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Water System Improvements

Preliminary Engineering Report

Report

Village of

Lannon, WI

March 2020

STRAND ASSOCIATES®

Report for

Village of Lannon, Wisconsin

Water System Improvements
Preliminary Engineering Report

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SECTION 1
PROJECT PLANNING

1.01 PROJECT PLANNING

This section describes the Village of Lannon (Village) project planning for its Water System Improvements project.

A. Location

The Village is located in Waukesha County in southeastern Wisconsin (see Appendix 1-1 through 1-3). The Village is located approximately 14 miles northwest of Milwaukee, Wisconsin and approximately 10 miles north of Waukesha, Wisconsin. The Village neighbors the Village of Menomonee Falls to the southwest and the Village of Sussex to the northeast. The Village limits include Sections 8, 17, 18, 19, and 20 of Township 08 North Range 20 E. The total area of the Village limits is approximately 2.5 square miles.

The existing water distribution system is located within the Village limits (Appendix 1-4) and provides service to only part of the Village.

The existing sanitary sewer system is located within the Village limits and provides service to every building within the Village Limits. The effluent flows to the Sussex Wastewater Treatment Plant (WTP) to be treated and discharged to Sussex Creek.

The Village operates a police department to provide law enforcement services. The Village employs the Menomonee Falls Fire Department to provide services including administrative, fire, and medical emergencies.

The 2010 Census notes that the Village consisted of a population of 1,107 people, 479 households, and 314 families. The Village is known for Lannon stone, which was the name given to the type of limestone rock that is quarried by one of the quarries located within the Village.

B. Environmental Resources Present

A description of the existing environmental resources present in the project planning area is outlined in the following.

1. Historic Properties and Cultural Resources

The Village submitted a Wisconsin Historic Preservation Database (WHPD) Geographical Information System (GIS) Data Request Form to the Wisconsin Historical Society (WHS) and obtained records for the Village. The WHS provided GIS files for historic structures and locations of archaeological surveys. There are numerous structures listed on the Architecture Historic Inventory along the project planning area. Some areas of the project planning area have also been surveyed for archaeological resources. A map depicting the archaeological survey results is available upon request. There is an existing cemetery located at the northernmost part of the Village. The proposed project planning area is several hundred feet from this area.

It has been determined that no historic properties will be affected as a result of the project. Properties listed on the National Register of Historic Places (NRHP) or on properties eligible for listing on the NRHP are not located in any location of the project planning area. The characteristics and features and setting near the sites will not be adversely affected.

The archaeological sites near the project planning area will not be affected because the work will be limited majorly to the existing, previously disturbed road right-of-way (ROW), to three existing utility easements, and to an existing well site parcel that was also previously developed.

2. Threatened or Endangered Species, Critical Habitat, and State Listed Species

Coordination with the United States Fish and Wildlife Service (USFWS) and the Wisconsin Department of Natural Resources (WDNR) related to federally-listed and state-listed threatened and endangered species has been completed[1].

An Official Species List (dated November 21, 2019) was obtained from the USFWS Information for Planning and Consultation (IPaC) Web site. Because the project planning area for new water main is almost totally within paved street ROW, besides three existing utility easements, there were no critical habitats identified in the project area.

The online USFWS mapping of the High Potential Zone for the rusty patched bumble bee (RPBB) was reviewed. The proposed action is not within the High Potential Zone and a No Effect Determination was made for the RPBB.

A WDNR Endangered Resources Preliminary Assessment was completed for the project planning area on November 20, 2019 and is available upon request. The assessment indicated no further action is necessary and that the project is covered by the Broad Incidental Take Permit/Authorization for No/Low Impact Activities.

3. Wetlands

The project planning area for the water main extensions are majorly within existing road ROW, besides three existing utility easements, and will not impact any mapped wetlands. There are no anticipated waterway or wetland crossings. A wetlands map is available upon request.

The project planning area for the new well site is not located in or adjacent to any mapped wetlands. The mapped wetlands nearest to the well site are approximately 1,000 feet east along Lannon Creek, the nearest waterway to the well site. The existing potable well has been operational at this location since approximately 1992 when it was constructed and it is a regulated and permitted, high capacity well. No impacts to wetlands or waters from the continued withdrawal of water from the deep limestone aquifer is anticipated.

[1] United States Department of Interior, Fish and Wildlife Service, Consultation Code 03E17000-2020-SLI-0325, Event Code 03E17000-2020-E-00923, Project Name: Lannon Water System Expansion

4. Floodplains

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Community Panels 55133C0094G (2014), 55131C0370D (2013), 55133C0093G (2014), and 55133C0092G (2014) were reviewed for the project planning area. No part of the project planning area is located within the 100-year floodplains as part of this project. There will be no direct or indirect impacts to any floodplains and there are no waterway crossings. No mitigation measures are required. A floodplains map is available upon request.

5. Formally Classified Lands

Certain properties that are administered by federal, state, or local agencies have special protection through formal legislative designations. These are designated as formally classified lands. The project planning area was reviewed for potential project impacts to formally classified lands, such as parks, wild and scenic rivers, state and national forests, wilderness areas, landmarks, trails, and wildlife refuges.

One location of potential conflict was identified, where Lannon Road crosses the Bugline Trail, a Waukesha County Park System Trail. The 16-mile asphalt multiuse trail was built in 1983 on the former Chicago, Milwaukee, St. Paul, and Pacific Railroad ROW. The trail is 8 feet wide and extends from the Village of Menomonee Falls west to the Village of Merton. The trail connects Village neighborhoods to Menomonee County Park. A zoning map that includes the Bug Line Trail is available upon request.

The proposed water main route On Lannon Road is anticipated to cross the trail. The water main will be constructed using conventional open trenching within the existing ROW of Lannon Road and will temporarily impact the trail. The temporary impact to the trail will be minimized and the contractor will be required to restore the pavement on Lannon Road immediately following completion of the crossing (the same day). While the crossing is being constructed, the contractor will be required to install a temporary path to the north approximately 30 feet and the path will remain open across Lannon Road until the pavement is restored on the same day as the crossing.

6. Water Resources

Lannon Creek routes through the center of the Village from north to south. The Fox River runs on the eastern side of the Village from north to south. These resources are not anticipated to be affected by the project.

Wisconsin does not have any designated sole source aquifers that need to be addressed for water quality issues. There is a well-head protection area around the Village's existing well located on South Weather Edge Circle in the southwest portion of the Village. The project planning area is located within the Upper Fox River Watershed.

There is potential for erosion and construction runoff containing particulate matter during construction. Measures will be taken to minimize soil erosion and sedimentation controls will be required. All construction activities will comply with industry-standard construction site best

management practices and an erosion control plan, and an erosion control implementation plan will be prepared.

7. Coastal Resources

There are no coastal resources, coral reefs, or protected aquatic habitats within the project planning area.

8. Prime Farmlands

There are no prime farmlands within the project planning area.

C. Population Trends

There are several population projections available for the Village. The 2010 United States Census population for the Village was 1,107. Southeastern Wisconsin Regional Planning Commission (SEWRPC) projects a recommended-growth estimate of 1,900 and a high-growth estimate of 3,510 for the existing Village sewer service area by 2035. The Wisconsin Department of Agriculture (WDOA) projects the population to be 1,240 by 2035. The Waukesha County Land Use Plan projects the population to decline to 856 by 2035. See Figure 1.01-1 for a compilation of the population projections. For the purposes of this report, the projections from the Lannon Comprehensive Plan were used as it includes planned development projects within the Village.

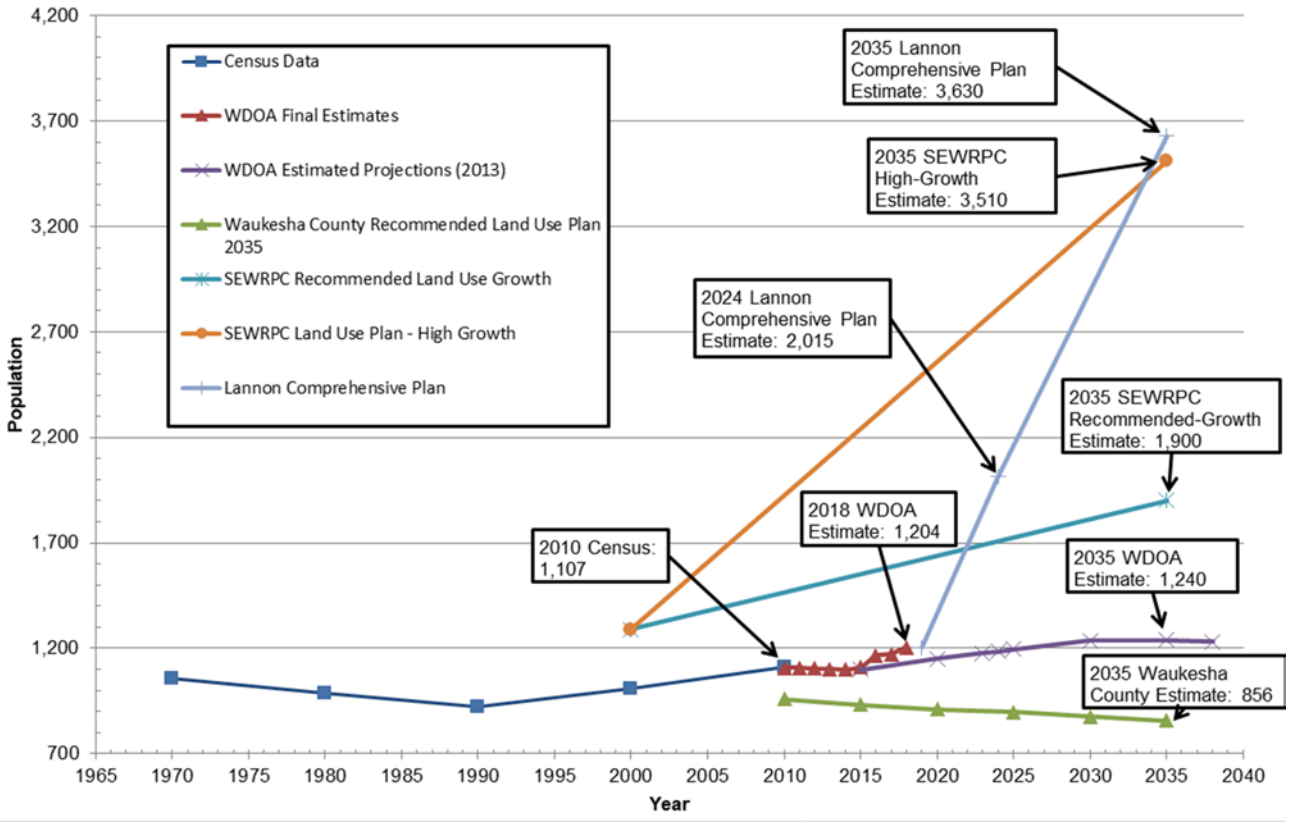


Figure 1.01-1 Population Trends

The Village of Lannon Board and Plan Commission recognized while updating the Comprehensive Land Use Plan in 2017 that aggressive growth was required in order to maintain existing infrastructure and remain a viable community. The Planning Consultant, Vandewalle & Associates, Inc., recommended a high-growth alternative and the Village accepted that alternative. The Village Board and Plan Commission subsequently took action to allow higher-density residential growth than what was historically allowed in the Village. The NR-4 zoning district was created and requires a minimum density of three dwelling units per acre, whereas previous zoning practices in the Village mostly required medium and low density developments. The response from the development community was immediate. The Village currently has signed developer agreements and conditional use permits that will result in the addition of 276 housing units. A separate developer purchased land in the Village and is in the process of drafting a developer agreement for 270 apartments and a 72-bed elderly housing facility. These developer projects have the potential to double the population of Lannon by the time they are complete. Additional lands are available in the Village that are shown in the comprehensive land use plan for high-density residential use, which provides the opportunity for further growth. The following documents were used in the population projections and are available upon request.

- Lannon Development Analysis Report, 2017–This document includes the population growth strategies and projections completed by Vandewalle & Associates Inc. in support of the Comprehensive Land Use Plan Amendment.

- Comprehensive Land Use Plan Amendment, 2017–This document, prepared by Vandewalle & Associates, Inc., was adopted by the Village and includes high-density residential districts.

- NR-4 Zoning Ordinance, 2018–The Village Board adopted this new ordinance to align with the Comprehensive Land Use Plan Amendment and requires a minimum density of three units per acre.

- Overstone Developers Agreement–This developer agreement is signed and recorded and includes the first 2 phases of Overstone Condominiums which is comprised of 80 side-by-side ranch condos and a clubhouse. As of the end of 2019, 37 of the first 80 units were sold in the first 14 months of the project.

- Overstone Phase 3 Concept Plan–This concept would add 60 more side by side condos and includes land owned by the developer. The developer intends to amend the existing developer agreement to include Phase 3 in 2020.

- Whispering Ridge Estates North Developer Agreement–This agreement was signed in 2019 and site improvements are currently under construction to support a 38 single-family home development.

- Cawley Farm Development Conditional Use Permit–This land is currently owned by a quarry company and zoned as NR-4 requiring three dwelling units per acre. The conditional use permit allows the quarry to extract stone from the site until the end of 2028 and prepare the entire site for a residential development. The quarry has posted a financial guarantee to do so and has submitted a reclamation plan for a 100-unit residential development.

- Rock Point Village Apartments and Elderly Housing Site Plan–This land is owned by the developer who is currently drafting a developer agreement to construct 270 apartment units with two clubhouses and an adjacent 72-bed elderly housing facility.

D. Community Engagement

The public has been notified of and asked to provide input on the water system improvements project. A public information meeting was held on August 14, 2019, to inform the Village residents about the project details and the identified funding sources to pay for the project.

A notice of intent (NOI) to file an application with Unites States Department of Agriculture (USDA) Rural Development (RD) was published and distributed to all residents. The NOI included a notice of a public hearing that occurred during the Village Board meeting on December 9, 2019. A copy of the formal notification, affidavit, tear sheet, agenda, and meeting minutes will be submitted with the application.

The project has been discussed at Village Board meetings and Plan Commission meetings that have been open to the public. During design and construction, the Village Board will continue to hold public meetings for input.

1.02 ABBREVIATIONS AND DEFINITIONS

ATS	automatic transfer switch
EDU	equivalent dwelling units
EM	equivalent meters
ER	Environmental Report
ERP	Emergency Response Plan
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GIS	geographical information system
gpm	gallons per minute
gpm/ft	gallons per minute per foot
HDPE	high-density polyethylene
HGL	hydraulic grade line
hp	horsepower
iPac	Information for Planning and Consultation
kWh	kilowatt-hour
MGD	million gallons per day
MHI	mean household income
NRHP	National Register of Historic Places
O&M	operation and maintenance
OPCC	opinion of probable construction cost
OTM	other-than-municipal
PER	Preliminary Engineering Report
PVC	polyvinyl chloride
PSC	Public Service Commission
psi	pounds per square inch
RD	Rural Development
SCADA	supervisory control and data acquisition
ROW	right-of-way
RPBB	rusty patch bumble bee
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SLA	short-lived asset
Strand	Strand Associates, Inc.®
TID	tax increment district
USFWS	United States Fish and Wildlife Service
Village	Village of Lannon
VFD	variable frequency drive
WDNR	Wisconsin Department of Natural Resources
WDOA	Wisconsin Department of Agriculture
WEGS	Water, Electric, Gas, and Sewer
WHPD	Wisconsin Historic Preservation Database
WHS	Wisconsin Historical Society
WTP	water treatment plant

SECTION 2
EXISTING FACILITIES

2.01 EXISTING FACILITIES

This section describes the Village's existing water system facilities. A more detailed explanation of the existing facilities is described in the 2019 Water System Study[1] that can be supplied upon request. A summary of the water system is included in Appendix 2-1.

A. Location Map

The Village currently operates one shallow-aquifer well (Well No. 1) that is located within the pumping facility located on South Weather Edge Circle. The pumping facility contains the well, reservoir, two booster pumps, and a 5,500-gallon pneumatic pressure tank. A 160,000-gallon below-ground concrete reservoir is located just south of the existing pumping facility. Based on information provided by the Village to the Public Service Commission, there is approximately 18,440 feet of existing water main in the distribution system. See Appendix 1-4 for facility locations.

B. History

As noted above, there is currently only one well facility for the entire system; construction began on the well in 2007 and the facility was completed and operating in 2008. The system operation is described below followed by a more detailed review of each of the system components.

Water is pumped from Well No. 1 and sodium hypochlorite is injected for disinfection upstream of the below grade reservoir. The well is called to run by a pressure transducer in the reservoir. Water is routed through baffles in the reservoir to provide contact time for disinfection and prevent short cycling. Two booster pumps pump the water from the reservoir into the distribution system. A pneumatic pressure tank in the facility maintains system pressure (at the facility) between 62 and 70 pounds per square inch (psi). The booster pumps operate in an alternating lead-lag function and the second booster pump is only called to run if the pressure at the facility reaches 58 psi.

CTW, a local well contractor, is the licensed operator for the water system. The water system is set up so that the system can be automatically operated. Periodic visits are required to fill the sodium hypochlorite chemical tank and collect system data stored locally. In the event of an emergency, the facility is equipped with a dialer system to notify the operator of any issues.

1. Water System Supply and Treatment Facilities

According to the well construction report[2], Well No. 1 was constructed in 2007 and drilled to a depth of 340 feet. The well is cased with a 12-inch-diameter A53B steel pipe from the surface to 158 feet below the surface. The casing was grouted with neat cement grout from the surface down to 158 feet below the surface. An 18-inch-diameter outer casing was installed from the surface down to 15 feet below the surface.

[1] Water System Study, Prepared by Strand Associates, Inc.® for the Village of Lannon, December 2019.
[2] WDNR Well Construction Report SO642.

After the well was drilled, it was pump tested at 252 gpm for four hours. Now, the capacity of Well No. 1 well pump is currently 250 gpm but the borehole is designed for 300 gpm. The specific capacity of the well when it was drilled was 3.1 gallons per minute per foot (gpm/ft).

The well draws water from the Niagara aquifer, a limestone and dolomite rock unconfined aquifer. The Maquoketa shale confining layer is located below the Niagara aquifer.

The well pump is powered by a 30-horsepower (hp) motor that is fitted with a variable frequency drive (VFD). The motor was recently replaced in 2019. The pump has not been pulled out of the well hole since it has been installed.

Water is pumped from the well to the existing below-ground reservoir. Sodium hypochlorite is dosed as water is pumped from the well to the reservoir.

There are two booster pumps with 30-hp motors fitted with VFDs located in the well facility. Water from the booster pumps is metered and is pumped out of the adjacent belowground reservoir to the distribution system. The total current booster pump capacity is 1,100 gpm, or 1.584 million gallons per day (MGD). The firm booster pump capacity assuming the largest booster pump out of service is 550 gpm or 0.792 MGD. There is space in the well and booster pump facility for an additional booster pump adjacent to the two existing booster pumps. The Village has been considering installing a 1,000-gpm fire pump at this location. Neither of the existing booster pumps have had any maintenance performed on them since being installed.

The well and booster pumping facility has an enclosed sodium hypochlorite room that contains a storage tank and chemical dosing pump.

The facility has a 200 kilowatt-hour (kWh) backup diesel-powered generator that is located just southeast of the existing well and booster pump facility. In the event of a power outage, an automatic transfer switch (ATS) switches power from domestic power to generator power. The generator is sized large enough to provide enough power to the well and booster pump facility under normal conditions. The standby generator sizing would need to be confirmed in a third fire booster pump is installed. The facility was constructed in 2007 and is in good condition.

2. Water System Storage Facilities

System storage includes one concrete belowground reservoir and one hydropneumatic pressure tank. The reservoir is located to the south of the well and booster pump facility. The reservoir was constructed in 2007 and has a storage capacity of 160,000 gallons. The reservoir contains baffle walls intended to increase chlorine contact time. The reservoir was last inspected on February 2, 2019.

The pneumatic pressure tank has a capacity 5,500 gallons and sets the hydraulic grade line (HGL) in the distribution system. The tank is located in the well and booster pump facility and is connected to the system downstream of the booster pumps. The tank was last inspected on August 26, 2015. The setpoints of the booster pumps are such that the pressure tank has a maximum pressure of 70 pounds per square inch (psi) and minimum pressure of 62 psi. This

correlates to a HGL that ranges between 1,045 and 1,064 feet. The corresponding average pressure in the distribution system ranges between 65 and 81 psi and is discussed in more detail in Section 5 of this report. Once the HGL in the system drops below the minimum set point, one booster pump turns on at full speed. If the pressure drops below 58 psi (1,036 feet HGL) while one booster pump is running, the second booster pump turns on.

3. Water Distribution System

The water distribution system is comprised of 6-, 8-, 12-, and 16-inch ductile iron, polyvinyl chloride (PVC), and high-density polyethylene (HDPE) piping. Most of the piping is PVC piping and was constructed in 2008 when the distribution system was first established. Table 2.01-1 presents the diameter, material, and lengths of the installed water main. There are approximately 39 fire hydrants and 93 valves in the system. See Appendix 1-4 for a water system map that depicts the location and size of all water main and location of fire hydrants.

Water Main Diameter (inches)	Material	Length (feet)
6	Ductile Iron	90
8	Ductile Iron	113
8	PVC	4,989
12	Ductile Iron	2,697
12	PVC	9,132
16	Ductile Iron	1,419
	Total	**18,440**

Table 2.01-1 Existing Distribution System Water Main Inventory

There are approximately 141 total customers consisting of 131 residential, with seven commercial and three public authority users. Figure 2.01-1 shows the daily residential, commercial, and public usage per customer for the previous 10 years. The projected usages for each category are 116 gallons per customer per day for residential, 107 gallons per customer per day for commercial, and 421 gallons per customer per day for public. Converting usage to equivalent dwelling units (EDUs), where 1 EDU equals 116 gallons per day, and the projected average Village sales is approximately 6,285,222 gallons per year, there are approximately 148 total Village EDUs.

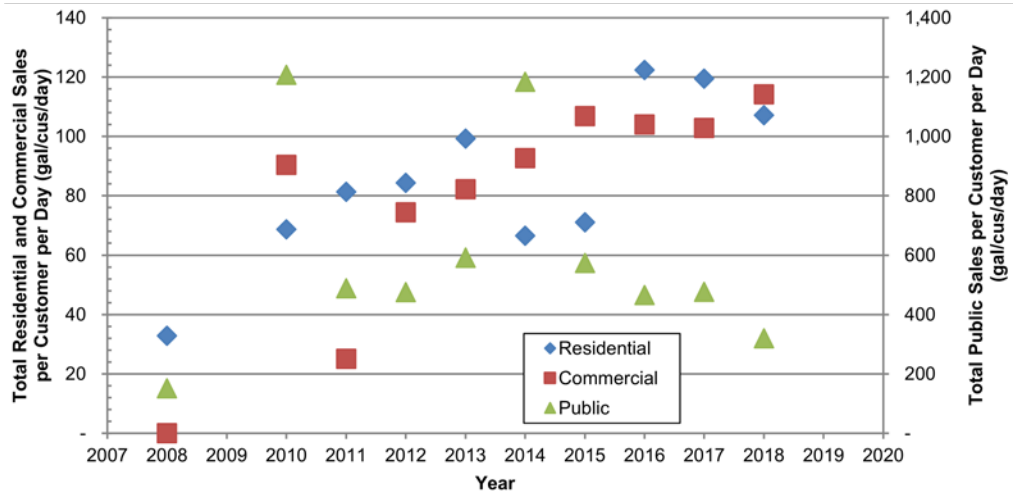


Figure 2.01-1 Per Customer Sales

The Village of Menomonee Falls Fire Department currently handles all administrative, fire, and medical emergencies needed by the Village.

As part of the Water System Study, existing and future system demands were estimated for the average and maximum day demands. Table 2.01-2 shows these demands.

Year	Average Day Demand (gpm)	Maximum Day Demand (gpm)
2019	20	50
2024	75	188
2035	196	490

Table 2.01-2 System Demands

C. Condition of Existing Facilities

1. Water System Supply and Treatment Facilities

The well pump has not been pulled or inspected since it has been installed. If the well needs to be taken out of service, the water system is dependent on the amount of storage remaining in the reservoir. The Village currently limits the well pump to 250 gpm as it draws down local private wells at higher rates. The Village and its operator report the well is operating with no major issues. However, it is generally recommended to rehabilitate a well and maintain pumping equipment at least every ten years and the Village is currently restricted as it only has one source of supply.

The booster pumps are operating at the rated capacity and there are no known issues.

The pumping facility appears to be in good condition. The operator noted that there is not a paved walkway to get to the sodium hypochlorite room. When a new tank of chemical needs to be installed, it must be carried over rocks to get to the chemical feed room door.

According to the 2018 Public Service Commission (PSC) Water, Electric, Gas, and Sewer (WEGS) report, the water utility used 43,225 kWh of energy for the year.

The current well supply can meet current average and maximum day demand conditions. However, the Village only has one groundwater well to supply water to the system. The guidance document Guidance for Municipal Drinking Water Source Capacity Determination recently published by WDNR states that a water system that relies on one source does not have adequate source capacity. A redundant source of water is required immediately to allow for long-term well servicing because of maintenance or emergency. In addition to having a redundant source, a capacity evaluation shows additional firm source capacity is required to meet maximum day demands by 2024. This could be met by various combinations of new well supply or interconnections with neighboring systems. It should be noted that the Village is entirely outside of the Great Lakes Watershed and surface water from Lake Michigan is not an alternative.

2. Water System Storage Facilities

The below-ground reservoir was last inspected and cleaned in 2019. According to the reservoir inspection report, the reservoir appeared to be in good condition and no repairs are required.

The pressure tank was last inspected and cleaned in 2015. According to pictures taken during the inspection, the tank appears to be in good condition and no repairs are required.

A typical residential fire flow is 500 gpm. Given the maximum day demand equals 50 gpm and the reservoir capacity equals 128,000 gallons, the available storage could provide fire flow for a 500-gpm residential fire for approximately four hours under firm supply condition. If the well is assumed to be operating, the available storage could provide ample fire flow for a 500-gpm residential fire for approximately seven hours. The amount of available storage for fire protection will decrease as there is additional demand in the system.

3. Water Distribution System

According to the 2018 PSC WEGS report, the water system has 39 percent non-revenue water and 39 percent water loss as a percentage of net water supplied. This equates to approximately 3,747,000 gallons of water loss throughout the year, or approximately 10,300 gpd. There have been leaks found in past years and it is suspected that additional leaks in the system are causing the water loss issue. The 2018 Sanitary Survey noted that a leak detection study shall be conducted to find and address leaks in the system.

Other methods identified to potentially reduce water loss include preventing illegal taking of water from fire hydrants without being accounted for or billed. In 2019, a commercial business was found to be taking water from a nearby fire hydrant. CTW was able to identify times of the day when large volumes of water were being pumped, which signified when water was being taken

from the hydrant. The Village does not have available staff to monitor and coordinate the water use against water consumption.

The well pump meter was replaced in 2019 due to suspicions that it was not registering the correct amount of water due to the high amount of water loss.

The Village of Menomonee Falls Fire Department currently performs annual hydrant flushing and valve turning to maintain the distribution system. The Village of Menomonee Falls also is responsible for meter reading, maintenance and replacement. The existing meters are all less than 15 years old and are in good condition. The Village of Menomonee Falls then provides the read information to the Village to perform the billing of water usage.

In October 2018, several surrounding private wells for residents in the Village tested positive for coliform and *E.coli*. Although the existing public water distribution system has not had any positive coliform tests, there is some concern that the Village's well may be contaminated in the future.

The Village currently does not have an asset management plan in place.

D. Financial Status of any Existing Facilities

The 2018 PSC WEGS report[3] contains financial information for the Village's water utility.

1. Rate Schedules

The current water rate structure is based on the PSC rate case decision [4]approved on October 20, 2017. The current volume charge for metered general service is $5.80 per 1,000 gallons. There is a quarterly service charge for each size of meter and is shown in Table 2.01-3. In 2018, the Village revenue from water sales equaled $84,295. Using the calculated number of EDUs (148), the calculated fee per EDU was approximately $48 per EDU per month in 2018.

[3] Water, Electric, or Joint Utility Annual Report for the Lannon Municipal Water Utility For the Year Ended December 31, 2018.
[4] Public Service Commission of Wisconsin Rate Decision 3045-WR-101 for the Village of Lannon, Service Date October 20, 2017, PSC Reference Number 332466.

Size Meter	Quarterly Service Charge	Quarterly Public Fire Protection Service Charge
5/8-inch	$48.00	$42.60
3/4-inch	$48.00	$42.60
1-inch	$60.00	$105.00
11/4-inch	$75.00	$159.00
1 1/2-inch	$90.00	$213.00
2-inch	$120.00	$339.00
3-inch	$210.00	$636.00
4-inch	$300.00	$1,062.00
6-inch	$405.00	$2,127.00
8-inch	$600.00	$3,405.00
10-inch	$900.00	$5,109.00
12-inch	$1,200.00	$6,813.00

Table 2.01-3 Quarterly Water Meter Charge

The Village currently imposes impact fees under Chapter 63 of its municipal code to be used for facilities for pumping, storing, and distributing water. Existing users on the public water supply have already paid impact fees and those funds have already been allocated to impact fee eligible projects. Impact fees, special assessments, and user rates are discussed in more detail in the following sections.

2. Operation and Maintenance (O&M) Cost

Operating expenses for the water system were gathered from the 2018 PSC WEGS report. There was a significant increase in O&M in 2018 due to engineering fees for the emergency elementary school water main extension project. Annual operating expenses are typically closer to $58,000 per year.

3. Tabulation of Users

Table 2.01-4 shows the number of customers for each category of water users; 131 of the 141 total customers (93 percent) are residential.

Year	Residential	Commercial	Public	Total
2008	39	0	3	42
2009	45	1	3	49
2010	65	1	3	69
2011	66	7	3	76
2012	66	6	3	75
2013	66	6	3	75
2014	66	7	3	76
2015	84	7	3	94
2016	105	7	3	115
2017	113	7	3	123
2018	131	7	3	141

Table 2.01-4 Number of Customers by Category

4. Existing Debts and Required Reserve Accounts

The Village currently funds the water utility through water rates in addition to the general fund. A list of the existing debts is shown in the following.

As shown in the 2018 WEGS report, the Village currently has a 2017 General Obligation (GO) Refunding Bond with a principal amount of $972,064 at the end of 2018.

The Village currently does not have any separate accounts to be used for short-lived asset replacement.

E. Water/Energy/Waste Audits

The 2018 PSC WEGS report provides a brief water audit. The audit showed a substantial non-revenue and water loss issue and stated that a leak-detection study shall be completed.

As part of the recently completed Water System Study, an in-depth water audit was completed and a water loss control plan was created. The Water Loss Control Plan recommends finding real losses in the water system, improving the water meter accuracy in the customer meters, and improving unbilled, unmetered consumption data and recording hydrant use within the system.

SECTION 3
NEED FOR PROJECT

3.01 NEED FOR PROJECT

This section describes the need for any water system improvement projects.

A. Health, Sanitation and Security

1. Water System Supply and Treatment Facilities

A second source of supply is needed immediately for system redundancy. The system currently only has one well and one storage facility to meet demands and supply fire protection. Ten States Standards (the Standards) Code 3.2.1.1 state the total source capacity must equal or exceed the design maximum day demand with the largest producing well out of service. The Standards Code and 3.2.1.2 states a minimum of two sources of groundwater shall be provided. WDNR guidance also states a water system that relies on only one source does not have adequate source capacity.

Strand Associates, Inc.® (Strand) completed a Water System Study that performed a capacity analysis and recommended a second source of supply immediately and a third source of supply once the maximum day demand exceeded the existing well capacity, which is projected to be in 2024.

There is an immediate need for a second source of supply for the Village from a capacity perspective. There is a future need for a third source of supply based on the population projections discussed in Section 2.

2. Water System Storage Facilities

The Water System Study included a detail analysis for current and future water storage needs. The Village needs additional storage volume to provide adequate fire protection. The Water Study recommends that 178,000 gallons of additional storage is currently required to meet maximum day demand fluctuations plus a 2,500 gpm fire for two hours. Assuming a second source of supply is added in 2024, 167,000 gallons of storage is needed in the future to meet 2035 projected maximum day demands plus fire demands. For planning purposes, it is generally assumed that only 80 percent of the tank's volume is available; thus a 250,000-gallon storage tank is recommended. The study also recommends an elevated tank versus a second reservoir and booster pumping station.

There is a future need for additional storage based on the population projections and demands discussed in Section 2.

3. Water Distribution System

The Village needs to extend the water distribution system to serve areas of private well contamination. In 2018, there were several private wells that tested positive for coliform and *E.coli* bacteria. Through the end of October 2018, 33 of 55 private wells tested at the Waukesha County Laboratory were positive for coliform and 12 were positive for *E.coli*. Appendix 3-1 shows a map of the contamination areas. Some of the residents with a contaminated well have tried to clean

and chlorinate the well but the wells still tested positive. The positive test results have prompted interest in existing residential, commercial, and public facilities to connect to the Village's public water system. The Village will need to install new meters in order to bill the customers. The Village does not have a supply of spare water meters to use for a project.

There is an immediate need for expansion of the water system regardless of population projections discussed in Section 2.

B. Aging Infrastructure

The water distribution system began operation in 2008. All water main is relatively new and does not need replacement in the near future.

The existing water meters within the Village are reaching their anticipated lifespan of 15 to 20 years. The meters will need to be replaced in the near future.

C. Reasonable Growth

1. Water System Supply and Treatment Facilities

The water system cannot currently meet its maximum day demand with its largest and only well out of service. A second source is needed at this time to meet the existing and future demand. Additional customers currently using private wells will connect to the distribution system once the distribution system expansion is complete. A third source will be needed in 2024 when additional customers from planned development projects connect to the system. See the Water System Study, upon request, for a detailed analysis of source supply.

2. Water System Storage Facilities

The Village cannot provide adequate fire flows with its existing facilities. The Village needs additional storage. The Village only has three to five days of storage to supply average day demands if the existing well is out of service. This issue is only exacerbated with anticipated system growth or under maximum day and fire supply scenarios.

3. Water Distribution System

Several existing residents will connect to the water main extensions throughout the Village. Approximately 211 customers would be added to the system as water main extensions are constructed.

SECTION 4
ALTERNATIVES CONSIDERED

This section summarizes the water supply, water storage, and distribution needs, briefly reviews alternatives for each, discusses infeasible alternatives, and then presents three project alternatives for a Water System Improvements project.

4.01 SUMMARY OF ALL ALTERNATIVES CONSIDERED

A Source Water Supply

As discussed in Section 3, the Village needs a second source of supply immediately and a third source of supply in 2024. For the purposes of the Water System Improvements project for this report, only the second source of supply is considered.

1. Deep-Aquifer Well with Treatment

The benefit of a deep well is it reduces the bacteriological concerns of the shallow aquifer. However, deep wells in the area are known to have elevated radionuclide levels, which typically require treatment. According to the Water System Study, a deep-aquifer well with treatment was the recommended solution to provide a redundant source for the Village. The addition of this component to the project would increase project costs by approximately $3 million. This is the option currently being targeted for the third source of supply in 2024 and is planned to be funded through Tax Increment District revenue. Based on current revenue and preliminary discussions with the USDA, increasing project costs by $3,000,000 makes this alternative infeasible.

2. Neighboring Interconnection

Constructing an interconnection with a neighboring community would provide a second source. Considerations of system hydraulic gradient, water main extension, necessary infrastructure improvements, community politics, and the Great Lakes Compact are necessary. The Village had detailed discussions with several communities and an interconnection is currently infeasible.

3. Emergency Response Plan (ERP)

A second source is needed immediately for a redundant source of supply in the event of Well No. 1 being taken out of service. The third source shown to be needed in 2024 is required due to increasing demand. An ERP can identify how water will be obtained when Well No. 1 is out of service and how fire protection will be handled in that event. While not a preferred option, this option is technically feasible, if necessary. Operating with an ERP is included in Alternative No. 1.

4. Shallow-Aquifer

The Water System Study discusses the local shallow aquifer in detail. The concerns of a shallow limestone aquifer include lowering water levels due to increased quarry mining and potential bacteriological concerns that some local private wells are already experiencing. A

shallow well can be constructed deeper than private wells in the area, thereby eliminating the water level concerns. However, the potential for bacteriological issues still remains. The Village could consider two separate shallow-aquifer well options. One option would be to drill a new shallow well and construct a new well facility; this has an opinion of probable construction cost (OPCC) of $1,500,000. The second option is to acquire an existing shallow well and pumping station. Including acquisition costs and upgrade, this has an anticipated OPCC of $600,000. The second option of acquiring an existing shallow well is included in Alternative No. 2.

B. Water System Storage Facilities

While water storage is a need, based on future projections, elevated storage can be delayed until 2024 and a storage project is not included in the current proposed Water System Improvements project. No alternatives for Water Storage are included.

The Village recently implemented a tax increment district (TID) that includes planning to construct an elevated storage tank using future revenues. This funding has been identified as the preferred method to construct the elevated tank. Construction of this tank is estimated to begin in 2021.

C. Water Distribution System

Water system expansion is necessary to build out the system. Both Alternative Nos. 1 and 2 include the same proposed water main improvements.

D. Do Nothing

The Village has an obligation to provide safe and abundant drinking water to its customers. Several residents have private wells that are bacteriologically contaminated. New developments funded through TIDs are anticipating public water supply to be available. The Village currently does not have a redundant source of supply which makes proper maintenance and operation of its only well facility difficult. The “do nothing” approach does not solve any of these issues.

4.02 ALTERNATIVE NO. 1–WATER MAIN EXTENSIONS AND ERP

A. Description

The project alternative includes constructing 1,471 feet of 6-inch, 7,967 feet of 8-inch, and 6,860 feet of 12-inch water main to extend the water distribution system to areas of private well contamination. Hydrants and distribution system valves will also be installed. The proposed water main extensions span through several streets within the Village limits. The extensions will connect to the existing water distribution system and are anticipated to add approximately 158 new customers to the system. The Village is anticipating creating an ordinance that every parcel near an existing water main shall connect. There are approximately 53 customers adjacent to existing water main that are anticipated to connect as a result of this project. Therefore, approximately 211 new customers will be connected to the system as a result of the project. The majority of the water main will be constructed within existing road ROW and no additional land acquisition will be needed to route the water main. The only areas outside of the ROW

include three existing utility easements. Easement maps and legal documentation is available upon request.

Approximately 262 feet of 8-inch water main will be constructed within the easement at the Lannon Elementary School, 630 feet of 6-inch water main will be constructed in the easement on the Private Road off Good Hope Road, and 836 feet of 6-inch water main will be constructed in the easement on Diamond Drive.

This alternative does not include any new water supply or storage sources. Therefore, an ERP will be incorporated into Village operations to account for the use of only one groundwater well. The ERP will include the following items:

1. Identify alternative sources of potable water to use in the event of a failure of the Village's well.

2. Provide agreements between necessary parties to provide water and fire protection during an emergency response situation.

3. Provide a communication plan for operations during an emergency response situation.

4. Provide operational guidelines for operations during an emergency response situation.

B. Design Criteria

The proposed project components will meet the applicable design criteria standard requirements of the Wisconsin Department of Natural Resources (WDNR) Chapter NR 811.

C. Map

A map of the water main improvements is shown in Appendices 4-1 through 4-3.

D. Environmental Impacts

No environmental impacts are anticipated for any portion of this project. If there were any need to cross wetlands, directional drilling will be implemented. Similarly, any installation of water main in floodplains will not impact surrounding areas as the land will be returned to its original condition. Any historical and archaeological properties found within the project area are identified and discussed in the ER and will not be impacted as part of the project. Almost the entire length of proposed water main will be located within existing road ROW. A small amount of the water main extensions will be located in three existing utility easements as discussed in the following. There are no anticipated environmental impacts to the areas within the project limits.

E. Land Requirements

Most of the water main will be installed within existing road ROW. Three existing easements will be required to route the proposed water main to connect customers to the distribution system.

1. Private Road Utility Easement

An existing permanent sanitary sewer easement was established along the private road located approximately 100 feet east of the intersection of Good Hope Road and Main Street when the sanitary sewer system was installed. The existing easement is 20 feet wide and spans from West Good Hope Road to the 20577 Good Hope Road residence. The 720 feet of water main is anticipated to be constructed within the limits of the easement. The easement is located on parcel LANV0073452002.

2. Lannon Elementary School Easement

An existing permanent utility easement was established along the south edge of the elementary school as part of the Lannon Elementary School water main project. The existing easement is 25 feet wide and spans from the ROW from Lannon Road to the west edge of North Parkview Drive. The easement is located on parcel LANV0073453.

3. Diamond Drive Utility Easement

An existing permanent sanitary sewer easement was established along Diamond Drive south of Good Hope Road when the sanitary sewer was installed. The existing easement is 30 feet wide and spans from Good Hope Road to 20255 West Good Hope Road Unit A. Approximately 800 feet of water main is anticipated to be constructed with the limits of the easement. A pressure reducing valve and manhole structure are anticipated to be constructed at the end of the water main to serve as a redundant service lateral connection for the Lannon Estates system. The easement currently routes through the private road, parcel LANV0078481, LANV0078480003, and terminates on parcel LANV0078480005.

F. Potential Construction Problems

Potential construction issues for the water main extension include encountering shallow bedrock, traffic control, noise requirements, land restoration, and parking.

G. Sustainability Considerations

It is not sustainable for private residents to replace or rehabilitate their private wells that test positive for coliform and *E. coli*. Extending public water supply to these customers provides a source of safe and reliable drinking water.

H. Opinion of Probable Costs

1. Capital Costs

The opinion of probable cost for the alternative is $8,295,000. This is comprised of $6,870,000 in construction costs and $1,425,000 in non-construction costs. See Appendix 4-4 for a more comprehensive breakdown of the project costs. A 10 percent contingency is used for the project.

2. Operation and Maintenance (O&M) Costs

The current annual O&M cost for the water utility is $58,000. The anticipated additional annual O&M cost for the alternative is approximately $64,900 and is detailed in Appendix 4-5. The total anticipated water utility O&M costs total approximately $122,900.

4.03 ALTERNATIVE NO. 2–WATER MAIN EXTENSIONS PLUS WELL FACILITY ACQUISITION

A. Description

In addition to the water main extensions described for Alternative No. 1, Alternative No. 2 includes the acquisition and improvements of an existing well and well facility currently owned and operated by Lannon Estates, a local mobile home park within the Village limits located on the northeast corner of Diamond Drive and Lannon Road. The well will be operated in tandem with the existing Village well. The current Water System Operator, CTW, currently operates the existing Lannon Estates Well and would continue under Village ownership. The two well facilities would operate independently of each other until a Village-wide supervisory control and data acquisition (SCADA) system in installed.

A land parcel of approximately 100 feet by 100 feet will be acquired from Lannon Estates and will be owned by the Village. See Appendix 4-6 for the project limits. The existing well and well facility will also be acquired. The project will include an extension of water main from a proposed water main extension on Lannon Road to the well facility located on the northeast corner of Lannon Road and Diamond Drive. The well facility contains a storage room that is currently used by Lannon Estates. The room will be leased out to Lannon Estates for maintenance equipment storage.

The well and well facility were originally constructed in 1992. The well was drilled in 1992 to a depth of 353 feet below the ground surface. The well is cased with an 8-inch-diameter A53B steel pipe from the surface to 202 feet below the surface. The casing was grouted with neat cement grout from the surface down to 202 feet below the surface. The well was originally test pumped at 20 gpm for four hours. In 2002, the well was test pumped at a stabilized flow of 120 gpm. The well motor speed is currently reduced to pump at a flow rate of approximately 100 gpm. The well facility consists of a wooden structure with a sloped roof located on the northeast corner of Lannon Road and Diamond Drive. The well was originally designed to pump from the well to a 5,000-gallon steel pressure tank and to the private distribution system. In 2003, a 22,000-gallon below-ground fiberglass storage tank and two 150 gpm booster pumps were constructed to the west of the well facility to decrease the peak demand on the well.

The well currently supplies water to the Lannon Estates Mobile Home Park. Approximately 170 units are served by the private water supply. According to historical pumpage records, the well currently pumps an

average of approximately 15 gpm. The well was originally tested to have a capacity of around 200 gpm. During the design of the 2003 additions, it was determined to assume a capacity of 150 gpm. The well will continue to operate at similar pumping conditions. However, during an event where the existing Village well is out of service, the Lannon Estates well would need to increase in flow to compensate for the lost capacity. The Lannon Estates well has sufficiency capacity to meet current day demands with the existing well out of service.

The WDNR regulates the water system as an other-than-municipal (OTM) facility that is regulated by the WDNR NR 811 code, which is the same code as municipal water systems. According to the 2018 Sanitary Survey[1], there were two minor deficiencies with the system that included the floor drain discharge outlet not being completely buried and an electrical conduit sensor box for the reservoir not being completely sealed.

Historical water quality was obtained for the well and compared to the existing Village well. The water quality in the Lannon Estates well is very comparable to the water quality of the existing Village well and is available for review upon request. This is expected as the two wells generally draw water from the same depth of the aquifer formation.

The following improvements are proposed to convert the existing well facility from providing water to the mobile home park to the Village. Costs for these improvements are summarized in the cost opinion shown in Appendix 4-4.

1. Water main will be extended from a 12-inch water main stub on Lannon Road, just west of the well facility.

2. The process piping inside of the well facility will be replaced to connect to the Village water distribution system.

3. The existing pressure tank is only rated for 50 psi maximum working pressure. The gradient of the existing Village water system would exceed the pressure needed to be kept in the pressure tank once the two wells serve the same water system zone. Therefore, it is proposed to eliminate the pressure tank in the Lannon Estates well facility by valving it off from the system.

4. Sodium hypochlorite storage and feed equipment will be installed at the Lannon Estates well facility as it currently does not chlorinate the water.

5. Other minor improvements to the facility will also be done to have the facility meet the current WDNR code requirements.

B. Design Criteria

[1] WDNR Public Water Supply Sanitary Survey Report and Notice of Noncompliance, May 25, 2018, PWS ID# 26802743, Lannon Estates MHP-OC, Lannon, WI Waukesha County

The proposed project components will meet the applicable design criteria standard requirements of the WDNR Chapter NR 811. Improvements have been identified to bring the Lannon Estates well facility in compliance with current WDNR code.

C. Map

See Appendix 4-6 for the project limits.

D. Environmental Impacts

A comprehensive ER has not been completed at this time. As a requirement of the WDNR, a well siting study and a wellhead protection plan will need to be completed prior to the well being approved to produce water for the Village's system. No environmental impacts are anticipated for any portion of this project as the current well facility is permitted to pump water under the same regulatory code section as the Village will be.

E. Land Requirements

The Village will be purchasing a parcel of land from Lannon Estates that will contain the well facility and the adjacent below-ground water storage reservoir.

F. Potential Construction Problems

Potential construction issues for the well facility acquisition and improvements include shallow bedrock and coordination of schedule with the water main extension project. Shallow bedrock issues are also a potential issue with the water main expansion. Temporary water connections will need to be implemented to keep pressure within the existing Lannon Estates private water system.

G. Sustainability Considerations

As part of the water main extension project, Lannon Estates will be required to connect to the Village water distribution system and abandon the well facility. This project allows the existing well and facility to remain active and not be abandoned. It will also provide the Village a redundant water supply source.

H. Opinion of Probable Costs

1. Capital Costs

The opinion of probable cost for the alternative is $8,916,000. This is comprised of $7,086,000 in construction costs and $1,830,000 in non-construction costs. See Appendix 4-4 for a more comprehensive breakdown of the project costs. A 10 percent contingency is used for the project.

An estimate of $216,000 is to be used to improve the existing well facility by extending water main to the facility, interior piping modifications, and miscellaneous structural and electrical improvements within the facility. The engineering fees for this work is anticipated to be approximately $45,000 based on minor improvements requiring design to meet code requirements.

2. O&M Costs

The current annual O&M cost for the water utility is $58,000. The anticipated additional annual O&M cost and short-lived assets for the alternative is $50,000 and is detailed in Appendix 4-5. The total anticipated water utility O&M costs total approximately $108,000.

4.04 ALTERNATIVE NO. 3–WATER MAIN EXTENSIONS PLUS NEW DEEP-AQUIFER SANDSTONE WELL FACILITY

A. Description

In addition to the water main extensions described for Alternative No. 1, Alternative No. 3 includes the construction of a deep-aquifer sandstone well and facility. The well will be operated in tandem with the existing Village well.

The Village owns a parcel of land that has been reserved for a future elevated tank and future groundwater well facility. The location of the parcel is just west of West Main Street, between the intersections of West Main Street and Becker Drive and West Main Street and West Edgewood Drive. There is a school bus storage facility located just to the south of the parcel. The project will include an extension of the existing water main on W Main Street.

Constructing a deep sandstone aquifer well is preferred compared to a shallow limestone aquifer well. Sandstone aquifer well capacities tend to be greater than shallow limestone aquifer wells. Nearby sandstone aquifer wells tend to produce capacities above 500 gpm, but additional pump testing would be required to determine the actual well capacity. However, deep aquifer wells also tend to have elevated levels of iron and radium that will likely require treatment. It is assumed that the well facility will contain treatment equipment.

It is assumed the well facility will include chemical addition and filtration for radium, iron, and manganese removal. The facility will contain a backwash holding tank to reduce the flow impact to the sanitary sewer system.

B. Design Criteria

The proposed project components will meet the applicable design criteria standard requirements of the WDNR Chapter NR 811.

C. Map

A map of the proposed well facility location is shown in Appendix 4-7. The well facility parcel is LAN0066498002 and is 0.955 acres in size.

D. Environmental Impacts

No environmental impacts are anticipated for any portion of this project. As a requirement of the WDNR, a well siting study and a wellhead protection plan will need to be completed before the well is approved to be constructed and produce water for the Village's system.

E. Land Requirements

The Village currently owns a grassy lot located within Village limits. No additional land will need to be required to construct the well facility.

F. Potential Construction Problems

Potential construction issues for the well facility acquisition include shallow bedrock. Shallow bedrock issues are also a potential issue with the water main expansion. Depending on the water quality of the well once it is drilled, radium or iron removal treatment might or might not be required. The design will include a treatment facility; however, if the water quality is found to be sufficient without treatment, the design could potentially change.

Another potential issue is that the deep aquifer has different water quality parameters from existing Well No. 1. A water quality analysis would need to be conducted to determine if any special operational considerations are necessary before blending the water in the system.

G. Sustainability Considerations

Because of the nature of the nearby quarries, dewatering and potentially lowering the level of the shallow limestone aquifer, deep-aquifer sandstone wells historically provided greater water capacity than shallow-aquifer wells and can provide a sustainable source of supply to the Village. Additionally, the deep sandstone aquifer has a confining layer of shale to protect it from surface contaminants.

Concerning the water main extensions, it is not sustainable for private residents to replace or rehabilitate their private wells that test positive for coliform and *E. coli*. Extending public water supply to these customers provides a source of safe and reliable drinking water.

H. Opinion of Probable Costs

1. Capital Costs

The opinion of probable cost for the alternative is $11,075,000. This is comprised of $9,400,000 in construction costs and $1,675,000 in non-construction costs. See Appendix 4-4 for a more comprehensive breakdown of the project costs. A 10 percent contingency is used for the project.

2. O&M Costs

The current annual O&M cost for the water utility is $58,000. The anticipated additional annual O&M cost for the alternative is approximately $50,000 and is detailed in Appendix 4-5. The total anticipated water utility O&M costs total approximately $108,000.

SECTION 5
SELECTION OF AN ALTERNATIVE

5.01 SELECTION PARAMETERS

This section describes the process by which data from Section 4 is analyzed in a systematic manner to identify the recommended alternative. The selection of an alternative will consider both life cycle costs and non-monetary factors.

A. Life Cycle Cost Analysis

A 20-year present worth life cycle cost analysis was conducted for each alternative. A discount rate of 0.3 percent was used. Appendix 5-1 details the present worth analysis. The 20-year present worth of Alternative No.1 is rounded to $9,553,000, Alternative No. 2 is $9,885,000, and Alternative No. 3 is $12,129,000.

B. Nonmonetary Factors

Several nonmonetary factors need to be considered. Water quality and quantity, operability, sustainability, and cost-effectiveness were evaluated and compared between each of the three alternatives.

1. Water Quality and Quantity

All three alternatives add approximately a significant number of users to the water system. The total number of users is discussed in more detail in Section 6. This equates to approximately 800 residents to the Village's existing water distribution system.

For Alternative No. 1, the existing and new residents would be served by one existing groundwater well for supply. In the event that the existing well would need to be put out of service, additional storage or a temporary water supply would be needed through an ERP. Supplying water through an ERP is not the preferred way to operate a water system as the outage period for a well facility can range between several hours to several weeks depending on the circumstances.

Alternative No. 2 proposes to acquire an additional groundwater well as a redundant source of supply to the existing well. From a water supply perspective, Alternative No. 2 is preferred to Alternative No. 1 as it provides a redundant water supply source to the Village's distribution system, which allows the Village to properly maintain and operate its water system.

Alternative No. 3 proposes to construct a new well as a redundant source of supply to the existing well. The well would provide redundant water supply source to the Village and would be preferred to Alternative Nos. 1 and 2 as it provides a well with higher capacity, longer life expectancy, and has a confining shale layer that adds protection from surface contaminants.

2. Operability

Water system operation, including Alternative No. 1, would involve functioning under an ERP and potentially using emergency response procedures. Alternative Nos. 2 and 3 would require less emergency action to operate as there is redundancy. Alternative No. 3 will require additional expertise and costs to operate the treatment equipment than Alternative No. 2.

Additionally, Alternative No. 3 provides water from a different aquifer with different water quality parameters from existing Well No. 1. A water quality analysis would be necessary to confirm no special considerations are needed to operate two wells with different water quality.

Therefore, Alternative No. 2 is preferred.

3. Sustainability

Alternative No. 2 is the most sustainable option as it is reusing an existing functioning well to continue supplying water to the Village residents. No additional major infrastructure is needed. Alternative No. 2 is still providing an additional source of supply, which provides redundancy and keeps the water system operating.

4. Cost Effectiveness

Alternative No. 1 is cost-effective to bring water main to customers using several funding opportunities. However, Alternative No. 2 is the most cost-effective alternative as it is obtaining a well and well facility at a fraction of the cost to construct a new facility in addition to extending water main to several residents.

5.02 SELECTION OF AN ALTERNATIVE

A weighted scoring method was used to determine the selected project. The weights given to each criterion are shown in Table 5.02-1 and were decided based on the importance for each. The cost of the project was given the highest weight as the Village has limited funding compared to the infrastructure needed.

Criteria	Weight
Life-Cycle Cost	60%
Water Quality and Quantity	15%
Operability	5%
Sustainability	10%
Cost-Effectiveness	10%

Table 5.02-1 Components Weighting

Each alternative was then given a score for each criterion shown in Table 5.02-2 based on the justification in the previous section.

Criteria	Alternative No. 1	Alternative No. 2	Alternative No. 3
Life-Cycle Cost	10	9	5
Water Quality	4	8	10
Operability	2	10	8
Sustainability	4	10	9
Cost-Effectiveness	8	9	3

Table 5.02-2 Criteria Scoring

The scoring was then multiplied by the weight to give a total score for every criteria of each alternative, which is shown in Table 5.02-3. The scores were added together for each alternative and compared. Theoretically, the alternative with the highest score should be the preferred alternative. Alternative No. 2 is the preferred method based on the weighted scoring as it scored the highest. Section 6 discusses the project in more detail.

Component	Weight	Alternative No. 1	Alternative No. 2	Alternative No. 3
Life-Cycle Cost	60%	6.0	5.4	3.0
Water Quality	15%	0.6	1.2	1.5
Operability	5%	0.1	0.5	0.4
Sustainability	10%	0.4	1.0	0.9
Cost Effectiveness	10%	0.8	0.9	0.3
Total	**100%**	**7.9**	**9.0**	**6.1**

Table 5.02-3 Weighted Scores

SECTION 6
PROPOSED PROJECT

6.01 PROJECT DESIGN

The proposed project, Alternative No. 2, is the extension of the water distribution system and the acquisition and upgrades of the Lannon Estates Well Facility in the project areas shown in Appendices 4-1 through 4-3.

The project will extend approximately 16,300 lineal feet of 6-, 8-, and 12-inch water main. Throughout the project corridor, mainline valves, hydrants, fittings, curb stops, corporation stops, valve boxes, and Village-owned portions of the water services will be constructed. The project will include construction of a PRV station that will be used to serve the existing Lannon Estates private water system located in the southeast portion of the Village. The project will also include necessary road restoration and ditch improvements to facilitate the watermain expansion. The majority of the water main extensions will be within existing road ROW. The water main extensions located outside of the existing ROW are within three existing utility easements shown in Appendix 4-4.

The project will acquire the existing Lannon Estates Well Facility and the surrounding parcel of land. Several minor improvements will be done to the facility including connection to the Village distribution system, addition of sodium hypochlorite injection, and disconnection of the existing pressure tank to the system. A meter will be installed within the well facility to meter the water usage to the Lannon Estates Mobile Home Park users.

The project will connect new users along the proposed water main and any properties that are currently adjacent to existing water main. A more detailed discussion of types of users connected is included later in this section.

6.02 PROJECT SCHEDULE

The Village will bid and construct this project under two phases and two contracts. Table 6.02-1 shows the anticipated project schedule for the water main and Table 6.02-2 shows the anticipated project schedule for the well facility acquisition and improvements.

Action	Anticipated Schedule
Start Water Main Design	November 2019
Submit Preapplication (Preliminary Engineering Report [PER] and ER)	December 2019
Receive Application Decision and Complete Application	March 2020
WDNR Agency Review	March 2020
USDA RD Agency Review	March 2020 and April 2020
Advertisement	April 2020
Bid	May 2020
Contract Execution	July 2020
Start Construction	August 2020
Final Completion	September 2021
Loan Closing	September 2021
One-Year Warranty	September 2022

Table 6.02-1 Anticipated Project Schedule–Water Main Extension

Action	Anticipated Schedule
Start Facility Upgrade Design	April 2020
WPSC Agency Submittal	April 2020
WDNR and WPSC Agency Review	November 2020
Acquire Lannon Estates Facility	December 2020
USDA RD Agency Review	February 2021
Advertisement	March 2021
Bid	April 2021
Contract Execution	May 2021
Start Construction	June 2021
Substantial Completion	August 2021
Final Completion	September 2021
Loan Closing	September 2021
One-Year Warranty	September 2022

Table 6.02-2 Anticipated Project Schedule–Well Acquisition

6.03 PERMIT REQUIREMENTS

The following permits are anticipated to be required for the water main portion of the project and will be submitted as part of the design process.

- WDNR Water Main Extension Approval
- WDNR Construction Site Storm Water Runoff
- Waukesha County Concurrence on Temporary Construction on Bug Line Trail, which is listed as a Formally Classified Land
- Confirmation from PSCW that Construction Authorization is not necessary for water main.

In order for the WDNR to approve the well facility to operate as a Village groundwater well, the following WDNR forms and submittals will need to be completed.

- WDNR Form 3300-044 Public Well Approval
- WDNR Form 3300-266 High Capacity Well Ownership
- WDNR Form 3300-296 Pump Discharge Line Checklist
- WDNR Form 3300-304 Pumping Stations, Pumphouses, and Water Treatment Plant Buildings Submittal Checklist
- Water System Study
- Well Investigation Report
- Wellhead Protection Plan
- Plumbness and Alignment Test
- PSCW Construction Authorization for Well Acquisition

6.04 SUSTAINABILITY CONSIDERATIONS

All water main is anticipated to be constructed within existing road ROW with exception to the existing utility easements described in Section 4 and no additional land acquisition will be needed. Road ROW provides an area of already disturbed ground to construct new utilities without impacting natural resources or native soils.

The recommended alternative preserves existing infrastructure by incorporating the acquisition of the Lannon Estates well facility; the well will be used to supply water to the Village instead of being demolished.

6.05 TOTAL PROJECT COST ESTIMATES

Refer to Section 4.03.

6.06 WATER ANNUAL OPERATING BUDGET

A. Income

According to the 2018 PSC report, the Village operating revenue from the sales of water in 2018 was $84,295. A detailed discussion of user rates, users, impact fees, and special assessments is detailed in Sections 6.07 and 6.08. The anticipated operating revenue from sale of water after the project is $204,000 annually.

Additional anticipated revenue streams for this project include impact fees and special assessments, which are discussed in detail in Section 6.07. Impact fees will be collected on a one-time basis and are assumed to be $283,000. Special Assessment Fees will be collected on an annual basis for 20 years and are assumed to be $296,000. Both special assessment and impact fee values are subject to change based on the project variables.

B. O&M Costs

Water O&M costs are anticipated to increase because of the additional infrastructure. Valves and hydrants are recommended to be exercised, which will require additional staff time. With the additional demand in the system, additional water usage will occur. Additional maintenance costs will occur at the existing well and booster pumping facility in addition to the acquired well facility. Additional chemicals will need to be delivered and the existing equipment will need to be maintained and replaced more frequently. CTW, who currently operates each existing well facility, will continue to operate both facilities. Additional costs to operate the existing facility and the acquired facility will be needed. An estimated additional $50,000 of O&M costs will be needed with the additional infrastructure for a total estimated annual O&M expense of $108,000. See Appendix 4-7 for details regarding the estimated operating budget.

C. Debt Repayments

1. Existing

The last three years' worth of financial audits were prepared by Baker Tilly and are available for review upon request.

2. Proposed

The projected increase in indebtedness for the proposed project is approximately $189,400 per annum. This is based on a 55 percent RD loan and 45 percent grant at 2.375 percent and a 40-year life.

D. Rate Increases

The Village is anticipating performing a rate study once the proposed customers are connected to the system. This is anticipated to take place in 2022. It is understood that grant funding is given with respect to how the water rate (cost per EDU) compares to a percentage of the median household income (MHI). The Village is currently anticipating the need to raise its rates to 1.5 percent of the MHI, but the determination will occur after the project is funded and with the assistance and concurrence of the Wisconsin PSC.

E. Reserves and Short-Lived Assets (SLAs)

Appendix 5-1 shows a table of the Reserves and SLAs for the Village. The total annual budgeted SLA replacement cost for the existing system plus Alternative No. 2 is estimated to be approximately $23,200.

6.07 DISCUSSION OF USERS, SPECIAL ASSESSMENTS, AND IMPACT FEES

As part of this project, the Village anticipates requiring all property owners to connect to the water system once the water main is adjacent to its property. This includes property owners that are

adjacent to but not yet connected to existing water main and property owners who are adjacent to the proposed water main.

The Village has already assessed impact fees on all existing connected properties for source development, local water main, and water main oversizing. While the proposed well acquisition does benefit the entire community, the existing connected users have already paid impact fees for source development and water main expansion. The Village used existing impact fees to pay down the debt on the water main project and acquire a future storage and source supply site as they are eligible impact fee expenses. Thus, the water utility debt is lower than it would have been if a portion of the impact fees had been reserved for a second source. Furthermore, the Village has not yet collected enough impact fees from properties adjacent to existing water main to pay off the debt of that existing water main. Thus, existed connected users will not be assessed an additional impact fee for the second source of this project.

When customers connect as a result of this project and the mandatory connection requirement for customers adjacent to existing water mains, each will be charged or assessed according to one of several scenarios:

1. Existing residential, commercial/industrial, and public users that are already connected to the existing water main–They will not pay any special assessment or additional impact fees. As discussed, their impact fees have already been allocated towards eligible impact fee projects. Their water usage is anticipated to continue based on the EDUs described in Section 2. The following tables identify this is User Type 1–Existing Main and Existing Connection. The Lannon Estates meter is assumed to be 55 EDUs.

2. Residential, commercial/industrial, or public users with a planned connection to the proposed water main–They will have a $1,200 impact fee plus a special assessment fee and they will have anticipated water usage based on the EDU described in Section 2. The following tables Identify this is User Type 2–New Main and New Connection.

   Lannon Estates is included in this group and is treated separately from residential, commercial/industrial, and public users, although it is technically a multifamily residential user. For special assessments, Lannon Estates is equal to 20 equivalent meters (EMs). For assumed billing purposes, Lannon Estates has a different meter charge than the other meters in the system. Over 95 percent of the Lannon Estates water bill will be from usage as opposed to quarterly meter fees. For comparison, most residential property's bills will be closer to 50 percent general meter charge fee and 50 percent water usage. Thus, assuming Lannon Estates water bill based on the Village's current billing structure is not recommended

3. Commercial/industrial users along the proposed water main route that are not planning to connect as they do not have plumbing in their existing building–They will pay a special assessment fee but will not pay an impact fee with this project as they

are not connecting. They will not have any anticipated water usage. The following tables identify this is User Type 3–New Main and No Connection.

4. Connection of residential, commercial/industrial, or public users to existing water main connecting to trunk mains (Impact Fee Zone 2)–They will pay an impact fee of $1,200 that includes the USDA RD well acquisition and an impact fee of $8,800 for local mains, but they will not pay a special assessment. They will have anticipated water usage based on the EDU described in Section 2. The following tables identify this is User Type 4–Existing Trunk Main and New Connection.

5. Connection of residential, commercial/industrial, or public users to existing water main connecting to trunk sectors (Impact Fee Zone 3)–They will pay an impact fee of $1,200 for the USDA RD well acquisition plus an impact fee of $3,800 for local mains, but they will not pay a special assessment. They will have anticipated water usage based on the EDU described in Section 2. The following tables identify this is User Type 5–Existing Sector Main–New Connection.

Table 6.07-1 summarizes the anticipated customers for the proposed project. As discussed previously, Lannon Estates is a residential user but is being tracked separately for the purposes of this report.

User Type	Existing Main and Existing Connection 1	New Main and New Connection 2	New Main and No Connection 3	Existing Trunk Main and New Connection 4	Existing Sector Main and New Connection 5	Total Users
Residential	131	146	0	23	10	310
Commercial/Industrial	7	19	6	15	3	44
Public	3	0	0	0	0	3
Residential–Lannon Estates	0	1	0	0	0	1
Total	141	166	6	38	13	358

Table 6.07-1 Proposed Water System Users

Table 6.07-2 shows the anticipated number of EDUs. EDU values from Section 2 are used in the tables. Additionally, Lannon Estates is assumed to be equivalent to 55 EDUs.

User Type	Existing Main and Existing Connection 1	New Main and New Connection 2	New Main and No Connection 3	Existing Trunk Main and New Connection 4	Existing Sector Main and New Connection 5	Total Users
Residential	131	146	0	23	10	310
Commercial/Industrial	7	20	0	16	3	46
Public	9	0	0	0	0	9
Residential–Lannon Estates	0	55	0	0	0	55
Total	147	221	0	39	13	420

Table 6.07-2 Proposed Water System EDUs

Table 6.07-3 shows the anticipated impact fees for the USDA RD Secondary Source Project. As noted in this section, existing customers have already paid impact fees for water eligible projects. Additionally, customers connecting to existing main have additional impact fees that they will be paying that will not be funding additional impact fee eligible projects. The impact fee is currently anticipated at $1,200 per connection and the Lannon Estates property will pay an equivalent 20 connections. It should be noted that the impact fee may vary depending on total project costs and variables.

User Type	Existing Main and Existing Connection 1	New Main and New Connection 2	New Main and No Connection 3	Existing Trunk Main and New Connection 4	Existing Sector Main and New Connection 5	Impact Fee
Residential	$0	$175,200	$0	$27,600	$12,000	$214,800
Commercial/Industrial	$0	$22,800	$0	$18,000	$3,600	$44,400
Public	$0	$0	$0	$0	$0	$0
Residential–Lannon Estates	$0	$24,000	$0	$0	$0	$24,000
Total						$283,000

Table 6.07-3 Anticipated Total Impact Fee for USDA RD Second Source

Table 6.07-4 shows the anticipated special assessment for the USDA RD Project. The special assessment value is currently assumed at paying back a USDA RD Loan amount of $3,534,000 at 2.25 percent in 20 years. This value equals the total project cost minus the well acquisition costs USDA RD grant amount, other contributions, and anticipated rate modifications. Customers in Scenarios 2 and 3 will pay a special assessment. Again, Lannon Estates is assumed to be worth 20 EMs, so there are 191 EMs. Based on a standard 20-year amortization schedule, their assumed annual payment per EM is $1,149.70. The assumed special assessment value in this report is also subject to change.

User Type	Existing Main and Existing Connection 1	New Main and New Connection 2	New Main and No Connection 3	Existing Trunk Main and New Connection 4	Existing Sector Main and New Connection 5	Special Assessment
Residential	$0	$167,856	$0	$0	$0	$167,856
Commercial/Industrial	$0	$21,844	$6,898	$0	$0	$28,742
Public	$0	$0	$0	$0	$0	$0
Residential–Lannon Estates	$0	$22,994	$0	$0	$0	$22,994
Total	$0	$212,694	$6,898	$0	$0	$219,000

Table 6.07-4 Anticipated Annual Special Assessment Revenue for 20 Years

6.08 SUMMARY OF ANTICIPATED PROJECT COSTS

Table 6.08 summarizes project costs, O&M costs, SLAs, and other funding amounts for the selected project alternative. As noted previously, several of these costs are subject to change.

Item	Anticipated Cost
Total Project Cost Opinion (Alternative No. 2)	$8,916,000
Cost Opinion for Existing System O&M (per year)	$58,000
Cost Opinion for Project O&M (per year)	$50,000
Total Cost Opinion O&M	$108,000
Total Cost Opinion for System SLA (per year)	$23,000
Anticipated Annual Special Assessment Income (per year)	$219,000
Total Anticipated Connect and Impact Fee	$283,000
Total Anticipated Revenue (420 EDUs at $555.72 per EDU per year)	$233,000

Table 6.08-1 Anticipated Project Costs

SECTION 7
CONCLUSIONS AND RECOMMENDATIONS

7.01 CONCLUSIONS AND RECOMMENDATIONS

The proposed project is to extend the water distribution system to the areas of private well contamination and acquire the Lannon Estates Well Facility as shown in this report to provide safe and reliable drinking water to the Village residents. Additional storage volume is anticipated to be constructed in the near future to provide adequate storage and fire protection. Section 7.02 includes additional items for contingency funding.

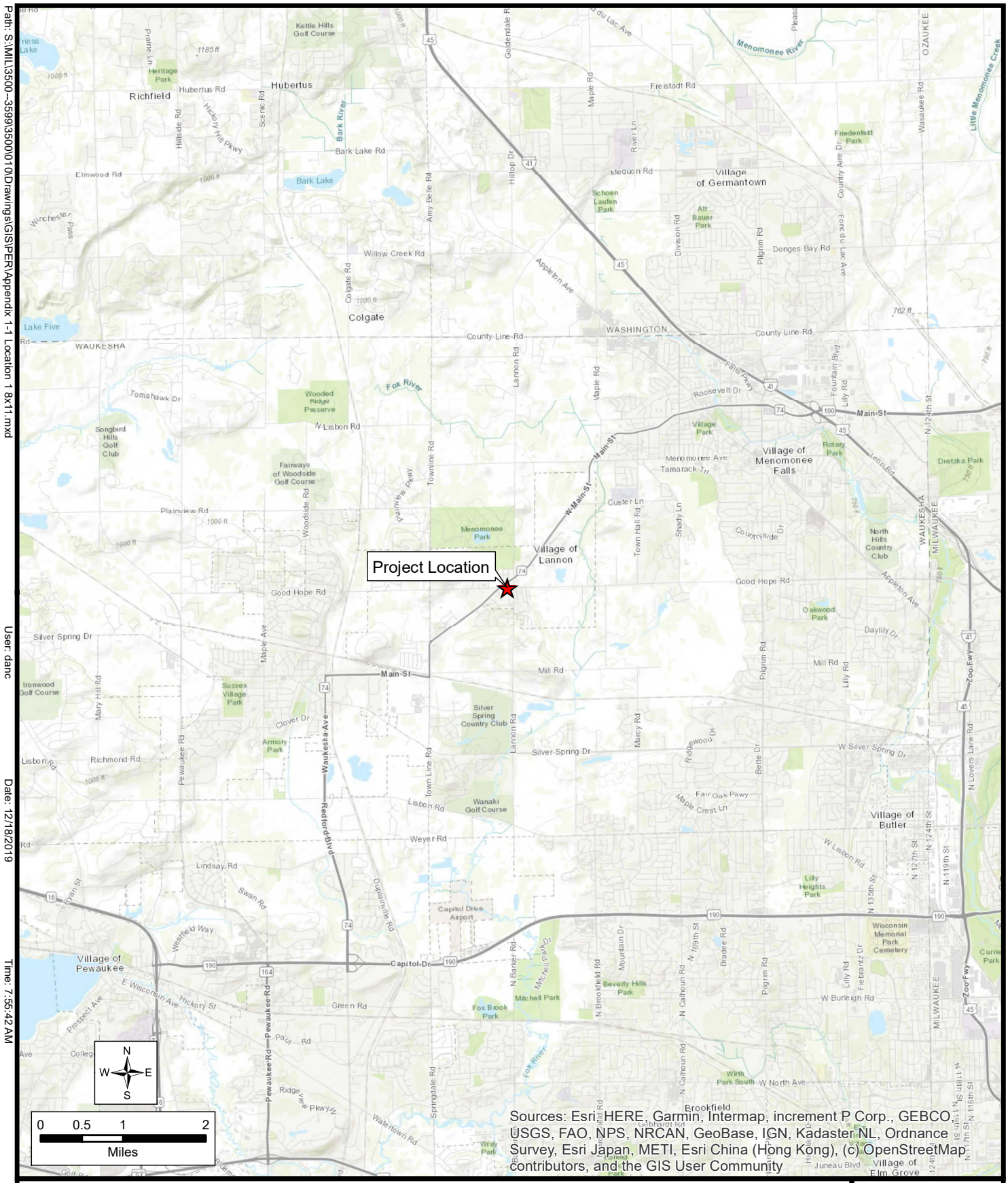
7.02 ADDITIONAL ITEMS FOR CONTINGENCY FUNDING

In addition to the needed projects described in Section 6, additional project improvements to be constructed using additional contingency monies are shown in Table 7.02-1. Because the total value of the projects identified in Table 7.02-1 exceeds the total contingency amount, these projects will be prioritized and completed only as actual contingency funds allow.

Item	Design Life (years)	Replacement Cost	Annual Set Aside
Well No. 1 Rehabilitation	10	$15,000	$1,500
Third Fire Booster Pump	20	$75,000	$3,750
Booster Pump Motor Replacement	20	$20,000	$1,000
Booster Pumping Station Facility Improvements	20	$10,000	$500
Leak Detection Study	10	$5,000	$500
Leak Detection Study Improvements	10	$100,000	$10,000
Residential Meter Replacement (141 existing meters)	15	$28,000	$1,867
New Residential Meters (175 new meters)	15	$35,000	$2,333
Replace Lannon Estates Pressure Tank	20	$25,000	$1,250
Extend Water Main on Town Line Road to Good Hope Road to Complete Looping and Reach Additional Customers	100	$600,000	$10,000
Extend Water Main on Lannon Road to Lannon Village Park	100	$400,000	$4,000
Extend Water Main for Emergency Interconnect to Town of Lisbon	100	$200,000	$2,000
Village Water SCADA System	20	$100,000	$5,000
	Total	**$1,613,000**	**$43,700**

Table 7.02-1 Contingency Funding Items

APPENDIX 1-1
LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

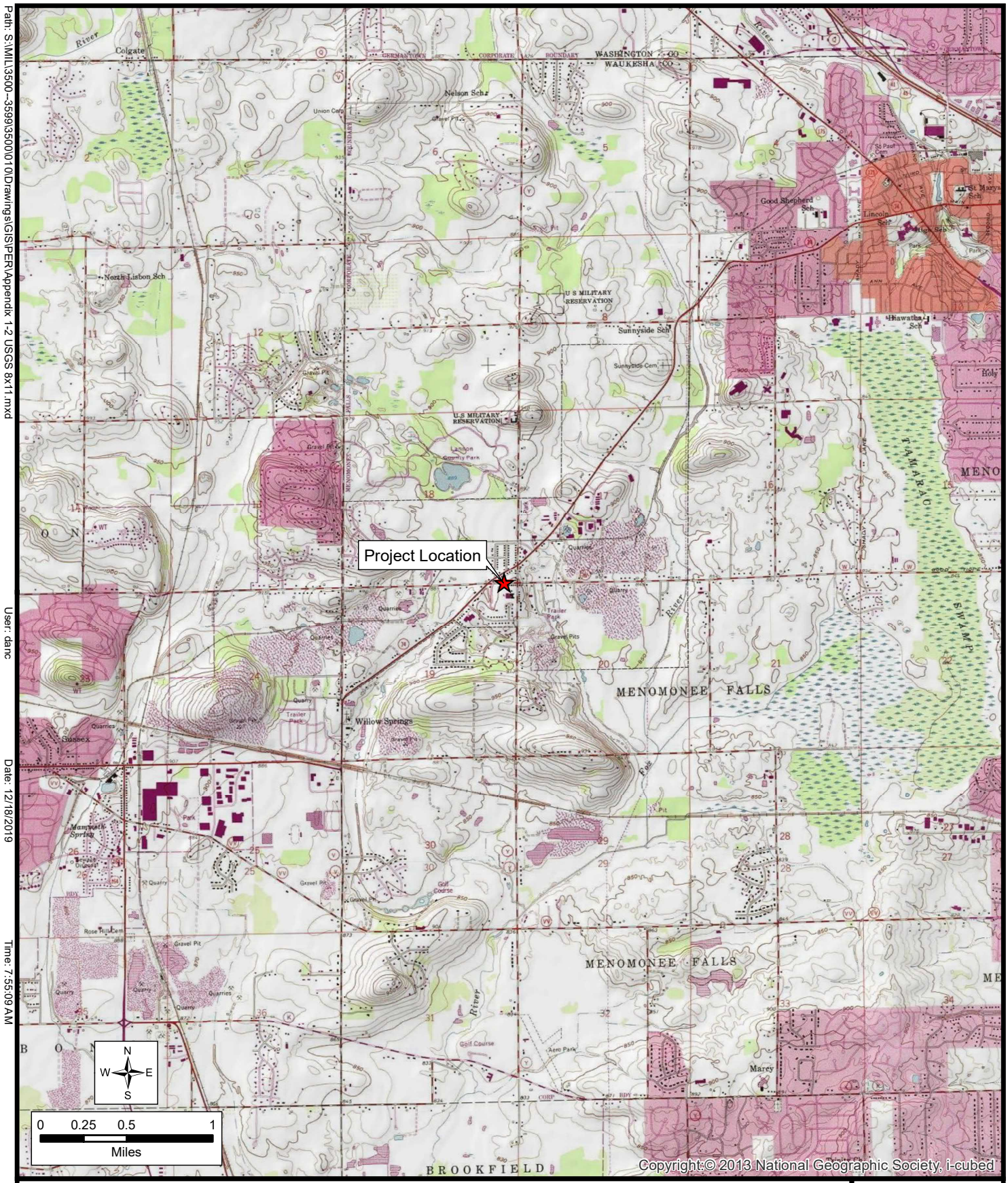
LOCATION MAP

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 1-1
3500.010

APPENDIX 1-2
USGS MAP



USGS MAP

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

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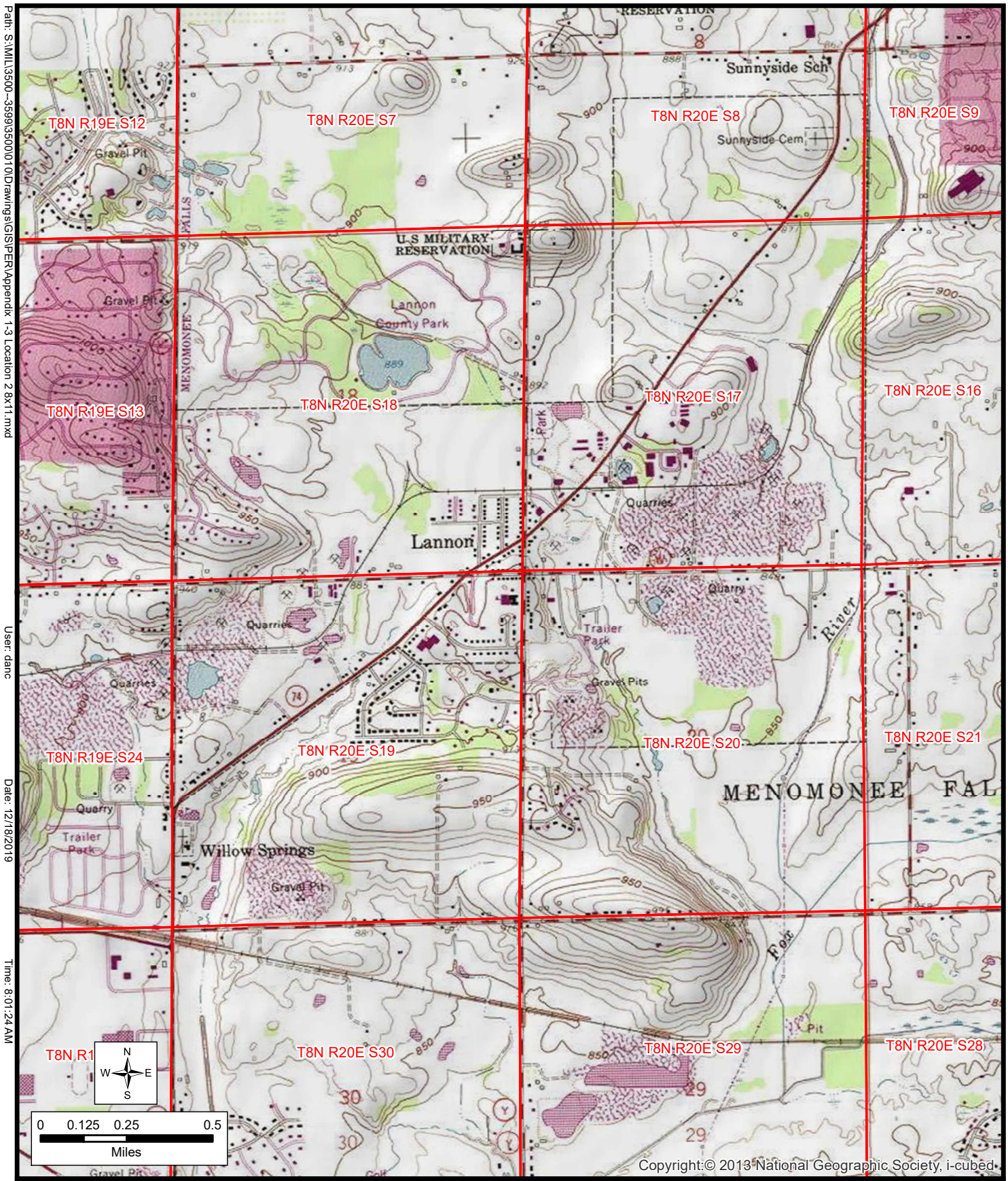
3500.010

APPENDIX 1-3
LOCATION MAP CLOSEUP



LOCATION MAP

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

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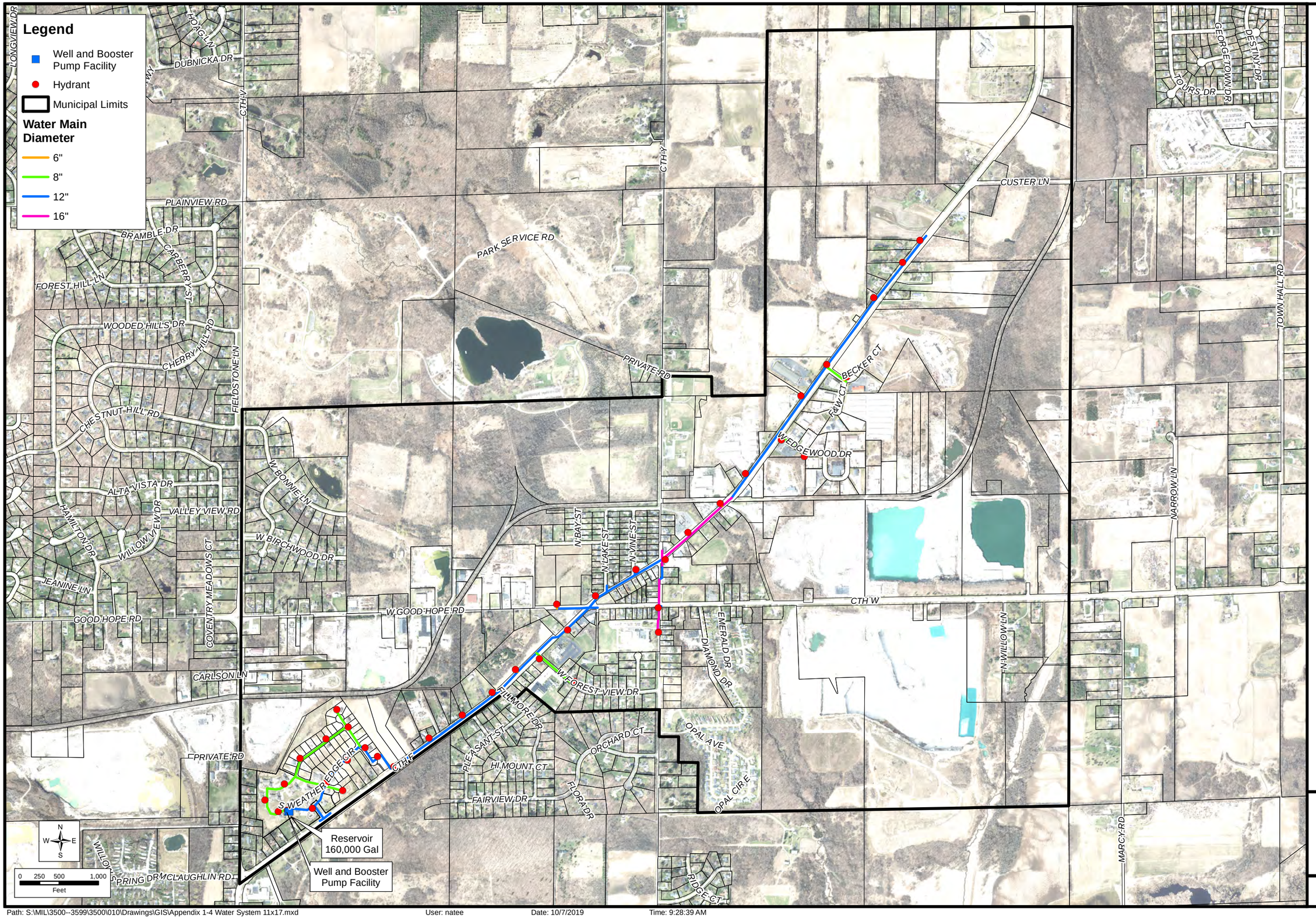
APPENDIX 1-3
3500.010

APPENDIX 1-4
WATER DISTRIBUTION SYSTEM



WATER DISTRIBUTION SYSTEM

WATER SYSTEM IMPROVEMENTS
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 1-4
3500.010

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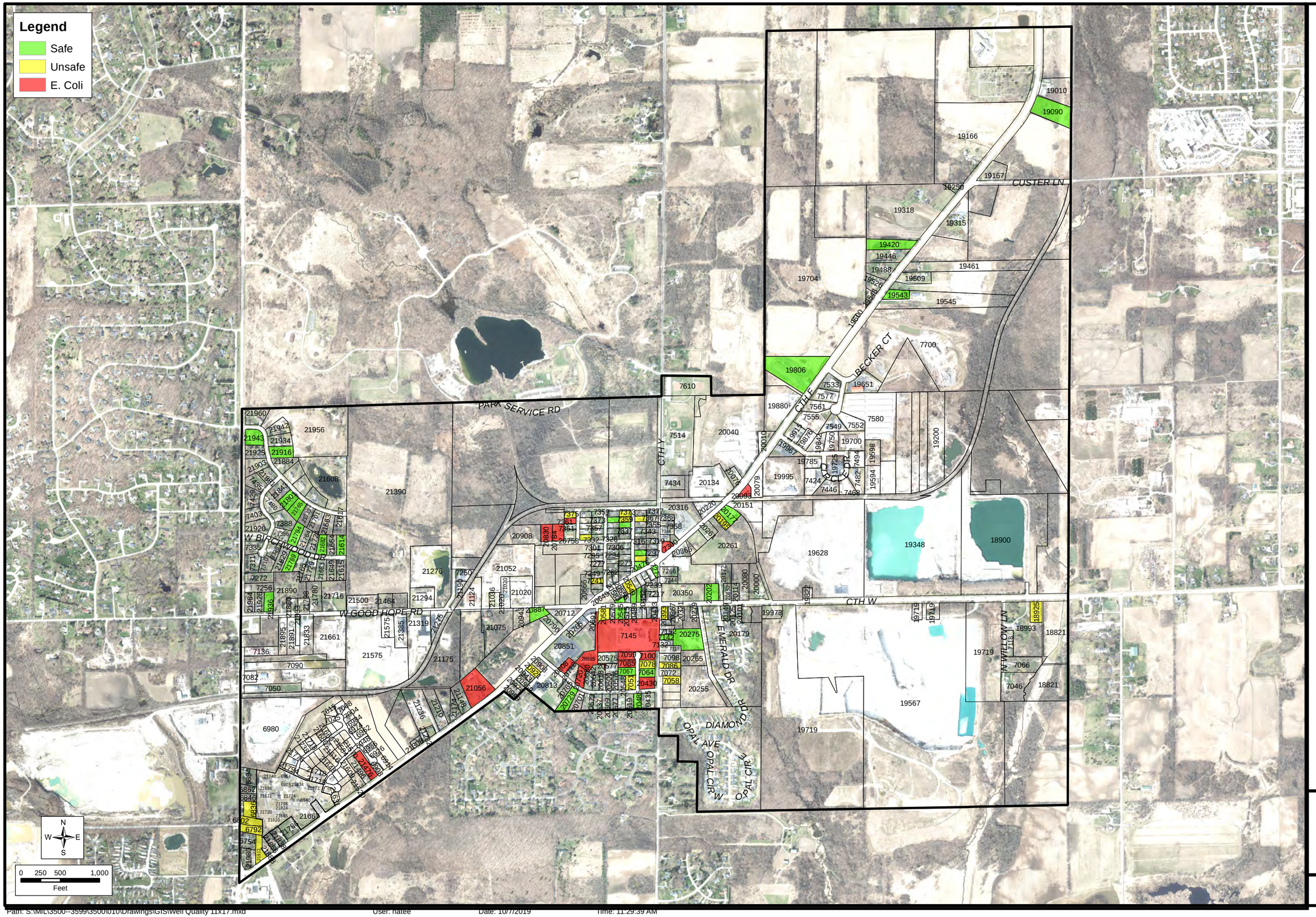
APPENDIX 3-1
PRIVATE WELL WATER QUALITY MAP



PRIVATE WELL WATER QUALITY

VILLAGE OF LANNON

WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 3-1

3500.010

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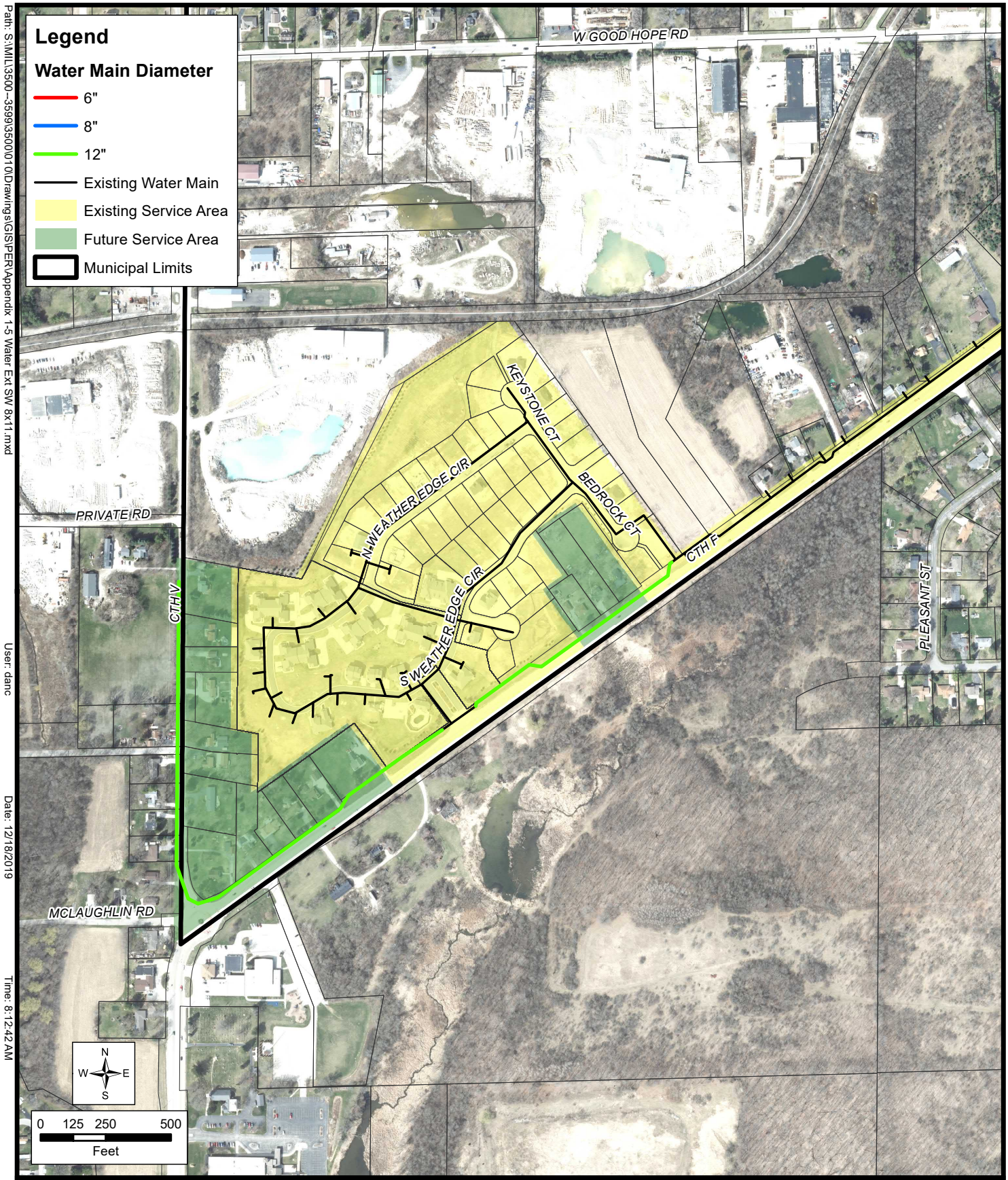
APPENDIX 4-1
WATER MAIN EXTENSION PROJECT LIMITS–SOUTHWEST REGION



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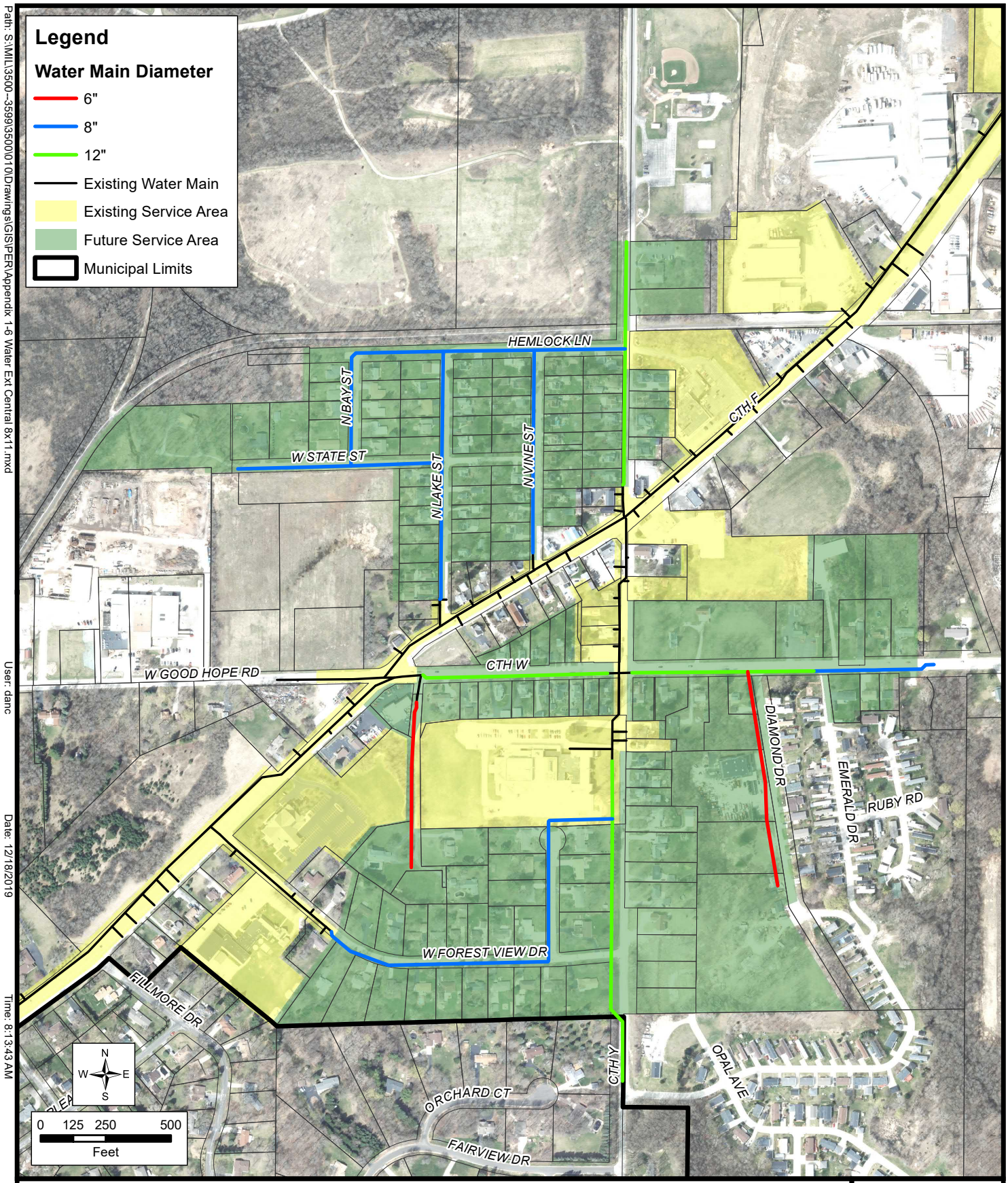
WATER MAIN EXTENSION PROJECT LIMITS
SOUTHWEST REGION

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 1-5
3500.010

APPENDIX 4-2
WATER MAIN EXTENSION PROJECT LIMITS–CENTRAL REGION



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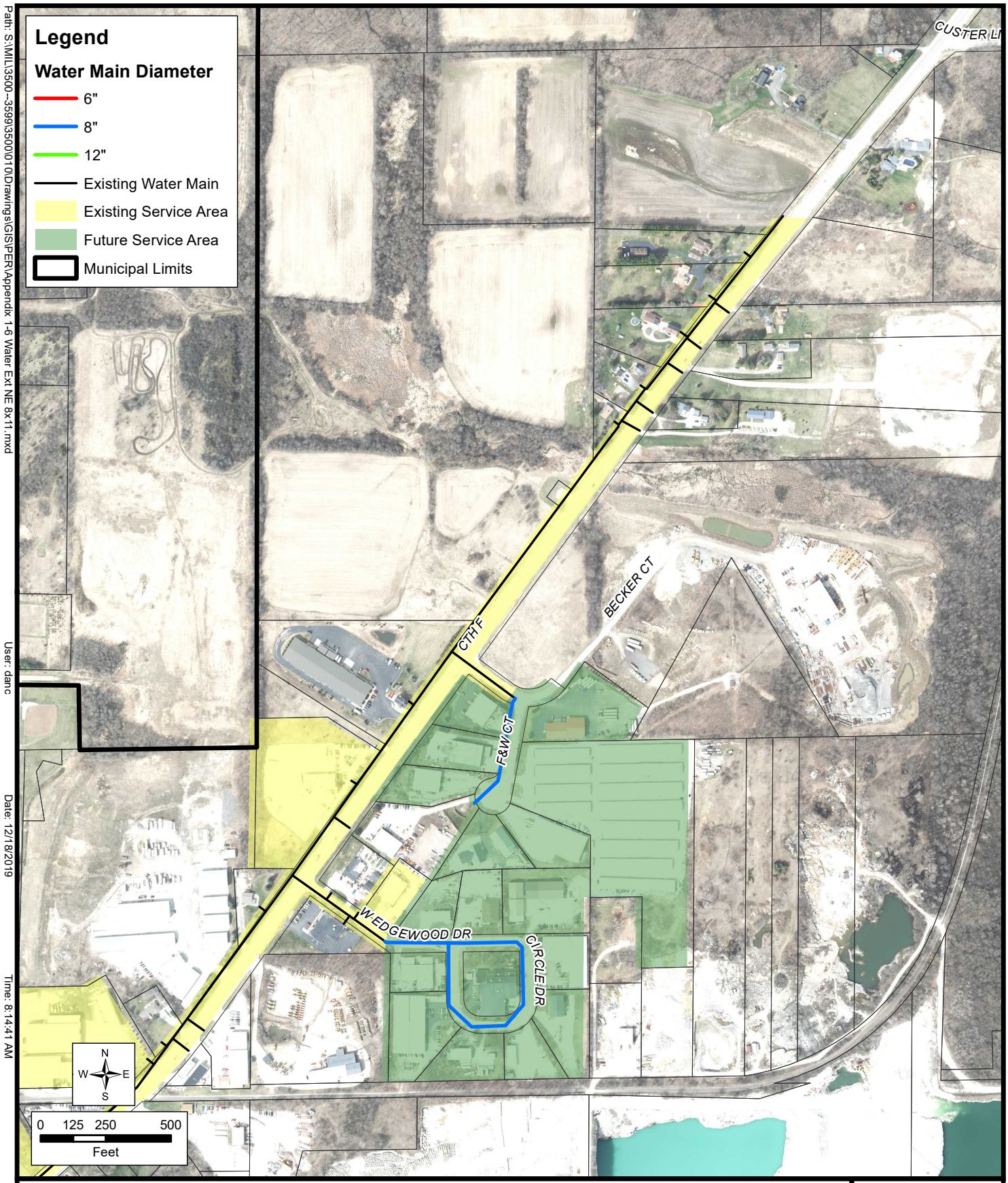
WATER MAIN EXTENSION PROJECT LIMITS
CENTRAL REGION

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 1-6
3500.010

APPENDIX 4-3
WATER MAIN EXTENSION PROJECT LIMITS–NORTHEAST REGION



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WATER MAIN EXTENSION PROJECT LIMITS
NORTHEAST REGION

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 1-7
3500.010

APPENDIX 4-4
COST OPINION ALTERNATIVE

VILLAGE OF LANNON (WAUKESHA COUNTY WISCONSIN)
PRELIMINARY ENGINEERING REPORT (PER)-WATER SYSTEM IMPROVEMENTS
OPINION OF PROBABLE COST

CONSTRUCTION COSTS

CONTRACT 1 - WATER MAIN EXTENSION (2019 Dollars)

Item No.	Description	Est. Qty.	Unit	Unit Price	Total - Alternative 1	Total - Alternative 2	Total - Alternative 3
1	12-IN PVC Water Main with Slurry Backfill	4,871	LF	$170	$828,150	$828,150	$828,150
2	12-IN PVC Water Main with Granular Backfill	1,989	LF	$130	$258,570	$258,570	$258,570
3	8-IN PVC Water Main with Slurry Backfill	584	LF	$160	$93,440	$93,440	$93,440
4	8-IN PVC Water Main with Granular Backfill	7,143	LF	$120	$857,148	$857,148	$857,148
5	8-IN PVC Water Main with Native Backfill	240	LF	$95	$22,800	$22,800	$22,800
6	6-IN PVC Water Main with Granular Backfill	1,471	LF	$115	$169,165	$169,165	$169,165
7	24-IN Steel Casing	40	LF	$650	$26,000	$26,000	$26,000
8	18-IN Steel Casing	30	LF	$625	$18,750	$18,750	$18,750
9	Fire Hydrant W/ Aux Valve	35	EA	$6,500	$227,500	$227,500	$227,500
10	12-IN Gate Valve & Valve Box	12	EA	$3,500	$42,000	$42,000	$42,000
11	8-IN Gate Valve & Valve Box	18	EA	$2,500	$45,000	$45,000	$45,000
12	6-IN Gate Valve & Valve Box	1	EA	$1,500	$1,500	$1,500	$1,500
13	Connect New Water Main to Existing Water Main	14	EA	$7,500	$105,000	$105,000	$105,000
14	1 1/4-IN Water Service with Slurry Backfill	1,081	LF	$160	$173,027	$173,027	$173,027
15	1 1/4-IN Water Service with Granular Backfill	3,279	LF	$120	$393,444	$393,444	$393,444
16	1 1/4-IN Water Service, HDD	680	LF	$105	$71,400	$71,400	$71,400
17	1 1/4-IN Corporation Stop, Curb Stop, and Curb Box	175	EA	$450	$78,750	$78,750	$78,750
18	Exploratory Excavation	15	EA	$1,500	$22,067	$22,067	$22,067
19	Insulation	2,411	SF	$10	$24,110	$24,110	$24,110
20	Rock Excavation	3,323	LF	$275	$913,712	$913,712	$913,712
21	Pressure Reducing Valve in Manhole	1	EA	$10,000	$10,000	$10,000	$10,000
22	Sawcutting	24,274	LF	$1	$24,274	$24,274	$24,274
23	Concrete Pavement, 9-IN	645	SY	$95	$61,286	$61,286	$61,286
24	Crushed Aggregate Base Course	7,813	Ton	$20	$156,269	$156,269	$156,269
25	Aggregate Shoulder	1,509	LF	$7	$10,561	$10,561	$10,561
26	30-IN Concrete Curb and Gutter Removal and Replacement	2,573	LF	$30	$77,186	$77,186	$77,186
27	Remove and Replace Culvert	50	LF	$40	$2,000	$2,000	$2,000
28	Adjust Existing Structure	63	EA	$750	$47,250	$47,250	$47,250
29	Remove and Reset Inlet	8	EA	$2,000	$16,000	$16,000	$16,000
30	Asphaltic Concrete Pavement - Trench Patch	3,034	Ton	$120	$364,094	$364,094	$364,094
31	Asphaltic Concrete Pavement - Overlay	4,167	Ton	$105	$437,483	$437,483	$437,483
32	Milling	37,388	SY	$2	$74,777	$74,777	$74,777
33	Remove and Replace Asphalt Driveway	1,232	SY	$40	$49,280	$49,280	$49,280
34	Pavement Marking - General	22,736	LF	$2	$45,472	$45,472	$45,472
35	Restoration	4,205	SY	$10	$42,049	$42,049	$42,049
36	Remove and Replace Fence	50	LF	$175	$8,750	$8,750	$8,750
37	Remove and Reset Mailbox	1	LS	$7,500	$7,500	$7,500	$7,500
38	Remove and Reset Existing Landscaping	1	LS	$25,000	$25,000	$25,000	$25,000
39	Clearing and Grubbing	1	LS	$15,000	$15,000	$15,000	$15,000
40	Traffic Control	1	LS	$50,000	$50,000	$50,000	$50,000
41	Mobilization	1	LS	$130,000	$130,000	$130,000	$130,000
42	Erosion Control	1	LS	$20,000	$20,000	$20,000	$20,000
43	Ditching	6,900	LF	$13	$89,700	$89,700	$89,700
44	12-IN Driveway Culverts	1,500	LF	$40	$60,000	$60,000	$60,000
45	Remove and Replace Asphalt Driveway	1,000	SY	$40	$40,000	$40,000	$40,000
46	Remove and Replace Concrete Driveway	60	SY	$70	$4,200	$4,200	$4,200
47	Remove and Replace Gravel Driveway	60	SY	$10	$600	$600	$600
48	Adjust Inlet	6	EA	$750	$4,500	$4,500	$4,500
	Subtotal Contract (rounded to nearest $1,000)				$6,245,000	$6,245,000	$6,245,000
	General Contingency (10%)				$625,000	$625,000	$625,000
	Total Contract				$6,870,000	$6,870,000	$6,870,000

CONTRACT 2 - LANNON ESTATES WELL FACILITY ACQUISITION (2019 Dollars)

Item No.	Description	Est. Qty.	Unit	Unit Price	Total - Alternative 1	Total - Alternative 2	Total - Alternative 3
1	Extend Water Main to Well Facility	1	LS	$63,000	$0	$63,000	$0
2	Internal Piping Modifications and Additions	1	LS	$30,000	$0	$30,000	$0
3	Chemical Feed System Modifications	1	LS	$14,000	$0	$14,000	$0
4	Facility HVAC/Plumbing Improvements	1	LS	$13,500	$0	$13,500	$0
5	Facility Structural Improvements	1	LS	$30,000	$0	$30,000	$0
6	Facility Electrical Improvements	1	LS	$45,000	$0	$45,000	$0
	Subtotal Contract (rounded to nearest $1,000)				$0	$196,000	$0
	General Contingency (10%)				$0	$20,000	$0
	Total Contract				$0	$216,000	$0

CONTRACT 2a - NEW DEEP-AQUIFER WELL FACILITY WITH TREATMENT (2019 Dollars)

Item No.	Description	Est. Qty.	Unit	Unit Price	Total - Alternative 1	Total - Alternative 2	Total - Alternative 3
1	Well Drilling	1	LS	$400,000	$0	$0	$400,000
2	Well Facility	1	LS	$1,150,000	$0	$0	$1,150,000
3	Well Facility Treatment	1	LS	$750,000	$0	$0	$750,000
	Subtotal Contract (rounded to nearest $1,000)				$0	$0	$2,300,000
	General Contingency (10%)				$0	$0	$230,000
	Total Contract				$0	$0	$2,530,000
	Total Construction Costs				$6,870,000	$7,086,000	$9,400,000

NON-CONSTRUCTION COSTS

Description	Est. Qty.	Unit	Unit Price	Total - Alternative 1	Total - Alternative 2	Total - Alternative 3
Engineering Service Costs						
Engineering (Design)						
Contract 1 - Water Main	1	LS	$256,000	$256,000	$256,000	$256,000
Contract 1 - Water Main Amendment 1	1	LS	$34,000	$14,000	$14,000	$14,000
Contract 2 - Facility Improvements	1	LS	$45,000	$0	$45,000	$0
Contract 2a - Well Drilling	1	LS	$35,000	$0	$0	$35,000
Contract 2a - Well Facility	1	LS	$90,000	$0	$0	$90,000
Contract 2a - Well Treatment Facility	1	LS	$35,000	$0	$0	$35,000
Engineering (Additional Services)						
Contract 1 - Surveying	1	LS	$84,000	$84,000	$84,000	$84,000
Contract 1 - Surveying Amendment 1	1	LS	$5,000	$5,000	$5,000	$5,000
Contract 1 - Soil Borings	1	LS	$25,650	$25,650	$25,650	$25,650
Contract 1 - Sewer Televising for WM Design	1	LS	$70,000	$70,000	$70,000	$70,000
Contract 2 - Wellhead Protection Plan	1	LS	$7,500	$0	$7,500	$7,500
Contract 2 - Plumbness and Alignment Test	1	LS	$7,500	$0	$7,500	$7,500
Contract 2 - Well Siting Study	1	LS	$12,500	$0	$12,500	$12,500
Contract 2a - Surveying	1	LS	$2,000	$0	$0	$2,000
Contract 2a - Soil Borings	1	LS	$5,000	$0	$0	$5,000
Contract 2a - SCADA Graphics	1	LS	$25,000	$0	$0	$25,000
Water System Expansion Program Management (Additional Services)						
Project Management and Administration including communication between various design teams; with the Village President, Clerk, and Board; with Village Consultant Staff such as Attorney, Accountant, and Municipal Financial Advisor; with Government Officials at the County, State, and Fedaral levels; and with Potential Project Vendors.	1	LS	$75,000	$75,000	$75,000	$75,000
Assist with Ordinance Revisions Regarding Water Connections, Well Abandonment, Impact Fees, and Special Assessments.	1	LS	$10,000	$10,000	$10,000	$10,000
Conduct Funding Research and Studies including Special Assessment Report, Impact Fee Report, and Calculate Anticipated Water Rates.	1	LS	$25,000	$25,000	$25,000	$25,000
Participate in Acquisition Negotiations Related to the Second Source including Researching Improvements, Drafting an MOU, and Reviewing Well Purchase Agreement.	1	LS	$20,000	$20,000	$20,000	$20,000
Public Outreach Activities including Door-to-Door Property Survey; Answer Property Owner Inquiries, and Assist with Public Meetings and Notification Mailers.	1	LS	$70,000	$70,000	$70,000	$70,000
Engineering (Inspection)						
Contract 1 - Geotechnical Construction	1	LS	$55,000	$55,000	$55,000	$55,000
Engineering - Construction Administration						
Contract 1 - Bidding Services	1	LS	$10,000	$10,000	$10,000	$10,000
Contract 1 - RPR	1	LS	$251,000	$251,000	$251,000	$251,000
Contract 1 - Construction Staking	1	LS	$54,000	$54,000	$54,000	$54,000
Contract 1 - General Admin	1	LS	$120,000	$120,000	$120,000	$120,000
Contract 2 - Bidding Services	1	LS	$10,000	$0	$10,000	$0
Contract 2 - RPR	1	LS	$10,000	$0	$10,000	$0
Contract 2 - General Admin	1	LS	$12,000	$0	$12,000	$0
Contract 2a - Bidding Services	1	LS	$10,000	$0	$0	$10,000
Contract 2a - RPR	1	LS	$50,000	$0	$0	$50,000
Contract 2a - General Admin	1	LS	$55,000	$0	$0	$55,000
Engineering - PreDevelopment						
Environmental Report	1	LS	$14,000	$14,000	$14,000	$14,000
Pre-Application	1	LS	$10,000	$10,000	$10,000	$10,000
Preliminary Engineering Report	1	LS	$29,000	$29,000	$29,000	$29,000
Water Model and Water System Study	1	LS	$49,500	$49,500	$49,500	$49,500
PSC Construction Authorization	1	LS	$10,000	$10,000	$10,000	$10,000
USDA Final Application Assistance and Agreement Preparation						
Project Management and Administration	1	LS	$8,000	$8,000	$8,000	$8,000
Emergency Response Plan	1	LS	$10,000	$10,000	$10,000	$10,000
Vulnerability Assessment Certification	1	LS	$5,000	$5,000	$5,000	$5,000
Budgeting Assistance	1	LS	$2,000	$2,000	$2,000	$2,000
ROW Easement Drawings	1	LS	$3,000	$3,000	$3,000	$3,000
General Application Assistance	1	LS	$10,000	$10,000	$10,000	$10,000
Other Costs						
Legal Services						
Owner's Attorney Fees	1	LS	$20,000	$20,000	$20,000	$20,000
Municipal Advisor Fees	1	LS	$20,000	$20,000	$20,000	$20,000
Bond Counsel						
Owner's Bond Counsel	1	LS	$10,000	$10,000	$10,000	$10,000
Interim Financing						
Owner's Interim Financing	1	LS	$80,000	$80,000	$80,000	$80,000
Land & Rights						
Lannon Estates Well Facility and Land Acquisition	1	LS	$300,000	$0	$300,000	$0
Total Non-Construction Costs (nearest $1,000)				$1,425,000	$1,830,000	$1,760,000
TOTAL OPINION OF PROBABLE COST				**$8,295,000**	**$8,916,000**	**$11,160,000**

APPENDIX 4-5
O&M COSTS

Operating Budget
For First Full Year After Construction

(add or delete rows as necessary)

Community Name: Village of Lannon Water Utility **County:** Waukesha

Address: 20399 W. Main Street
P.O. Box 456
Lannon, Wisconsin 53046

		Alternative 1	Alternative 2	Alternative 3
A. Applicant Fiscal Year:	**From:** Jan-20 **To:** Dec-20			
B. Operating Income:	**From Water Sales or Sewer Rates & Charges:**	$204,000	$204,000	$204,000
	Other (e.g. hydrant rentals, etc)	$0	$0	$0
	Total Operating Income:	$204,000	$204,000	$204,000
C. Operating Expenses:				
Utilities		$17,000	$17,000	$17,000
Insurance/Audit			$0	
Salaries/Benefits		$7,400	$5,000	$5,000
Other - Lab or other Costs		$0	$0	$0
Other - Vehicle Expenses		$0	$0	$0
Administrative/Office		$2,700	$3,000	$3,000
Repairs/Maintenance		$4,000	$4,000	$4,000
Supplies		$3,000	$3,000	$3,000
Chemicals		$10,000	$10,000	$10,000
Legal		$0	$0	$0
Outside Services		$55,800	$57,000	$57,000
Emergency Response Plan		$14,000	$0	$0
General Expenses		$9,000	$9,000	$9,000
	Total Operating Expenses:	$122,900	$108,000	$108,000
D.	**Net Operating Income:**	$81,100	$96,000	$96,000
E. Non Operating Income:				
Interest:		$0	$0	$0
Other:		$0	$0	$0
	Total Non Operating Income:	$0	$0	$0
F.	**Net Income**	$81,100	$96,000	$96,000
G. Expenditures/Transfers				
Depreciation and Taxes		$6,500	$6,500	$6,500
Income Deductions		$70,000	$70,000	$70,000
Interest		$32,000	$32,000	$32,000
Repair, Replacement & Improvement Fund		$0	$0	$0
Bond Reserve		$0	$0	$0
Payment to USDA Loan		$0	$0	$0
Payment to Other Loans		$0	$0	$0
	Total Expenditures/Transfers:	$108,500	$108,500	$108,500
		-$27,400	-$12,500	-$12,500

APPENDIX 4-6
DEEP FACILITY ACQUISITION PROJECT LIMITS

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Date: 2/4/2020

Time: 8:56:52 AM

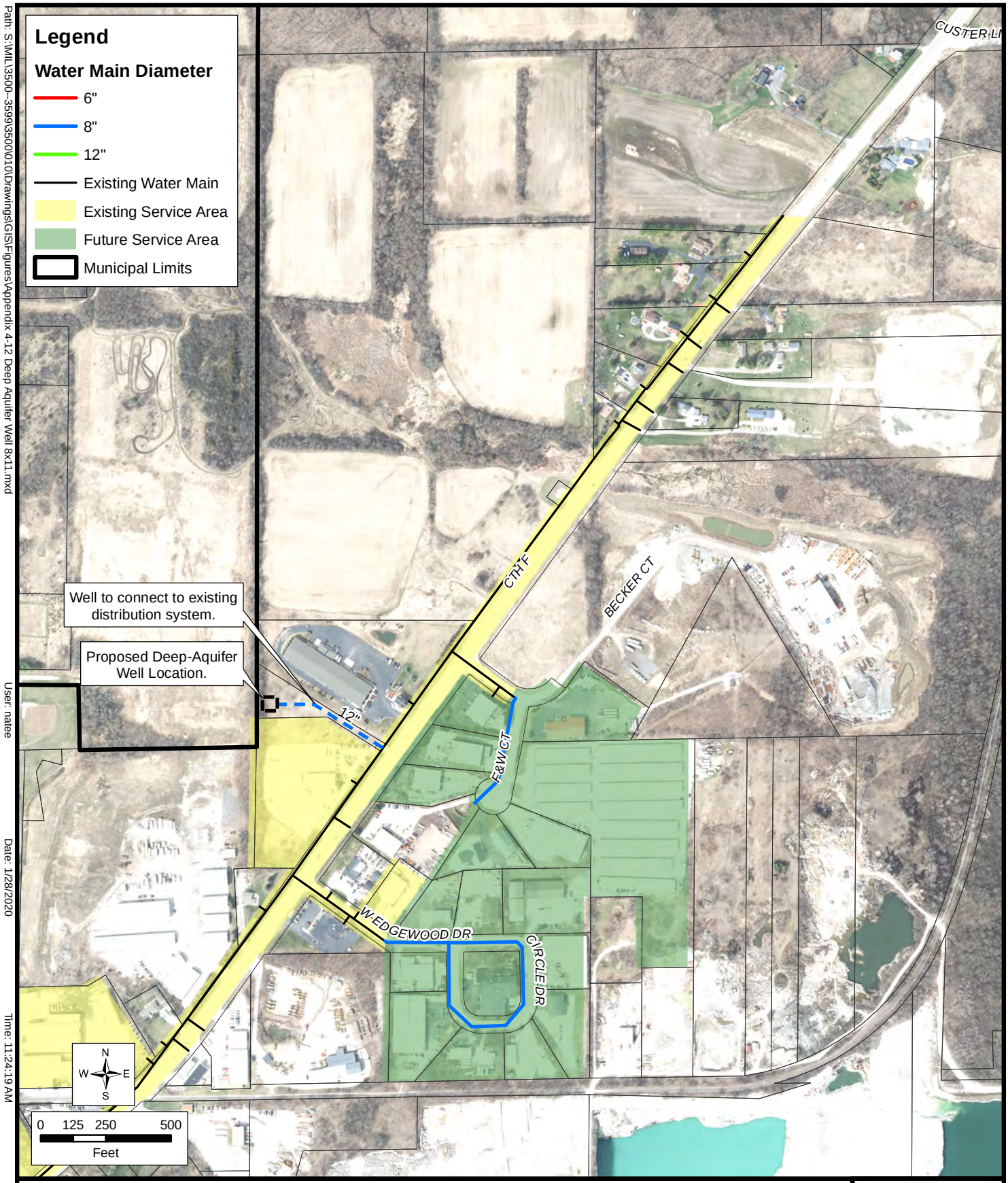
WELL FACILITY ACQUISITION PROJECT LIMITS

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 4-8
3500.010

APPENDIX 4-7
DEEP AQUIFER WELL



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User: natee

Date: 1/28/2020

Time: 11:24:19 AM

NEW DEEP-AQUIFER WELL LOCATION

WATER SYSTEM IMPROVEMENTS PRELIMINARY ENGINEERING REPORT
VILLAGE OF LANNON
WAUKESHA COUNTY, WISCONSIN

STRAND ASSOCIATES®

APPENDIX 4-12
3500.010

APPENDIX 5-1
PRESENT WORTH ANALYSIS

Present Worth Analysis & Short Lived Depreciation

(add or delete rows or cells as necessary)

Community Name: Village of Lannon Water Utility

Federal Discount Rate for Water Resources Planning (Interest Rate) i = 0.003
Number of Years, n = 20 years

Alt. 1: Watermain Improvements		Alt 2: Watermain Improvements + Well Acquisition		Alt 3: Watermain Improvements + New Well	
Initial Capital Costs =	$8,295,000	**Initial Capital Costs =**	$8,916,000	**Initial Capital Costs =**	$11,160,000
Annual Operations & Maintenance Costs =	$64,900	**Annual Operations & Maintenance Costs =**	$50,000	**Annual Operations & Maintenance Costs =**	$50,000
Future Salvage Value =	$0	**Future Salvage Value =**	$0	**Future Salvage Value =**	$0
Present Worth of 20 years of O & M =	$1,258,000	**Present Worth of 20 years of O & M =**	$969,000	**Present Worth of 20 years of O & M =**	$969,000
PW = Annual OM *(1+i)^n-1 / i*(1+i)^n					
Present Worth of 20 yr Salvage Value =	$0	**Present Worth of 20 yr Salvage Value =**	$0	**Present Worth of 20 yr Salvage Value =**	$0
PW = FSV* 1 / (1 + i)^n					
Alternate 1 Total Present Worth =	$9,553,000	**Alternative 2 Total Present Worth =**	$9,885,000	Alternative 3 **Total Present Worth =**	$12,129,000

Short Lived Depreciated Assets - Existing Plus Alternative No. 2

Item	Years of Life Expectancy	Number of Units	Replacement Cost	Funds to Set Aside Yearly
Pump, Motor and Piping	10	2	$25,000	$5,000
Pump Controls	15	2	$50,000	$6,700
Chem Feed Equipment	10	2	$15,000	$3,000
Pressure Transducers	10	2	$1,000	$200
Flow Meters	10	4	$3,000	$1,200
Res. And Com. Meters	15	318	$200	$4,200
Lannon Estate Meter	15	1	$3,000	$200
Pressure Tank Painting	15	2	$20,000	$2,700
		Total	**$117,200**	**$23,200**

Note:
This is not intended to include every piece of equipment in the system. It is to itemize the critical equipment or maintenance be set aside for via

rates and charges.

Note: Rather than labeling Alternatives 1, 2, & 3, etc. give a short description of what they are (e.g. lagoon, regional trtment, mech plant, new well, etc.)

No short lived assets > 15 years of life expectancy

For more location information
please visit www.strand.com

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