WATER SUPPLY AND STORAGE REPORT

DECEMBER 2022

REPORT

ON

WATER SUPPLY AND STORAGE

URBANA WATER SUPPLY
URBANA, IOWA

DECEMBER 2022

VEENSTRA & KIMM INC.

REPORT

ON

WATER SUPPLY AND STORAGE

URBANA WATER SUPPLY

DECEMBER 2022

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.

Signed: Date:

1/5/2023

Dave R. Schechinger, P.E.
Iowa License No. 16538
My license renewal date is December 31, 2024

Parts covered by this seal:

All

Prepared by
VEENSTRA & KIMM, INC.
Coralville,
Iowa

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CHAPTER 1 – INTRODUCTION

PURPOSE

The City of Urbana, Iowa, owns and operates drinking water supply, treatment, storage, and distribution facilities serving the developed areas of the city. This document is meant to guide the City of Urbana in the development of these water systems to handle future population growth and land development over the next 20 years. The firm capacity of Urbana's water supply and water storage capacity are of particular interest in this report.

DESCRIPTION OF CITY

The City of Urbana is located in Benton County, Iowa, Polk Township, T86N R9W. Located off Interstate 380, the town is northwest of the Cedar Rapids metropolitan area. The current corporate limits include approximately 1.81 square miles of land.

The community consists of residential, commercial, and industrial development. Towne Centre Subdivision and Laird's Subdivision are extensions adjacent to existing residential neighborhoods, and Blue Creek Industrial Park is a large tract of land for commercial and industrial zoning stretching between existing industrial parcels to the north and residential area to the south.

PLANNING AREA

Figure 1-1 presents the planning area for this study. The planning area includes the entire town of Urbana within city limits, the adjacent Iowa Department of Transportation (IDOT) maintenance garage, City of Urbana wastewater treatment campus, and tracts currently being reviewed for inclusion into city limits.

PLANNING PERIOD

The Iowa Department of Natural Resources (IDNR) requires the planning period for proposed drinking water improvements extend for a minimum of 20 years beyond the date when the improvements are scheduled to begin operation. For the purposes of this report, the planning period will be 20 years and extend to the year 2043.

POPULATION

U.S Census Data

U.S. Census data for the City of Urbana is available from 1900 to 2020. Data from 1990 through 2020 is shown in Table 1-1. The average annual growth between 1990 and 2020 was 32.0 people per year, where the most recent population growth from 2010 to 2020 was roughly 6.6%.

Future Population Projection

For the purposes of this report, it is anticipated that the population of Urbana is expected to grow at a rate of 2% annually. Large shifts in population are not anticipated as seen between 1990 and 2010. This future population projection is consistent with the City's growth trends and expected land use and recent building permits and new (residential) water service accounts. The population is expected to be

approximately 1,894 residents in 2030 and 2,451 by the reporting planning period of 2043. Table 1-2 includes population projections over the 20-year planning period.

TABLE 1-1. POPULATION CENSUS DATA

YEAR	POPULATION	GROWTH (capita per year)	% CHANGE	DATA SOURCE
1990	595	2.1	3.7%	Decennial Census
2000	1019	42.4	71.3%	Decennial Census
2010	1458	43.9	43.1%	Decennial Census
2020	1554	9.6	6.6%	Decennial Census

TABLE 1-2. POPULATION GROWTH PROJECTIONS, 2% ANNUAL GROWTH

YEAR	POPULATION	GROWTH (capita per year)	% CHANGE	DATA SOURCE
2020	1554	9.6	2.0%	Decennial Census
2025	1716	34	2.0%	Predicted Growth
2030	1894	37	2.0%	Predicted Growth
2035	2091	41	2.0%	Predicted Growth
2040	2309	45	2.0%	Predicted Growth
2043	2451	48	2.0%	Predicted Growth

COST ESTIMATES AND PRESENT WORTH ANALYSES

All costs included herein represent present day costs. No provisions have been made for inflation or deflation except for the annual operation and maintenance costs.

Cost analyses include present worth computations and are used to compare alternatives to determine the most cost-effective alternatives over the planning period. The present worth computations are based on a 20-year planning period and an annual interest rate of 5%.

Present worth takes into account project costs, annual operation and maintenance costs, and equipment replacement costs for the planning period. Present worth may be thought of as a sum, which if invested now at a given rate of interest, would provide the funds required to make all necessary expenditures during the planning period of the project. The alternative with the least net present worth is the most cost-effective in monetary terms.

AERIAL: 2019 NAIP

PRINTED: 2023-01-04

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CITY OF URBANA
WATER STUDY PROJECT AREA

FIGURE 1-1

CHAPTER 2 - GENERAL

SCOPE

This report presents the results of the engineering studies and analyses as to the adequacy of the existing Urbana Water Supply's water supply and treatment facilities to meet the present and future water demands of residential, commercial, industrial, and governmental users. The major tasks performed are the following:

1. An analysis of past water use trends, present usage, and future water use projections.

2. An evaluation of pertinent requirements of the Safe Drinking Water Act (SDWA) and its amendments, including maximum contaminant levels (MCLs) which are applicable now and a schedule of those to be regulated in the future.

3. A determination of the adequacy of the existing water system to meet present and future demands, specifically storage and fire flow needs.

ABBREVIATIONS

Throughout this report, parameters such as water pumpage, water use, and plant capacities are presented in various units. For the purpose of clarification, the following definitions are established:

1. Million gallons per year (mgy): This term represents the total annual amount of water being discussed for any particular purpose. In decimal form, 54.8 mgy is equal to 54,800,000 gallons per year.

2. Million gallons per day (mgd): This term represents the daily amount of water being discussed for any particular purpose. In decimal form, 0.15 mgd is equal to 150,000 gallons per day.

3. Gallons per minute (gpm): This term is used to describe well and system capacity. Since there are 1,440 minutes in a day, a conversion from gpm to mgd is accomplished by multiplying gpm by 1,440 (900 gpm x 1,440 = 1.296 mgd).

4. Gallons per capita per day (gpcd): This term is calculated by dividing the total annual usage, such as 54,750,000 gallons per year, by 365 to determine the average daily flow. The resulting flow is then divided by the population to determine use on a per capita basis. The annual usage is based on water sold rather than total production. Individual meter readings are the only source of this information.

5. Milligrams per liter (mg/L): Milligrams per liter can be equivalent to parts per million based on a weight/weight ratio when the assumption is made that 1 liter of water weights 1 kilogram. If the concentration is greater than 10,000 mg/L; the result is more commonly expressed in percent, 1% being equivalent to 10,000 mg/L.

6. Micrograms per liter (µg/L): Micrograms per liter is equivalent to parts per billion based on a weight/weight ratio. For comparison, 1,000 µg/L is equivalent to 1 mg/L.

7. Grains per gallon (gpg): This term is used to indicate the total hardness of water. Hardness is also expressed in parts per million (ppm) or milligrams per liter (mg/L). To convert from gpg to ppm (or mg/L), multiply gpg by 17.1.

CHAPTER 3 - WATER USE AND STORAGE

GENERAL

This chapter reviews past water usage in order to determine historical trends that can be applied in the preparation of future projections. In the following paragraphs, water pumped versus water sold, non-revenue water, and water use projections will be discussed along with fire flow needs.

HISTORICAL WATER USE

Table 3-1 presents the past water use from 2017 through 2021. Also present is the average day and peak day usage with their relationship expressed as a peaking factor, the per capita consumption on an average day basis and a comparison of water pumped versus water sold.

TABLE 3-1 – HISTORICAL WATER USE

Year	Raw Water Pumped (mgy)	Water Use Billed (mgy)	Raw Water Pumped Average (mgd)	Raw Water Pumped Peak (mgd)	Peaking Factor	Estimated Population	Consumption Average (gpcd)
2017	45.34	26.76	0.12	0.27	2.17	1524	81.45
2018	48.27	27.16	0.13	0.29	2.22	1534	86.16
2019	49.98	27.51	0.14	0.22	1.63	1544	88.66
2020	53.64	28.90	0.15	0.27	1.84	1554	94.31
2021	52.98	28.65	0.15	0.28	1.90	1564	92.92
Average	50.04	27.80	0.14	0.27	1.95		88.70
Maximum	53.64	28.90	0.15	0.29	2.22		94.31

In addition to average daily and annual water use, peak pumping days were reviewed over the same 5-year period. Figure 3-1 contains a graphical representation of daily total pumpage for the system (sum of wells 2, 3, and 5), and the total water pumped for the highest six (6) pumping days are highlighted in Table 3-2. No fires or main breaks were recorded on peak days listed in Table 3-2 according to city records.

TABLE 3-2 – HISTORICAL PEAK DAILY WATER PUMPED, 2017-2021

Date	Pumpage Total (MG)
7/20/2019	1.41
3/12/2020	1.23
2/20/2020	1.01
10/16/2018	0.98
12/7/2019	0.92
11/30/2017	0.43

HISTORICAL WATER LOSS

For the period evaluated, the percent of unaccounted for water has averaged approximately 35% as shown in Table 3-3. A well-maintained distribution system of this size and age could expect approximately 15% unaccounted for water. Urbana's unaccounted for water is above this commonly accepted standard. Unsold or unaccounted for water can be attributed to unmetered water use (fire hydrant flushing, water plant use, and other), fires, leakage, and inaccurate meters. Known non-revenue water use for the Urbana system include non-billed municipal building use (buildings are metered but not read as part of regular metering reading program), bi-annual fire hydrant maintenance flushing, use for running Well 3 pump, and bulk water sales billed separately from utility billing program. Well meters are considered accurate, having been rebuilt and replaced within the last five years and align with reading of other system meters.

TABLE 3-3 – HISTORICAL WATER LOSS

Year	Raw Water Pumped (mgy)	Water Use Billed (mgy)	Bulk Water Sold* (mgy)	Unsold Water (%)	Unbilled Municipal Facilities ** (mgy)	Fire Hydrant Flushing *** (mgy)	Well 3 Pre-lube for Turbine Pump**** (mgy)	Water Loss (mgy)	Water Loss (%)
2017	**45.34**	**26.76**	**0.015**	**41%**	**0.90**	**1.26**	**2.63**	**13.78**	**30%**
2018	48.27	27.16	0.015	44%	0.90	1.26	2.63	16.30	34%
2019	**49.98**	**27.51**	**0.015**	**45%**	**0.90**	**1.26**	**2.63**	**17.67**	**35%**
2020	53.64	28.90	0.015	46%	0.90	1.26	2.63	19.94	37%
2021	**52.98**	**28.65**	**0.015**	**46%**	**0.90**	**1.26**	**2.63**	**19.52**	**37%**
Average	**50.04**	**27.80**	**0.015**	**44%**	**0.90**	**1.26**	**2.63**	**17.44**	**35%**
Maximum	**53.64**	**28.90**	**0.015**	**46%**	**0.90**	**1.26**	**2.63**	**19.94**	**37%**

*Based on average of 15,000 gallons sold per year based on City of Urbana estimates.

**Per Urbana staff, the average water usage for all metered-but-unbilled municipal facilities is 900,000 gallons/year.

*** Based on 126 (CAD count) fire hydrants flushed twice a year (April and October), an average of 5 minutes per flush at 1000 gpm.

**** Based on an estimated 5 gallons per minute of constant flow for a 1/2" line.

As Table 3-3 shows, although overall water loss is still relatively high, accounting for known non-revenue water use by the system reduces water loss calculations by 10% to 11% in any given year. Two possible points for unbilled water loss identified by the system operators are old water meters and water theft. There is currently a project proposed to replace all water meters in the downtown area as they are at the high-end of design life of 15 to 20 years.

PROJECTED WATER USE

Table 3-1 indicates the recent per capita average day water consumption has fluctuated between 82 to 94 gallons per day. For planning purposes, it is recommended that an average day per capita consumption of 100 gpcd be used for a growing community. The slightly higher projected per capita daily consumption will account for capacity for commercial/industrial type development. Therefore, future average day demand for the City of Urbana will be based on 100 gpcd.

The peaking factor relating average to peak day demand ranges from 1.63 to 2.22 as seen in Table 3-1. A peaking factor of 2.0 will be used in future projections to establish a relationship between average day and peak day water use based on the recent historical average. Future peak day water use projections will be based on a peaking factor of 2.0 resulting in peak usage of 200 gpcd. Table 3-4 presents the estimated future water demand for Urbana based on 2% annual increase in population.

TABLE 3-4 - FUTURE WATER USE

Year	Population	Average Daily Demand (mgd)	Peak Daily Demand (mgd)
2020	1,554	0.147	0.270
2025	1,716	0.163	0.325
2030	1,894	0.181	0.361
2035	2,091	0.200	0.401
2040	2,309	0.222	0.444
2043	2,451	0.236	0.472

WATER STORAGE

Urbana Water Supply has two elevated storage tanks that supply pressure and storage for the water distribution system. Tank sizes, types, and locations are listed in Table 3-5.

TABLE 3-5 - EXISTING WATER STORAGE

Tank ID	Location	Type	Capacity (MG)	Effective Capacity (MG)
South	W Main Street (School)	Elevated	0.100	0.078
North	W Main Street	Elevated	0.100	0.100
		Total Storage	**0.200**	**0.178**

Effective capacity in the elevated tanks is determined by maintaining a water elevation that provides a minimum of 20 psi at all points in the distribution system. Effective capacity for the South tower is based on information that the top four (4) feet of tank cannot be filled when North tower is also online. Available drawings show the South tower has a 30-foot diameter, which leaves the volume left unfilled calculated to be approximately 2,828 cubic feet, or 0.02115 MG.

The Iowa Department of Natural Resources (IDNR) follows GLUMRB Recommended Standards for Water Works (AKA the Ten States Standards) criteria for determining the minimum storage capacity that a public water system must provide. The minimum storage necessary for the Urbana Water Department is the larger of the following criteria:

1. Storage must equal the design year average day demand (0.236 million gallons).

2. Storage should be sized according to fire protection needs where the system provides fire protection.

SYSTEM FIRE FLOW CAPACITY

Urbana has been actively pursuing the development of properties into larger commercial developments that can require a minimum fire flow of up to 3,500 gpm for a three (3) hour duration for fire protection based on International Standards Organization (ISO). Table 3-5 outlines Needed Fire Flow (NFF) as determined through the ISO Fire Suppression Rating Schedule (2012). Iowa Statewide Urban Design and Specifications (SUDAS) Design Manual, Section 4 Water Mains, refers to ISO guidance. NFFs are based on structure type, their main use, materials used in construction, and distances between neighboring buildings. The length of time the NFF is needed is also outlined in the ISO Schedule. Table 3-6 does not include various items that may impact NFF decisions for individual structures such as installation of sprinkler systems or use of wood shingles on the exterior of a building. Calculating NFF for individual structures is determined through use of ISO Guide for Determination of Needed Fire Flow (2014). General water system design guidelines based on general structures and setbacks zoned for an area are what are indicated in Table 3-6. Maximum NFF is set at 3,500 gpm for 3 hours. Any fire flows in a system must not decrease system pressure to below 20 psi at any time.

TABLE 3-6 – ISO Needed Fire Flow (NFF)

Structure Type	Structure Subclass	Distance Between Structures (ft)	Needed Fire Flow (gpm)	Fire Flow Event Length (hr)
Residential	1-2 Family Dwelling not Exceeding 2 Stories (≤ 4800 sq. ft.)	Over 100	500	1
		31 to 100	750	1
		11 to 30	1000	1
		10 or Less	1500	1
	1-2 Family Dwelling not Exceeding 2 Stories (> 4800 sq. ft.)	-	2500	2
		-	3000	3
		-	3500	3
Commercial	NA	-	2500	2
		-	3000	3
		-	3500	3

A basic water model was run for the Urbana drinking water system to incorporate two water main loop connections currently being constructed to the Heartland Nature Estates and Becca Industrial Park subdivisions on the west side of the system. Model outputs for estimated fire flows for the system are shown in Figure 3-2. After reviewing model estimates over the system, selection of 2,000 gpm for 2 hours as a base NFF for the system in commercial areas was selected. Additional fire flow needs to current and future commercial construction would need to be met by individual on-site fire suppression systems.

Based on a fire flow rate of 2,000 gpm for 2 hours, the storage requirement for fire protection for the City is 0.24 MG. The fire demand will occur concurrent with consumption in the system. If the fire

demand is added directly to the average day demand, the total demand for the design year average day would be 0.476 MG. This storage demand could be offset by individual fire suppression systems, as already installed by Clickstop, Inc., which has its own fire suppression and fire pump on site. Table 3-7 highlights projected water use calculations and emergency fire needs versus existing effective storage.

TABLE 3-7 – PROJECTED WATER NEEDS VERSUS EXISTING WATER STORAGE

Fire Flow (gpm)	Water Flowed in 2 hrs (MG)	Design Average Daily Well Pumpage (MG) 2% Annual Growth	Potential Emergency Fire Event Use (MG)	Current Effective Water System Storage (MG)	Difference in Emergency Daily Use and Storage (MG)
500	0.060	0.236	0.296	0.178	-0.118
1000	0.120	0.236	0.356	0.178	-0.178
1500	0.180	0.236	0.416	0.178	-0.238
2000	0.240	0.236	0.476	0.178	-0.298
2500	0.300	0.236	0.536	0.178	-0.358
3000	0.360	0.236	0.596	0.178	-0.418

The existing effective capacity for the Urbana Water Supply at the current average day demand of 0.14 million gallons meets requirements set forth by the IDNR but does not meet the storage requirements to meet the fire flow requirement when added to the average day demand.

In addition to the capacity of the system to sustain require fire flows, the IDNR has begun to require systems to plan replacement of all 4-inch diameter water main and smaller from distribution system within the next 20 years. These upgrades will result in all fire hydrants being fed by the minimum recommended (Ten State Standards) water main diameter of 6 inches. Figure 3-3 shows the locations of water main 4-inch and smaller in the Urbana water system. There is approximately 5,280 feet of 4-inch water main active in the distribution system.

ELEVATED WATER STORAGE INSPECTIONS

Both elevated water towers were inspected in July 2022. Each was taken offline from the water system, drained, and visually inspected following current industry standards. Separate detailed tank inspection reports were completed for each tower and the general findings and recommendations will be highlighted in this report.

The north tower was found in overall good condition, with minor external spot repair and safety additions recommended. Based on current conditions, inspections every three to five years was suggested.

The south tower was also found in overall good condition, with additional minor corrections and repairs to the exterior of the tower. Future inspections for this tower were suggested to occur every three to five years for interior surfaces and every two to four years for the exterior.

Figure 3-1: Urbana Water Supply Daily Pumpage Total, 2017-2021

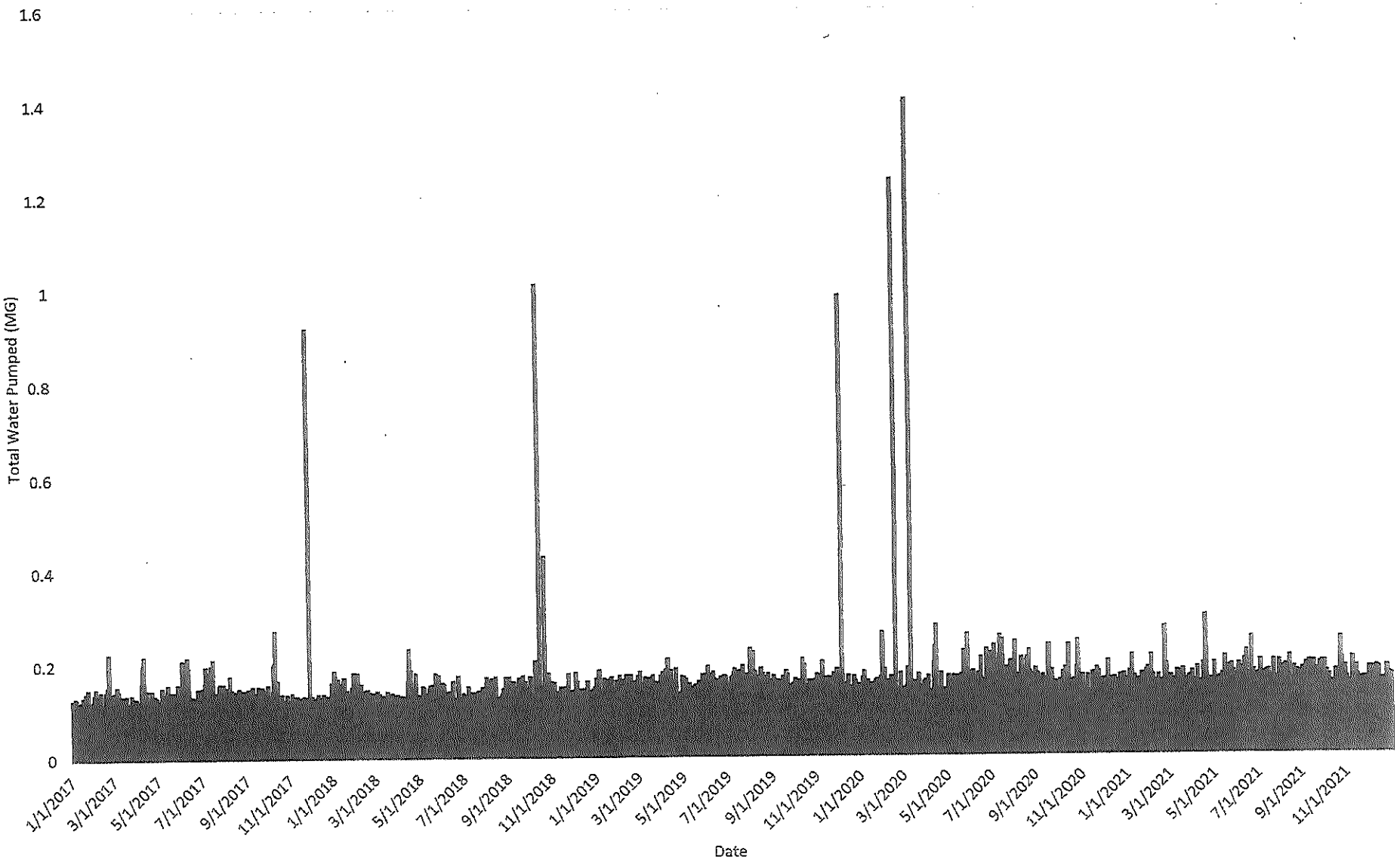

FIGURE 3-2

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		CHECKED	DRS
		APPROVED	BBW
		DATE	6/6/2022
		ISSUED FOR	REVIEW

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WATER DISTRIBUTION SYSTEM
URBANA, IOWA

WEST 8-INCH LOOP
EXISTING SYSTEM
AVG. DAY FIRE FLOW

DWG. NO.
ADFF1

PROJECT 6900

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		DATE	9/28/2023
		ISSUED FOR	REVIEW

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WATER DISTRIBUTION SYSTEM
URBANA, IOWA

WEST 8-INCH LOOP
EXISTING SYSTEM
AVG. DAY FIRE FLOW

DWG. NO.
ADFF2
PROJECT 9999

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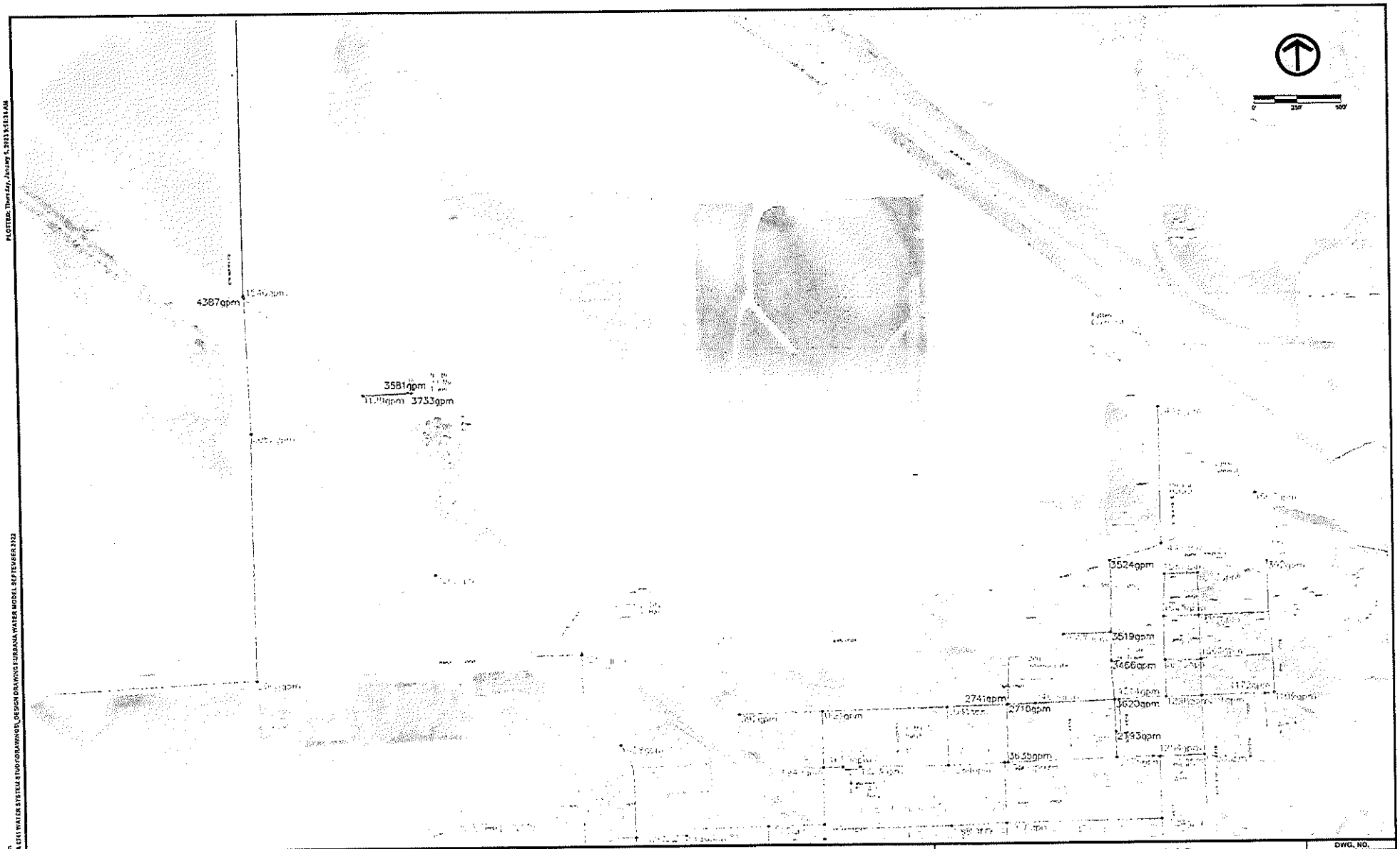

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APPROVED	RKM
DATE	6/29/2022
ISSUED FOR	REVIEW

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WATER DISTRIBUTION SYSTEM
URBANA, IOWA

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WEST 8-INCH LOOP
EXISTING SYSTEM
AVG. DAY FIRE FLOW

DWG. NO.
ADFF3
PROJECT

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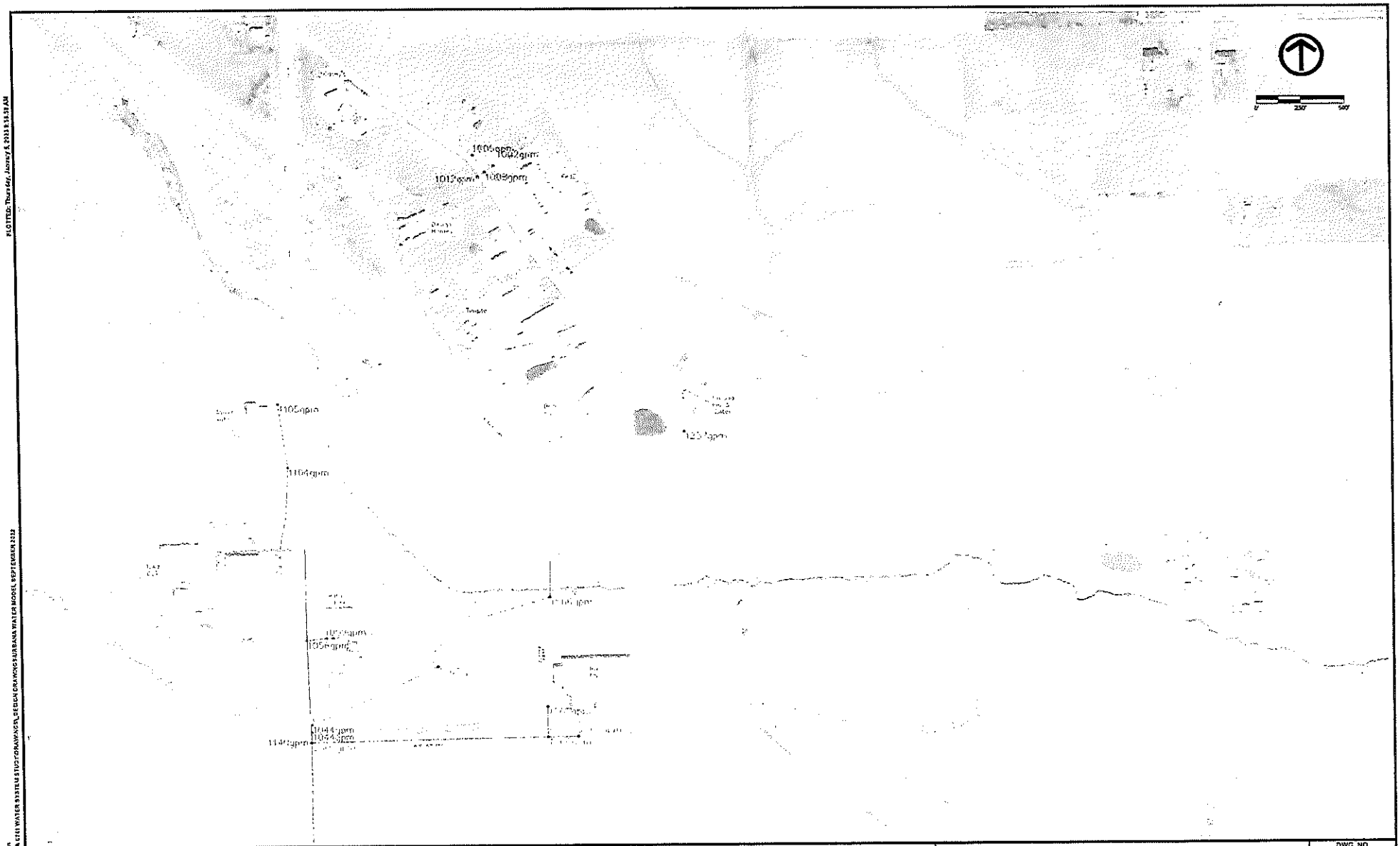

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		APPROVED	####
		DATE	9/28/2023
		ISSUED FOR	REVIEW

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WATER DISTRIBUTION SYSTEM
URBANA, IOWA

WEST 8-INCH LOOP
EXISTING SYSTEM
AVG. DAY FIRE FLOW

DWG. NO.
ADFF4
PROJECT ####

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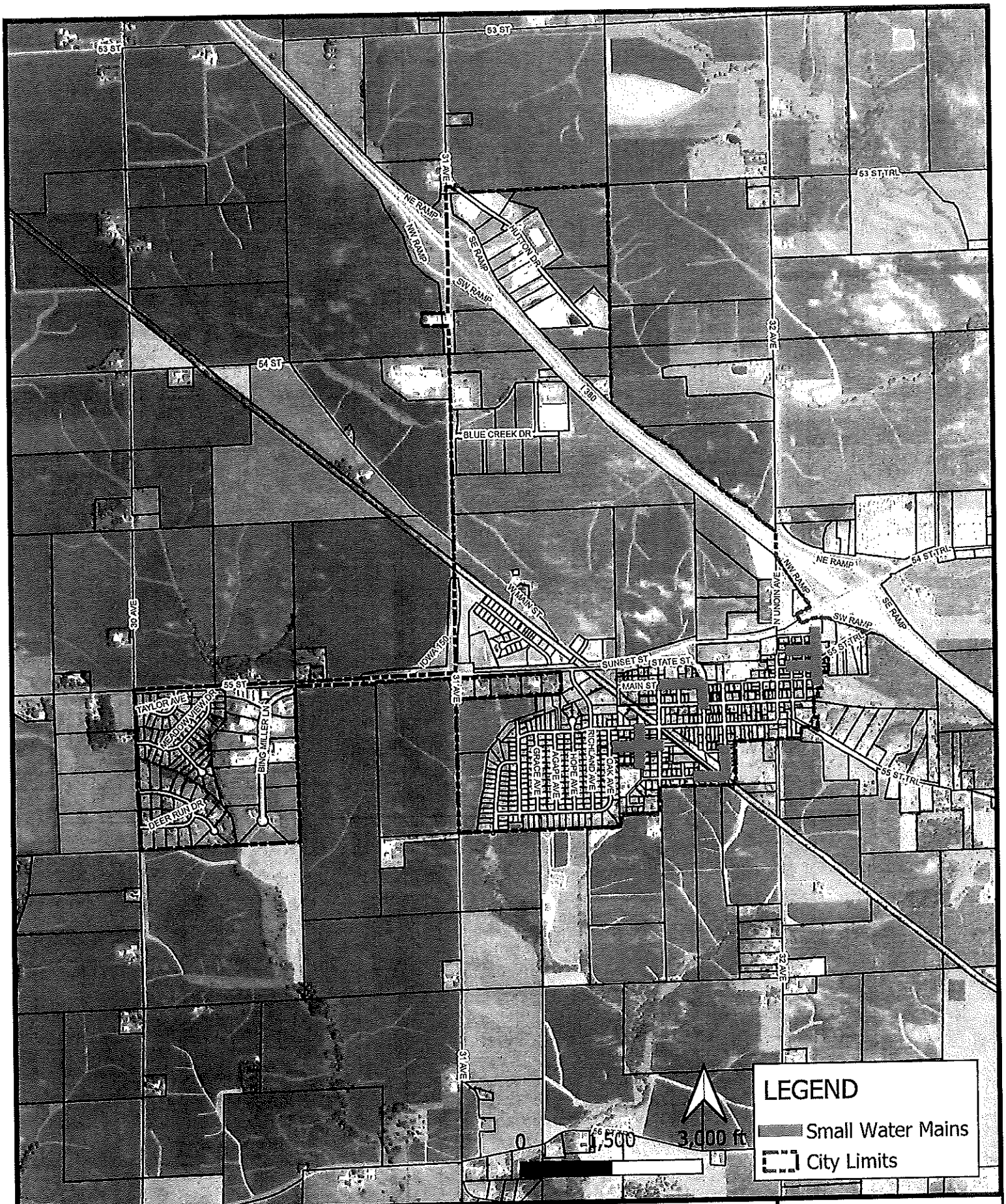

AERIAL: 2019 NAIP

PRINTED: 2022-10-07

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CITY OF URBANA
SMALL WATER MAIN LOCATIONS

FIGURE 3-3

CHAPTER 4 - WATER SUPPLY

WATER SUPPLY

The City currently operates three wells that withdraw water from the Silurian-Devonian aquifer. The combined pumping capacity of available wells is approximately 430 gpm (0.619 MGD). The firm pumping capacity, which assumes the highest capacity well (Well 5) is out of service, is 260 gpm (0.374 MGD). The characteristics for each City well are shown in Table 4-1.

TABLE 4-1 - EXISTING CITY WATER SUPPLY

Well No.	Source	Depth (feet)	Year Drilled	Current Capacity (gpm)	Current Capacity (mgd)	Standby Power
2	**Silurian-Devonian**	**560**	**1959**	**150**	**0.216**	**Yes**
3	Silurian-Devonian	560	1980	110	0.158	Yes
5	**Silurian-Devonian**	**400**	**1995**	**170**	**0.245**	**Yes**
			Total Capacity	**430 gpm**	**0.619**	
			Firm Capacity	**260 gpm**	**0.374**	

IDNR requires that the firm source capacity shall equal or exceed the design peak day demand with the largest well out of service. From Table 3-3 in Chapter 3, the design peak day demand was calculated at 0.472 MGD. The firm pumping capacity of the wells is greater than the existing peak day demand of 0.270 MGD and less than the design year peak day demand of 0.472 MGD. Urbana Water Supply's source of supply does not meet the IDNR firm capacity requirements for the planning period. These calculations assume that the pumping rates presented are accurate. Urbana also experiences gradually reduced capacity of all three wells over time. Table 4-2 highlights potential reductions of 5 gpm/year for Wells 2 and 3 and the impacts on overall total and firm capacities of the system in five years (year 2027).

TABLE 4-2 – PROJECTED SHORT-TERM CITY WATER SUPPLY

Well No.	Current Capacity (gpm)	Reduction gpm/yr	Calendar Year 2023	2024	2025	2026	2027
2	150	5	145	140	135	130	125
3	110	5	105	100	95	90	85
Firm Capacity (mgd)	**0.374**		**0.360**	**0.346**	**0.331**	**0.317**	**0.302**
Projected Peak Demand (mgd)	0.306		0.312	0.319	0.325	0.332	0.339

Based on the assumed 2% annual population growth, the extrapolated Urbana population would be approximately 1,716 people with a peak water use demand of 0.325 MGD in 2025. The existing water system would meet 2025 water firm capacity requirements of 0.331 MDG, but at a much narrower margin than currently. Extrapolation of the 5 gpm/year reduction in well capacity results in flipping to

not meeting firm capacity requirements by the next year, 2026. These projections assume no well improvements are completed during this time.

Current production of Well 3 is considered at the upper limit for the well according to televising results from Northway Well and Pump Company out of Marion, Iowa. Additional production after any future well improvements are considered unlikely for this well.

STANDBY POWER

All three system well houses have a dedicated, standalone, standby generator installed for emergency use. General information available for each generator is shown in Table 4-3.

TABLE 4-3 – SYSTEM STANDBY GENERATOR INFORMATION

Location	Distributor Name	Engine Make	Fuel	Generator	Cooling	kW	Phase
Well 2	**Kohler**	-	-	-	-	55	3
Well 3	EPS	Deere	Diesel	Marathon	Radiator	40	3
Well 5	**Ace Electric Inc**	**Deere**	**Diesel**	**Marathon**	**Liquid**	50	3

WATER QUALITY

Water pumped from the three current active wells is of good quality and is minimally treated to meet water quality standards for drinking water. Since 2019, concern for ammonia levels exceeding 1.0 mg/L was noted by the IDNR and potential for nitrification occurring in the system (2019 Urbana Water Supply Water Supply Sanitary Survey, IDNR) and its effect on system chlorine residuals. Issues with fluctuating chlorine residuals were noted by the system staff in September 2021 and additional water quality testing was completed by a third party, Water System Solutions of Franklin, Indiana. Water quality results for all water wells is presented in Table 4-4.

The Urbana Water Supply currently disinfects through chloraminating and has no disinfection byproduct issues.

UPDATED WATER REGULATIONS

Three specific water quality concerns have been highlighted within the previous year by the IDNR: manganese concentrations, lead concentrations, and identification and concentration of PFAS (per- and polyfluoroalkyl substances) in water samples.

Based on previous water sampling, well water for the Urbana system is well under the Secondary Maximum Contaminant Level (MCL) and Action Level (AL) set by the Safe Drinking Water Act for manganese. Extended exposure to manganese concentrations above these levels is considered especially concerning for the mental and behavioral development of infants and young children.

Under the Lead and Copper Rule Revision (LCRR), all water systems shall develop and maintain a service

line inventory for their system. This is in relation to developing future plans to remove all lead and partial lead water services from all drinking water systems. The Urbana Water Supply system met LCRR testing requirements when last tested in 2021 according to the 2021 Water Quality Report (Consumer Confidence Report). Most service lines are understood to be copper, but all systems must still complete and maintain this inventory.

The PFAS family of substances are a group of man-made chemicals created to manufacture "non-stick" coatings, degreasers, fire suppressants, and other industrial products. Included in this family of chemicals are PFOS and PFOA which have been found to cause various health issues and have been slated to received MCL, or similar, concentration limits in drinking water standards. Currently, a health advisory level of 70 nanograms per liter of PFOS or PFOA has been issued by the USEPA. At this time, testing of raw water to see if these chemicals exist in the system's production water is recommended.

TABLE 4-4 – WELL SUPPLY WATER QUALITY RESULTS

Constituent	Well 2		Well 3		Well 5		Maximum Contaminant Level (MCL)*	Units
	Nov. 2011	Sept. 2021	Nov. 2011	Sept. 2021	Nov. 2012	Sept. 2021		
Alkalinity, as CaCo3	240	-	238	-	267	-	-	mg/L
Alkalinity, Phenolphthalein	240	-	238	-	<10	-	-	mg/L
Ammonia, as N	1.2	1.07	1.18	0.76	0.799	0.87	30[TT]	mg/L
Silica	7.06	-	6.57	-	7.8	-	-	mg/L
Chloride	3.2	-	3.2	-	3.0	-	250[S]	mg/L
Fluoride	0.8	-	1.0	-	0.7	-	2.0[S], 4.0[P]	mg/L
Nitrate, as N	<0.1	-	<0.1	-	<0.1	-	10[P]	mg/L
Orthophosphate as P	<0.10	-	<0.10	-	<0.10	-	-	mg/L
Sulfate	32.6	-	37.0	-	31.4	-	250[S]	mg/L
Aluminum, Total	<0.100	-	<0.100	-	<0.100	-	-	mg/L
Calcium	49.3	-	49.2	-	50.5	-	-	mg/L
Iron	<0.100	0.02	0.158	0.33	0.257	0.17	0.3[S]	mg/L
Hardness, Total as CaCO2	231	-	231	-	232	-	-	mg/L
Potassium	4.4	-	4.5	-	4.2	-	-	mg/L
Magnesium	26.1	-	26.4	-	25.6	-	-	mg/L
Manganese	<0.005	0.015	0.005	0.030	0.007	0.021	0.3[AL], 0.05[S]	mg/L
Sodium	30.3	-	27.3	-	23.2	-	30-60[TT]	mg/L
Zinc	<0.020	-	<0.020	-	<0.010	-	5[S]	mg/L

P = Primary MCL
S = Secondary MCL
TT = Taste Threshold
AL = Action Level

CHAPTER 5 - WATER FACILITIES EVALUATION

GENERAL

This section accumulates the information presented in the previous four chapters and guidance delivered through Urbana City Council and staff input and IDNR 2022 Sanitary Survey for the system. Initial review of the drinking water system and calculations included in draft Chapters 1 through 4 were presented to the City Council at the October 12, 2022, city council meeting.

EVALUATION REVIEW

Selected calculations reviewed through previous chapter of this report have been condensed and can be found in Table 5-1. As discussed in Chapter 3, the Urbana Water Supply currently has effective storage capacity of 0.178 MG. This existing effective storage does not meet the design year average day requirements set forth by the IDNR (0.236 MG) nor does it meet the current or future fire flow requirement when added to the average day demand (0.490 MG and 0.712 MG, respectively). Field reviews of both existing elevated storage tanks were completed in 2022, with no major safety concerns noted. Separate reports were completed for these field reviews.

TABLE 5-1 – REPORT CALCULATION REVIEW

Description	Historical Information, 2017-2021	Report Location	Design Year Calculations, 2043	Report Location
Population	1,554	Table 1-1	2,451	Table 1-2
Average Day Water Use	0.14 MGD	Table 3-1	0.236 MGD	Table 3-4
Peaking Factor	1.95	Table 3-1	2.0	Chapter 3
Peak Day Water Use	0.29 MGD	Table 3-2	0.472 MGD	Table 3-4
Water Storage Capacity	0.178 MG	Table 3-5	-	-
Water Storage Needs with Fire Event	0.490 MG	Chapter 3	0.712 MG	Chapter 3
Total Water Supply Capacity	0.619 MGD	Table 4-1	-	-
Firm Water Supply Capacity	0.374 MGD	Table 4-1	-	-

As reviewed in Chapter 4, IDNR requirements include design requirements that the firm source capacity shall equal or exceed the design peak day demand. Current water supply firm capacity is not projected to meet future peak day water demands around or after 2027 (0.339 MGD) with anticipated well capacity loss of 5 gpm/year (Table 4-2).

In accordance with Recommended Drinking Water Standards (AKA Ten State Standards) requirements, no serviceable fire hydrants can be connected to a line smaller than 6-inches in diameter. Other community water supplies have been requested by the IDNR during their sanitary survey reviews that a plan to identify and remove all water main smaller than 6-inch from their systems. Urbana currently has

approximately one mile (5,280 feet) of water main smaller than 6-inch in its system according to mapping records.

In addition to storage and supply considerations, water quality testing and IDNR system comments were also reviewed. Current water quality test results meet all current requirements. IDNR has noted a general concern that ammonia concentrations are close to 1.0 mg/L and the potential disinfection byproducts generation through chlorination disinfection, and review and adjustments have been made by the Urbana Water Supply to ensure this potential issue is addressed.

Over the last few years, particular attention has been given to lead, manganese, and PFAS in water supplies. Under the Lead and Copper Rule Revision (LCRR), all water systems must complete and maintain an inventory of all water service lines connected to their system not later than October 16, 2024. This requirement is to determine which specific services include lead or certain galvanized iron lines in the system with the anticipation that all of these lines will be removed from service in the future, as yet to be set by the USEPA after review of the Lead and Copper Rule Improvements (LCRI).

Current sampling of the Urbana water supply sources show manganese concentrations under the maximum contaminant levels. The regulation and sampling for PFAS in water systems is relatively new and quickly evolving. Sources considered to be potentially susceptible to PFAS contamination are located near facilities that produced or used PFAS products, surface waters, and shallow or non-confined wells. Water PFAS have not been sampled for in the Urbana system.

In the 2022 sanitary survey conducted by the IDNR on the Urbana water system, specific items in the system were noted for correction or improvements to meet regulatory requirements. These items include ensuring minimum separation distance between diesel generators and well heads (50 feet), repair malfunctioning airline at Well 3, protect Well 5 from physical damage, review water rates, and complete a more comprehensive water audit to more accurately identify where non-revenue water is being "lost."

RECOMMENDATION EVALUATIONS

Water Storage

To meet current and future drinking water and emergency fire flow needs, additional storage is recommended for the Urbana system. Elevated storage and ground storage reservoirs (GSR) are two options for increasing system storage. Advantages and disadvantages of both storage types are highlighted in Table 5-2.

As additional storage would initially be needed to meet system fire flow capacity, and the City of Urbana is actively pursuing expansion of its area zoned for commercial uses, additional storage through the installation of a GSR and accompanying booster station would allow for a more versatile water storage system for future growth. Part of this versatility is through the ability to install a larger capacity storage system above what is currently needed at relatively low cost per gallon and increase storage used as system needs require. This will be further detailed under the cost estimate section.

To minimize project costs and maximize fire flow availability, new water storage would ideally be constructed connected to an existing water transmission line and near commercial/industrial zoned areas.

TABLE 5-2 – WATER STORAGE OPTION EVALUATIONS

Storage Type	Advantages	Disadvantages
Elevated Storage Tank	• No separate booster station required • Not reliant on electrical service or controls • Limited operational effort • Operators knowledgeable of operating elevated towers	• Expensive maintenance • Water quality concerns during low use periods • Drawdown impacts system pressure • Potential for freezing during cold weather • Long lead time on materials for construction • Locations limited based on elevations
Ground Storage Reservoir	• Lower maintenance compared to elevated tower • Supplements peak demand and fire flow • Draw down without impacting system pressure • Short construction period compared to tower • Effective storage is very close to tank volume • Not tied to location based on elevations like elevated tanks	• Requires booster station/electrical service • Fire flow rate restricted to pumping capacity • Pumps will require maintenance over time • Relies on controls to operate system • Requires standby power for firm capacity

Water Supply

Currently, existing total and firm water supply capacities meet average and peak day demands. In approximately five years, firm capacity will no longer meet peak day demand needs based on projections and review of historical well capacity deterioration.

Review of the three existing source wells and potential projects to improve capacities was reviewed with Northway Well and Pump Company of Marion, Iowa. In their opinion, Well 2 may be able to reach near original 230 gpm at time of drilling if the well was acidized and pump rebuilt. Any work to Well 3 was not considered beneficial as gaining additional capacity was not considered feasible at this well. Justification for improving Well 5 is hindered by its location next to a business where the well cannot be made larger (greater pumping capacity), additional infrastructure cannot be added to secure the well, and its proximity to a closed well on IDOT property that is known to be contaminated.

It is recommended that Well 2 be improved with proposed acidization and rebuilt pump and a new well be drilled for the system to meet future needs. Well 2 improvements will assist with meeting short-

term future needs and a new well will meet projected needs near the 20-year design timetable. A new well location could potentially be included on a new GSR site. Water quality of any new well would be reviewed during sampling requirements of test wells before any new source is brought into the system. Urbana currently feeds from Silurian wells with good water quality, so a projected new well from this aquifer would likely have similar constituents. Potential sites for a new well are shown in Figure 5-1. Ammonia levels would be of particular interest, and a "deep" well such as a confined Silurian would be considered less susceptible to PFAS contamination. Well 5 could be potentially removed from service or kept as an emergency standby well for the system.

Three items related to the source wells were noted by the IDNR for correction or attention. Urbana Water Supply has responded to the IDNR that diesel generators will be moved to meet minimum separation requirements as part of future major capital projects and the malfunctioning airline of Well 3 will be replaced the next time the pump is pulled for maintenance. Protection of Well 5 may be completed through the installation of bollards or other practices that deflect impact of vehicles into the wellhead.

Water Distribution

As previously noted, the IDNR has begun requesting systems to develop programs to replace all water mains smaller than 6-inch in diameter from their systems over the next 20 years to meet Ten State Standards. The Urbana Water Supply maintains a map that includes location and size of water mains, with approximately 5,280 feet of 4-inch water main still in service, generally located in the downtown area.

Recommendations for replacing small diameter water mains include prioritizing replacement, incorporate water main replacement with other municipal projects as feasible to maximize pavement and landscaping rehabilitation costs, and include water main projects in CIP development over 20-year timeframe.

Associated with the distribution system is the required identification of all service line materials connected to the system. A complete and maintained inventory of water service lines is required to be submitted to the IDNR by October 16, 2024. The required format is available for download from the IDNR website, https://www.iowadnr.gov/Environmental-Protection/Water-Quality/Drinking-Water-Compliance/Lead-Service-Line-Inventories. It is advised that these requirements are reviewed as soon as possible by staff and a plan of completion developed. There is currently no financial assistance designated for completing this service line inventory.

Water Auditing

IDNR recommended Urbana Water Supply review their water rates in relation to meeting their financial responsibilities for maintenance of the system and complete an audit of water use to identify non-revenue water losses and implement practices to decrease water loss to 15% or less of metered pumped source water.

This report recommends the system reviews water rates on a regular basis against the projected needs of the water system to maintain and improve the system to meet future needs and regulatory requirements. Water loss identification is hindered by the amount of non-metal water main in the system and current water leak detection methods, but a planned water meter exchange program may

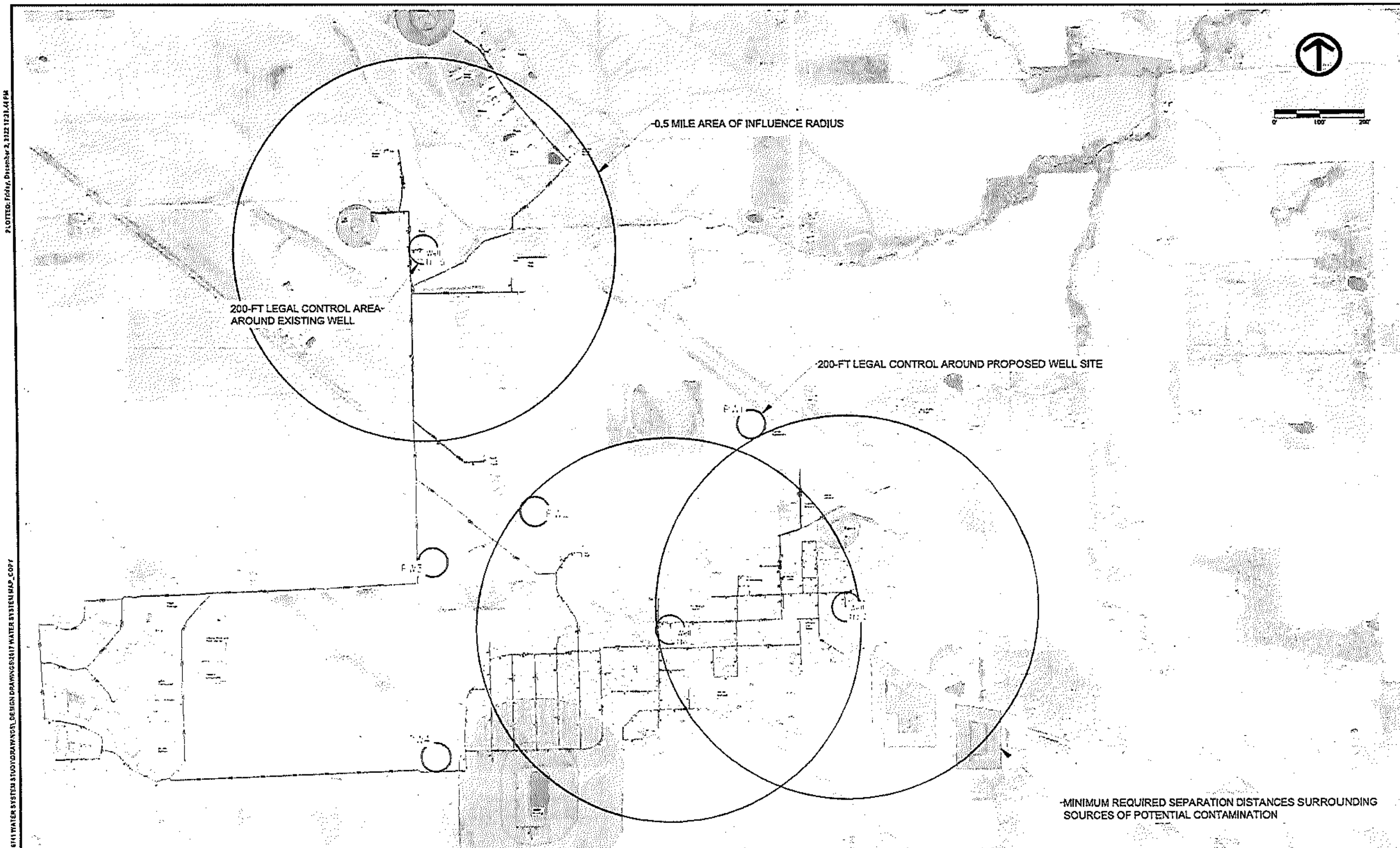
impact water use numbers as end-of-design-life meters are replaced. A program to more accurately tally fire hydrant flushing time, read municipal meters on a regular basis, and meter and read bulk water tank(s) are additional ways water losses may be more accurately ascertained.

RECOMMENDATION ESTIMATED COSTS

Estimated costs for water system supply and storage projects recommended in this report are found in Table 5-3. Estimated costs for water main replacement projects is not included due to extended installation timeline (20 years).

TABLE 5-3 – ESTIMATED COST FOR CAPITAL IMPROVEMENTS

Item No.	Item Description	0.25 MG GSR	0.40 MG GSR	0.50 MG GSR
1	Prestressed Concrete GSR	$ 1,300,000	$ 1,550,000	$ 1,650,000
2	Booster Station	$ 500,000	$ 500,000	$ 500,000
3	Generator, booster station	$ 75,000	$ 75,000	$ 75,000
4	Controls and Electrical Service	$ 90,000	$ 90,000	$ 90,000
5	Site Work, booster station	$ 100,000	$ 100,000	$ 100,000
6	Silurian Well, 560 feet deep	$ 750,000	$ 750,000	$ 750,000
7	Generator, well	$ 50,000	$ 50,000	$ 50,000
8	Sitework, well	$ 80,000	$ 80,000	$ 80,000
9	Well 2 Acidification	$ 40,000	$ 40,000	$ 40,000
10	Well 2 Pump Rebuild	$ 50,000	$ 50,000	$ 50,000
11	Well 5 Protection	$ 7,500	$ 7,500	$ 7,500
	Estimated Construction Total:	$ 3,042,500	$ 3,292,500	$ 3,392,500
	Estimated Contingency (10%)	$ 304,250	$ 329,250	$ 339,250
	Estimated Engineering, Legal, and Permitting Total (20%)	$ 608,500	$ 658,500	$ 678,500
	Estimated Total Project Cost:	$ 3,955,250	$ 4,280,250	$ 4,410,250



DATE	REVISIONS		
		SCALE	AS NOTED
		DRAWN	DRS
		CHECKED	DRS
		APPROVED	[illegible]
		DATE	[illegible]
		ISSUED FOR	REVIEW

VEENSTRA & KIMM INC.

WATER DISTRIBUTION SYSTEM
URBANA, IOWA

2500 University Parkway, Suite 1 • Coralville, Iowa 52241
319-466-1000 • 319-466-1008(FAX) • 888-241-8001(WATS)

FIGURE 5-1
POTENTIAL WELL SITES

DWG. NO.
DS-1

PROJECT

Matt Presented to Council
1-6-23

Summary Notes

1. Water Supply
    a. Supply currently meets peak day water usage
    b. Report projects that FIRM capacity of wells will not meet peak day demand by 2026
        i. Assumes continued loss of capacity (reasonable assumption if no action taken)
        ii. Assumes usage increase of 100 gpcpd (about double current actual usage)
        iii. TOTAL capacity of all 3 wells will continue to operate above projected demand through the design year (but gets closer, which adds greater risk)
        iv. FIRM capacity exceeds capacity of design year average day demand
2. Water Storage
    a. Current water storage capacity is only about 20% above average day demand (and about 25% below average day demand)
    b. Current water storage does not provide adequate capacity for desired fire flow (2,00 gpm for 2 hours) or fire flow needed based on typical residential zoning (1,500 gpm for 1 hour).
3. Water Quality
    a. Generally good water quality; minor issues to address
4. Distribution System
    a. 5,280 LF of 4" water main to be replaced over the next 20 years
    b. Lead service inventory to be completed by 10/16/24 (no lead services expected)

Recommendations

1. Acidification of Well 2 and rebuild pump
    a. Estimated year of expenditure = 2023
    b. Estimated budget = $117,000
2. Well 5 protection with bollards
    a. Estimated year of expenditure = 2023
    b. Estimated budget = $10,000
3. GSR & Booster Station
    a. Estimated year of expenditure = 2026
    b. Estimated budget = $3,140,000
4. New Well
    a. Estimated year of expenditure = 2030 (may consider doing with GSR)
    b. Estimated budget = $1,144,000
5. Replace 4" Water Mains
    a. Estimated year of expenditure = Annually 2023-2033
    b. Estimated budget = $55,000/year (assumes construction in conjunction with other improvements)