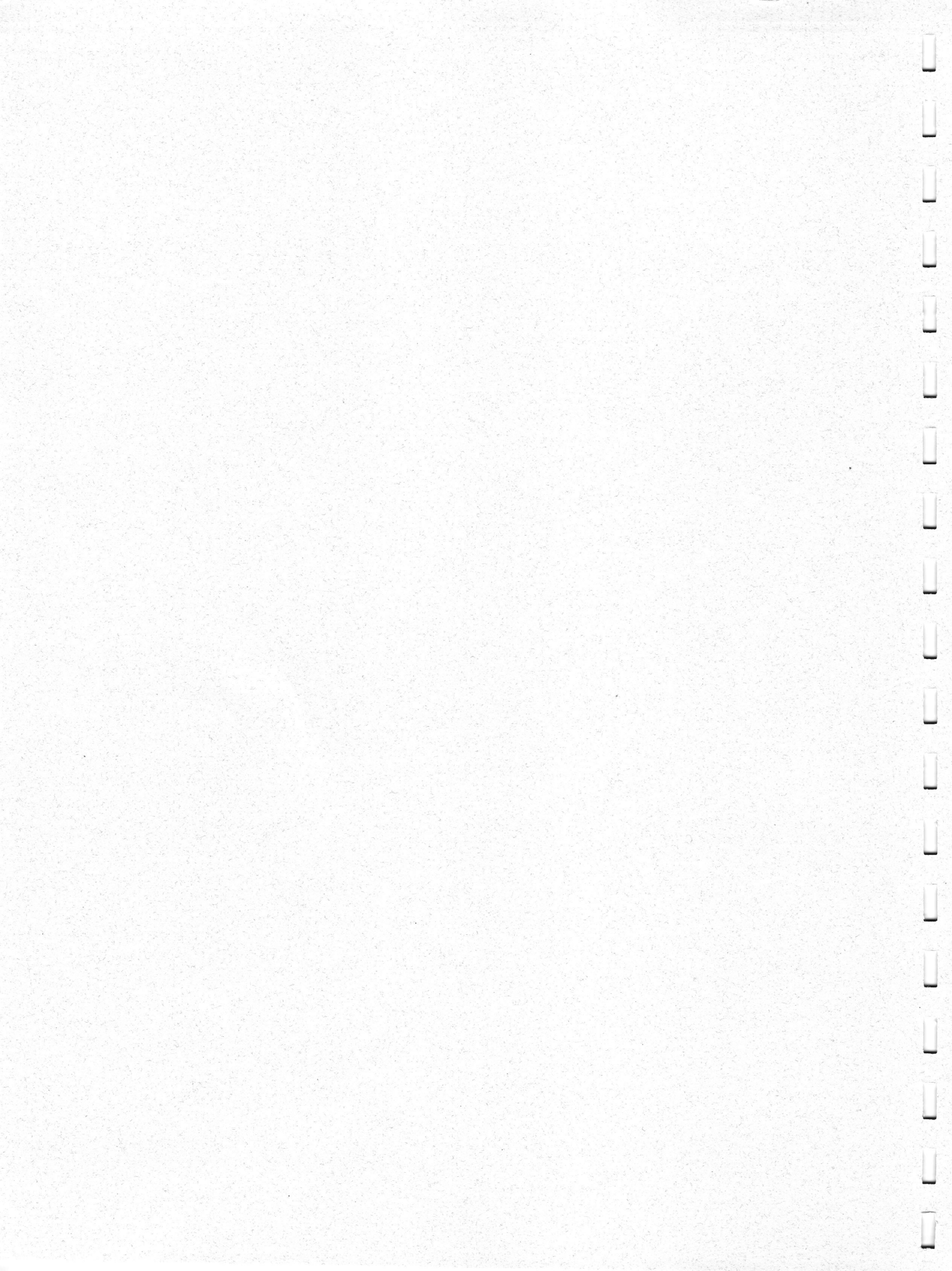


PRELIMINARY ENGINEERING REPORT

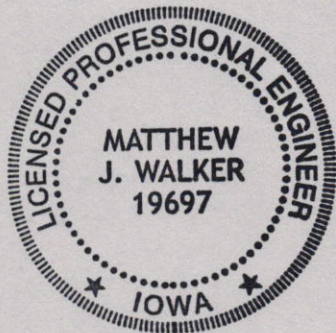
PRELIMINARY ENGINEERING REPORT
FOR
WATER DISTRIBUTION SYSTEM IMPROVEMENTS
HEDRICK, IOWA
2021

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I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

Matthew J. Walker

10/29/2021

Matthew J. Walker, P.E.

Date

License Number: 19697

My license renewal date is December 31, 2021

Pages or sheets covered by this seal:

All

Prepared by
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INTRODUCTION

The City of Hedrick, Iowa is located in southwest Keokuk County. The existing Hedrick water distribution system provides potable water service to residents and businesses located within the city limits. There are approximately 298 water customers. Potable water is supplied to the City of Hedrick by Wapello Rural Water Association, Inc. (WRWA) through a water purchase contract.

The Hedrick water distribution system consists of a valve station, an elevated storage tank, and water main piping and appurtenances. WRWA delivers water to the City's valve station, which was formally the water treatment plant. The water treatment plant was abandoned in approximately 2009 when Hedrick connected to WRWA. The Hedrick elevated storage tank is filled by gravity flow with pressure from WRWA. New PVC water mains were installed in approximately 1985 to improve the water distribution system, however, several sections of cast iron pipe are still in service. The water distribution system also has sections of 1 inch and smaller piping that is used to service multiple houses. Significant water loss has been an issue for the City, but recent leak identification and repair work has substantially reduced the percentage of water loss.

The elevated storage tank is at least 87 years old and the exterior coating has failed and needs removed prior to being painted. Since lead-based paint has been identified in the exterior coating, containment would be required to remove the paint. The elevated storage tank also does not meet all the current standards for safety and sanitation. Improvements to repaint or replace the existing tank in the near future are required.

The City of Hedrick has authorized Garden & Associates, Ltd. to complete an evaluation of alternatives to repaint or replace the existing Hedrick elevated storage tank in order for the City to continue to provide dependable and safe water service for the foreseeable future. Improvements to the water piping system will also be evaluated to provide the City guidance when making future decisions to replace water main piping. The engineering report will be used to support applications for funding requests to USDA – Rural Development (USDA-RD), the Iowa Department of Natural Resources – State Revolving Loan Fund (IDNR-SRF), Community Development Block Grant (CDBG), or other sources identified by the City.

PROJECT PLANNING

Location (1.a)

The City of Hedrick is located in southwest Keokuk County, east of Highway 21 along Highway 149. The existing water tower and valve station are located southwest of West 2nd Street and North Main Street, see Figures 1 and 2 (attached to the report). The water distribution system is primarily located within the corporate limits of Hedrick, Iowa.

Environmental Resources Present (1.b)

No significant environmental impacts are anticipated for the proposed improvements. Proposed water main improvements would be located in existing City right-of-way that has been previously disturbed and the preliminary site for a proposed water tower was previously used as a yard area for a grain elevator. The proposed improvements will be consistent with funding agency environmental policies and regulations; the proposal will also comply with Iowa Department of Natural Resources (IDNR) rules and regulations. The proposed improvements are predicted to have “no effect” on threatened or endangered species, their habitats, or their proposed or designed critical habitats. The proposed improvements are not expected to involve historical or archeological properties; impacts to flood plains and wetlands are also not expected.

Population Trends (1.c)

The population growth, as established during a review of the census data presented below, is a downward trend since 2000, but is estimated to have been stable over approximately the past 10 years. Zero population growth from the 2010 population of 764 is predicted during the 20-year planning period.

<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>
790	847	810	837	764

Community Engagement (1.d)

Hedrick water customers are represented by members of the elected City Council, who conduct public meetings at least monthly at City Hall. The public is invited to address the City Council at each regularly scheduled public meeting. Water utility customers are also able to present comments and questions related to the water distribution system during the scheduled business hours of City Hall.

EXISTING FACILITIES

Location Map (2.a)

Figure 1 shows the location of the existing Hedrick water distribution system, valve station, and elevated storage tank.

History (2.b)

The Hedrick elevated storage tank (also referred to as water tower) and water distribution system was in existence prior to 1935 as indicated by a tag on the water tower foundation with the date of 1934. However, a 1916 Sanborn Map also shows the water tower at its current location and a note indicating construction was in 1915. The existing 50,000 gallon water tower is a riveted tank with a conical roof. The riser pipe is insulated and has a stainless steel shield. The exterior coating on the existing elevated storage tank is less than 5 years old, and the age of the interior coating is not known.

The existing valve station is located in the abandoned water treatment plant. The water treatment plant was constructed in approximately 1978 to provide iron removal, zeolite softening, and disinfection, but was converted to a valve station in approximately 2009 when the City connected to WRWA for their water supply. Water is delivered by gravity from WRWA's water tower to the valve station through approximately 1 mile of 8-inch water main; WRWA's water tower is approximately 10 feet higher than Hedrick's water tower. The water purchase agreement with WRWA is for 144,000 gallons per day at a rate not to exceed 150 gallons per minute; maximum emergency deliver rate is not to exceed 290 gallons per minute. WRWA also allocates 27,900 gallons of storage from their water tower to the City of Hedrick.

Several water main improvement projects have been completed in the past 42 years. In 1979, 2-inch water main was installed to replace 1-inch and smaller water pipes at approximately five locations. In 1985, 6-inch and 8-inch polyvinyl chloride (PVC) water mains and fire hydrants were installed. The City has also completed numerous repairs in the past 3 years to reduce water loss. It is assumed that the majority of the 4-inch and larger water mains not replaced in 1985 are cast iron and water mains 3 inch and smaller are plastic (PVC or polyethylene).

Condition of Existing Facilities (2.c)

As listed in the Tower Visual Inspection Report in Appendix A, the following observations were made regarding the condition of the existing elevated storage tank.

- Significant failure of exterior coating requires full removal and replacement in the near future, several layers of paint are cracking and peeling off; please note that exterior coating contains lead, see Limited Asbestos Survey and Paint Sampling Report in Appendix B
- Structural steel and foundation appear in adequate condition
- Riser pipe insulation, ladder, safety climb, and overflow appear in good condition; please note that riser pipe insulation is a non-asbestos material, see Appendix B
- Balcony top rail is damaged; balcony does not meet OSHA standards and needs replaced
- Roof manway locking hasp is broken and needs repaired
- Tower does not have secondary manway
- Roof vent does not meet current standards
- Tank interior coating is failing and will need to be replaced within approximately 3 years
- Roof eave opening needs sealed or screened

The existing elevated storage tank has a high-water-level (HWL) elevation of 940.5 feet, which provides a minimum static pressure in Hedrick of approximately 50 psi. However, due to 1-inch and smaller water piping that serves multiple buildings, some water mains were hydraulically modeled (see Appendix C – Existing Water System – Operating Pressures) to have normal working pressures below 35 psi; 35 psi minimum is recommended by 10-States Standards section 8.2.1. The majority of potential low pressures are along Highway 149 on the east side of Hedrick. 2-inch and larger water piping was modeled to have normal working pressures above 35 psi. Pressure recordings would be required to verify the results of the hydraulic models.

In addition to the 50,000 gallons of elevated storage within the City of Hedrick, 27,900 gallons of storage capacity is reserved for the City in a WRWA water tower located approximately 1 mile away; 77,900 gallons of storage total. Please note that the storage reserved by WRWA for Hedrick is part of the existing water purchase agreement that expires in 2029. Based on the information tabulated below, approximately 71,400 gallons of storage is currently required to provide average day storage capacity and meet recommended fire flow requirements. Please note that in past years the average day demand was significantly higher due to leaks; the City will need to continue to maintain the distribution system to control unbilled water use.

ADD – Recorded (June 2020 to May 2021, see Table 1), gpd	44,900
ADD – Estimated from Population (100 gpd/person), gpd	76,400 ²
ADD – Estimated from Customers (200gpd/customer), gpd	59,600 ²
ISO Fire Flow (peak day demand & 340 gpm for 2 hours), gallons	71,400
IDNR Fire Flow ¹ (peak day demand & 250 gpm for 2 hours), gallons	60,600

ADD = Average Day Demand
gpd = gallons per day

ISO = Insurance Services Office, Inc.
gpm = gallons per minutes

Notes:

1. Calculation accounts for WRWA water supply having backup emergency power.
2. ADD per person/customer values used as comparison to verify recorded ADD flow.

The existing valve station consists of a buy meter provided by WRWA, a rubber flapper check valve, and an actuated butterfly valve. Water tower level monitoring and telemetry are also located in the valve station. The valve station appears in good condition.

The water distribution system is made up of approximately 15 percent cast iron piping and 20 percent of the piping is 1-inch in diameter or smaller; the majority of the piping is plastic. Detailed water service line information is not available, but it is estimated that 50 percent are copper and 50 percent are plastic. Lead service lines are not common and are replaced when discovered. Around 30 percent of the water meters are located in meter pits and are estimated to have been installed in the past 10 years. Approximately 70 percent of the water meters are located in buildings and are in need of replacement. The City is gradually replacing the old meters and transitioning to using meter pits.

Fire hydrants are generally located within one block (300 to 350 feet) of most buildings, but there are numerous locations, along the perimeter of the City, where hydrants are located further than one block away, see Figure 1. The majority of fire hydrants are on 6-inch and larger piping,