CHAPTER 4
HAWTHORN CENTER RESERVOIR

BACKGROUND

The Hawthorn Center Reservoir was constructed in 1973 and consists of a 1.2 million gallon cast-in-place concrete reservoir with an attached pump station, as shown in Figure 4-1. This reservoir originally included a groundwater well (Well #2) with a pumping capacity of 1,300 gpm. When CLCJAWA began supplying Lake Michigan water to Vernon Hills, this well was only needed for emergency situations. The LCPWD has permanently abandoned this well. The pump station includes the following components:

- Abandoned Well #2
- One 750 gpm and two 1,500 gpm water supply booster pumps (Figure 4-2)
- One 1,500 gpm primary fire pump and a 1,500 gpm diesel-driven standby fire pump
- The station's chlorine room has been empty since the well was abandoned.

Figure 4-1
Hawthorn Center Reservoir

Figure 4-2
Existing 1,500 gpm
Water Supply Booster Pumps

RECOMMENDATIONS

Electrical Equipment

The Hawthorn Center Reservoir motor control center (MCC) and diesel-driven standby fire pump system were evaluated. The existing Cutler-Hammer UNITROL MCC, shown in Figure 4-3, has been discontinued. Original parts for this model are no longer being manufactured, however, various replacement parts can be ordered from Eaton. It is recommended that the existing MCC be replaced with a new one in order to increase reliability, make the procurement of replacement parts easier, and reduce the footprint of the structure. The number of sections for the new MCC will be less since the existing well pump has been removed.

Figure 4-3
Existing MCC in the Hawthorn Center Reservoir Pumping Station

Appendix B contains equipment cut sheets and a drawing of the new MCC elevation prepared by Eaton. The new MCC will contain similar provisions for the utility metering current transformers, as well as the tap before the main disconnecting device that feeds power to the primary fire pump controller.

The diesel-driven fire pump system (Figure 4-4) was evaluated for possible replacement with a similar diesel-driven fire pump outdoors, but was found to be impractical due to the extensive water piping modifications that would be required. Another alternative to the current indoor diesel-driven fire pump system is placing a GenSet outdoors that provides power to a new electric motor and fire pump controller indoors. Though replacement of the pump with a generator outdoors would be a significant investment, requiring new components such as a GenSet, fire pump controller, motor, and pump assembly, modifications to the existing piping would be minimal. Additionally, the footprint for the new equipment inside the building would not exceed that of the current, as the existing diesel fuel tank inside would no longer be needed. As such, it is recommended that the existing diesel driven fire pump be replaced with a standby generator set outside. The placement of the generator will be evaluated during the final design of the project, including determining whether or not the existing structure can be modified so that the generator can be placed in the old footprint of the well pump.

Figure 4-4
Existing 1,500 gpm Diesel-Driven Fire Pump

The new standby generator and fire pump system would be modeled after the existing electric motor primary fire pump that is fed from the MCC. The standby generator would be 200 kW, sufficient to power the standby fire pump and some auxiliary loads, but also to meet the voltage drop restrictions required by NFPA 20 and NEC 695. A diesel powered unit was found to be more cost-efficient for the size of generator needed to power the standby fire pump motor and its associated equipment. At lower kW ratings, natural gas and diesel units are comparable in price, but as the kW ratings increase, natural gas units become more expensive than diesel units. A 200 kW diesel generator is approximately $38,000 versus $70,000 for a natural gas generator (equipment cost without installation). The downside of a diesel generator is that a fuel tank that meets the run-time requirements for fire pump systems will be required, thus increasing the physical size of the unit. Information on the recommended diesel generator is provided in Appendix C.

Currently, the Utility metering equipment is located within the structure. Once a month, the LCPWD staff has to meet the Utility technician at the site in order to let them inside so that they can read the meter. It is recommended that during the design phase the utility be coordinated with in order to move the service meter to the exterior of the building so that the technician can read it without entering the structure and no LCPWD staff need be present.

Lighting

Record drawings of the Hawthorn Center Reservoir facility indicate that there are 17 linear T12 fluorescent fixtures that provide most of the lighting within the reservoir pumping station. Figure 4-5 shows the typical linear fluorescent fixture in the facility. Since one of the objectives of this study was to identify energy savings, LED fixtures were considered but at the time of this report were deemed too costly to justify the potential energy savings. However, upgrading to LED fixtures or the retrofitting of the existing fixtures with LEDs can be reevaluated during final design.

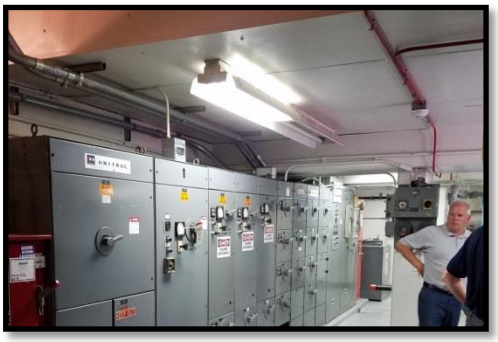

Figure 4-5
Typical Existing T12 Linear Fluorescent Lighting Fixture

The lighting system was evaluated for replacement of the current T12 fixtures by energy-efficient T8 fixtures. This replacement was difficult to justify based solely on actual energy savings, as it would be difficult to recoup the costs of the new fixtures due to the limited use of the facility. However, since the manufacture and import of T12 bulbs has been barred in the United States, the fixture upgrades are recommended to improve reliability and reduce maintenance issues. The recommended replacement for the linear fluorescent fixtures is the Lithonia EJS on a one-to-one basis for several reasons:

- Matches the existing fixtures in terms of looks
- Houses new energy efficient T8 bulbs
- Provides similar lighting levels

In addition to the linear fluorescent fixtures, there are three wall mounted incandescent fixtures that provide lighting to the southwest corner of the reservoir. The recommended replacement for the wall mounted incandescent fixtures is the Lithonia WT8 model for several reasons. This model uses the same T8 bulbs as the EJS, which offers ease of ordering, stocking of spare bulbs, and maintenance. These fixtures also provide significant energy savings versus incandescent fixtures. A DIALux lighting simulation of the Hawthorn Center Reservoir showed that lighting levels will remain adequate if the three incandescent fixtures are replaced with only two of the Lithonia WT8 fixtures.

Additional evaluations at this facility included exterior lighting, emergency lighting, and light switches. The record drawings indicate that the current emergency lighting is past its useful life and should be replaced. For ease of ordering, maintenance, and length of life considerations, the Lithonia ELM2 LED emergency fixture is recommended.

For exterior lighting, the drawings show that there are four Perfeclite MVR wall units located on the walls surrounding the driveway and entryway. Replacement of these units with LED units will provide energy and maintenance cost savings due to the reduced wattage consumption and increased lifespan associated with the LED fixtures. The recommended replacement unit is the

Hubbell LNC2 model. For the light switches, the Hubbell Occupancy Sensor is being recommended for consistency throughout the different water system facilities.

SCADA System

Figure 4-6 shows the existing control panel and SCADA system. The control panel has been upgraded since its original installation in 1973. It includes control switches, level and flow indicators and charts, and an annunciator panel.

Figure 4-6
Existing Hawthorn Center Reservoir Control Panel Exterior

As discussed in Chapter 3, all of the remote water system sites currently include a telephone line telemetry system back to the existing Water System Control Panel located in the operations building of the Vernon Hills WRF. The LCPWD installed a radio telemetry system in the Hawthorn Center Reservoir control panel in 2013. It consists of MDS/GE 900 Mhz spread spectrum radio and an Ethernet switch. The radio is operational and links back to the Vernon Hills WRF. However, there are no Programmable Logic Controllers (PLCs) or Remote Terminal Units (RTUs) connected to the radio. Switching over to the radio system will eliminate the need for the existing telephone line.

It is recommended that a new SCADA PLC panel be installed at the Hawthorn Center Reservoir facility. The panel would include:

- Allen-Bradley CompactLogix L33ER PLC
- (4) 16-point digital input cards
- (4) 4-point analog input cards
- (2) 16-point digital output card.

Figure 4-7
Existing Hawthorn Center Reservoir Control Panel Interior

A 15-inch touchscreen on the front of the panel will display local data display and provide control. An uninterruptible power supply (UPS) will maintain PLC function and data transmission in the event of a power failure. Programming will be conducted to replace the pump exercise function of the existing MicroLogix 1100. The existing Ethernet switch will be utilized to connect the new PLC to the SCADA network to provide control, status monitoring, and alarm monitoring data to the Master SCADA PLC at the Vernon Hills WRF. Additionally, as part of this control system project the existing bubbler system will be replaced with a pressure transducer system connected to the new PLC.

Miscellaneous

The ceiling of the Hawthorn Center Reservoir is reported to contain asbestos. An asbestos investigation was not carried out as part of this electrical systems evaluation. We would recommend an asbestos investigation be undertaken during the design phase for this project to determine the extent of asbestos and the recommended remediation. We have included an allowance for an asbestos investigation and removal in the capital cost estimate. This estimate also includes the cost of refinishing the ceiling. However, the final costs will be estimated after the investigation is completed. Additionally, since the existing MCC is to be removed, the wall behind it will be accessible before the new MCC is installed. It is recommended that this opportunity be taken to repair the leaks in the wall.

CAPITAL COSTS

The estimated capital costs for the recommended electrical, lighting, SCADA system and miscellaneous improvements are shown in Table 4-1. It includes contingencies, engineering and administration.