

MEMORANDUM

DATE: March 12, 2018 PROJECT: 17-5-018

TO: Beth Gabor
Manager of Operations and Strategy
County of Yolo

FROM: William Gustavson, Principal Project Manager
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SUBJECT: **RECOMMISSIONING OF THE CANVAS BACK AND PINTAIL PUMP STATIONS
CAPITAL IMPROVEMENT PLAN – WILD WINGS CSA**

BACKGROUND

The Capital Improvement Program (CIP) described in this memorandum is a result of the recent testing (of the pumping equipment) and assessment of the Wild Wings CSA water distribution system. The system, includes two wells (the Canvas Back and Pintail well and pump stations), storage tanks and booster systems, and a water distribution system that serves water to 338 single-family residential units, and provides supplemental water for irrigation of the golf course.

The water wells are designed to pump directly into the storage tanks where booster pumps (operationally controlled by a hydropneumatics tank and pressure switches) pressurize the water distribution system. Both wells are connected by a common raw water line to permit well water to supplement the treated waste water for golf course irrigation or to supplement lake level via any one of several lake turnout valves. With the onset of elevated levels of arsenic measured in the Canvas Back well, service duty for Canvas Back has been relegated to waste water treatment plant treated water supplementation with the Pintail Well fully committed to providing potable drinking water.

The pump stations were designed to be redundant in the event of a failure at one of the sites with the storage tanks designed to provide operational, fire suppression and emergency storage for the system. Solenoid controlled flow control valves were installed at each pump station to permit filling of the storage tanks from the water distribution system in the event a water well at that location was out of service. This permits the booster systems at each well site to cycle the storage tanks, so the water does not become stagnant and provides higher volumes of water for fire suppression events.

From our review of the system and the subsequent results of the well pump station testing at both sites, there were several system deficiencies that need to be addressed and thus, is the basis of the recommendations and associated costs shown below.

The costs below are broken down into two categories: 1.) Maintenance, in which the described item should be part of a normal maintenance program or replacement, and 2.) Capital Improvements (CAP) which are intended to provide Yolo County with a guidance item of work that needs to be planned and performed in the future. All of these items are intended to improve the conveyance/storage infrastructure, and/or adding, repairing, replacing or modifying infrastructure or implementing an operational procedure to bring the system into conformance with current regulatory standards and good engineering/operating practices.

The cost estimates are shown in general lump sum form and are expressed in current day costs, with no adjustment for inflation, and include costs for engineering, construction inspection/administration, and contingencies, if needed. The items are listed below.

Prioritization of Improvements

An important consideration relative to the following items is recognition that, considered individually or collectively, many of the other recommended system modifications or improvements could be considered to be immediately required to bring the Wild Wings CSA current with regulatory standards, to adhere to good engineering/operational practices, or to solve operational problems. However, it is practically impossible to budget, design, undertake and complete all those modifications and improvements more-or-less immediately. Consequently, a significant component of the following maintenance or CAPs was to derive suitable prioritization that could be used to assess, rank, and temporally distribute the water system improvements over an owner selected time frame to accommodate budgeting as well as achievable project implementation.

Maintenance Items

- A. **Properly adjust instrumentation** – During the testing of the well stations, inaccuracies were observed in the water level readings at each of the well sites. Apparently, neither of the well water level transducers were calibrated utilizing an electric sounder to measure the water level. The program algorithm should be corrected accordingly.

This work should have a high priority as the period of high demand is approaching and it is imperative that proper water levels should be observed to protect the well pumps in addition to monitoring the groundwater basin.

The estimated cost for this item is \$1,000.

Reportedly, there has been some operator issues with obtaining consistent water level measurements which could be associated with moisture contamination of the transducers resulting in a current drift; thus drifting of output data. An option for consideration by the system owner is if the condition persists, then either replacement of the transducers is in order, or the use of sonic water level devices (these do not have a long track record for well use so reliability issues are not known).

The estimated cost for this option is \$3,000.

- B. **System Valve Exercising and Flushing Program** – During the testing of the pump stations and observing the station repairs, it was noted that complete water shutdowns could not be effected by the closure of any of the gate valves. The valves that were installed are high quality AWWA standard valves, and common to the industry. It is doubtful that all of the valves have failed rather in all likelihood the valve seating areas have all been encrusted with tuberculated deposits from system directional flushing inactivity since the system was put in operation. The system should be methodically directionally flushed with each valve repeatedly operated employing the AWWA valve turning/counting method to ensure complete travel of the valve stem has been obtained and as much material/debris is removed from the valve seat as possible.

This work should commence immediately as any system leak/breakage could result in the operators having to depressurize a large portion or all of the system to effect a large mainline repair without the benefit of properly operating mainline valves.

The estimated cost for this item will range from \$4,000 to \$6,000 based upon two operators and approximately spending 80 total man-hours to effect the program. This cost does not include the electrical power usage that will be expended during the flushing, nor the cost of dechlorinating agents.

- C. **Rebuild Control Valves** – Each pumping station, waste water treatment plant pond, and each lake fill station, utilizes hydraulic control valves. The valves have not been exercised or serviced since the system was put into service or have fallen into disrepair. The valves should be serviced to include replacement of the diaphragm, o-rings, and general cleaning of the pilot circuitry. In cases where electrical microswitches or solenoids are utilized, the units should be checked for proper operation and replaced if faulty.

This work should proceed as soon as practical, preferably during a period of low demand.

Estimated cost for this work is \$18,000.

Capital Expense Items

- D. **Installation of an Arsenic Removal Plant at the Canvas Back Well Pump Station** – As the County is aware, the Canvas Back well has exceeded the Safe Drinking Water Maximum contaminant level for Arsenic. An Arsenic removal filtration system should be installed at the site. The County can consider various options for treatment including split flow and modification of the piping so that the Pintail site can also utilize the treatment facility should long term use result in that well exceeding Arsenic MCL's. As the Pintail site contains more room than the Canvas Back site it might make more sense to locate the filtration system there and pipe raw water to the site

utilizing the raw water mainline. All of the various options can be explored in the preliminary design stage.

This project should commence as soon as possible as the preliminary and follow up engineering, pilot testing, plans and specifications, bidding, construction and commissioning will take over a year. Delivery of filtration systems and electrical switchgear alone can take 16 to 20 weeks.

The estimated cost for this item is \$950,000.

- E. ***Modification of the Well Pump at the Canvas Back Station*** – During well pump performance testing, the efficiency was determined and found to be in the excellent range. No vibration of the well pump was noted nor were there any bearing noises observed. However, it is reported that during prolonged pumping periods during the high demand summer months, the operators throttled the capacity of the well pump to manage very low pumping water levels in the well. As long term data of the pumping water level is in question as to the accuracy it is only assumed the water level in the well was depressed as a function of the prolonged drought in addition to possible local interference between operating wells in the area.

The existing pump setting depth is 220 feet bgs with a suction pipe extended to the bottom of the well. There is a single screened intake section in the well from 364 to 415 feet bgs. When low water levels are observed in wells, the usual practice is to extend the well pump setting by the addition of column assembly. Given the top of the screen section is located at 364 feet, there is certainly plenty of room to extend the pump setting depth. However, just arbitrarily lowering of the pump can have unintended consequences as line shaft elongation may allow the shaft to stretch beyond the axial clearance of the bowl assembly and the hydraulic load may exceed the carrying capacity of the motor thrust bearing.

In this item, it was assumed the well pump was going to be modified in conjunction with the installation of the arsenic removal plant as the operating hydraulic conditions will require the well pump bowl be changed to meet changing system-head hydraulic conditions.

The cost of a pump modification was estimated in the cost of the arsenic removal plant described above in Capital Item D.

If there is going to be a prolonged period of time before the installation of the arsenic station, or the arsenic station is not going to be installed, it is recommended the well pump be extended to the pump setting depth of 320 feet bgs, and a standard 10 foot suction pipe installed as there is no need for the existing 200 foot suction assembly. This will require replacement of the bowl, the lineshaft and possibly the upper motor bearing assembly. Due to the lower pumping level, the pump will have a reduced output due to the higher head requirements but an anticipated reduction of 200 to 300 gallons per minute should not have a profound impact on operations.

Estimated cost of this option is \$100,000.

- F. **Modification of the Well Pump at the Pintail Station** – During well pump performance testing, the efficiency was measured at a rated good level, but the efficiency is much lower than other pumping equipment at Wild Wings. Though no operational issues were noted during the recent testing, a change in the bowl unit will result in lower operating costs to the County. The County should continue testing of the unit on an annual basis and when the unit has an operating overall plant efficiency in the low 60's, the County should consider replacement of the bowl assembly. However, given the prolonged drought with the corresponding lowering of water levels in the area, The County should consider both a bowl replacement and a lowering of the pump setting depth. The Pintail well has plenty of room to lower the pump as the first screen section is over 900 feet bgs, and the pump bowls are currently set at 300 feet bgs

It is recommended the well pump be lowered at least another 100 feet. As with the Canvas Back well pump, arbitrarily lowering of the pump can have unintended consequences as line shaft elongation may allow the shaft to stretch beyond the axial clearance of the bowl assembly and the hydraulic load may exceed the carrying capacity of the motor thrust bearing. Preliminary calculations indicate that the motor bearing may be adequate (dependent on the thrust characteristics of the chosen bowl assembly) but will require replacement of the lineshaft to lessen shaft elongation. This work can be scheduled or planned three or more years out and dependent on the measured operating efficiency.

The estimated cost for the bowl replacement, pump setting depth extension and new lineshaft is also estimated at \$100,000.

- G. **Repainting of the Canvas Back and Pintail Tanks** - During the recommissioning of the Canvas Back site, the storage tank interior was cleaned from accumulative organic deposits. During the cleaning, blistering and lifting of the interior paint was observed. Inspection of the Pintail Tank interior indicated a similar blistering of the paint.

Accordingly, the interior of both tanks should be sand-blasted and repainted. The primer, and finish coats must be NSF61 certified to conform with the State of California Division of Drinking Water Standards. As humidity and temperature control are needed during the re-painting process, only painting firms with experience in painting domestic water tanks should be utilized. The process of tank painting is a multi-week process and it is recommended the tanks be painted at least a year apart. The County should ensure the tanks are painted with a product that is NSF61 certified for contact with potable drinking water.

The estimated cost for both tanks is estimated at \$150,000.

- H. **Operator Instrumentation** – To properly operate the system the system operators should possess instrumentation that is common to water utility operation with systems using groundwater wells. The recommended instrumentation is:

- An electric sounder to manually measure the water level in the wells. Extra sounding tips should be provided for spares,
- A pressure test gage to accurately check system pressure,
- A combination amp probe – volt meter to occasionally check the running condition of the equipment,
- A fire hydrant spanner wrench, diffuser, and dechlor box to operate the fire hydrants,
- A gate valve key for exercising the system gate valves for maintenance of the system,
- A HACH field kit that can measure TDS, pH, chlorine residual, iron, manganese, etc. along with extra chemicals for testing,
- An accurate thermometer for measuring water temperature,
- A mechanics stethoscope for locating motor bearing noise,

Though one would expect that system operating companies be equipped with all or most of the above equipment we find that most are lacking in basic equipment.

Estimated cost for the above equipment is \$12,000.