Attachment #3

TECHNICAL SPECIFICATIONS

FOR THE CONSTRUCTION, TESTING AND INSTALLATION
OF A 12" IRRIGATION PRODUCTION WELL AND PUMP

The work consists of the drilling and testing of an irrigation test well for L.E. Kaufman Golf Course, Kent County, Michigan

OWNER: L. E. Kaufman Golf Course
Kent County Parks Department

CONSULTANTS: Colein & Kuhn Associates, Inc
127 W. University Drive
Rochester, MI 48307

WELL CONSTRUCTION

The irrigation well will be constructed in the sequence outlined below. The stated depth and material requirements are based on knowledge of nearby wells. All stated depth and material requirements are to be verified or adjusted as required at time of installation of well.

1. Drill one well to a depth of three hundred feet (300').

2. Install one hundred and ninety feet (190') of nominal twelve inch (12") diameter schedule 40 steel casing.

3. Develop well to a sand-free condition.

4. Conduct six hour step rate pumping test up to maximum well capacity plus two hour recovery.

5. Conduct eight hour constant rate pumping test at seven hundred and fifty gallons per minute (750 GPM).

6. Report complete findings of test and provide to Consultant.

7. Based on test well data, furnish and install a submersible pump capable of producing 600 hundred gallons per minute (600 GPM) at 10 PSI discharge pressure. It is assumed the pump is to be 30 horsepower.

   Alternate bid: furnish and install a submersible pump capable of producing seven hundred and fifty gallons per minute (750 GPM) at 10 PSI discharge pressure. It is assumed the pump is to be 50 horsepower.

QUANTITY AND PAYMENT

Prices and measurement: Payment for work under this Contract will be made on a unit price or lump sum basis for work actually completed. Final measurements of the work will be taken to determine the amount of work done, to be applied to determine the total cost. The method of applying the unit prices to measured quantities will be as herein specified.

Mobilization of Equipment: The quantity and payment for Mobilization of Equipment will be made at the lump sum price bid for the item Mobilization of Equipment in the Proposal, which shall include the cost of all labor and materials in connection with the mobilization and demobilization of equipment for this Contract. Also included in the cost of the mobilization and demobilization shall be the cost to clean up and restore the well site to its pre-construction condition.

Well Borings: The quantity of well borings for which payment will be made will be the number of linear feet of borings, measured from the original ground surface elevation in dry areas or from water surface in wet areas, at the site of the hole to the bottom of the hole.

Payment for Well Borings will be made for the quantity, as above determined, at the unit price per linear foot bid for the item Well Borings in the Proposal, which price shall include the cost of all labor and materials for completing the boring, including, if required, the furnishing and sinking of casing, the cost of probings, if any, to locate existing utilities and the cost of their repair and removal and replacement if damaged, and all other work, materials or services in connection therewith and incidental thereto.

Well Casing: The quantity of approved well casing for which payment will be made will be the actual number of linear feet of well casing provided and installed.

Payment for well casing will be made for the quantity, as above determined, at Contract unit price per bid for item Well Casing the Proposal, which price shall include all necessary cost for the furnishing and placing of the well casing including all necessary drive shoes and packers and all other work and materials in connection with and incidental thereto.

The cost of well grouting including all labor, equipment materials used to grout the well(s) in accordance with the specifications and shall be incidental to well casing installation.

Well Development: The quantity of well development for which payment will be made will be the actual number of hours of well development provided. Well development procedures could require periodic flushing of the well, until groundwater samples are clear and suitable for sample collection.

Step-Test: Payment for six hour step test will be based on the actual number of hours that the step test is performed. All labor, materials and equipment necessary will be incidental thereto.

Constant Rate Test: Payment for the 8 hour constant rate test will be based on the actual number of hours that the rate test is performed. All labor, materials and equipment necessary will be incidental thereto.

Well Logs: Payment for well logs complete will be on a lump sum basis.

Pump: Payment for the pump shall include pump, motor, steel riser pipe, submersible cable with copper conductors, sanitary well seal, fittings and labor. Pump starter and other electrical work is not part of this contract.

SCOPE OF WORK

The work includes the furnishing of all materials, labor, equipment and all else necessary for completing well borings, testing and pump as listed in the Proposal. The well borings shall be made to determine the character, thickness and stratification of the subsurface materials.

The exact location and depth of the well boring will be jointly determined by the Consultant and Contractor.

The Contractor may not alter his unit prices should the Owner delete any work item from the scope of work.

MISS DIG

The Contractor shall notify MISS DIG Utility Communications System and obtain clearance 48 hours prior to starting any drilling.

SITE CONDITIONS

It is required that the Contractor familiarize himself with Construction Contract Documents and with the working conditions by making a personal examination of the site. Before any drilling is started, the Contractor shall locate any adjacent utilities or underground structures, and adjust the position of the drilling site as necessary to prevent damage to them. Contractor is responsible for cost of repair if damaged.

ELECTRICITY AND FUEL

The Contractor shall furnish his own portable generator of sufficient size to run the pumps or other equipment at his own complete cost and expense. Electrical service of 480 volt is at the existing pumphouse and may be used if desired.

ADDITIONAL BORINGS

Additional borings may be necessary. The Contractor therefore agrees that the Owner may order such additional borings as may be required.

COMPETENT WORKMEN

The Contractor shall employ only competent workmen expert in the performance of the type of work required by these specifications. The crew shall be under the direct

supervision of an experienced driller, and the Contractor shall provide the services of a drilling superintendent who shall be available to the job at all times. The crews and superintendent shall be in the employ of the Contractor.

PERMITS, CERTIFICATES, LAWS, AND ORDINANCES

The Contractor shall, at his own expense, obtain all permits, certifications, and licenses required of him by law for the execution of the work. He shall comply with all Federal, State, or local laws, ordinances, or rules and regulations relating to the construction and performance of the work.

PROJECT SCHEDULE

It is intended that the drilling begin as soon as possible, and the work completed by May 31, 2004, weather and site conditions permitting.

LOCAL GEOLOGY

The Contractor shall satisfy himself regarding all local conditions affecting his work by personal investigation and neither the information on local geology, not that derived from maps or plans nor from the Owner or his agents or employees shall act to relieve the contractor of any responsibility hereunder or from fulfilling any and all of the terms and requirements of the drilling contract and specifications.

WELL SITE

It is believed the selected drilling site is clear and accessible to standard truck-mounted drilling equipment.

The exact locations of the proposed well is to be jointly determined by the Consultant and Contractor.

DRILLING METHODS

The drilling method used to construct the well will be at the option of the Contractor. Regardless of the drilling method the Contractor chooses, the Contractor will comply with all State and local rules and regulations governing water well construction.

EQUIPMENT REQUIREMENTS

Equipment in first class working order must be provided. The Contractor shall use his own drilling equipment having the minimum capabilities necessary to do the described work. No unnecessary delays or work stoppages will be tolerated because of equipment failure, nor will they be considered as a valid reason for extending the length of the contract. The Contractor shall be held responsible and payment may be withheld for

damages to the well due to any cause of negligence, faulty operation, or equipment failure.

DRILLING LOGS

A drilling log shall be kept by the Contractor showing all changes in strata, completed casing placed, static water level and dynamic water level for different pumping rates. This log shall be completed on the standard water Well Report Form supplied by the Michigan Department of Public Health. Copies of the log shall be furnished to the Owner, Consultant, Geological Survey Division of the DNR and Michigan Department of Public Health upon its completion.

Representative samples of the soil or drill cuttings shall be taken at every change in soil stratification or at intervals not to exceed five feet.

WELL CASING

The well shall be cased to such depths as will be determined during drilling operations and as jointly permitted with the Consultant.

Well casing shall be new black steel pipe. Casing shall have standard drive couplings or plain ends for welding. Casing shall meet ASTM A-53 or A-120 for water well construction.

Well casing shall terminate one foot above the established ground surface and be constructed to exclude dirt of other foreign matter.

Install observation tube on the side of the well casing.

PLUMBNESS AND ALIGNMENT

The wells shall be constructed sufficiently round, straight and plumb so that the maximum size pump can be installed without difficulty.
A plumbness and alignment test may be required using the method as described in "Ground Water and Wells", published by UOP Johnson. The Contractor shall furnish the necessary equipment to perform the test and the test shall be acceptable to the Consultant. The standard for plumbness shall be that the axis of the well casing not deviate from the vertical in excess of one half the inside diameter of the casing per 100 feet of depth. Any deviating shall be consistent in one direction. The Contractor shall correct any deviation in plumbness or alignment at his own expense.

GROUTING

The annular space between the well casing and borehole shall be tightly sealed to prevent the entrance of surface water and vertical migration of water along the well casing and borehole.

The Contractor shall maintain records of the grouting method used and volume of grouting material used.

Grouting material shall be neat cement grout.

WELL DEVELOPMENT

The Contractor shall develop the irrigation well by approved procedures. Among the methods that may be acceptable for development of the irrigation well are:

a. horizontal jetting and surging and by air lift
b. water surge

Development work must be done in a manner that will not cause undue settlement or disturbance of the strata above the water bearing formation, or disturb the seal effected around the well casing which provides the natural sanitary protection against vertical seepage. Water produced during development shall be conducted away from the well site in a manner that does not cause a hazard or nuisance.

SAND CONTENT TESTING

Sand content of the discharge shall be tested during development and pumping test. Sand content shall not exceed five parts per million in any sample collected while pumping the well at the rate employed during the constant rate pumping test. In the event the sand content exceeds five parts per million during the constant rate pumping test, well development shall continue, or abandoned as jointly determined by the Contractor and Consultant.

STEP DRAWDOWN PUMP TEST

Following well development operations and after 100% recovery, the Contractor shall perform a complete step drawdown pump test of the well. The Contractor shall make a test of the well by pumping at three successive pumping rates. The static water level in the well shall be measured at ten minute intervals for sixty minutes before testing to establish the groundwater elevation trends. During the test, pumping shall continue at each rate for one hundred and twenty minutes. Water level measurements shall be recorded as indicated below. No further testing will be completed until the well is one hundred percent recovered.

Time Since Pumping Start/Stop (Min.)	Time Interval Between Measurement
0 - 10	1
10 - 20	2
20 - 40	5
40 - 60	10
60 - 120	30

CONSTANT RATE TEST

Upon agreement by the Owner , Contractor and Consultant that the well is suitable for use as a permanent irrigation well, the Contractor may be authorized to proceed with the Constant Rate Test. The Contractor shall furnish and install for test purposes a pump and generator with a capacity as noted below.

The Contractor shall provide, for testing the irrigation well, a pump and prime mover capable of pumping water at a rate between 0 and 450 gallons per minute for the 12" well.

The Contractor shall furnish and install in the pipeline within one hundred feet (100') of the well to be pumped, an orifice/manometer or a flow meter capable of recording instantaneous flow rates. The flow meter shall have an accuracy of five percent at the tested rate. The flow meter shall be sufficiently removed from obstructions in the pipeline, valves, elbows, reductions, etc. to allow the meter to perform within its specifications.

There is an irrigation pond near the proposed well site and can be used to discharge water during the constant rate test.

The Contractor shall provide a means to accurately measure static and pumping water levels in the well before, during and at the completion of the pumping tests and pumping water levels shall be measured at regular intervals during the test period. Water level measurements for the step test are to be made as follows:

Time Since Pumping Start/Stop (Min.)	Time Interval Between Measurement
0 - 10	1
10 - 20	2
20 - 40	5
40 - 60	10
60 - 300	30
300 - 480	60

At the conclusion of the pumping, the recovery of water level is measured in the same sequence for at least two hours or until 95% recovery occurs.

CAPPING

The Contractor shall provide temporary capping on the irrigation wells when not in use. The cap shall be fitted to prevent malicious mischief.

WELL HEAD COMPLETION

The irrigation well will be finished with a sanitary well seal installed one foot above finished grade.

PUMP AND INSTALLATION

The Contractor shall purchase and install in the irrigation well a 460 volt, three phase, 3600 RPM submersible pump set at an estimated depth of approximately 150' at 600 GPM or 180' at 750 GPM. . The exact setting depth for the pump will be determined after drilling and the constant rate pumping test on the well. Pump manufacturer to be domestic manufacturer, nationally recognized, have good regional service, and acceptable to the County. Pump model to be jointly selected by Contractor and Consultant.

Pump bowls shall be close-grained ASTM A48, Class 30, cast iron and shall have porcelain enamel coating of the water passages.

Impellers shall be of the enclosed type, bronze, ASTM B584.

Bowl shalft shall be stainless steel.

Motor shall be vertical, submersible designed for continuous duty under-water operation of 3 phase, 60 cycle, 460 bolt alternating current. Motor shall have a 1.15 service factor.

The motor shall not be loaded in excess of its nameplate rating at design and noladed in excess of 110% of its nameplate rating at any condition from zero flow to maximum capacity of the pump.

The drop pipe size shall be such that velocities are not less than 4-5 FPS nor more than 12 FPS.

Pipe to be A53 steel threaded and coupled.

Cable shall be a single cable assembly with three copper conductors and sized to limit the voltage drop to 5% at the motor's terminals.

The conductor shall be water and oil resistant, suitable for continuous immersion.

ELECTRICAL

No electrical work, including pump starter, is to be included under this contract. Pump starter and control panel is to be bid under a separate contract.

480 volt electrical service will not be available at the well location at time of pump testing. Contractor to assume a generator will be required to perform all testing and reporting operations.

WELL ABANDONMENT

If the Contractor fails to attain the specified depth, or should the Contractor choose to abandon the hole, the Consultant shall be notified. If sufficient capacity is not available to be deemed useful as an irrigation well, the Owner may order the well to be abandoned.

All casing shall be removed, insofar as is practical, and the bore hole shall be plugged with cement grout or other approved materials.

CONTRACTOR'S PROPOSAL FORM

Bidders are instructed to submit bids for this project on a lump sum basis with adjustments for footage and materials more or less as stated in the Contractor's Proposal Form. Bidders will complete and submit information as requested in these specifications.

All bid items shall be tax inclusive. All work will be performed in accordance with the specifications and all applicable laws.

IRRIGATION WELL -- 12"

ITEM	DESCRIPTION	LUMP SUM, UNIT PER FOOT COST PLUS OR PER HOUR BASIS
1.01	Mobilization of equipment to job site	$_____
1.02	Reamed borehole to a depth of 300'	$_____
1.03	Well Casing, 190' length	$_____
1.04	Well Development, 8 hours	$_____
1.05	Step Test, 6 hours	$_____
1.06	Constant Rate Test, 8 hours	$_____
1.07	Well Logs	$_____

ADJUSTMENTS

1.20	For reaming hole to more or less than three hundred feet (300')	
	Per foot cost:	$_____
1.21	Well casing, more or less than one hundred and ninety feet (190')	
	Per foot cost:	$_____
1.22	Well Development time, hours more or less than eight (8)	
	Per hour cost:	$_____
1.23	Step test, hours more or less than six (6)	
	Per hour cost:	$_____

1.24	Constant Rate test, hours more or less than eight (8) Per hour cost:	$_____

IRRIGATION PUMP:

ITEM	DESCRIPTION	LUMP SUM
2.01	Submersible Pump, 3 phase motor, 480 volt, 600 gallons per minute at estimated 150' T.D.H. Minimum size, 30 H.P.	$_____
2.02	Submersible Pump, 3 phase motor, 480 volt, 750 gallons per minute at estimated 180' T.D.H. Minimum size, 50 H.P.	$_____

THIS PROPOSAL IS SUBMITTED IN THE NAME OF:

Name of Contractor: _____

Signed by:_____

Date: _____

Print Name: _____

Title: _____