. A major rebuild or replacement would be budgeted to be performed as part of the construction contract or through a change order to Layne.

Well Capacity Testing – We also recommend that the capacity of the wells and screen be tested through a step pump test to determine the specific capacity of the well. Specific capacity involves monitoring the fluctuation of the well elevation with varying pump rate. It is most useful to compare this test result to past tests to determine if for the same pumping rate, the well produces a greater drawdown. A change in this drawdown can indicate deterioration of the well screen. However, at the initial stage of screen deterioration, it is very difficult to diagnose problems as the change in well elevation is quite small.

Well Screen Rehabilitation and Inspection – From past specific capacity tests, it appears that well cleaning or restoration would be beneficial at Steere Farm (if not recently performed). The cause of well capacity loss can be due to mineral deposits, biological deposits, screen plugging, or screen corrosion. Our proposal assumes the wells will be televised to determine the condition of the screens. Televising may reveal corrosion of the screens including the casing seams. Televising the well screen will be done concurrently with the pump tear downs as the well pump needs to be removed to complete the televising. Our subcontractor will deliver the results of these activities and these results will be included in the study report.

Layne will perform a mechanical/chemical cleaning of each of the three wells while the pumps are pulled. This will involve an acid cleaning and double disk surge block. Should the televising reveal that an alternate cleaning technique or screen repairs are needed, a change order will be needed.

We understand the process desired by the City is to conduct a project walkthrough and put rough ideas together prior to a project workshop with the City. The workshop will identify the chosen alternatives. Upon completion of the workshop, a memo (approximately 10 pages) will be prepared to document the direction of the design.

Electric Service

Problem Statement – Most of the project goals follow from establishing electrical service to the well house. Thus, it is important to thoroughly plan and execute the process of providing electrical service. This site presents several challenges in establishment of electrical power including:

◊ **Schedule** – Utility companies can be the critical path in many projects. Consideration needs to be made to streamline the DTE schedule to provide
electrical service

◊ **Airport Coordination** - The adjacent airport presents challenges such as likely dictating that underground wire be used (to reduce the risks that poles may provide to air traffic), ensuring that the airport operations are not interrupted, and potentially needing FAA permits.

Approach – Tetra Tech will coordinate with DTE Energy (Detroit Edison) to provide electrical service sized appropriately for the anticipated station loads. We will work with DTE to determine the nearest location where electrical service is available (likely along State Street) and confirmation that the needed electrical loads can be served. We believe the Ann Arbor utilities department maintains a service building near the hangers (perhaps housing a flow meter) which has electrical power and this utility line may be adequately sized for the new load. Service off of this line would also allow the City to maintain a single electric bill for this site, and utilize a backup generator during power outages. We will also investigate the potential for a redundant electrical feed which could allow the City to abandon on-site power generation. A key consideration within the DTE conversation will be whether DTE can provide current capacity needed to start the motors, "across the line." By, "across the line," we are referring to starting the motors without
controls such as soft starts to control the inrush of electrical current. Starting motors "across the line" can cause current inrush up to seven times that of steady-state conditions. If the design includes across the line starters we will include power correction capacitors to improve the power factor at the site which will lead to lower rates. Motor soft starts and variable frequency drives can be used to meter current inrush at a controlled rate, are alternates to "across the line" starting, and will be evaluated during the study phase. As part of our dialog with DTE, we will request information that allows us to estimate a cost for DTE to provide electrical service to the well houses. The typical way is to pay for extending electrical service as an allowance through the construction contract but the City could pay for this outside the contract. DTE's guidance will assist in establishing an accurate allowance budget.

We have assumed that new electrical service is best provided by underground conduit to the well houses. Underground conduit would cause few concerns whereas overhead lines on poles may be discouraged so close to the airport. During the study we will also discuss with the City if easements are needed for the electrical line. It may be determined that the airport parcel is fully owned by the City and no additional easements to construct the electrical line are required. We understand that the soils at Steere Farm are aggressive and promote corrosion of underground infrastructure. As part of our coordination with DTE, we will encourage materials be used that are resistant to these aggressive soils.

Gas Supply Evaluation

Problem Statement – The existing natural gas distribution system appears to have served the City well. The RFP asks for an evaluation of this network presumably to verify it can continue to serve the City. Additionally, at least one backup power method suggested by Tetra Tech could concentrate the gas demand at one location. Doing so would change the gas demands providing further confirmation of the need to check the gas pipelines. As part of the

study, Tetra Tech will coordinate with the gas utility company to confirm the available gas pressure and capacity for each station. The evaluation will include a new or relocated natural gas service for the natural gas generators. The evaluation will also include the capacity requirements of each building's heating system.

New Electric Motors and Gear Drives

Problem Statement – The existing pumps are powered by Caterpillar engines rotating on a horizontal drive shaft. Existing right angle drives convert the rotation on the horizontal axis to the vertical pump axis. The City desires the installation of electric motors as the primary power supply. A secondary power system will also need to be maintained.

Approach –
We believe the best arrangement will be to replace the right angle drive and install the electric motor vertically above the pump shaft. There appears to be ample head room within the building for that installation.
An alternate arrangement would be to mount the electric motor with a horizontal shaft. However, this will occupy floor area and may dictate that a well house wall be relocated. We will evaluate both potential geometries but feel the vertical installation has the most promise at the Steere Farm site.

Tetra Tech will briefly evaluate using dual gear drives to allow the pumps to be powered by either electrical service or the existing natural gas engines. However, this is a mechanically complex system and may not be desirable to operate. We have not budgeted funds to further this dual gear system beyond a conceptual check that the electric motor with generator backup is preferable.

Structural Support

Problem Statement – A new 200 HP electric motor will weigh approximately 3000 pounds. The motor will need to be supported and this load transferred through the floor to the ground.

Approach – Tetra Tech will analyze the load from the new motor and conceive if the existing pump motor pad and floor can support the new load. The existing well house floor may require a new motor foundation pad be constructed.

Variable Frequency Drive (VFD)

Problem Statement – By installing an electric motor, additional control methods become available to the City. While VFD control adds some cost, the advantages may be beneficial to the City and will be evaluated.

Approach – Tetra Tech will work with the City to identify if operations, maintenance, and operating cost would improve if the project included VFDs. Benefits could include the following:

◊ Reduction in hydraulic surges / process transients during startup and shutdown resulting in fewer main breaks
◊ Improved ability to control the amount of water being supplied to the WTP
◊ Improved ability to detect transmission line breaks (if the rotational speed is paced on header pressure or downstream flow rate, then an increased pump speed would infer a leak)
◊ Reduce the number of starts per well pump extending the pump life
◊ Reduce stress on pump and process equipment extending the useful life
◊ Reduce electrical peak charge cost by lowering the power inrush at start-up
◊ Reduce power cost (when desired flow is less than 100%)

From our site visit we observed at least one engine operating at 1020 RPM (although we believe the maximum speed for the engine is 1200 RPM) with the drive gear ratio being 2:3. This implies that the pump speed at the time of the visit was approximately 1530 RPM. By installing a 1760 RPM electric motor, the pump would be operating at a higher rate producing more flow and head than observed during our visit. This increased speed may be undesirable and a VFD may be needed to reproduce the legacy pump speed. The existing engines at full speed operate at 1200

RPM and with the 2:3 gear ratio produce a pump rotational speed of 1800 which is nearly identical to the available speed of an electric motor. DTE makes rebates available for installation of VFDs. However, these rebates are presently only eligible if the VFD saves energy over an alternate control method (such as a throttled valve). We will evaluate the criteria present at the time of the study to determine if the City would be eligible for a rebate for installing VFD control.

Instrumentation

Problem Statement – Electrical motor operation will have new and different diagnostic needs than gas engine operation. Furthermore, the establishment of electrical service will allow additional instrumentation options for well operation. Instrumentation options will be evaluated during the study.

Approach – Tetra Tech believes that there are new opportunities to improve operation and maintenance. The following is a list of instrumentation that potentially could be added to the scope of work:

◊ Monitoring
- Water level measurement within the well
- Main discharge line gate valve open and close position indication
- Discharge pressure measurement
- Transmission line pipe leak detection alarm (by monitoring flow and pressure and alarm can be configured to detect a transmission line break)
- UPS alarm
- Electric motor
    - Starter status
    - In Auto
    - Running
    - Overload alarm
    - Hot motor windings
- Power
    - Power loss alarm (PLC and SCADA communication would be on UPS for a minimum of 1 hour)
    - Breaker status
    - KW (power)
    - KVAR (power factor)
    - Amps
    - Power monitoring devices

- Start and stop electric well pump 21W
- Start and stop electric well pump 25W
- Start and stop electric well pump 741

◊ Security
- Door access switches (door not closed contacts) for 21W, 25W, 741

◊ Building systems
- Room temperature for 21W, 25W, 741

SCADA/Telemetry

Problem Statement – With the establishment of electrical service, the City's ability to instrument the wells and well house functions increases. Similarly, the ability to transmit this information and control the operation at a remote site (such as the Water Treatment Plant) also increases. These options should be evaluated and a plan of action identified during the study.

Approach – We understand that the City of Ann Arbor uses a radio system to send security data to a fiber optic node at the airport terminal. Tetra Tech will design the instrumentation to communicate via radio to the existing

receiver at the fiber optic node. We have also assumed that programming of the City's SCADA system to accommodate the new I/O will be handled through the construction contract or performed by the City.

Back-up Power Options

Problem Statement – With the installation of electricity as the primary power for the well field, a means of backup power for the pumps should be identified. We have discussed Tetra Tech's initial thoughts within this section and will review these ideas more thoroughly during the study.

Approach – We will evaluate the options described below and develop a recommended plan. The recommended plan will consider the City's staff thoughts and budget constraints for the project.

Existing Natural Gas Engines – The continuation of the existing natural gas engines will be briefly evaluated during the evaluation phase.

New Natural Gas Engines – Tetra Tech will evaluate the cost impact of replacing the existing engine drives with new engine drives. The cost will consider the impacts on fuel consumption, automatic/remote controls, emission requirements and local noise ordinances. Items that will be considered when reviewing new engines are the normal operating speed and horse power rating. Newer engines tend to operate at higher speeds to obtain the output horsepower and satisfy emission requirements. The horsepower and torque at the engine rated speed will be evaluated with pump requirements and the new drive speed ratio. The cost for each new natural gas engine range from $12,000 to $20,000. Therefore, the City may realize less capital cost, less operating cost, and a lower carbon footprint by replacing the engines than refurbishing the existing engines. New engines also come equipped with instrumentation that facilitates remote starting and sensing.

Natural Gas Generator – An alternate approach that the City may wish to consider is abandoning the gas engines and installing a gas-driven electric generator. A transfer switch would be provided to activate the generator at the time of a power outage. This generator could be either permanently installed and sized to handle two or three well pumps or a trailer-mounted generator that could be mobilized elsewhere in the City. With this option the City would trade service on three older engines for service on one newer generator. By having the backup power as electricity and not a connected engine, the potential impact of vibrations on the system would be eliminated.

Redundant Electric Feed – During our discussions with DTE, Tetra Tech will investigate the potential to have a redundant electrical feed supplied as a power backup.

Remote Start and Conversion of Backup Power – As part of our evaluation of backup power supplies, we will consider remote or automatic starting of the power generation. Not only will such operation allow the pumps to continue operation with minimal disruption, it will also save staff time to respond to call-outs. Automatic remote start-up of an electrical generator or engines is a relatively simple item to design and construct. However, automatically engaging an engine to an electronically powered pump system is more complex and costly. A clutch is used to transfer power from the electric motor to the engine. As with automobiles, the clutch mechanism can be manual or automatic. Automatic clutches can be classified as centrifugal or electromagnetic and each of these is further described below.

Manual – Manual clutches require more than moving a lever. Engaging the clutch typically requires tools and requires time to change from one drive to another.

Centrifugal – Centrifugal clutches use the engine's driveshaft rotation to engage the clutch. Engine speeds of 1700 RPM or greater to engage the clutch may be required. It is likely undesirable to engage the engine to a stagnant water column instantaneously at this speed.

Electromagnetic – Electromagnetic clutches draw from an uninterruptable power supply in the control panel to automatically engage the clutch. These clutch systems are the most likely to be used to automatically convert from electric power to engine power. These electromagnetic clutches generally go up to 200 horsepower systems. Automatically engaging and disengaging the engine systems will require extensive thought and planning. Engine systems have warm-up periods that electrical motors do not. As indicated above, the sequence of operation needs to be carefully designed to engage the engine to a pumping system that is stagnant without causing driveshaft breaks or pipeline failures. Each manufacturer of engine and drive gear will have different requirements that must go into the design. Tetra Tech has successfully navigated these challenges on past projects and will lead Ann Arbor through the same challenges on this project.

Hydraulic Transient Control

Problem Statement – Sudden changes in fluid velocity create pressure waves within the pipeline. Under some conditions, these pressure waves can be severe and damage the pumps and pipe systems. While we do not know of any damage caused by the existing system, it is prudent for the City of Ann Arbor to consider methods to control these conditions.

Approach – The best means to control hydraulic transients is to control their formation. This is best done by slowly starting and stopping the fluid. A few approaches to doing this are discussed below and these will be further evaluated during the study.

Soft starts – Motor soft starts were designed to control the voltage and current drawn by alternating current motors at start-up and do an excellent job of that. By starting the motor slowly, the fluid will also be started slowly. Soft starts work best when set to ramp to full voltage over a few seconds. When routinely asked to transition over longer periods (say 30 seconds or longer), the units dissipate large quantities of heat that can cause them to fail. Tetra Tech worked on a local project where the design consultant used soft starts to control hydraulic transients on a pump system and the end result was repeated failure and replacement of the soft starts. Tetra Tech has performed a brief transient analysis on the Ann Arbor raw water pipeline and we estimate the well water travels about 33,000 feet from Steere Farm to the Water Treatment Plant. The pressure wave caused by the transient takes approximately 22 seconds to travel from Steere Farm to the Water Treatment Plant and back. The fluid should be slowed down over a duration much longer than this 22 second period (perhaps 6 cycles or longer). Thus, the soft start would need to be set to ramp up to full voltage over a duration of up to two minutes or more to effectively control transients. Tetra Tech believes this is too long of a period to use soft starts without premature failure. While soft starts may be desirable to control inrush current over the first few seconds of start-up, we believe an alternate method to control hydraulic transients will be needed for Steere Farm.

VFDs – Variable frequency drives (VFDs) can be programmed to ramp from zero to full speed over a programmed time interval. VFDs do not dissipate energy like soft starts and can accomplish this transition without the heat dissipation concerns of soft starts. VFDs are a proven way to control transients and will be further evaluated during the study.

Control Valves – A control valve can be designed to slowly open and close upon well pump start-up. The slow change with water velocity prevents the formation of a transient. Controlled valve opening/closure was the preferred method to control transients before the proliferation of VFDs and are still used in many systems. Valve position can also be monitored and reported through the SCADA.

WELL HOUSE EVALUATION

The existing well house structures were economically constructed and consist primarily of a steel frame with metal exterior siding. Labels on the building indicate the two eastern houses were constructed by the Steelox Company and this company's product line was purchased by a manufacturer still in business. Fiberglass insulation exists on the interior and the floor is a concrete slab. Ventilation of the two easternmost buildings is accomplished by opening folding overhead doors. The westernmost building (741) was built most recently and is also economically constructed. This building has sprayed-on insulation. There are simple fluorescent lights within the buildings.

Our scope assumes the existing three buildings will be evaluated for repair versus replacement. Our design fee assumes repairs to the existing three building will be chosen. We have also assumed one new prefabricated steel building will be required to house a generator. Our scope includes architectural services to specify the building and structural services to design the foundation. Brief electrical and mechanical services are included to design such things as electrical distribution, lighting and heating/ventilation within the new building. Our fee assumes a few soil borings will be obtained to support the foundation design.

Security

Problem Statement – A water supply system is a vulnerable element of every drinking water utility and should be reasonably protected. During our site visit we observed intrusion alarms on the entry doors powered by batteries charged by a solar panel. This project offer an opportune time to evaluate security technology for the well houses to decide to keep the existing system or improve upon it.

Approach – The site seems to be fenced and secure although it is a distance from State Road or the airport terminal. It would not be difficult for a pedestrian to access the well houses without being noticed. We have assumed that existing or new electronic contact sensors will be designed and constructed with signals telemetered back to the WTP. Tetra Tech also has proficiency for designing electronic access systems and security cameras to monitor sensitive sites. We have not included fee to design these systems but will discuss the benefits and costs of these systems as part of the study phase should the City wish to add them to the project.

Architectural Work

Problem Statement – We understand that the well houses need miscellaneous improvements such as repairing insulation, seal building penetrations, and repairing roof leaks.

Approach – Tetra Tech's architect will visit the site, document the needs, and make recommendations for repair. A key architectural objective will be to determine if the installation of electrical motors requires building modifications such as access ways or roof improvements. The electrical motor will sit above the well pumps and depending on dimensions, may require raising the roof. The need for any modifications will be identified and a cost opinion prepared. One consideration during the study would be the installation of sky lights to provide more natural lighting for the buildings. These would be especially useful during a power outage. An alternate would be to install the gravity ventilators on the roof hatches that will provide the exhaust for the ventilation air used to cool the VFDs, motors and related building heat gains. The walls in the building consist of metal siding with fiberglass insulation. These thin walls make it impossible to use a Link-Seal to make a conventional seal at the wall. We will contact the siding manufacturer to inquire about the availability of manufactured plates to allow pipes to penetrate the siding and cover existing coarse holes. This plate combined with caulk may be the most reliable solution and will cut moisture, drafts and insects from entering the building. The building supplier will be contacted regarding replacement of the insulation. It is likely in-kind insulation can be replaced. We will also evaluate spray-on insulation as it exists in house 741. Tetra Tech will investigate roof leaks by inquiring with maintenance staff regarding the locations of leak observations. We also propose to be available to visit the well houses during rains to observe the roof performance during wet weather (our office location ensures we can be on-site within minutes of a storm). Solutions to repair roof leaks will be conceived such as flashing improvements, steel panel replacement and steel panel repair. The City may also wish to consider epoxy coating to extend the life of the concrete floors within the buildings. The epoxy coating will protect the floor from oil spills and extend the floor's life.

Replacement of the existing rollup doors we be reviewed. If the existing engines are no longer used, one of the existing openings can be utilize for the supply fan with remaining area filed in with an insulated metal panel. The remaining door could be replaced with insulated double door to reduce the potential for air infiltration.

Electrical Lighting

Problem Statement – The existing lighting is powered from a portable generator brought to each well head building. When power is available at the site, one improvement could be to improve the lighting and connect it to the building power system.

Approach – Adding or replacing lighting fixtures will be evaluated during the study. The existing fluorescent lighting could be replaced with new LED-style, energy efficient lighting fixtures. This increases the energy efficiency of the lighting system, decreases the power usage required for lighting, and decreases the overall lighting system maintenance for lamp replacement. Particular attention will be paid to the selection of the new lighting fixtures to make sure that they are rated for the environments in which they will be installed, such as corrosion resistant NEMA 4X enclosures in corrosive areas. Lighting controls will be updated to include the replacement of switches and the addition of timers and motion sensors to turn off lighting when areas are unoccupied. We also

suggest the City consider the need for exterior lighting to facilitate building ingress and egress during nighttime call-outs.

Process and Site Work

Problem Statement – Various process and site needs are evident at the well houses including:

◊ Sidewalk repairs and the absence of areas to load and store oil drums
◊ Corrosion on pipeline and inoperable pressure gauges
◊ No outlets for seal water discharge

Approach – Our approach is identified by the labeled bullets below:

Sidewalk – Some building have sidewalks and Tetra Tech will evaluate their need for repair or replacement. Some or all buildings lacked concrete loading areas which would be beneficial for service trucks to load and unload equipment. Some man doors lack concrete exterior pads which may reduce mud and water being tracked into the building. The advantages and costs for these improvements will be reviewed with the City.

Pipe corrosion and pressure gauges – The discharge piping from the pumps exhibits some paint loss and minor corrosion. We will identify a recommended improvement during the study. Our initial opinion is that the corrosion could be easily removed and the pipe repainted. Pressure gauges can be replaced with either analog gauges or electronic gauges which can be tied to SCADA.

Seal water outlets – Seal water is presently piped outside and pools near sidewalks. The exposed pipes are trip hazards and the pooling water may freeze. The seal water pipes could be installed in a shallow trench to avoid being a trip hazard. A dry well could be constructed to infiltrate the water.

Hoisting – A method to hoist and remove the proposed motors will be evaluated and incorporated into the design.

Roof Hatches – We observed that pump house 741 is newer than the other pump houses. Pump house 741 does not have a roof hatch for removing the well pump while the other two houses do. We will evaluate installing a hatch in the building although there may be sufficient room to pull the pump in stages within the existing building.

Heating and Ventilation Work

Problem Statement – The existing buildings use natural-gas infrared heating unit to moderately heat the buildings. Concurrent with the work, heating upgrades will be considered. This will be particularly important as electric motor life is extended if installed within a heated area (cold, humid air causes condensation which shortens a motor's life). Furthermore, the pump stations are located near a wooded area where air borne particles such as cottonwood seeds are prevalent and cause air intakes to become blocked by the particles.

Approach – The installation of a screening material that is designed to protect equipment from cottonwood seeds will be evaluated to replace the existing damaged screen on the wire mesh doors is one approach to reducing the cottonwood seeds from entering the building. The material is designed so that the cottonwood seed can be removed mechanically with a broom or low pressure water. The evaluation will also consider the addition of shrouds on the radiator discharge to improve heat removal from the space. A ventilation system to remove the heat gain from the electrical motor and electrical gear (VFD) will be evaluated. A recommended approach with is to install a filtered supply fan with two speed control and roof exhaust with gravity dampers. The supply fan will slightly pressurize the building to reduce cottonwood infiltration. This system will also provide different ventilation rates based on building interior temperature to mitigate over cooling the space during cool and cold weather seasons and allowing adequate ventilation during summer days. The heating system will be evaluated on a basis to maintain a building temperature to prevent freezing of piping systems during extreme winter days. Radiant style heaters would be recommended and located near the smaller piping systems which are more prone to freezing. Radiant heating systems heat the surface of equipment and surrounding objects and does not rely on forced air for heating.

A heating and ventilation system will be provided for the generator building. The system would include insulated louvers that open when the generators are in operation. Louvers will be sized based on manufacturer's recommendations for maximum pressure drop across the generators cooling fan. Radiant heating system will be evaluated for the building.

Safety Improvements

Problem Statement – Tetra Tech recognizes that the City of Ann Arbor is dedicated to making every work environment safe or its employees. This project is the ideal time to evaluate potential hazards and implement improvements to address these hazards.

Approach – During our walk through we will discuss the work environment and concerns to the O&M staff who work in the buildings. Some preliminary thoughts are presented below and will be further explored during the study.

ArcFlash – With the addition of electrical power, new motor control centers will be constructed. With the construction of this equipment, a new arc flash hazard will be present. NFPA 70 E requires that an assessment of this hazard be performed and the hazard be labeled with recommended personal protection to mitigate the hazard.
As part of our construction services, Tetra Tech will conduct this Arc Flash assessment and make recommendations regarding needed protective equipment and warnings.

Oil Dispensing – Engine oil is presently lifted by chain fall from the crane within each building. This presents both a safety hazard should the canister fall but also presents the potential of a spill. The installation of a generator building and removal of the existing natural gas engines the well house, will eliminate the need to lift oil barrels. Typically generators are not operated in continuous operation and will not require the additional oil reserve. Tetra Tech will identify methods staff may consider to refill the generator oil reserve that may eliminate hoisting oil such as using an electric pump. This is not a permanent fixture but can be specified to be provided.

Rotating Process Protection – We observed that the existing engines have protective screens around the drive shafts. However, we observed that belts are exposed that could cause clothing or appendages to get entangled. If the study determines the existing engines should remain, we will investigate measures to install protective screens around all moving parts.

The new equipment provided will be reviewed to ensure that all rotating process and other hazards are properly guarded.

Service Platforms – We observed that platforms used to service the engines have minimal railings. We will evaluate OSHA requirements pertaining to improving the safety on these platforms. As part of the study, new equipment will be evaluated for the need to have raised platforms. We have not included design effort for this as we feel it is unlikely that permanent platforms will be selected.

Study Report

DELIVERABLES OF THE STUDY PHASE

The study phase will consist of the following steps:

- Evaluation of the facility and brief summary of options
- Workshop with City staff to screen options and identify the preferred course of the design phase
- Preparation of a +-10 page summary of the evaluation and the design basis including a project cost opinion, and proposed design and construction schedule

We will deliver five hard copies of the study report and meet to receive the City's comments. Upon receipt of comments, five hard copies of the final report and one electronic copy (PDF) will be delivered.

Design

SURVEY - While not in the RFP, a brief topographic survey of the proposed site will be obtained for development of the site plan including the building footprint and sidewalk. We also will take measurements of the engines and drive shaft dimensions relative to the floor elevation. The dimensions of gear drives vary from manufacturer to manufacturer. The dimensions of the existing system will allow us to diagnose what changes to the system may be needed to align the existing system with a new drive gear. It is not uncommon to find that the engine needs to be shimmed a few inches to align with a different manufacturer's gear drives.

CONCEPTUAL PLANS (30%)

Conceptual plans may depict the study concepts on the drawing backgrounds. These drawings will show the recommended alternatives in concept but may not include detailed dimensions. The main purpose of this level of drawings is to flush out additional comments on the concepts before detailed design continues.

DRAFT PLANS (60%)

Draft plans are typically 60% drawings, which are generally complete but without final notations and details. The purpose of this stage of drawings is to hold a review session prior to engaging in the detailed final design stage of the project. Steps of the draft plan work are as follows:

◊ Develop drawings and specifications describing the project
◊ Add construction notes and other details to drawings
◊ Prepare draft project technical specifications
◊ Hold a plan review session for the project with City staff

PERMIT APPLICATIONS

At this point in the project we suggest beginning the permit application and approval process. Key applications and coordination we foresee and will lead coordination with include:

◊ Ann Arbor Fire Department
◊ Ann Arbor Airport
◊ Ann Arbor Building Department
◊ Pittsfield Township Planning and Building Departments
◊ Michigan DEQ
◊ FAA
◊ DTE Energy (gas and electric)
◊ Washtenaw County Road Commission

In the case of the City and Township Building Departments, our coordination is expected to be to understand the permit requirements for the contractor. Tetra Tech has made inquiries with the City of Ann Arbor's Planning Department and the Pittsfield Township Planning Department. We understand the City Planning Department will not oversee this project and Pittsfield Township will require a site plan for the proposed building a new building is constructed. Our fee is based on preparing a site plan for the area around the proposed building and not the entire airport parcel (verbally confirmed by Pittsfield Township).

Application fees involving design drawings will be paid by Tetra Tech. Some of the permit fees are based on the construction value which Tetra Tech cannot readily quantify at this proposal stage. Therefore, we have included a $5,000 allowance in our fee structure to cover these fees.

Permit fees associated with construction will be specified as being paid by the selected contractor. Tetra Tech suggests including a permit application allowance in the contract for the contractor to use to pay for his permit fees.

DRAFT FINAL PLANS (90%)

Draft final plans are typically 90% drawings, which are completed with the exception of final reviews. Steps of the draft final plan work are as follows:

◊ Perform detailed quantity takeoff, and add quantities to drawings
◊ Prepare Engineers Opinion of Probable Construction Cost (EOPCC). The EOPCC is prepared from the quantity takeoff taking into account historical costs, current market conditions and the design conditions
◊ Prepare and submit permit applications to MDEQ and other regulatory agencies
◊ Prepare technical specifications and submit to City
◊ Submit draft final drawings, project technical specifications, and EOPCC to City for review

FINAL PLANS (100%)

Final plans are the final documents used for advertisement and bidding. Steps of the final plan work are as follows:

◊ Incorporate City and permit comments into plans and specifications
◊ Assemble and reproduce the contract drawings and project manuals
◊ Prepare final documents for bidding
◊ Submit final plans and contract documents to City departments
◊ Submit final plans to the permitting agencies
◊ Submittal to Planning Commission and attendance at the meeting to present the project

DELIVERABLES

The following key deliverables will be prepared for the Design Phase:

◊ Site plan and elevations for public engagement and City approvals
◊ Draft Plans (60%)
◊ Draft Final Plans (90%)
◊ Final Plans (100%)
◊ Technical Specifications (Draft, Draft Final, Final)
◊ Cost Opinions (Draft Final, Final)
◊ Permit submittals for FAA and MDEQ

BIDDING

This portion of the design task focuses on awarding a construction contract to a qualified bidder and begins when final plans have been completed. During the bidding process, we will perform the following:

◊ Coordinate with Ann Arbor to arrange for the City to electronically host and distribute the bidding documents
◊ Attend the pre-bid meeting and respond to bidders questions
◊ Issue addenda. The addenda will include any contract document modifications, and response to questions raised by prospective bidders
◊ Attend the bid opening and prepare the bid tabulation
◊ Research the low bidder's qualifications and prepare a recommendation of award to the City for award of the construction contracts

Construction Management

CONSTRUCTION ENGINEERING

As part of construction engineering, we will provide the following services:

◊ Prepare the agenda and attend the preconstruction meeting
◊ Attend monthly construction progress meetings
◊ Engineering support and responses to contractor questions regarding the construction
◊ Review of technical documentation
◊ Review of construction administration, contract modifications and documentation
◊ Lead construction closeout and punch lists
◊ Prepare record drawings
◊ Tetra Tech's Project Manager will be responsible to follow all parts of the construction. The Construction Manager will assist in preparing paper work and tasks unique to construction.

PRECONSTRUCTION MEETING

The preconstruction meeting provides overview and detailed project information to the entire construction project team, including the owner, contractor, engineer, utilities, and other key stakeholders. The meeting sets up a chain of command for addressing issues that will occur in the field. The Ann Arbor Building Department may attend if City-issued permits will be required for the work. The meeting helps underscore the owner's expectations of the contractor, regarding general and specific constraints, and how the owner will be involved to help resolve issues that may arise.

PROGRESS MEETINGS

Monthly progress meetings will be held at a location designated by the City. Tetra Tech's offices are located next to the well field and would provide an ideal location for these meetings. The purpose of the meetings is to review progress to date, update and review the construction schedule, discuss concerns, and resolve construction issues. Meeting minutes will be prepared and distributed to attendees and become a part of the construction records. Coordinating with City Departments is critical to maintaining construction progress and successful resolution of issues during construction.

RESIDENT ENGINEERING

We envision most tasks on the project can be completed with part-time observation. Given most of the work is above ground , the completed work can be observed during and immediately after it has been completed to ensure compliance with the contract documents. Key tasks that we suggest we be present during work include concrete pours, motor installation, and deliveries of key equipment (to ensure it is not dropped or otherwise handled in a manner to affect performance). Tetra Tech's office adjacent to the project site make it very efficient for Tetra Tech to work in this manner. It also makes it efficient for Tetra Tech's resident professional to bring the designer to the project site to observe specialty work or troubleshoot start-up issues. Our resident professionals will keep a daily log of activities completed by the contractor.

REVIEW OF TECHNICAL DOCUMENTATION

Throughout the project the Contractor provides technical information regarding supplied materials, equipment, and materials testing reports. All technical documentation provided by the contractor will be reviewed by an appropriate Team engineer who is familiar with the City's specifications and the project. Shop drawings will be logged and recorded to ensure that submittals are distributed to the proper staff and that the shop drawing review is completed within the time frame specified by the Contract. Tetra Tech also understands the City of Ann Arbor wishes to be involved with shop drawing review and will ensure the City has an opportunity to review submittals before delivery to the contractor. Our Team will determine the acceptability of substitute materials. We also review for general content, as required by the specifications, the maintenance and operating instructions, schedules, guarantees, and certificates of inspection, which are to be assembled by the contractor in accordance with the Contract Documents. Our Team will also review the construction inspector's daily reports (IDRs) for progress, unusual conditions or contractor performance, and will monitor the project construction files for completeness, and compliance with permit requirements.

REVIEW OF CONSTRUCTION ADMINISTRATION, CONTRACT MODIFICATIONS & DOCUMENTATION

Construction administration includes all the contract management and accounting to record work completed and pay the contractor for the materials and labor provided to construct the system improvements according to the terms of the construction contract. Tetra Tech will reviewing pay estimates and contract modifications prior to execution by the City.

START-UP

Equipment start-up is an important but often overlooked part of a construction project. Tetra Tech will specify that each equipment supplier attend and participate in equipment start-up. This will give the City staff hands-on training from the equipment experts and ensure the equipment is started in way that does not damage the equipment and protects the warranty. The Tetra Tech RPR will participate in all start-up activities and lead the completion of an equipment start-up sign-off. We will meet with the City and determine during design whether to begin the warranty of the equipment based on the start-up date of the project's substantial completion date.

CONSTRUCTION CLOSEOUT

Project closeout begins when the contractor reaches substantial completion, as defined by the contract. When the contractor indicates that they have reached this point, Tetra Tech will prepare a punch list and conduct an inspection of the project with the contractor's representative, the City's Project Engineer, and representatives from other appropriate City departments. The punch list will serve as a guide for the contractor and a checklist for the Resident Project Representative (RPR). Upon completion of the project punch list, a final inspection will be conducted. When the City's Project Engineer and the RPR are satisfied that the work is complete, the Engineer will recommend that final payment be issued to the contractor.

RECORD DRAWINGS

Record drawings will be prepared to provide the City of Ann Arbor with permanent documentation of what was constructed. Record drawings will consist of draft record drawings and final electronic and hard copy record drawings. Draft drawings will be prepared for review by the City, and final drawings will be prepared following receipt of comments from the City. Record drawings will be produced to provide a clear record of the system, as it exists after the project is completed. Record drawings will show the final work product with no construction notes, with all proposed work shown as constructed.

DELIVERABLES

Bidding & Construction Phase deliverables will include:

◊ Review comments for contract modification documents
◊ Review comments for contract pay estimates
◊ Review of shop drawings and material testing information
◊ Progress meeting minutes
◊ Daily resident representative reports
◊ Conforming to construction record drawings

OPERATION AND MAINTENANCE GUIDELINES & TRAINING

Tetra Tech will assemble manufacturer provided documentation and supplement this will text developed by Tetra Tech to produce a comprehensive Operation and Maintenance Manual for the City. The manual will be assembled in both 3-ring binders and with an electronic version with hypertext links. The manual will be arranged in the City's standard format. Tetra Tech will coordinate up to three training sessions and will stagger their times in such a way that City staff working different shifts and different departments can attend.

ASSUMPTIONS IN THE DEVELOPMENT OF OUR LEVEL OF EFFORT

The following assumptions were used in the derivation of the fee.

◊ The selected alternative will be installation of electrical service with the installation of a natural gas generator for backup power. We have assumed that one new building will be designed/constructed to house the generator with the existing three building rehabilitated.
◊ It is assumed that generator building would not be provided with service water and no drains installed in the building.
◊ Modification to incorporate new natural gas engines are not included. We have included natural gas service for natural gas generators and building heat.
◊ SCADA programming will be completed through the construction contract or by City staff
◊ No Public meetings will be needed
◊ No easements will need to be procured across the airport grounds
◊ Well services include:
- Well pump testing
- Pump inspection and replacement of wearing parts (assuming the pump can be removed in building 741 where a roof hatch is not presently provided. The City may need to install this hatch prior to the pump removal or bypass removing this pump)
- Well casing television inspection
    - Well cleaning

◊ Pittsfield Township's Zoning Compliance Certificate, site plan approval for a new building, and work in the State Road Right-of-Way are the only permit applications required to be completed by the consultant.. We have assumed that Pittsfield Township will require a site plan for the new building and that a site plan for the entire airport parcel will not need to be prepared.
◊ Building permit fees will be paid by the construction contractor
◊ Concrete cores to determine the existing floor thickness will not be needed
◊ Up to five instruments at each building will be designed and incorporated into SCADA
◊ Telemetry will be accomplished with radio communication to an existing receiver (likely at the airport terminal building)
◊ RPR hours as indicated in the LOE table (part-time)
◊ Security systems beyond door contact alerts are not included

EXHIBIT B
COMPENSATION

General

Contractor shall be paid for those Services performed pursuant to this Agreement inclusive of all reimbursable expenses (if applicable), in accordance with the terms and conditions herein. The Compensation Schedule below/attached states nature and amount of compensation the Contractor may charge the City:

EXHIBIT B
PRICE PROPOSAL
STEERE FARM ENGINE DRIVE REPLACEMENT PROJECT

TASK	FEE
1. Study	$45,135
2. Design	
a. 30% Design	34,086
b. 60% Design	46,010
c. 90% Design	33,681
d. 100% Design	25,456
e. Permits (allowance)	5,000
3. Well Inspection Services	37,000
4. Well Cleaning Services (allowance with mark-up)	60,000
5. Bidding Assistance	6,106
6. Construction Administration	61,493
7. Construction Observation	35,117
8. Training and O&M Manual Coordination	8,779
TOTAL	$397,863

EXHIBIT C
INSURANCE REQUIREMENTS

Effective the date of this Agreement, and continuing without interruption during the term of this Agreement, Contractor shall provide certificates of insurance to the City on behalf of itself, and when requested any subcontractor(s). The certificates of insurance shall meet the following minimum requirements.

A. The Contractor shall have insurance that meets the following minimum requirements:

1. Professional Liability Insurance or Errors and Omissions Insurance protecting the Contractor and its employees in an amount not less than $1,000,000.

2. Worker's Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:

   Bodily Injury by Accident - $500,000 each accident
   Bodily Injury by Disease - $500,000 each employee
   Bodily Injury by Disease - $500,000 each policy limit

3. Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 07 98 or current equivalent. The City of Ann Arbor shall be an additional insured. There shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. Further, the following minimum limits of liability are required:

$1,000,000	Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined
$2,000,000	Per Job General Aggregate
$1,000,000	Personal and Advertising Injury

4. Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 07 97 or current equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. The City of Ann Arbor shall be an additional insured. There shall be no added exclusions or limiting endorsements which diminish the City's protections as an additional insured under the policy. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

5. Umbrella/Excess Liability Insurance shall be provided to apply in excess of the Commercial General Liability, Employers Liability and the Motor

Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of $1,000,000.

B. Insurance required under A.3 and A.4 above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to contribute with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City.

C. Insurance companies and policy forms are subject to approval of the City Attorney, which approval shall not be unreasonably withheld. Documentation must provide and demonstrate an unconditional 30 day written notice of cancellation in favor of the City of Ann Arbor. Further, the documentation must explicitly state the following: (a) the policy number; name of insurance company; name and address of the agent or authorized representative; name and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which shall be approved by the City, in its sole discretion; (c) that the policy conforms to the requirements specified. Contractor shall furnish the City with satisfactory certificates of insurance and endorsements prior to commencement of any work. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) to the City. If any of the above coverages expire by their terms during the term of this contract, the Contractor shall deliver proof of renewal and/or new policies to the Administering Service Area/Unit at least ten days prior to the expiration date.