

**CITY OF FORT COLLINS  
INVITATION TO BID  
Bid 6010**

**SouthRidge Irrigation Pump Replacement  
BID OPENING: 2:30 p.m. (our clock), December 5, 2006**

Sealed bids will be received and publicly opened at the office of the Director of Purchasing and Risk Management, PO Box 580, 215 North Mason St., 2nd floor, Fort Collins, Colorado 80522, at the time and date noted on the bid proposal and/or contract documents. If delivered, they are to be sent to 215 North Mason Street, 2<sup>nd</sup> Floor, Fort Collins, Colorado 80524. If mailed, the address is P.O. Box 580, Fort Collins, 80522-0580.

**Bids must be received at the Purchasing Office prior to 2:30 p.m. (our clock), December 5, 2006.**

Questions concerning the scope of the bid should be directed to Project Manager Randy Bonneville, (970) 416-2787.

Questions regarding bid submittal or process should be directed to James R. Hume, CPPO, Senior Buyer (970) 221-6776.

**A pre-bid conference will be held on November 21, 2006, 10:00am, at SouthRidge Golf Course, SouthRidge Clubhouse, 5750 South Lemay Avenue, Fort Collins, CO 80525.**

**A copy of the Bid may be obtained as follows:**

1. Download the Bid from the Purchasing Webpage, Current Bids page, at: <https://secure2.fcgov.com/bsol/login.jsp>.
2. Come by Purchasing at 215 North Mason St., 2nd floor, Fort Collins, and request a copy of the Bid.

**Special Instructions**

All bids must be properly signed by an authorized representative of the company with the legal capacity to bind the company to the agreement. Bids may be withdrawn up to the date and hour set for closing. Once bids have been accepted by the City and closing has occurred, failure to enter into contract or honor the purchase order will be cause for removal of supplier's name from the City of Fort Collins' bidders list for a period of twelve months from the date of the opening. The City may also pursue any remedies available at law or in equity. Bid prices must be held firm for a period of forty-five (45) days after bid openings.

Submission of a bid is deemed as acceptance of all terms, conditions and specifications contained in the City's specifications initially provided to the bidder. Any proposed modification must be accepted in writing by the City prior to award of the bid.

Only bids properly received by the Purchasing Office will be accepted. All bids should be clearly identified by the bid number and bid name contained in the bid proposal.

No proposal will be accepted from, or any purchase order awarded, to any person, firm or corporation in default on any obligation to the City.

Bids must be furnished exclusive of any federal excise tax, wherever applicable.

Bidders must be properly licensed and secure necessary permits wherever applicable.

Bidders not responding to this bid will be removed from our automated vendor listing for the subject commodities.

The City may elect where applicable, to award bids on an individual item/group basis or on a total bid basis, whichever is most beneficial to the City. The City reserves the right to accept or reject any and all bids, and to waive any irregularities or informalities.

Sales prohibited/conflict of interest: no officer, employee, or member of City Council, shall have a financial interest in the sale to the City of any real or personal property, equipment, material, supplies or services where such officer or employee exercises directly or indirectly any decision-making authority concerning such sale or any supervisory authority over the services to be rendered.

This rule also applies to subcontracts with the City. Soliciting or accepting any gift, gratuity, favor, entertainment, kickback or any items of monetary value from any person who has or is seeking to do business with the City of Fort Collins is prohibited.


Freight terms: unless otherwise noted, all freight is F.O.B. Destination, Freight Prepaid. All freight charges must be included in prices submitted on proposal.

Discounts: any discounts allowed for prompt payment, etc., must be reflected in bid figures and not entered as separate pricing on the proposal form.

Purchasing restrictions: your authorized signature of this bid assures your firm's compliance with the City's purchasing restrictions. A copy of the resolutions is available for review in the Purchasing Office or the City Clerk's Office. Request Resolution 91-121 for cement restrictions.

Collusive or sham bids: any bid deemed to be collusive or a sham bid will be rejected and reported to authorities as such. Your authorized signature of this bid assures that such bid is genuine and is not a collusive or sham bid.

Bid results: for information regarding results for individual bids send a self-addressed, self-stamped envelope and a bid tally will be mailed to you. Bid results will be posted in our office 7 days after the bid opening.

  
James B. O'Neill II, CPPO, FNIGP  
Director of Purchasing and Risk Management

BID PROPOSAL  
BID 6010  
SouthRidge Irrigation Pump Replacement

BID OPENING: December 5, 2006, 2:30pm (our clock)

We hereby enter our bid for the City of Fort Collins' requirements for **SouthRidge Irrigation Pump Replacement**, per the bid invitation and any referenced specifications:

**Pre-Bid Conference:**

A pre-bid conference will be held on November 21, 2006, 11:00am, at SouthRidge Golf Course,

**Specifications:**

IRRIGATION PUMP SYSTEM

PART 1: GENERAL

1.01 SCOPE:

Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete manufacturing and installation of two pumping systems, and guarantee/warranty as specified herein.

Any existing conditions provided herein are for information only. It is the contractor's responsibility to confirm existing conditions on site prior to submitting bid. Items of work specifically included are:

- A. Procurement of all applicable licenses, permits, and fees as required by local utilities and regulations.
- B. Services of a factory field service person to supervise the assembly, installation, and start-up of the pumping system, and the training of maintenance staff.
- C. Furnishing and installing two prefabricated, vertical turbine type pumping systems including pumps, motors, electrical controls, and other items as specified.
- D. Electrical Improvements:
  - 1. Verify that existing conductors between existing electric meter and electrical panels are of sufficient size.
  - 2. Protect existing electric meter and phone line into pump building. Make all necessary connections to existing electric meter.
  - 3. Remove existing electrical panels.
  - 4. Furnish and install new electrical panels meeting UL listing for hose directed water. Existing location may not be appropriate based on layout of new pump station. Install new electrical panels in locations meeting

NEC requirements and approved by Owner. Provide all necessary electrical conduit and conductors if electrical panel locations are not appropriate. Coordinate exact location of panels and routing of conduit and conductors with the Owner on site prior to construction.

5. Furnish and install new conductors between new electrical panels and pump station control panel and complete all necessary connections.
- E. Install pump station using existing 5-foot inside diameter concrete wet well in existing pump buildings.
- F. Connect new pump station discharge pipe to existing flanged steel pipe approximately 30-40-inches from inside wall. The new discharge piping cannot be routed through the existing pump station building walls.
- G. Complete mandatory site visit prior to submission of bid. It is the contractor's responsibility to accurately record existing wet well location and discharge piping point-of-connection inside building. The contractor must provide accurate, to scale, shop drawing for each pump station installation with their bids. Contractor must ensure that there is adequate maintenance room around control panels and filter assembly
- H. Repair any damage to existing turf grass on site in either transporting or installing pump station.
- I. Maintenance period.

1.02 **WORK NOT INCLUDED:**

Items of work specifically excluded or covered by the City of Fort Collins:

- A. Provision and installation of electrical transformers on site.
- B. Demolition and removal of existing pumping station and piping inside of existing pump buildings.
- C. A new concrete pad will be poured inside the existing pump buildings.
- D. The existing pump building roofs will be removed and replaced in order to install the new pump station skids.
- E. Installation of new insulation and interior finish of existing pump buildings.
- F. Remove existing Naiad wetting agent injection assembly from #10 pump station on south side of course and mount on new pump skid.
- G. Provide new Naiad wetting agent injection assembly on #5 pump station on north side of course.

### 1.03 SUBMITTALS:

- A. Deliver four (4) copies of all submittals to the Owners Representative within 21 days from the date of Notice To Proceed. Deliver Maintenance Manual prior to start-up.
- B. Materials List: Include pipe, valve, fittings, pumps and motors, control system components, and electrical equipment. Quantities of materials need not be included.
- C. Manufacturers' Data: Submit manufacturers' catalog cuts, performance curves, specifications, and operating instructions for equipment shown on the materials list. Submit complete instructions for installation, operation, and recommended maintenance of the pump system.
- D. Maintenance Manual: Submit four copies of a bound maintenance manual that includes all manufacturer's data listed above and recommended operating procedures and preventive maintenance procedures. Include guide for troubleshooting operational problems with the pump station and complete documentation for programming, recommended settings and adjustments.
- E. Shop Drawings: Submit shop drawings of proposed pump system. Show products required for proper installation, their relative locations, and critical dimensions. Submit technical data sheets, electrical schematics, sequence of operation, UL listing authorization form.

Pump system manufacturer is responsible for layout and design of the pump system supplied, and any special coordination issues that affect the critical dimensions, layout, or orientation of the pump system.

The layout of the existing pump building, location of discharge pipe connection must be shown, and relative dimension of the pump station are required.

### 1.04 RULES AND REGULATIONS:

- A. Work and materials shall be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.
- B. All electrical control panels with controls shall be built in accordance to N.E.C., U.L. and E.T.L. standards. The electrical components and enclosure shall be labeled as a complete U.L. listed assembly with manufacturer's U.L. label applied to the door. All equipment and wiring shall be mounted within the enclosure and labeled for proper identification.

### 1.05 TESTING:

- A. Notify the Owner's Representative three days (72 hours) in advance of testing.

- B. On completion of assembly of the pumping station, all discharge pipe and valves shall be hydrostatically tested at 150% of the maximum pump shutoff head.
- C. Bump manual motor starter controls to prove correct rotation and secure local inspection/approval.
- D. Test, verify, and demonstrate to the Owner's Representative the proper operation of all control and safety shut off devices.
- E. Verify flow and discharge pressure from the pump system and demonstrate to the Owner's Representative system performance based on the specified values.

1.06 REVIEWS:

The purpose of on-site reviews by the Owner's Representative is to observe the Contractor's interpretation of the construction documents and to address questions with regards to the pump installation.

- A. Scheduled reviews such as those for testing should be scheduled with the Owner's Representative as required by these specifications.
- B. Impromptu reviews may occur at any time during the project.
- C. Final review will occur at the completion of the pumping system installation and Record Drawings.

1.07 GUARANTEE/WARRANTY AND REPLACEMENT:

The purpose of this guarantee/warranty is to insure that the Owner receives materials of prime quality, installed and maintained in a thorough and careful manner.

- A. The manufacturer shall warrant the pumping system to be free of defects and product malfunctions for a period of one year from date of start up or eighteen months after shipment, whichever occurs first.
- B. The programmable controller shall be unconditionally warranted for 5 years from the date of shipment. The pumping system manufacturer shall be responsible for all warranties, pass through warranties are not acceptable.
- C. Failures caused by lightning strikes, power surges, vandalism, flooding, operator abuse, or acts of God are excluded from warranty coverage.
- D. Repair damage to the premises caused by a defective item. Make repairs within seven days of notification from the Owner's Representative.
- E. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.

## PART 2: MATERIALS

### 2.01 QUALITY:

Materials used in the system shall be new and without flaws or defects of any type, and shall be the best of their class and kind.

### 2.02 SUBSTITUTIONS:

- A. Make complete submittals of all manufacturer's data showing compliance with the Contract Documents.
- B. In making a request for a substitution, the Contractor represents that he:
  - 1. Has investigated the proposed substitution and found that it is the same or better quality, level, capacity, function, or appearance than the specified product, and can demonstrate that to the Owner.
  - 2. Will coordinate the installation and make all modifications to the work, which are required for the complete installation and operation of the system.
- C. The Owner's Representative will determine acceptability of the proposed substitution and will notify Contractor of acceptance or rejection.
- D. Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at the option of the Contractor.

### 2.03 GENERAL REQUIREMENTS:

- A. Each prefabricated pumping station shall have a capacity of 1,000 GPM at a discharge pressure of 125 PSI downstream of all pump system components, using two equally sized main pumps. Provide a submersible pump as a pressure maintenance pump. The station shall be completely piped, wired, hydraulically and electrically tested on a structural steel skid before shipment to the job site.
- B. All components of the pumping system shall be designed to function in an outdoor environment exposed to all of the elements. Furnish protective enclosures and covers as required for proper operation of the system.
- C. Use a static lift of 10-feet when calculating the total dynamic head (TDH) requirements of the pump system.
- D. The existing wet well depths are 11-feet. Pump station intake must be 12-inches off of the bottom of the wet well.
- E. Construction shall include skid assembly to support all components during shipping and to serve as the installed mounting base. Base shall be of sufficient size and strength to resist twisting and bending from hydraulic forces and support the full weight of pumps and motors.

F. The pump station and related equipment shall meet all the general and technical specifications; shall be designed, fabricated and installed in a workmanlike manner; and shall be delivered within the negotiated schedule.

G. Provide a factory-trained technician to supervise the installation of the pump station, pumps, and motors.

In addition to the time required for installation supervision, the technician shall provide a minimum of 1 day of training for the Owner's staff in the operation, maintenance, and programming of the pumping system.

H. All pump station components shall be supplied by and be the responsibility of one manufacturer, even though others manufactured some components.

I. Acceptable Manufacturers:

1. FLOWTRONEX PSI Ltd., 10717 Harry Lines Blvd., Dallas, Texas 75220  
214-357-1320.

2. RAIN BIRD, 6991 East Southpoint Rd, Bldg #1, Tucson, AZ 85706  
520-741-6145

3. SYNCROFLO, 6700 Best Friend Rd., Norcross, Georgia, 30071  
770-447-4443

4. WATERTRONICS, 525 Industrial Drive, Hartland, Wisconsin 53029  
800-356-6686, 414-367-5000, Fax: 414-367-5551

#### 2.04 PUMPS:

A. Furnish two main vertical turbine type pumps, electric motor driven, 1800 nominal RPM, complete with the required length of threaded column assembly, galvanized steel basket type suction strainer, and cast iron discharge head.

B. Bowl assemblies including the suction, intermediate, and discharge bowls shall be furnished in cast iron, enamel lined with flanged connections. Furnish bronze statically balanced impellers that are adjustable vertically by an adjusting nut located at the top of the hollowshaft motor.

C. Pump efficiency shall be minimum 80% at the specified operating point. The performance curve of each pump selected shall be continuously rising as the shutoff condition is approached. The impeller diameter selected shall be less than the maximum diameter available.

D. Furnish each pump with a flanged, cast iron or fabricated steel discharge head complete with a cast iron adjustable packing gland, gland plate, grease seal, packing bushing, packing and water slinger. Provide a continuous bypass flush line from the stuffing box of each pump to the wet well.



- E. All bowl bearings shall be constructed of bronze, all column bearings shall be fluted rubber. Each pump shaft, column line shaft, and pump motor shaft shall be turned, ground and polished 416 stainless steel sized to transmit full nameplate HP of the motor. Minimum acceptable shaft size is 1-inch.
- F. All shaft couplings shall be threaded and machined from 300 series stainless steel. Furnish two piece headshaft assembly. Each motor shaft shall be removable and couple to the pump head shaft between the bottom of the motor and the packing gland with sufficient clearance to allow removal of the packing gland assembly without motor removal.
- G. Furnish a pressure maintenance pump, a multistage, submersible type, well pump. Pump shall be equipped with a motor shroud for proper cooling of submersible motor and stainless steel suction screen.

Furnish a pump with a Franklin submersible motor and Subtrol motor protection controls. Pump furnished shall be a Goulds, Grundfos or approved equal.

#### 2.05 MOTORS:

- A. Each main pump motor shall be 1800-RPM nominal, squirrel cage induction vertical hollow shaft type with a WP-1 enclosure and a 1.15 service factor. The temperature rise of the motor shall be to NEMA Standard MG-1-12.42 for Class B or Class F insulation.
- B. For 40 HP motor or greater, furnish "Premium Efficiency" US Electric motors Type RUS that are rated for continuous inverter duty with variable frequency drive and are designated NEMA MGI-31.
- C. Furnish motors of proper size to drive the pump at any point on its operation curve without exceeding motor horsepower nameplate rating.
- D. Furnish motor thrust bearings of ample capacity to accommodate the weight of all rotating parts plus the hydraulic thrust of the pump at shutoff conditions. Furnish motor bearings rated for a minimum service life not less than five years continuous operation at the design rating point.
- E. The pump shaft shall be connected to the motor by a bolted down coupling at the top of each motor. All couplings shall be equipped with non-reversing ratchets.
- F. Furnish motors manufactured in the U.S.A.

#### 2.06 PIPING:

- A. Fabricated Piping: All fabricated piping shall conform to ASTM specifications A53 for Grade B welded or seamless pipe. Piping 16" and smaller shall be Schedule 40. All welding flanges shall be forged steel with slip-on or welding neck type. All welding fittings shall be seamless, conforming to ASTM Specification A234, with pressure rating not less than 150 psi. All pressurized tube fittings shall be copper or brass.

- B. Winterization Connection: Provide 2-inch capped threaded nipple in pump system discharge manifold for compressed air winterization of the irrigation system.

2.07 VALVES:

A. Air/Vacuum Release Valve:

1. Provide a continuous-acting, combination air release/vacuum valve to release excess air from the pump discharge manifold. The valve must be capable of releasing air during filling and pump operation and also open in a vacuum condition to allow air to enter the manifold when piping is drained. Valve shall have a cast iron body rated for 300 PSI, stainless steel trim and float ball, Buna N and viton seats.
2. In lieu of an air/vacuum release valve, provide an approved equal device to release air from the system.

B. Drain Valves: Drains are to be provided from any possible low point in the system and are to consist of 1/4" brass angle valves unless otherwise noted. Drain piping is to be furnished so that no drain water runs out on top of the deck plate, but either under deck plate, or directly into the trench drain or wet well. They include, but are not limited to, the following:

1. Provide drain in the pump discharge manifold between pump check valves and control valve.
2. Provide 3/4" brass hose bib in the discharge piping to function as a washdown connection and also function as a drain.

C. Check Valves: Pump check valves shall be of the silent operating, non-slam type, cast iron bodied with bronze and stainless steel trim. Sealing surfaces shall utilize resilient Buna N rubber. The valve design shall incorporate a center guided, spring, loaded poppet, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe diameter. Valves shall be sized to permit full pump capacity to discharge through them without exceeding a pressure drop of 2.5 PSI. Furnish check valves on the discharge of each pump.

D. Isolation Valves: Valves shall be butterfly type with the position lever or gear hand wheels and rated at 200 psi WOG working pressure. Trim shall include stainless steel stem, bronze streamlined disc, and full faced resilient seat. Isolation valves shall be installed on the discharge side of each pump. The pump system shall also be furnished with a main station isolation valve located in the discharge manifold.

E. Pressure Relief Valve: Furnish pressure relief valve and bypass piping to wet well installed on the discharge piping upstream of the pressure regulating valve. Size pressure relief valve to bypass sufficient water to avoid operating pumps at or near shut off head conditions.

## 2.08 GAUGES:

Gauges and switch gauges shall be isolated from all electrical switch gear and control panels. Gauges shall be provided at appropriate locations to read inlet pressure and discharge manifold pressure. Switch gauges shall be 4" diameter vibration/pulsation dampened. Pressure gauges shall be 2.5" diameter, glycerin filled, with ANSI Class B accuracy. Install ball valves to provide total isolation of all pressure gauges.

## 2.09 ELECTRICAL:

A. Electrical Supply: The power supply to the station shall be three phase, 460 volt, 60 hertz, for full voltage across the line motor starting.

B. Enclosures:

1. The pumping station electrical controls shall be mounted in a self contained NEMA 3S (minimum NEMA rating) enclosure with a drip lip fabricated from not less than 14 gauge steel. Door gasket seals shall be neoprene sponge, sufficient to protect interior components from weather and dust. The electrical panel doors shall be constructed from 12-gauge steel with integral locking screws and latches.
2. Provide operating handle for the main station power disconnect on the front of the panel. Furnish weatherproof and dust proof external operating devices.
3. All internal components of the enclosures shall be mounted on removable back panels. Mounting screws for components shall not be tapped in the panel enclosure.
4. All internal wiring within, and interconnecting between, the panels shall be complete and no field wiring within the panels shall be required. Wiring troughs and cable raceways shall be self-contained within the enclosures and no external cable trays or wiring troughs are permitted.
5. No pressure gauges, pressure switches, water activated devices, or water lines of any sort shall be installed in any electrical control panel. All adjustments and maintenance shall be able to be done from the front of the control enclosure. A complete wiring circuit and legend with all terminals, components, and wiring identification shall be provided. Main disconnect shall be interlocked with door.
6. All electrical starter and control panels shall be assembled from components that are U.L. listed and each completed panel shall be U.L. listed as an Industrial Control Panel.
7. A closed type cooling system shall be included to cool the enclosure and reject heat from the VFD. Open type cooling systems allowing outside ambient air to enter the panel are not acceptable.

C. Pump Motor Starters, Disconnect, and Electrical Switch Gear:

1. The pump motor starters shall be contained within a single NEMA 12 enclosure with a single access door and main disconnect. Each starter shall be protected on each power leg by a time delay fuse of the appropriate amperage. Motor starter coils shall be 120 volt operated.
2. Overload relays shall be ambient-compensating type installed on each power leg and shall be set to trip at 105% of motor full-load current rating.

D. Variable Speed Master Controls and Display:

Provide complete instrumentation and controls to automatically start, stop and modulate pump speed(s) to smoothly, efficiently and reliably pump variable flow rates at a constant discharge pressure. Provide full alarms and safety features needed to protect the equipment and irrigation piping system.

1. Variable Frequency Drive: Provide a digital, pulse width modulation (PWM) variable frequency drive (VFD) with IGBT transistors.
  - a. Provide VFD with a minimum wire to wire efficiency of 98.5%, and shall be rated up to 550-volt operation in order to eliminate nuisance tripping at marginally high voltage conditions.
  - b. Provide VFD with the front end protected by fast acting semiconductor fuses. Any VFD error messages shall be displayed on a 40-character LCD readout in English or any one of 8 other languages.
  - c. Include the following fault protection circuits: Over-current (200%), over-voltage (130%), under-voltage (60%), over-temperature (70° C), ground fault, and motor overload.
  - d. Provide VFD capable of starting into a rotating load and accelerate or decelerate to setpoint without safety tripping.
  - e. Provide VFD with an automatic extended power loss ride through circuit, which will utilize the inertia of the pump to keep the drive powered. The minimum power loss ride-through shall be one cycle based on full load and no inertia.
  - f. Provide VFD optimized for a 3 kHz carrier frequency to reduce motor noise and employing three current limit circuits to provide "tripless" operation.
  - g. The following operating information shall be displayed on the VFD LCD: KWH, elapsed time, Output frequency (Hz), motor speed (RPM), motor current (amps), and voltage. Line reactor will be installed on input of VFD to protect against voltage transients.



- g. Individual motor overload/phase loss (indicates which individual motor was shut down)
- h. VFD fault (shutdown VFD pump only and attempts restart).\*

\*Three failed restarts in 15-minute period will give hard shutdown.

A red general alarm light will indicate all alarms. Specific alarm conditions along with procedures for correction will be displayed in English on the operator interface display (OID).

5. Panel face switches and lights:

- a. Individual pump run lights and pump on/off switches
- b. System Hand/Off/Automatic switch
- c. Mode Select switch -- allows automatic bypass mode of operation that can be used if VFD should fail.
- d. VFD selector switch -- in manual mode, allows user to select which pump will be run off the VFD.
- e. Reset -- Acknowledges pump station alarms
- f. Speed potentiometer -- in manual mode allows user to adjust VFD pump speed
- g. Low discharge pressure override switch -- disables low discharge pressure alarm
- h. PLC bypass switch mounted inside panel allows user to manually operate pumps should PLC fail.

6. Software:

- a. Software will be included to automatically and gradually ramp up irrigation system pressure to the desired operating pressure (i.e., 1 PSI every 3 seconds) without overshooting design pressure. This feature operates whenever pressure drops below set point pressure. This ramp up time is fully adjustable by the operator. This control feature is based on an increase in pressure over a pre-defined time period. The acceleration control on the VFD is **NOT** an acceptable means of adjusting pressure ramp up speed.
- b. Software will be included for optionally maintaining a lower irrigation system pressure when not irrigating. Reduced pressure values will be shown in the technical data sheet. Controls will cycle the PM pump at these reduced pressures during non-

irrigation times and pressure will gradually increase to design pressure when the irrigation periods begin.

- c. Neither flow meter nor VFD output frequency shall be used for shutting down last VFD driven pump. Controls and software shall incorporate a method to eliminate excessive cycling of VFD pump at very low flow conditions, yet not run the pump excessively at no flow conditions.
- d. Provide automatic alternation of VFD driven pumps accomplished by incorporating dual mechanically and electrically interlocked contactors allowing alternation of the VFD between pumps.
- e. Real time clock calendar allows PLC to internally provide all date and time functions used above.
- f. Two separately adjustable PID control loops for both low flow and high flow pressure stability.
- g. Provide system that allows user to field select either two modes of VFD operation. Auto switch VFD option allows VFD to sequentially start each pump. The standard mode of operation starts the first main pump on the VFD and the remaining pump starts across the line as required.
- h. Shutoff algorithm for fixed speed pumps to minimize pump cycling while also remaining responsive to sudden flow reductions. Minimum run timers alone for minimizing fixed speed pump cycling is not acceptable. Discharging through relief valve during pump transitions is not acceptable.
- i. Full manual operation capability with panel face mounted speed potentiometer for manually adjusting VFD speed.
- j. System can be immediately and directly switched from manual to automatic mode of operation. This allows for manual pressurization and immediate switching capability to automatic.
- k. Light test sequence. Pressing the reset button for 5 seconds illuminates all lights.
- l. Rate of pressure change algorithm to rapidly determine if there is an irrigation demand and immediately cycle on the VFD pump, in lieu of waiting for pressure to drop to a predetermined start pressure.
- m. All pump station shutdowns shall be of the controlled type which sequentially phase pumps off at user selectable internals to reduce water hammer within the irrigation system.

7. Operator Interface Device (OID):

- a. The pump station shall include a NEMA 4, 40 character LED display and keypad mounted on the control panel door. This device will allow the operator to view and selectively modify all registers in the PLC. The unit shall store its messages in non-volatile memory. The operator interface device shall incorporate password protection for protecting data integrity. The device will allow for display and modification of all timers, set points, lockout times, etc. The device shall communicate with the PLC through the programming port, and shall include an RS232 communications port allowing a printer to be attached for real time station status logging.
- b. The OID shall be an information system only and not required for pump station operation. No switches, reset buttons, general alarm light, run lights or speed potentiometers are included within this unit. This pump station will be fully functional in the event the OID unit should fail.
- c. In addition to normal data entry keys, the device shall include a minimum of the following function keys labeled:
  - (1) **Event.** Displays one of three data logging functions.
    - (a) Operator can scroll through the historical pump station flows and pressures for up to the last 7 days. The operator can change sampling time periods (from 1 to 60 minutes). Averages are taken over the sample period and the average recorded with time stamp.
    - (b) The last 128 sequential pump station events with time of occurrence. Events shall include but not be limited to: all alarms, starting of individual pumps, stopping of individual pumps and changing of selector switches.
    - (c) Station flow and pressure are shown every second for the previous 60 seconds and every minute for the previous 30 minutes. If a shutdown occurs, the flow and pressure tables are locked in so that the operator may view how the pump station was performing immediately before the shutdown occurred.
  - (2) **Status.** Will display the current operating status. When the station is running, the display will show the setpoint pressure, actual pressure, flow, and pump rpm.



- (3) **Alarm Info.** It will display detailed information on the alarm, time of occurrence, pumps operating at time of alarm and how to correct the alarm condition.
- (4) **Daily Log.** It will display the following: Last time of log reset, individual pump run times, run times since last reset, pump starts, pump starts since last reset, total flow, total flow since last reset, highest flow rate with time of occurrence, alarm conditions, and times since last reset.
- (5) **Scroll Key.** Used to scroll up and down through data.

8. Operation:

- a. During non-irrigation times, the pressure maintenance pump (PM) will cycle on and off as required to maintain irrigation system pressure. The cycling pressures can be user selected and can be set substantially below normal set point pressure, if desired. If the PM pump cannot maintain the desired pressure, then the VFD will start the first pump and will gradually ramp the pressure up to desired irrigation pressure.
- b. The pump speed will be modulated to hold a constant discharge pressure regardless of flow. As the flow rate increases and the VFD pump can no longer maintain pressure while at maximum speed, the next sequential pump will be started and the VFD driven pump will accordingly reduce its speed and modulate.
- c. An algorithm shall be include for accurately reducing the VFD pump speed as the next sequential pump is started so that no pressure surges are generated during the transition (even with across the line starting). If the user prefers to switch the VFD from pump to pump for sequential starting, he can select this option with the OID.
- d. As the flow continues to increase, pumps will sequentially be started until all pumps are operating. As the flow begins to decrease, pumps will be sequentially turned off until only a single VFD driven pump is operating. When a no flow condition occurs, the VFD pump shall be turned off.

E. Skid Wiring:

1. All wiring from control panels to motors shall be in liquid-tight conduit with copper conductors rated not less than 600 volts AC and of proper size to carry the full load amperage of the motors without exceeding 70% capacity of the conductor. A grounding cable shall be included in the liquid-tight conduit. There shall be no splices between the motor starters and the motor connection boxes.

2. Wiring to flow sensors and pressure transducer shall be multi-conductor shielded cable suitable for Class II low voltage controls.

F. Lightning Arrestor:

The main power supply feeding the pumping station shall be equipped with a 3 phase secondary lightning arrestor having a breakdown current rating of not less than 60,000 amps at 14,000 volts discharge. Power supplies, 300 volts and less, shall use 300 volt rated arrestor with an 800 volt spark-over voltage. Power supplies 301-600 volts shall use 600 volt rated arrestors with a 1,000-volt spark-over voltage.

G. Misc. Electrical Components:

1. Main Station Disconnect:

A three-pole main station disconnect shall be mounted in a separate NEMA 3S enclosure to completely isolate the electrical system from incoming power. The disconnect shall conform to the requirements of the NEC and applicable local codes. The main station disconnect shall have an operating handle on the front of the panel.

2. Secondary Control Circuit Fuses:

Single-pole secondary distribution fuses with appropriate ratings shall supply power to each pump starter coil circuit, the control system, and to other circuits as required.

3. Phase Failure - Low Voltage Safety Shutdown:

A phase failure - low voltage system dropout relay shall be provided to de-energize the individual pump controls and motor sequencing control in case of either low voltage or phase failure after a 5.0 second time delay. The resetting shall be automatic after full power is restored for 5.0 seconds, with pumps sequentially restarting. The phase failure - low Voltage indicator light is to remain illuminated until manually reset.

4. Low System Pressure Safety Shutdown:

Low discharge pressure is to be sensed by the pump starting set point. When the station discharge pressure decreases to this point and maintains a start signal for a preset time, the pumps will be de-energized and remains so until the circuit is manually reset. An indicator light shall illuminate to indicate a low discharge pressure shutdown has occurred.

5. Low Water Level Safety Shutdown:

Furnish liquid level probes and controls to prevent operation of the pumps when water levels in the wet well are insufficient. Furnish shutdown with

automatic restart after an adjustable delay. Low water level indicator lamp shall remain lit until manually reset.

6. Corrosion Inhibiting Modules:

Corrosion inhibiting modules shall be installed in all electrical enclosures in accordance with the manufacturer's recommendations.

H. Standards:

1. All wiring shall conform to the National Electrical Code Standards. Flexible conduit sections shall be under 5 feet in length. All conduit to devices shall be attached securely to avoid trip hazards.
2. The manufacturer shall provide a wiring schematic. The schematic shall show all devices, connections and wire numbers.
3. All controls and electrical equipment shall be thoroughly inspected and tested before shipment.

2.10 FLEXIBLE CONNECTIONS:

- A. Furnish coupling if transition between pipe materials due to distance or elevation is required between pump station discharge piping and existing irrigation piping in pump building. Coupling must be rated for minimum working pressure of 600 PSI. Use Dresser, Ford, Metraflex, or Owner approved equal.

2.11 PIPE SUPPORT STAND:

- A. Furnish manufactured steel pipe support stand as shown on the drawings and details. Support must be capable of supporting 500 lbs. dead load and be adjustable within the range shown on the pump piping detail.
- B. Furnish Standon Model S89 or S92 as required, with red oxide primer, as manufactured by Material Resources, Hillsboro, Oregon, (503) 693-0727 or approved equal.

2.12 FLOW METER:

- A. Provide a velocity sensing electromagnetic type, microprocessor based signal converter, sealed housing, flanged tube meter for 150 psi working pressure, and CSA approved meter.
- B. Acceptable manufacturers are KROHNE and BADGER.

2.13 AUTOMATIC BACKWASHING SCREEN FILTER:

- A. Provide automatic self cleaning suction scanning filter with 300-micron screen, or approved equal. Filter must be capable of an automatic backwash cycle based on pressure differential and time interval.
- B. Provide check valve on discharge pipe downstream of filter device.
- C. Acceptable manufacturers are Valve and Filter and Amiad.

2.14 REMOTE MONITORING:

- A. Provide necessary interface compatible with the remote monitoring software provided by pump station manufacturer.
- B. Use wireless communication between pump stations and existing central control system computer. Furnish and install all necessary radios, antennas, conduit, and conductors.
- C. Furnish and install all necessary software and peripherals at the central control system computer.

2.15 SKID MOUNTED HEATER:

Provide a thermostatically controlled skid mounted heater completely wired and permanently mounted on the skid.

2.16 POWER SUPPLY:

Provide a power supply suitably rated and sized for operating the existing NAIAD injection systems.

2.17 ACCESS HATCH:

Provide hatch as a hinged component of the pump-mounting skid for access to wet well.

2.18 PAINTING:

- A. Painting of the entire unit shall consist of a multi-step coating system which includes metal preparation, rust inhibitive prime coat, and a two part polyurethane finish having a total dry film thickness of not less than 4 mils.
- B. Pump station components shall be painted the manufacturer's standard color. All electrical enclosures, tank, and accessory panels shall be painted to a minimum thickness of 3 mils and baked at 160-180 F.
- C. Provide a 1-quart can of the finish paint with the system for job site touch up use.

## PART 3: EXECUTION

### 3.01 INSPECTIONS AND REVIEWS:

#### A. Site Inspections:

1. Verify site conditions and note irregularities affecting work of this section. Report irregularities to the Owner's Representative prior to beginning work.
2. Beginning work of this section implies acceptance of existing conditions.
3. Protect existing pump station buildings during construction and repair or replace any damaged item.

### 3.02 INSTALLATION:

- A. Shipping, off-loading and the technical start up shall be furnished by the pump station manufacturer. The pump station manufacturer shall furnish location and mounting details to Owner's Representative.
- B. Anchor pump system to concrete mounting pad and complete all piping connections prior to startup and operation of the pump system.
- C. Electrical connection shall consist of a single conduit from 3 phase 460 volt 200 ampere disconnect to the pump station main disconnect.
- D. Technical start up procedures by the pump station manufacturer shall include the following:
  1. Station start up and pressurization
  2. Pressure, flow, and programming adjustments
  3. Monitoring of irrigation cycle when possible. Technician will instruct operations personnel as to the operation, adjustment and maintenance of the pump station.

### 3.03 OPERATION AND MAINTENANCE MANUALS:

- A. Furnish four (4) copies of the bound Pump System Operation and Maintenance manuals as described in the specifications to the Owner's Representative prior to the start up.
- B. Tools and Spare Parts: Prior to the Pre-Maintenance Review, supply to the Owner operating keys, servicing tools, test equipment, and any other items indicated on the drawings.
- C. Other Materials: Install other materials or equipment shown on the drawings or installation details to be part of the pumping system, even though such items may not have been referenced in these specifications.

3.04 PROJECT RECORD DRAWINGS:

- A. The Contractor is responsible for documenting changes to the design. Maintain on-site and separate from documents used for construction, one complete set of contract documents as Project Documents. Keep documents current. Do not permanently cover work until as-built information is.
- B. Record pumping system alterations. Record work, which is installed differently than shown on the construction drawings. Record accurate reference dimensions.
- C. Prior to completion of project, obtain from the Owner a reproducible mylar copy of the drawings. Mylars or CAD data files compatible with AutoCAD software, can be purchased from the Owner. Cost of mylar reproducible drawings is \$50 per set and the cost of AutoCAD data files on diskette is \$100 per project set. Using technical drafting pen, duplicate information contained on the project drawings maintained on site. Label each sheet "Record Drawing". Completion of the Record Drawings will be a prerequisite for the Final Review.

3.05 MAINTENANCE:

- A. Upon completion of completion of project, maintain system for a duration of 30 calendar days. Make periodic examinations and adjustments to irrigation system components as necessary.
- B. Following completion of the Contractor's maintenance period, the Owner will be responsible for maintaining the system in working order during the remainder of the guarantee/warranty period, and for performing necessary minor maintenance.

3.06 CLEANUP:

- A. Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish.
- B. Manufacturer's Representative shall clean all surfaces and touch up scratches with factory paint to match original.

**Bid Proposal: Bid #6010, SouthRidge Irrigation Pump System Replacement**

Qty.	Description:	Extension
1	Replace Pump Station at SouthRidge Golf Course, as specified below.	\$

**Bid Submittals:**

Bidders must submit a complete written description and drawings of their proposed system. System and component descriptions must be listed in the same order as they appear in Specifications, Irrigation Pump System, Sections 2.03 through 2.18, as applicable.

Each bidder must also provide a written description of their proposed installation process and ability to comply with the requirements set forth in Specifications, Irrigation Pump System, Sections 3.03 through 3.05.

Bidders may include a separate list of optional items, including descriptions and prices.

**Delivery:**

Prices must be quoted FOB Destination: SouthRidge Golf Course, Fort Collins, CO

**Installation:**

Installation of new pump station will begin \_\_\_\_\_ days after notice of award.

For technical questions regarding the pump station, contact Randy Bonneville, Golf Superintendent, 970-416-2787.

For questions concerning bid procedures, contact Jim Hume, Buyer, 970-221-6776.

Signature:	Title:
Print Name:	Date:
Street: City: State/Zip:	Phone #: Fax #: Email: