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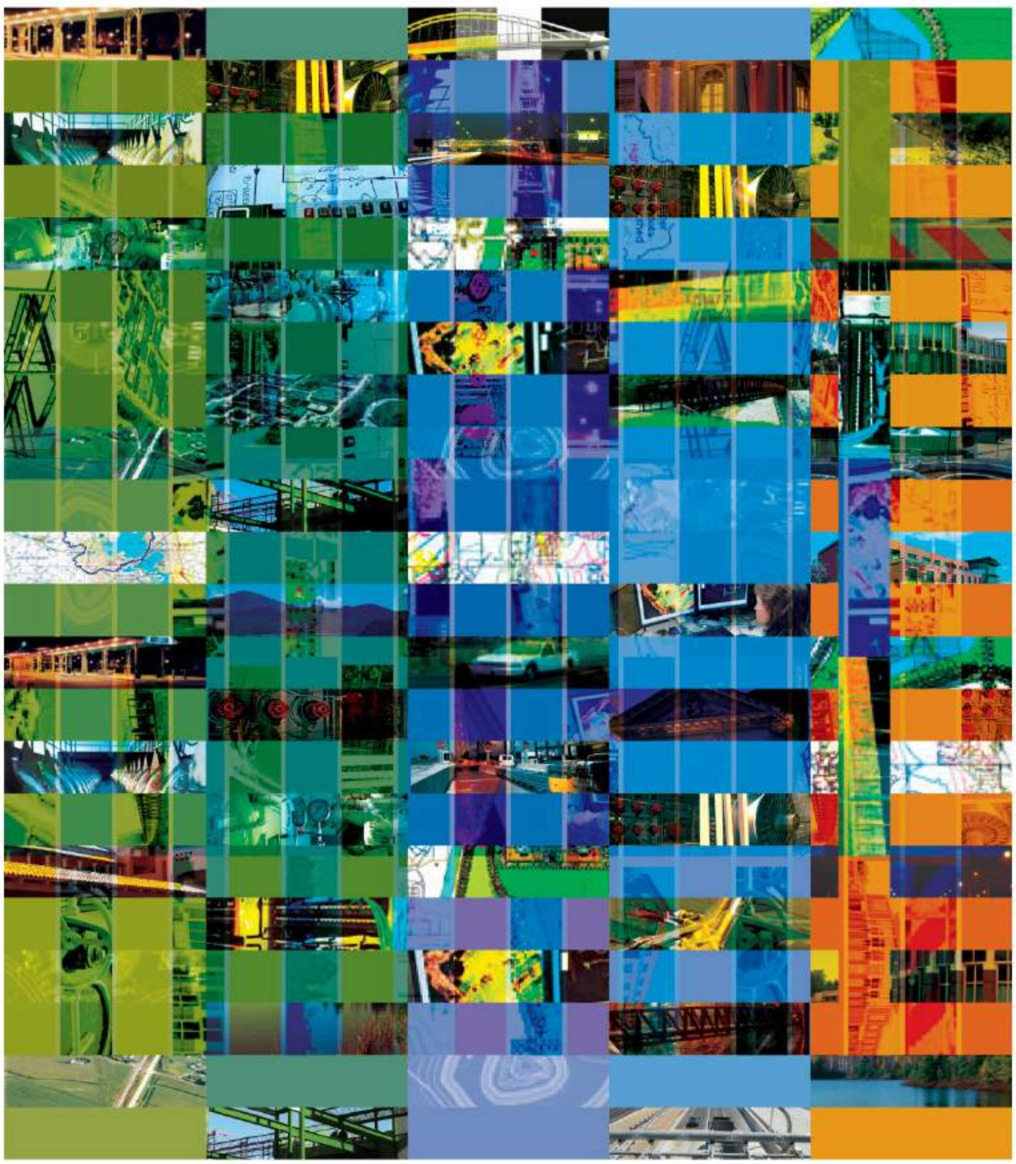
Alternative Water Supply Implementation Plan



Report

Village of

Minooka, IL

October 2022

STRAND ASSOCIATES®

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Strand Associates, Inc.®
1170 South Houbolt Road
Joliet, IL 60431
(P) 815.744.4200
www.strand.com

October 19, 2022

Mr. Ryan Anderson, Superintendent of Public Works
Village of Minooka
121 East McEvilly Road
Minooka, IL 60447-9420

Re: Alternative Water Supply Implementation Plan
Village of Minooka, Illinois (Village)

Dear Ryan,

Enclosed is one copy of the final Alternative Water Supply Implementation Plan.

This implementation plan reviews the potential infrastructure for the switch to Lake Michigan water to supply anticipated 2030 and 2050 demands and future demand projected beyond 2050. The preliminary design outlined for the potential improvements to transition to Lake Michigan water has been developed using information provided by Grand Prairie Water Commission (GPWC) at the time this plan was prepared. Any changes to the hydraulic conditions for water delivery or site requirements from GPWC would require a review of this study and feasibility level preliminary design and opinion of project costs, which are consistent with the Association for the Advancement of Cost Engineering cost estimate Class 4.

The projects and costs outlined in this Implementation Plan are for the infrastructure identified as necessary for the Village to implement the transition to GPWC supplied Lake Michigan water. The projects and associated costs for related items such as the GWPC connection charge, corrosion control treatment studies, and water loss management programs are not defined in this implementation plan. This plan also does not address the Village's routine water main replacement program or additional water main projects associated with meeting future development.

Please call 815-744-4200 with questions.

Sincerely,

STRAND ASSOCIATES, INC.®

Candace L. Scholz, P.E.

Enclosure: Report

c: Sean Kelly, Robinson Engineering, LTD.
Chris J. Ulm, Strand Associates, Inc.®

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Report for
Village of Minooka, Illinois

Alternative Water Supply Implementation Plan

CANDACE L. SCHOLZ
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10/18/22
exp. 11/23

Prepared by:

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October 2022

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APPENDIX

The Village of Minooka (Village) is proceeding with plans to transition from a groundwater supply to an alternative water supply (AWS) by 2030 (the Lake Michigan water supply). The purpose of this Alternative Water Supply Implementation Plan (Implementation Plan) is to summarize the water system modifications necessary to transition to the treated Lake Michigan water supply. Water system modeling was used to evaluate the potential water system modifications using design years 2022, 2030, 2050, and Ultimate Build-out.

The AWS will be supplied to the Village by the Grand Prairie Water Commission (GPWC). The Village is a member of the GPWC. In separate studies, the GPWC has identified its anticipated transmission main routes and delivery point locations. Figure 1 is an overview of the Village's existing water system and its major components (e.g., water treatment plants [WTPs], and elevated tanks) overlayed with the three anticipated GPWC infrastructure locations. Where the possible locations for GPWC delivery points are identified, the GPWC and the Village's infrastructure improvements are listed.

This Implementation Plan will summarize the Village's existing water system, existing and projected water demands, and anticipated infrastructure improvements as they relate to transitioning water sources and the water modeling used to review potential infrastructure improvements. The water modeling was conducted in two rounds. Water Modeling Round 1 was conducted to focus on potential water system improvement locations, specifically the GPWC delivery points and connections to the Village's distribution system, as well as the associated impact on water system pressure and available fire flows. Water Modeling Round 2 was conducted to refine the proposed water system improvement locations based on the results of Round 1 and to review sizing for anticipated pumping facilities. The recommended water system improvements are then summarized, and opinions of project costs and schedules are provided.

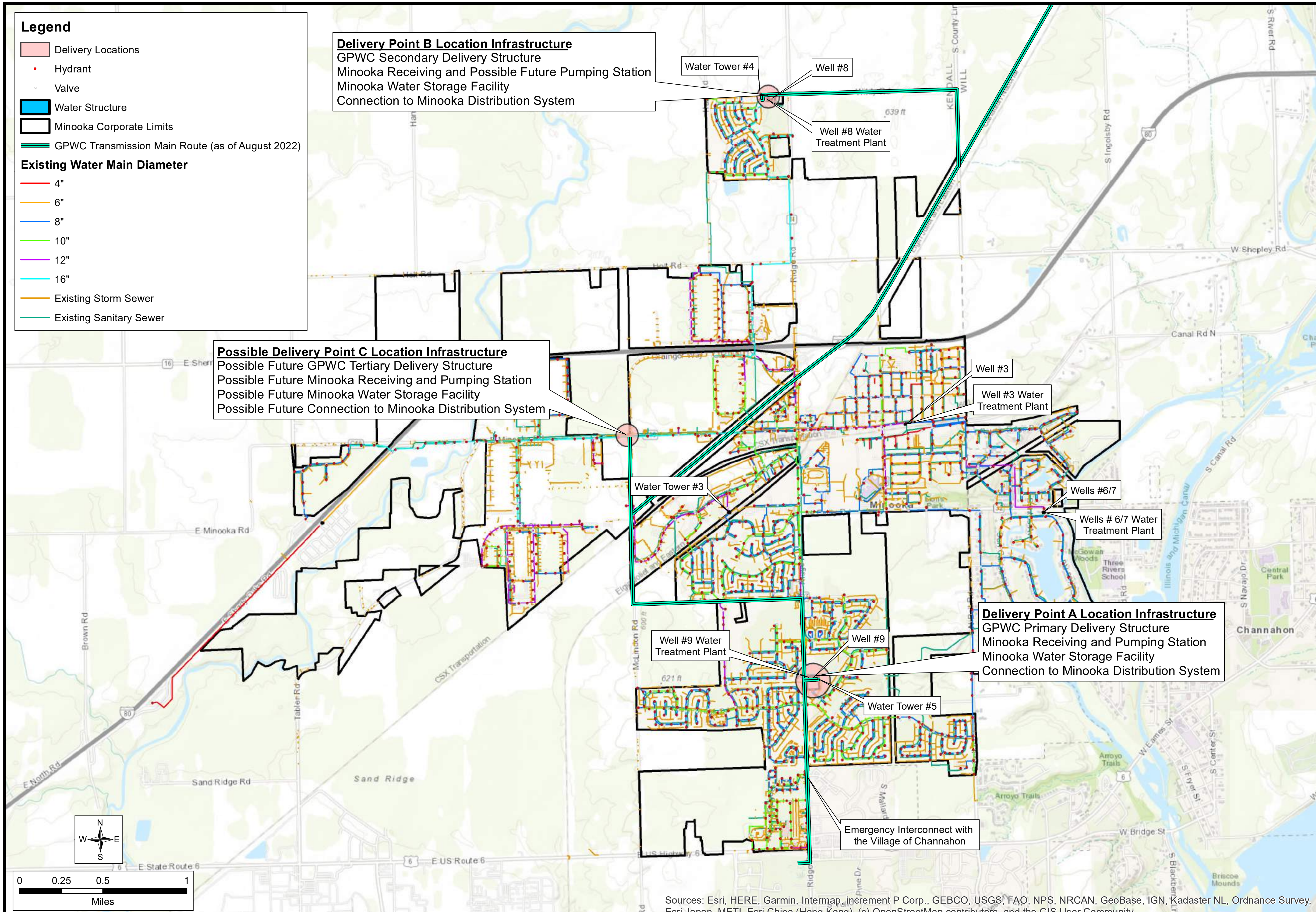
EXISTING SYSTEM

The Village's water system consists of a combination of shallow and deep wells at four independent WTP using various treatment methods including cation exchange and iron removal to treat the water. Finished water is pumped directly to the distribution system, which operates on a common pressure zone throughout the system. The distribution system overflow elevation is at a hydraulic grade of 735.5 feet.

The distribution system consists of three elevated storage tanks and approximately 77 miles of water main ranging in size from 4 to 16 inches in diameter, including fire hydrant leads, all in one pressure zone. The Village's water system provides finished water to primarily residential, commercial, and industrial customer areas in the Village.

A. Wells

The Village's water supply system consists of two shallow sand and gravel wells (Well Nos. 6 and 7) and three deep Ironton-Galesville sandstone wells (Well Nos. 3, 8, and 9). One deep well (Well No. 3) is also fed from the St. Peter sandstone aquifer. Between October 1, 2020, and September 30, 2021, approximately 89 percent of the Village's water demand was supplied by the three deep wells, while approximately 11 percent was supplied by the two shallow wells.



EXISTING AND PROPOSED WATER SYSTEM

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 1
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Fig 2 Existing and Proposed Water System 11x17.mxd User: nathanw Date: 9/13/2022 Time: 12:07:14 PM

Table 1 contains individual well information related to physical characteristics and pumpage. The Village's total capacity is 3,797 gallons per minute (gpm) (5.5 million gallons per day [MGD]) and firm capacity is 2,637 gpm (3.8 MGD).

Wells	Location	Aquifer Open To	Year Drilled	Well Depth (feet)	Well Capacity (gpm)
Well No. 3	202 East Mondamin Street	St. Peter and Ironton-Galesville Formations	1965	1,508	400
Well No. 6	529 San Carlos Road	Sand and Gravel	1987	50	747*
Well No. 7	529 San Carlos Road	Sand and Gravel	1987	50	370*
Well No. 8	1200 Wildly Road	Ironton-Galesville Formation	2005	1,520	1,160
Well No. 9	North of the Intersection of Ridge Road and Misty Creek Drive	Ironton-Galesville Formation	2005	1,601	1,120

*Data for this table was provided by the Village at the beginning of the project and used for water system modeling. Updated data provided later in the project showed a combined capacity of 700 gpm for Well Nos. 6 and 7, which is lower than the well outputs modeled. While this is expected to moderately change the baseline conditions, it does not impact the recommended infrastructure improvements needed for the switch from groundwater to lake water.

Table 1 Village Well Details

Well supplies enter the distribution system at their respective entry points. Existing entry points are as follows:

- TP03–Blended Well Nos. 6, 7, and 3
- TP04–Well No. 8
- TP05–Well No. 9

B. Elevated Storage Tanks

The Village currently has three elevated water storage tanks to maintain system pressures, with a combined total capacity of 1,750,000 gallons. Table 2 summarizes the Village's existing elevated storage tanks.

Elevated Storage Tank Number	Location	Capacity (MG)	Overflow Elevation MSL (feet)
3	Twin Rail Drive	0.5	735.5
4	Wildy Road and Ridge Road	0.5	735.5
5	South Ridge Road	0.75	735.5
	Total Capacity:	1.75	-

MG=million gallons
MSL=mean sea level

Table 2 Summary of Village's Storage Facilities

C. Distribution System

The Village's existing water distribution system consists of a network of more than 77 miles of primarily ductile iron water main, ranging from 4 to 16 inches in diameter, shown in Figure 1 and summarized in Table 3. The water system operates as one pressure zone.

Diameter (inch)	Length (feet)
4	11,883
6	31,515
8	202,808
10	74,168
12	50,316
16	37,311
Total (feet)	408,003
Total (miles)	77.27

Table 3 Existing Water Distribution System

PROJECTED DEMANDS

The Village's future water demands have been projected in previous studies using various methodologies. After reviewing the projections, the Village has selected one data set with which to proceed for the purposes of this Implementation Plan. The Village selected the Population Equivalent (PE) methodology, with growth at 550 PE per year to a projected maximum day demand of 4.0 MGD in 2050, as the data set considered to be most representative of the Village's anticipated growth. These projected demands are summarized in Table 4.

Year	Projected Average Day Demand (MGD)	Projected Maximum Day Demand (MGD)	Projected Max:Avg Ratio
2022[1]	1.18	2.12	1.80
2030	1.53	2.66	1.74
2050	2.40	4.00	1.67
Ultimate Build-out[2]	5.87	9.39	1.60

[1]Present Day Demands are interpolated using historic 2020 and projected 2025 demand data.
[2]Based on demand data from Year 2130.
Max:Avg=maximum to average

Table 4 Projected Water Demands

The demands were distributed within the water model as described in the following.

A. Current Demand Distribution

To represent demands in the water model, the Village's current 2022 demands were distributed evenly across the Village's existing water model nodes.

B. Projected Demand Distribution

To represent projected demands, the Village's projected demands for the growth periods to 2030, to 2050, and to Ultimate Build-out were generally allocated to the developments anticipated to occur by that year. The water main anticipated to support these developments was also phased for the defined growth periods and the projected demands were allocated to nodes in the general location of the anticipated developments. Figure 2 shows the layout of the anticipated water main and distribution of projected demands in the water model for the growth periods to 2030, to 2050, and to Ultimate Build-out.

POTENTIAL WATER SYSTEM IMPROVEMENTS

The Village's water system will be supplied water in adjusted amounts and locations when receiving Lake Michigan water. Currently, water is supplied by wells located throughout the distribution system. After the transition, Lake Michigan water would be supplied at up to three delivery points. Figure 1 shows the location of the GPWC transmission main and three proposed GPWC delivery point locations.

A. Primary Delivery Point

Delivery Point "A" is considered the primary delivery point and is located in the area of the Village's existing Well No. 9/Tower No. 5 site near the intersection of Ridge Road and Misty Creek Drive.

B. Secondary Delivery Point

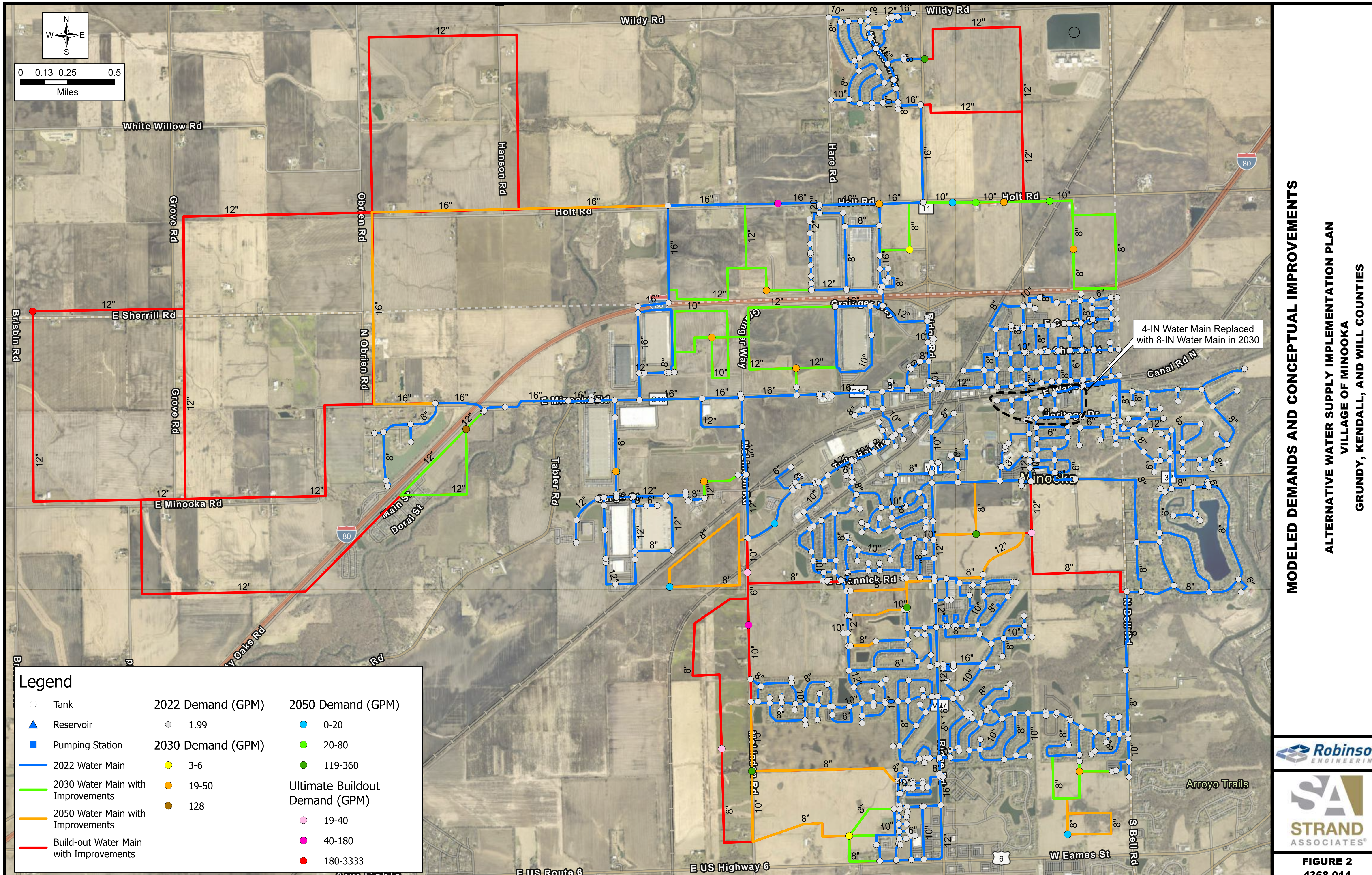
Delivery Point "B" is considered the secondary delivery point and is located in the area of the Village's existing Well No. 8/Tower No. 4 site near the intersection of Ridge and Wildy Roads.

C. Tertiary Delivery Point

Delivery Point "C" is considered the tertiary delivery point and is located near the intersection of East Minooka Road and Grainger Way.

D. Preliminary Design Conditions

Preliminary design conditions provided by the GPWC include the hydraulic configuration for the GPWC delivery points. The anticipated flow rates and hydraulic grade provided by the GPWC for the three GPWC delivery structures to the Village are summarized in Table 5. In an iterative process, the flow rates outlined in the following are the preliminary flows anticipated to be required by the Village at each delivery point location. These preliminary flow rates, along with those from other regional partners, were incorporated into a hydraulic water model by GPWC to provide the anticipated hydraulic grade that would be provided at each delivery point. The preliminary hydraulic grade line (HGL) data in Table 5 is being used in this implementation plan to update the preliminary flows anticipated to be required by the Village at each delivery point location.


MODELED DEMANDS AND CONCEPTUAL IMPROVEMENTS
ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES
FIGURE 2
4368.014
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4-IN Water Main Replaced with 8-IN Water Main in 2030
0 0.13 0.25 0.5
Miles
Legend
Tank
Reservoir
Pumping Station
2022 Water Main
2030 Water Main with Improvements
2050 Water Main with Improvements
Build-out Water Main with Improvements
2022 Demand (GPM)
1.99
2030 Demand (GPM)
3-6
19-50
128
2050 Demand (GPM)
0-20
20-80
119-360
Ultimate Buildout Demand (GPM)
19-40
40-180
180-3333
Wildy Rd
White Willow Rd
Holt Rd
E Sherrill Rd
E Minooka Rd
Brisbin Rd
Grove Rd
N Obrien Rd
Hanson Rd
Hare Rd
Tabler Rd
Canal Rd N
W Eames St
S Bell Rd
E US Route 6
E US Highway 6
Arroyo Trails
Aux Sable
Minooka
Main St
Doral St

Delivery Structure	Maximum Day	2030	2050	Ultimate Build-out
Primary Delivery Point A	Flow (MGD)	1.2	1.0	2.35
	HGL (feet)	735 to 790	715 to775	695 to 730
Secondary Delivery Point B	Flow (MGD)	1.46	1.4	3.29
	HGL (feet)	750 to 795	740 to 780	720 to 830
Tertiary Delivery Point C	Flow (MGD)	0	1.6	3.76
	HGL (feet)	740 to 795	720 to 775	720 to 755

Table 5 GPWC Delivery Structure Preliminary Design Conditions

As the GPWC had limited data at the time of this report to define Ultimate Build-out design conditions, the supplied HGL is preliminary and widely variable. As the Village's facilities move into project design, the supplied HGL should be revisited with the GPWC to use best available data during the design phase.

E. <u>Water Storage Improvements</u>

The Village will be required to provide water storage volume equivalent to two times the daily Lake Michigan water allocation. The Village's water storage requirements projected to 2030, 2050, and Ultimate Build-out are outlined in the following. The Village will need to revisit its water allocation in the future to further refine allocation projections.

1. 2030 Water Storage Projections

The Village's 2030 Lake Michigan water allocation is 1.086 MG. The resulting 2030 volume of required storage is 2.172 MG. Taking into account the Village's existing 1.75 MG storage capacity, 0.42 MG in additional water storage capacity is required to be added by 2030.

2. 2050 Water Storage Projections

The Village's 2050 Lake Michigan water allocation is 1.487 MG. The resulting 2050 volume of required storage is 2.974 MG. The Village has 1.75 MG in existing water storage capacity. Therefore, to meet the 2.974 MG requirement, 1.22 MG of additional storage must be added by 2050.

3. Ultimate Build-out Water Storage Projections

The Village will need to revisit its water allocation in the future to project beyond 2050 when these demands are better understood. For the purpose of this planning document, additional storage beyond the total additional storage of 1.22 MG is anticipated to be necessary.

Based on projected demands, Ultimate Build-out is shown to more than double from 2050 demands. Therefore, for the purpose of this planning document the 2050 water storage requirement of approximately 3 MG will be doubled to an Ultimate Build-out projection of 6 MG. Although this value will be used as a placeholder for anticipated storage needs, the volume requirements will need to be refined in the future based on Village water system needs and Lake Michigan water allocation requirements.

BACKUP EMERGENCY SUPPLY WELLS

The Village will maintain its existing wells as necessary to function for emergency backup conditions. Currently, the Village's preference is to maintain only deep wells and to abandon shallow Well Nos. 6 and 7. In Table 6, projected water system demands were compared to existing well capacities to determine the wells needed for future backup emergency supply.

Demands and Well Capacity	2030	2050	Ultimate Build-out
Average Day Demands (MGD)	1.53	2.40	5.87
Maximum Day Demands (MGD)	2.66	4.00	9.39
Well Nos. 8 and 9 Combined Well Capacity (MGD)	3.28	3.28	3.28
Well Nos. 3, 8, and 9 Combined Well Capacity (MGD)	3.86	3.86	3.86
Combined Well Capacity for All Village Wells (MGD)*	4.87	4.87	4.87

***** The table reflects the combined capacity of Well Nos. 6 and 7 as 700 gpm, as communicated by the Village on September 29, 2022.

Table 6 Water System Demands and Well Capacities

The total capacity of the Village's three deep wells (Well Nos. 3, 8, and 9) is 2,680 gpm or 3.86 MGD. The projected maximum day demand in 2030 is 2.66 MGD, making the deep wells a viable emergency backup option for the Village in 2030 and in subsequent years. By 2050, the maximum day demand is projected to increase to 4.0 MG, which exceeds the total deep well capacity.

The total capacity of the Village's deep and shallow wells is 3,797 gpm or 5.47 MGD. Maintaining the deep and shallow wells would provide a sufficient water supply capacity through 2050. However, the projected average and maximum day ultimate build-out demands of 5.87 and 9.39 MGD, respectively, exceed the Village's current shallow and deep well capacity. It is recommended that the deep and shallow wells are maintained for emergency backup use through 2050 and emergency backup supply and ultimate build-out demands are analyzed further when approaching the year 2050. Alternatively, the Village could pursue an interconnect with the City of Morris as a future emergency back-up supply.

WATER MODELING ROUND 1 DISCUSSION

Village water system modeling was performed by Robinson Engineering, Inc. (Robinson). Robinson provided Strand Associates, Inc.® with the resulting water modeling shapefiles for further evaluation.

To promote consistency in the water supplied to the Village's customers, each delivery and demand scenario was compared to the how the Village's current distribution system operates. A "baseline" was modeled to reflect how the current distribution system, with existing well supply previously outlined, operates under 2022 maximum day demands. The difference in available fire flows and pressures between each new scenario and the baseline were calculated to determine what improvements are necessary to meet projected demands.

All scenarios were reviewed in the water model using a steady state simulation, the maximum day demands were applied using the average hour of the maximum day. The first round of water modeling was conducted to simulate the proposed GPWC delivery structures to review the delivery point locations and note impacts on the distribution system. Water modeling to review infrastructure sizing was conducted in the second round of water modeling.

For evaluating fire flow and pressure changes between scenarios, a decrease in available fire flows of 50 gpm or less or a decrease in system pressure of 5 pounds per square inch (psi) or less is considered to have little impact on the overall system and deemed acceptable.

A. Baseline

Using 2022 demands to represent the current system supplied by existing wells, Figures 3 and 4 were developed to display pressure contours and fire flows, respectively.

Figure 3 shows satisfactory pressures, greater than 30 psi, throughout the Village. Note that the four locations indicating pressures less than 30 psi are a result of the water model's representation of a well and are not reflective of distribution system pressure.

Figure 4 shows satisfactory minimum available fire flows, greater than 500 gpm, at all but one node. The red node on Wapella Street represents a fire flow below 500 gpm, which is the result of an existing 4-inch water main. The Village is aware of this undersized main and has plans to replace the 4-inch water main with 8-inch water main by 2030.

A fire flow simulation provides an estimation of the amount of water available at points within the system while maintaining a minimum of 20 psi residual pressure. The model simulates a separate fire event at each fire hydrant in the system and increases the flow until either the hydrant itself or any point in the system reaches the 20 psi residual pressure. The majority of the nodes indicate fire flows above 1,500 gpm, which is the Village's available fire flow goal.

These 2022 maximum day demand pressure contours and available fire flows were used as a baseline for comparison with the improvements associated with the transition to the Lake Michigan water supply via GPWC.

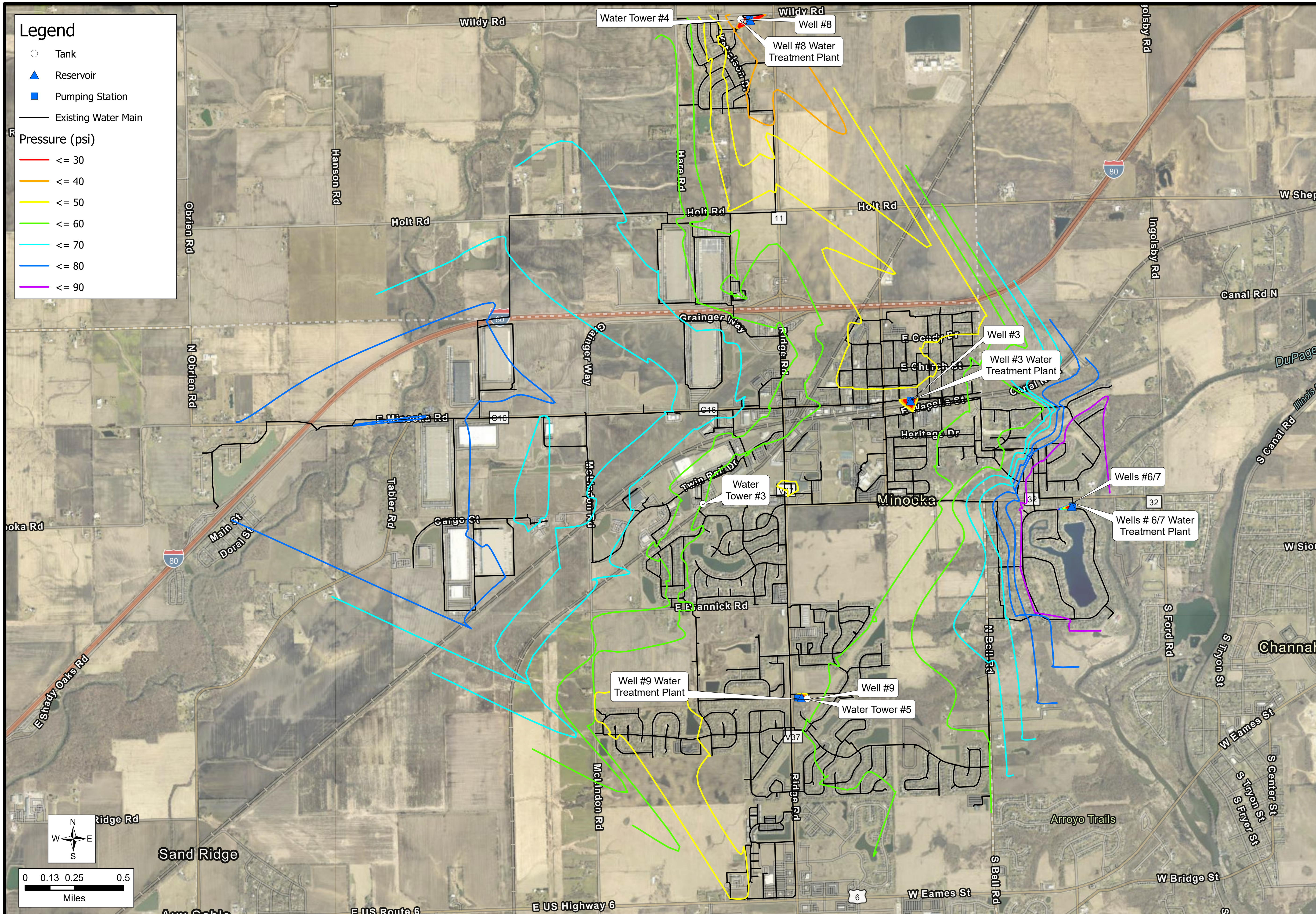
B. Two Delivery Points

Scenarios were run in the water model using Delivery Points A and B. Using these two delivery points, a steady state simulation was run in the water model for each of the current, 2030, 2050, and Ultimate Build-out demands. Maximum day pressure contours and available fire flows were reviewed.

1. Pressure Contours

Under the scenarios for current, 2030, and 2050 demands, no significant difference in pressures were found when compared to the baseline scenario. Figure 5 displays the 2050 demands being met by Delivery Points A and B. The 2050 pressure contours in Figure 5 are consistent with the baseline pressure contours of Figure 3.

Under the scenario for Ultimate Build-out demands, a drop in pressure occurred at the Village's far west side where Ultimate Build-out developments were projected. Figure 6 displays the Ultimate Build-out demands being met by Delivery Points A and B. This shows a decrease in pressure on the western side of the Village along Minooka Road of approximately 10 psi and also indicates pressures less than 30 psi on the far western anticipated build-out near Brisbin Road.



MAXIMUM DAY PRESSURE CONTOUR
2022 WELL SUPPLY

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

Robinson ENGINEERING

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FIGURE 3
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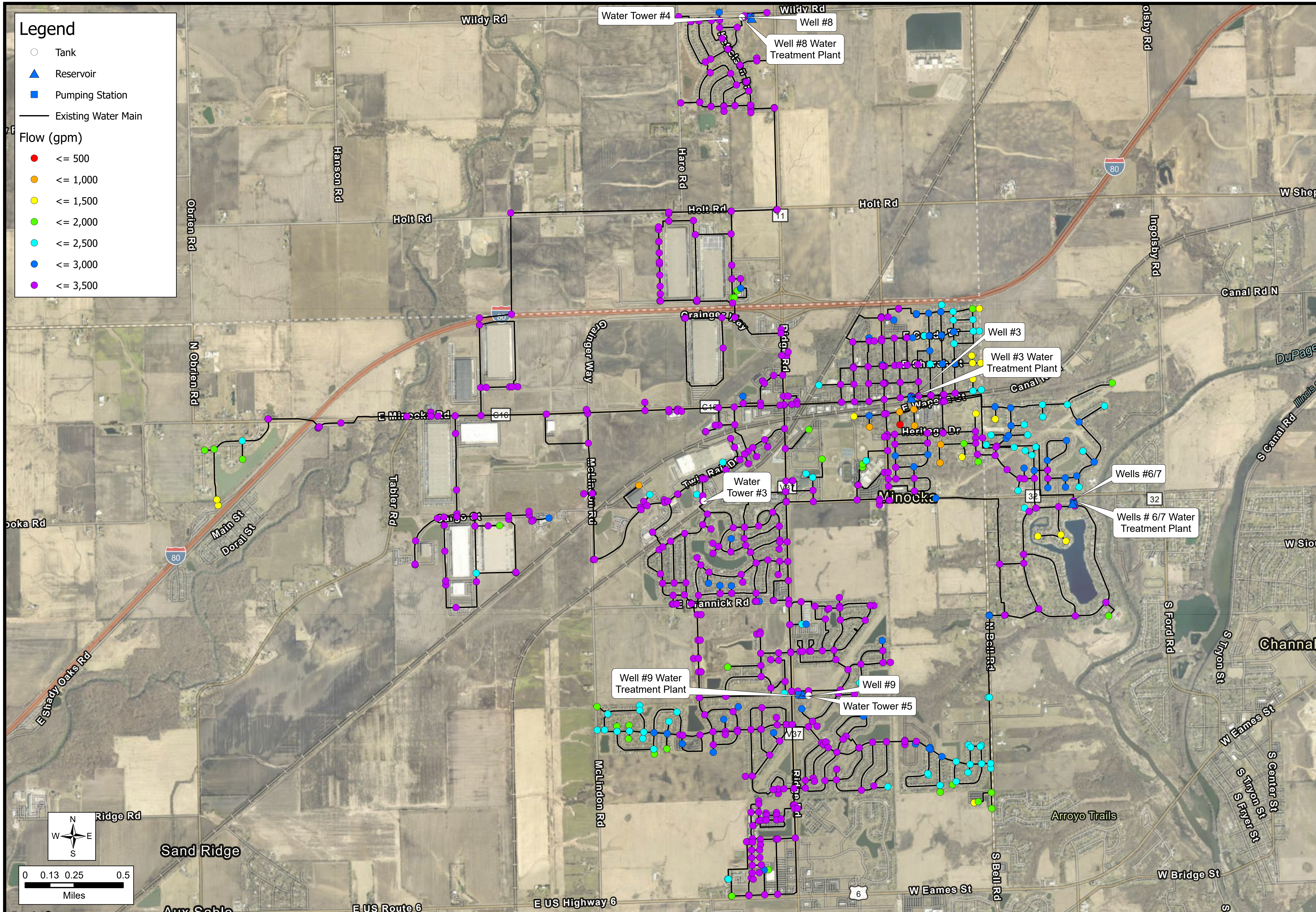
Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 3 2022 Pressure Wells 11x17 User: danc Date: 9/23/2022 Time: 10:26 AM



AVAILABLE FIRE FLOW
2022 WELL SUPPLY

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 4
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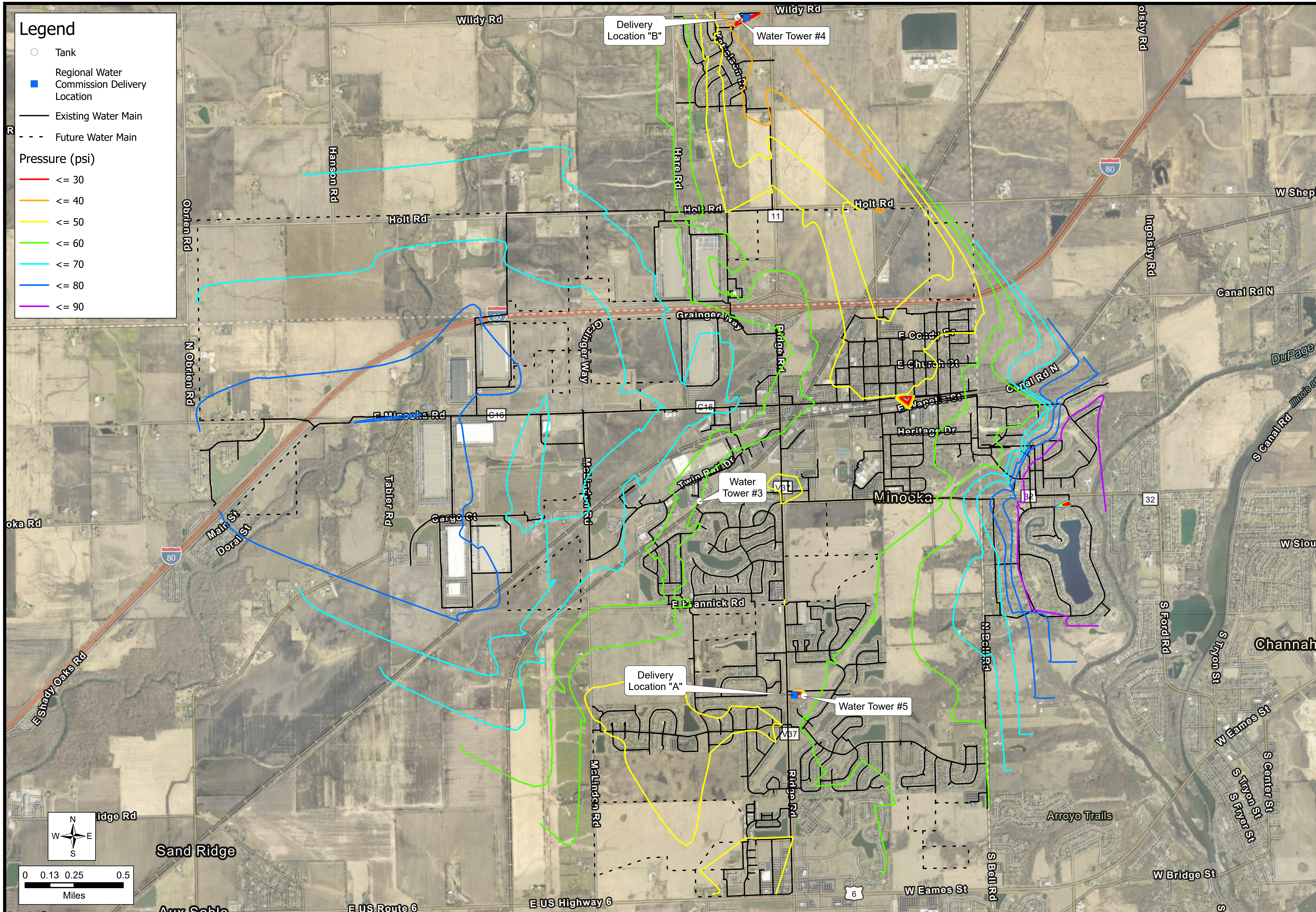

MAXIMUM DAY PRESSURE CONTOUR
2050 REGIONAL WATER COMMISSION SUPPLY WITH TWO DELIVERY POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 5
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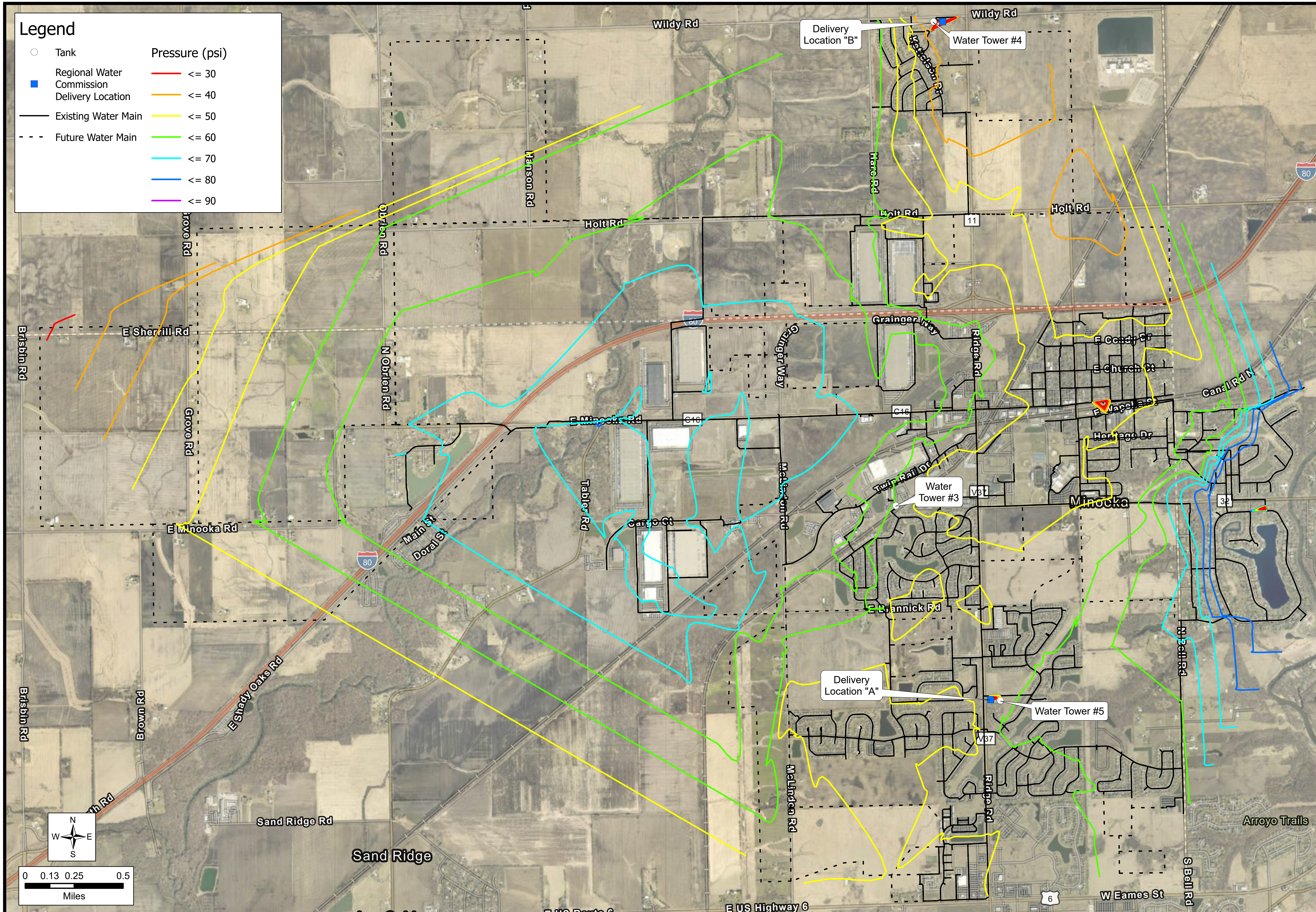

MAXIMUM DAY PRESSURE CONTOURS
ULTIMATE BUILDOUT REGIONAL WATER SUPPLY WITH TWO DELIVERY POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 6
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 6 Pressure Ultimate Buildout 2pts 11x17 User: danc Date: 9/23/2022 Time: 11:43 AM

2. Available Fire Flows

Figure 7 displays the available fire flows using Delivery Points A and B under current demands. Under the scenario for current demands, there is a noteworthy decrease in available fire flows in the historic and eastern areas of the Village as a result of the change from wells to two delivery points, without an increase in demands. Generally, only one node that was greater than the 500 gpm target fire flow during present day baseline conditions falls below this goal when the distribution system is supplied by two delivery points. Figure 8, which shows the difference in fire flows (as a result of the change from wells to two delivery points) shows an overall decrease of 100 to 560 gpm in this area. This decrease is associated with removing the Well Nos. 3, 6, and 7 supply from this area.

The fire flows for 2030 and 2050 are improved from the 2022 fire flows. The 2050 available fire flows are shown in Figure 9. These improved fire flows are a result of the water main improvements anticipated by 2050. The upgrade of the 4-inch water main to an 8-inch water main eliminates the node below 500 gpm. The 2030 water main improvements includes a 10- and 8-inch water main loop from Ridge Road east to County Line Road and south, and an 8-inch water main crossing Interstate 80 (I-80) to tie into this area of the water system. This water main improvement is critical to boosting available fire flows in this area of the distribution system.

Supplemental water modeling was completed and found that increasing the I-80 crossing from 8- to 10-inch water main did not significantly improve available fire flows. Supplemental water modeling was also completed to review whether a 12-inch water main running east to west on the south side of I-80 from Ridge Road to the eastern part of the Village could result in comparable improvements relative to the County Line Road I-80 crossing. The northeast portion of the eastern part of the Village experienced a decrease in fire flows up to 560 gpm with the change from the I-80 crossing to the 12-inch water main running east to west on the south side of I-80.

The fire flows for Ultimate Build-out demand with two delivery points, shown in Figure 10, are consistent with the 2050 results in the areas of the current Village extents, but show a decrease in available fire flows to the west to central west.

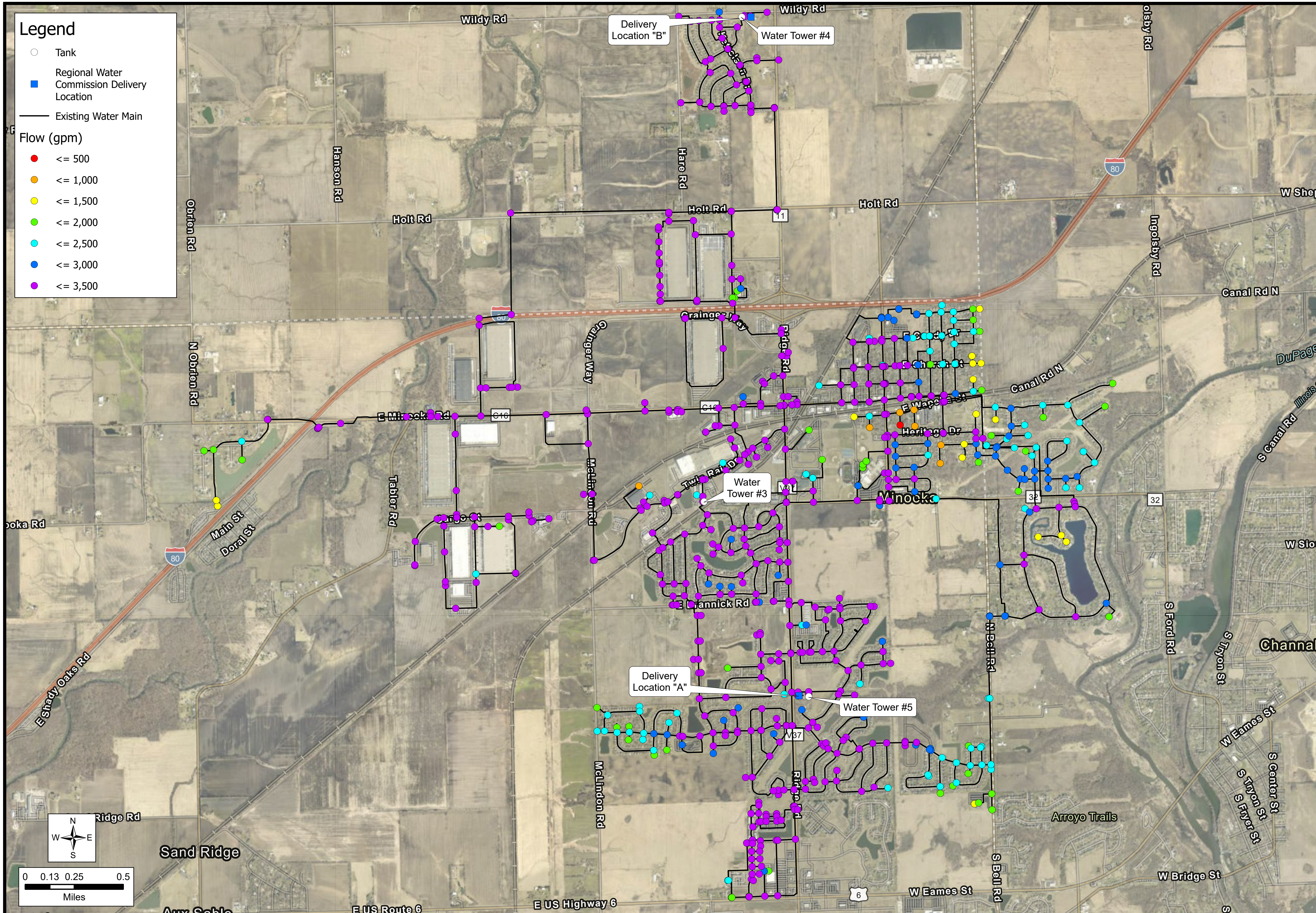
With the critical water main infrastructure improvements included, water modeling results for maximum day pressure contours and available fire flows indicate the Village is anticipated to be able to meet demands up to 2050 from two delivery points: Delivery Points A and B.

C. <u>Three Delivery Points</u>

Water modeling with supply from three delivery points added Delivery Point C. This water modeling focused on the 2050 and Ultimate Build-out demands.

1. Pressure Contours

No significant improvements or changes in 2050 pressure contours are shown with the addition of the third delivery point. In reviewing Figure 11, the Ultimate Build-out pressure contours using Delivery Points A, B, and C, and comparing it to Figure 6, the Ultimate Build-out pressure contours using only Delivery Points A and B, an improvement in pressures on the west side of the Village is noticeable.



AVAILABLE FIRE FLOW

2022 REGIONAL WATER COMMISSION SUPPLY WITH TWO DELIVERY POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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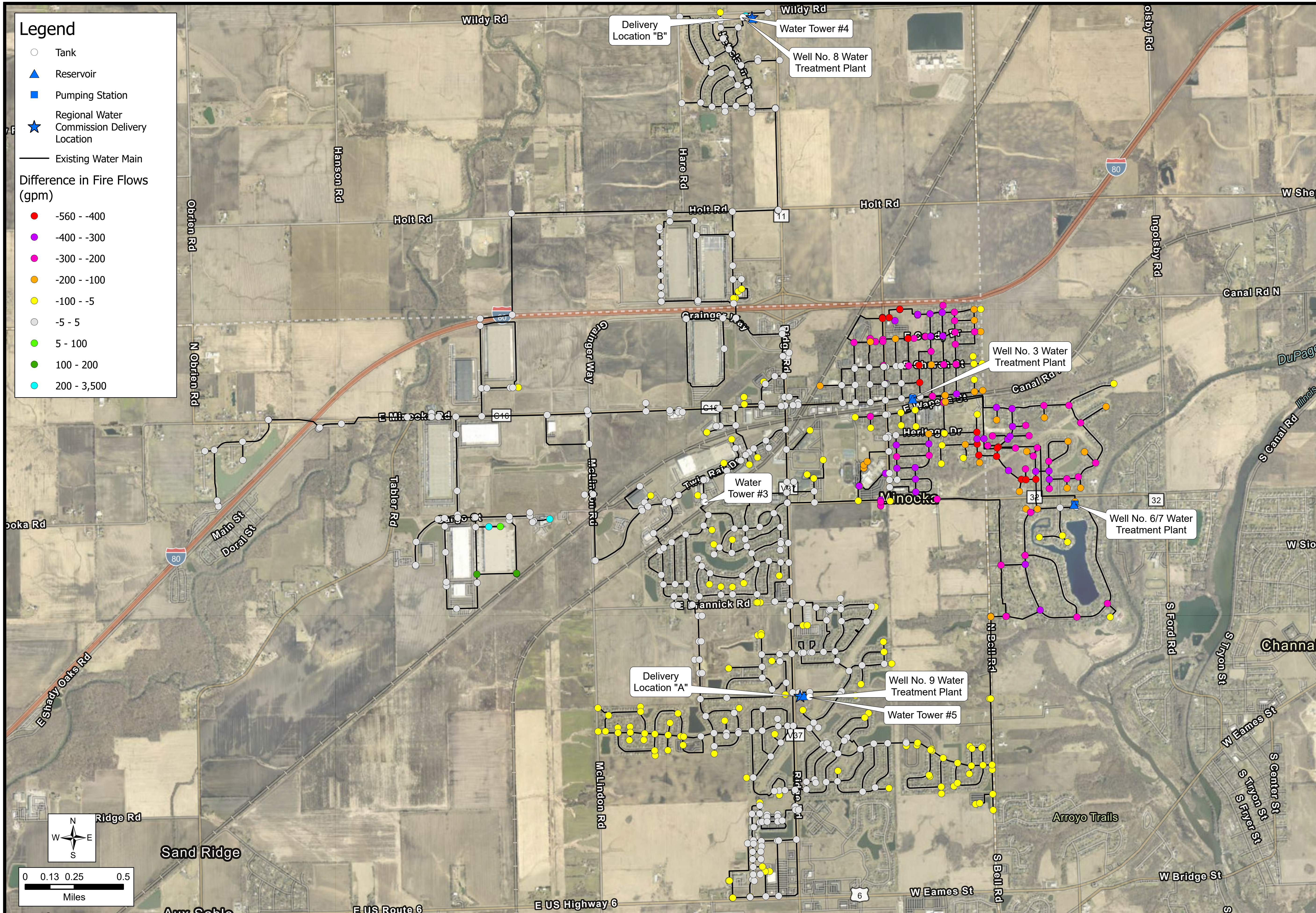
FIGURE 7
4368.014



DIFFERENCE IN AVAILABLE FIRE FLOW 2022 FF (RWC) MINUS 2022 FF (WELLS)

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

Robinson Engineering

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FIGURE 8
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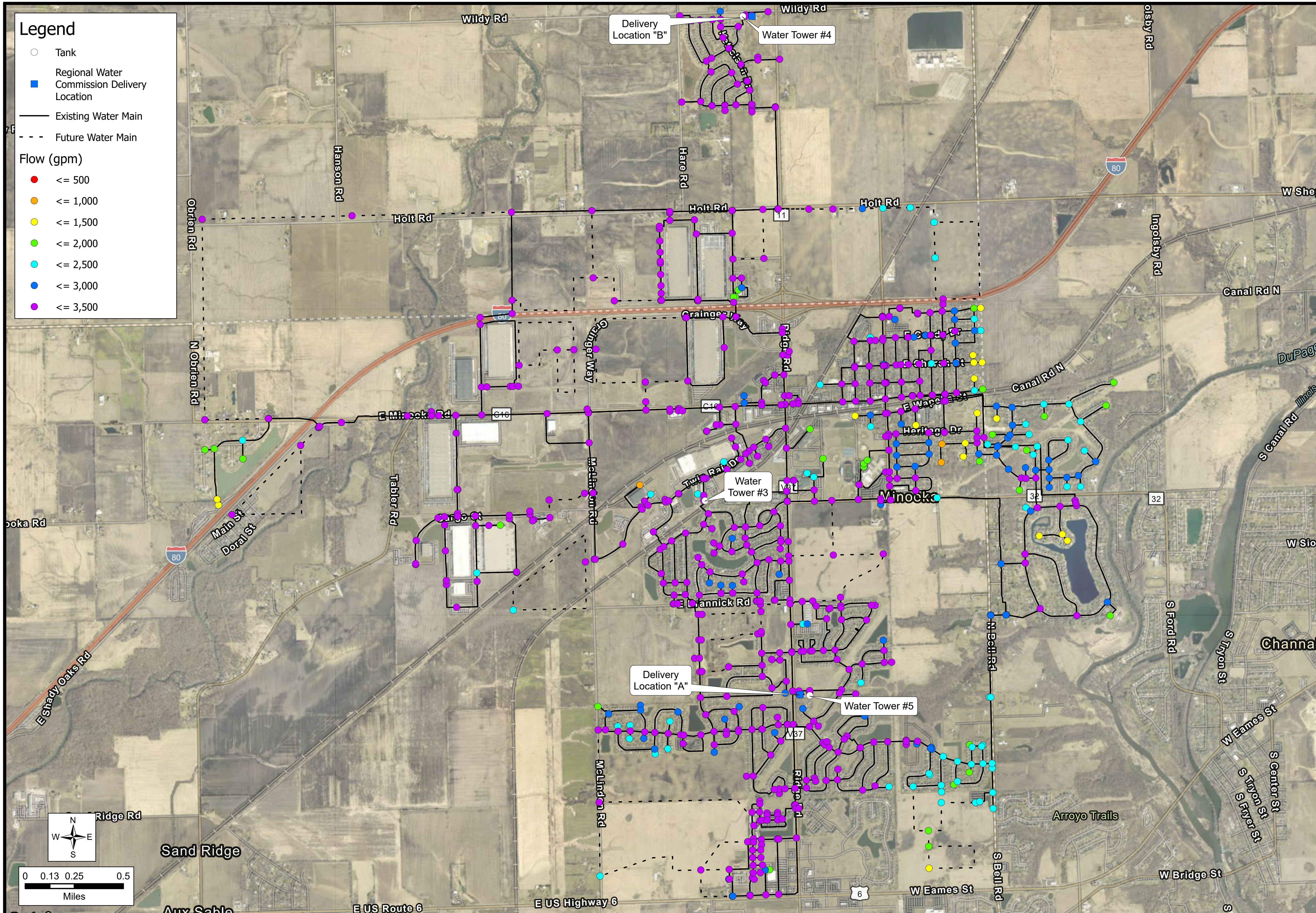
Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 8 Diff 2022 RWC - 2022 Wells 11x17 User: danc Date: 9/23/2022 Time: 10:28 AM



AVAILABLE FIRE FLOW
2050 REGIONAL WATER COMMISSION SUPPLY WITH TWO DELIVERY POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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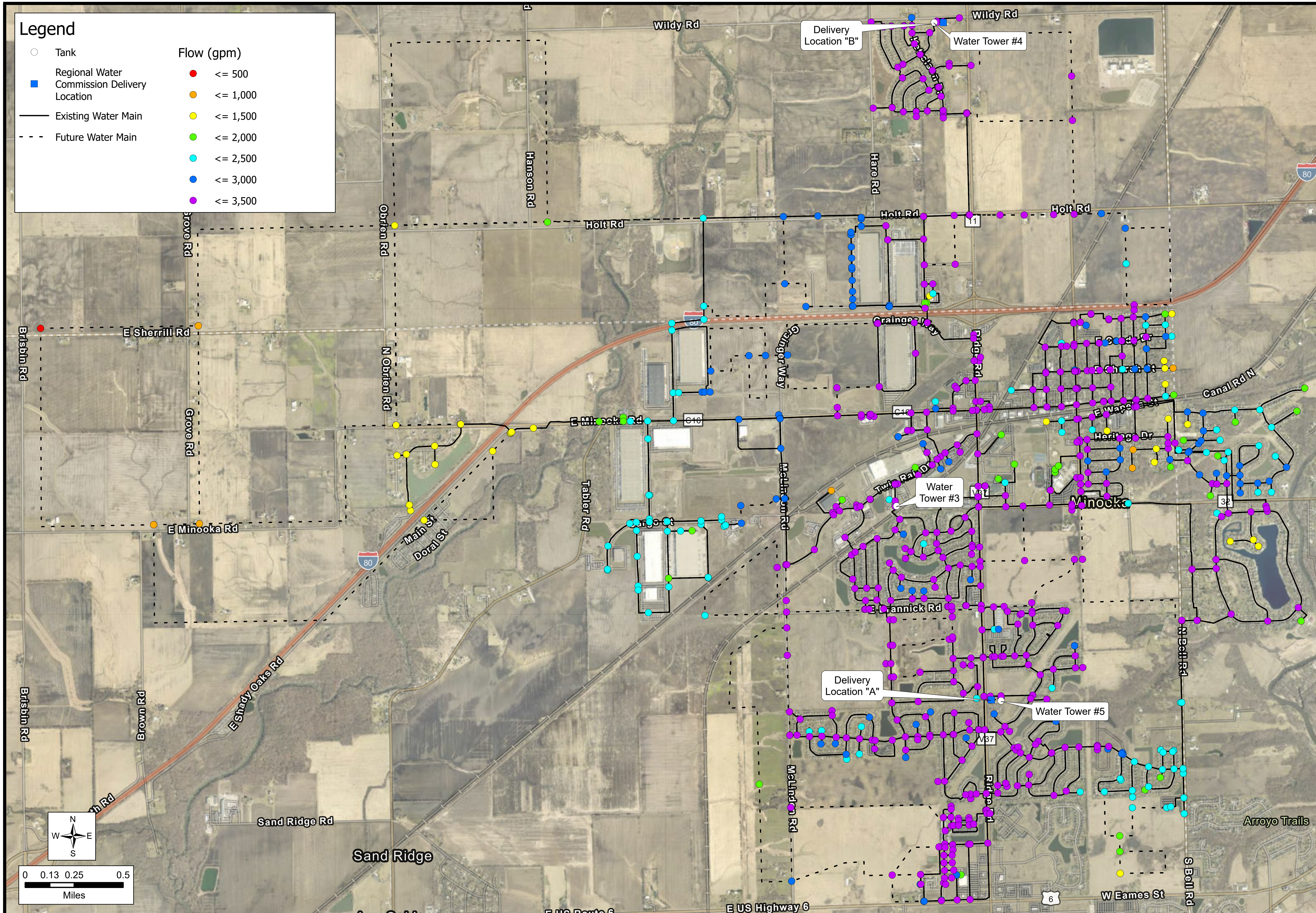
FIGURE 9
4368.014

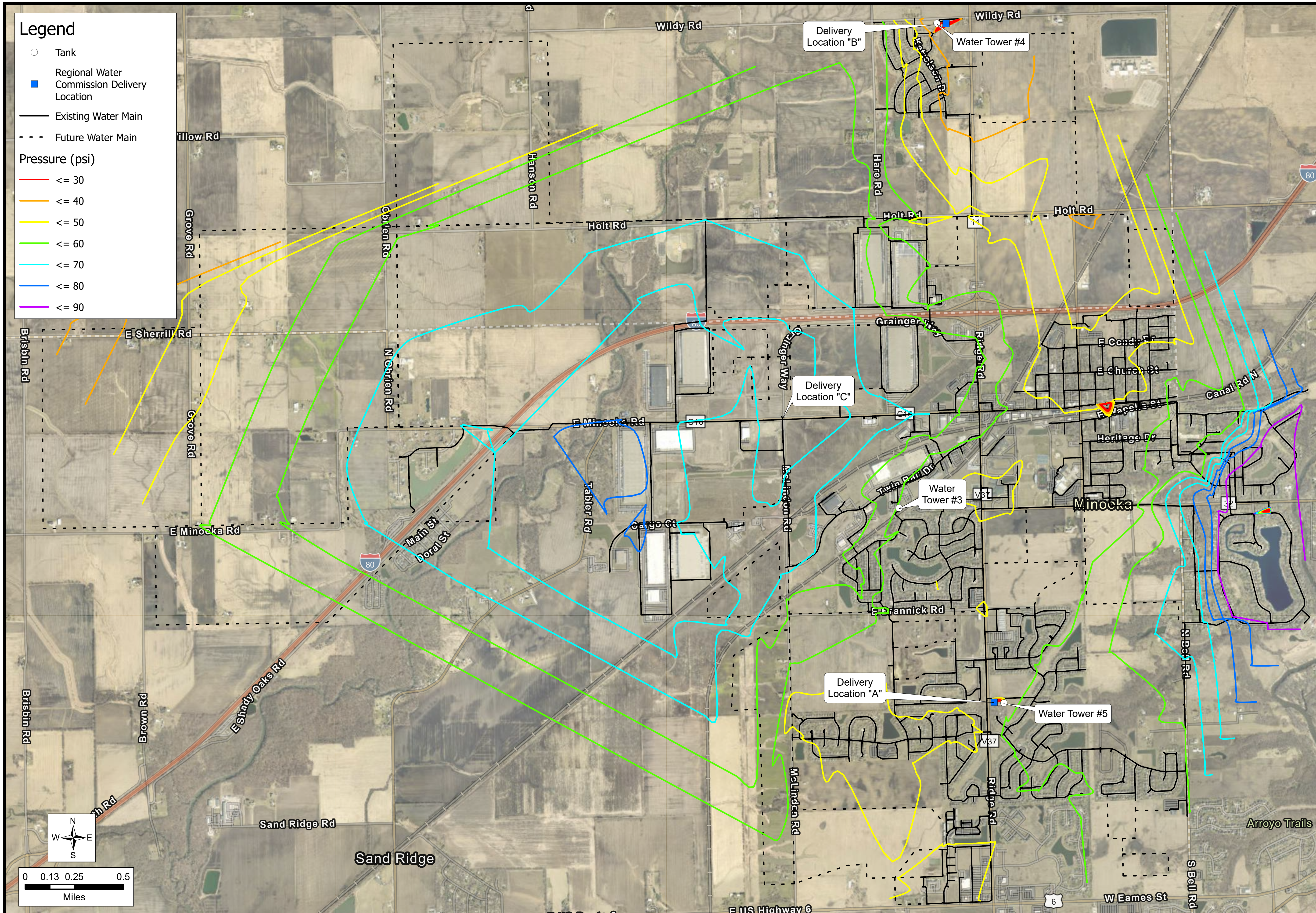
Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 9 2050 FF RWC 2pt 11x17 User: danc Date: 9/23/2022 Time: 10:28 AM



AVAILABLE FIRE FLOW
ULTIMATE BUILDOUT REGIONAL WATER SUPPLY WITH TWO DELIVERY POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

FIGURE 10
4368.014



MAXIMUM DAY PRESSURE CONTOUR
ULTIMATE BUILDOUT REGIONAL WATER SUPPLY WITH THREE DELIVERY POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 11
4368.014

2. Available Fire Flows

Figure 12 was developed to review potential improvements in available fire flows for 2050 demands with the addition of the tertiary delivery point. This figure shows a maximum improvement of 134 gpm, and no improvements that resulted in total available fire flow greater than the 1,500 gpm target in areas that did not meet the 1,500 gpm target with only two delivery points.

Figure 13 was developed to review potential improvements in available fire flows for Ultimate Build-out demands with the addition of the tertiary delivery point. This figure shows increases in fire flows of 600 to 1,300 gpm across the western side of the existing Village extents and increases of 100 to 400 gpm across the far west potential build-out.

Water modeling results indicate the tertiary delivery point does not provide significant improvement under 2050 demand conditions but does provide significant improvements under Ultimate Build-out demand conditions.

WATER MODELING ROUND 2 DISCUSSION

Figure 14 is a schematic summary of the improvements established as a result of the water modeling Round 1 results and further reviewed and sized in water modeling Round 2. The pressures and flow anticipated to be available at the GPWC delivery structures, previously shown in Table 5, were incorporated into the water model to assist in sizing and establishing preliminary design conditions for the three GPWC delivery points and associated infrastructure. The anticipated allocation of water storage requirements at the delivery points and in the Village's water system are also discussed in the following.

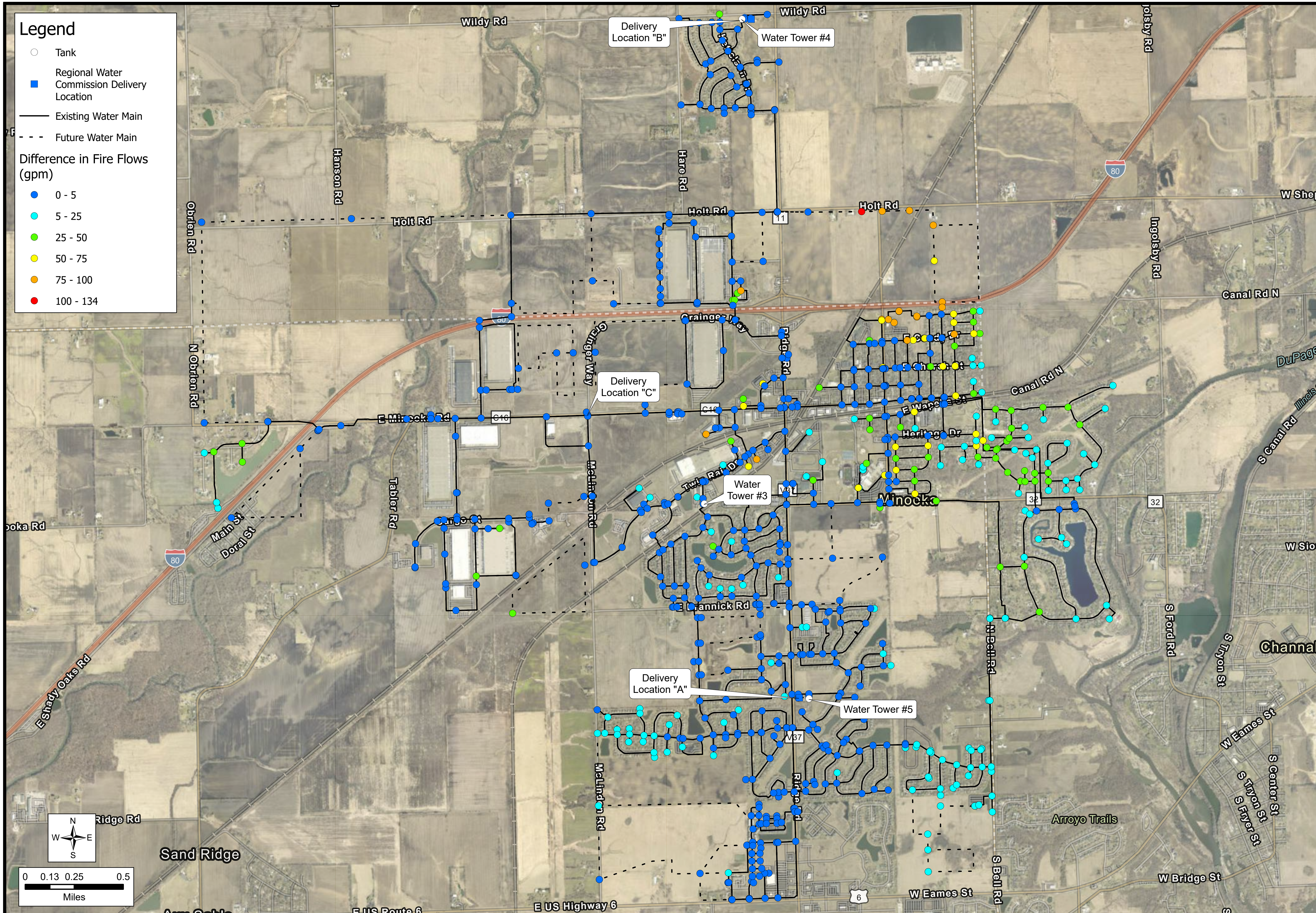
Based on the results of water modeling Round 1, the Village water main improvements, including the Wapella Street water main upgrade from 4- to 8-inch water main by 2030 and the 8-inch water main crossing I-80 by 2030, were incorporated into the water model for Round 2.

A. Primary Delivery Point A

Based on pressures anticipated to be available from the GPWC, Delivery Point A will need a ground level water storage facility and a Village receiving and pumping station at this location. Round 1 water modeling results indicate a supply of approximately 1,000 gpm at the Primary Delivery Point receiving and pumping station to meet 2030 system demands. Based on this, the Primary Delivery Point Receiving and Pumping Station pumps are sized at 1,000 gpm per pump, with a pump added by 2050 to meet projected demands. The Primary Delivery Point receiving and pumping station capacity is summarized in Table 7.

Primary Receiving and Pumping Station	Units	2030	2050	Ultimate Build-out
Total Capacity (MGD)	gpm	2,000	3,000	3,000
	MGD	2.88	4.32	4.32
Firm Capacity (MGD)	gpm	1,000	2,000	2,000
	MGD	1.44	2.88	2.88

Table 7 Primary Receiving and Pumping Station Preliminary Design Conditions



DIFFERENCE IN AVAILABLE FIRE FLOW
2050 FF WITH 3 POINTS MINUS 2050 FF WITH 2 POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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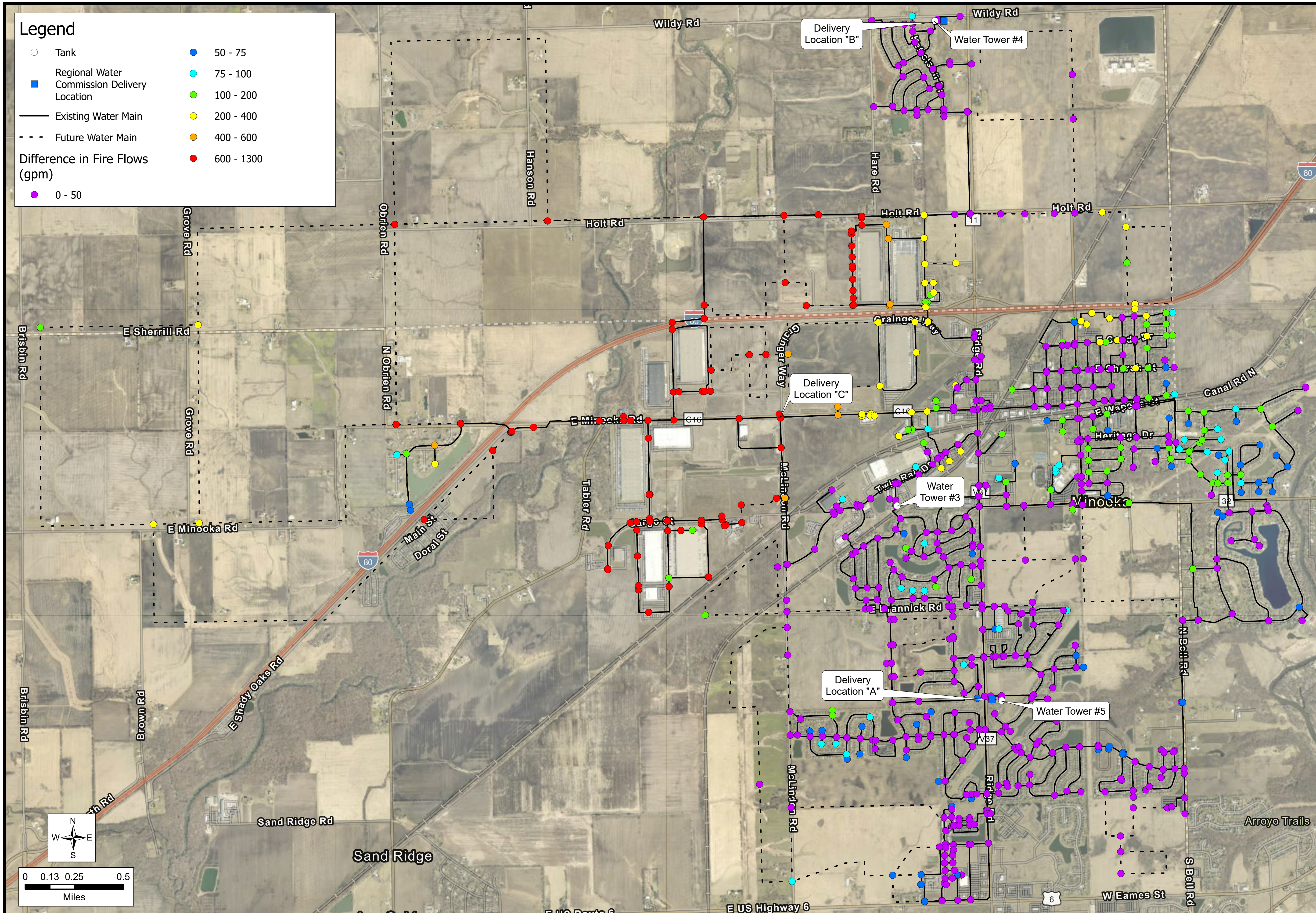
FIGURE 12
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 12 Diff 2050 3pt - 2050 2pts 11x17 User: danc Date: 9/23/2022 Time: 10:29 AM



DIFFERENCE IN AVAILABLE FIRE FLOW

ULTIMATE BUILDOUT FF WITH 3 POINTS MINUS ULTIMATE BUILDOUT FF WITH 2 POINTS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 13
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 13 Ultimate FF 3pts - Ultimate 2pts 11x17 User: danc Date: 9/23/2022 Time: 10:29 AM

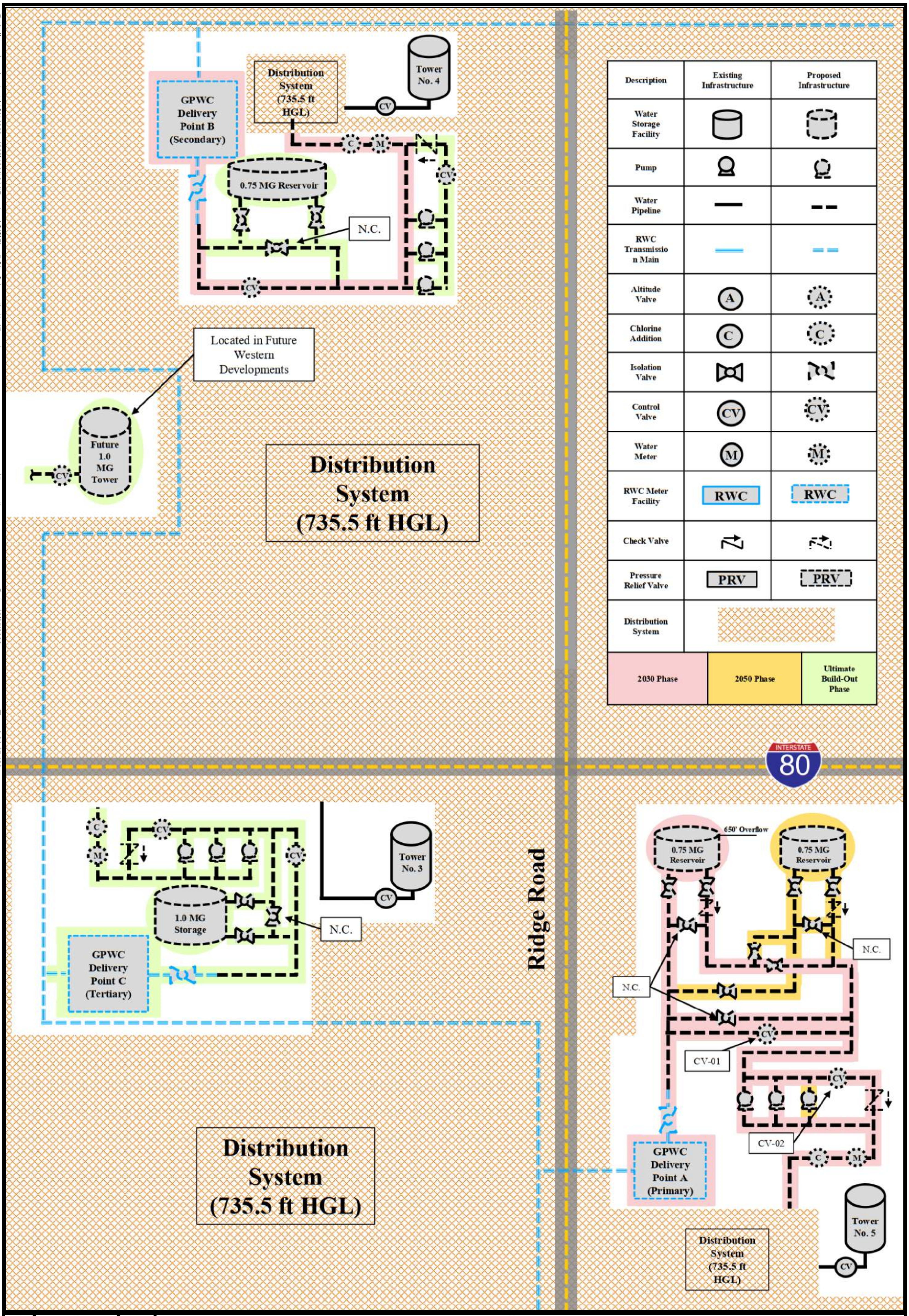

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FIGURE 14
4368.014

DISTRIBUTION SYSTEM SCHEMATIC

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

B. Secondary Delivery Point B

Based on pressures anticipated to be available from the GPWC, the Secondary Delivery Point B supply will have sufficient supply pressure to feed the Village's system without a pump station through 2050. This will allow the Village to supplement a range of demands using a pressure reducing valve (PRV) at this Delivery Point B location without the constraints of pump performance. The anticipated Delivery Point B Receiving Station conditions are summarized in Table 8.

Based on the preliminary data from the GPWC, the supply pressure may drop as low as HGL 720 feet for Ultimate Build-out conditions. If this drop in supplied pressure were to occur, a pumping station would need to be added at Delivery Point B. For the purposes of this planning document, a reservoir and pumping station are included at Delivery Point B for Ultimate Build-out. The Ultimate Build-out pump station capacity of 2,000 gpm is based on Round 1 water modeling results to meet demands in the area.

Secondary Receiving Station	Units	2030	2050	Ultimate Build-out
Maximum Day Supply	gpm	847	778	2,000
	MGD	1.22	1.12	2.88

Table 8 Secondary Receiving Station Preliminary Design Conditions

C. Tertiary Delivery Point C

Delivery Point C is not anticipated to be necessary until Ultimate Build-out. The capacity of Delivery Point C will need to be reevaluated and refined in the future. For the purposes of this planning document, the capacity is planned to be the Ultimate Build-out demand of 9.39 MG less the capacities of the Primary and Secondary Delivery Points (a total of 5.76 MG). Therefore, the capacity of the Tertiary Delivery Point Receiving and Pumping Structure is 3.63 MG, which can be met with three or four pumps. Two Tertiary Delivery Point pump design conditions are summarized in Table 9.

Tertiary Receiving and Pumping Station	Units	Three 1,300 gpm pumps	Four 850 gpm pumps
Total Capacity (MGD)	gpm	3,900	3,400
	MGD	5.62	4.90
Firm Capacity (MGD)	gpm	2,600	2,550
	MGD	3.74	3.67

Table 9 Tertiary Receiving and Pumping Station Preliminary Design Conditions

D. Water Storage

The Village has expressed a preference for prestressed concrete tanks, consistent with the Village's existing, low-maintenance water storage facilities.

To meet 2050 water storage requirements, 1.22 MG in additional storage is necessary by 2050. Of this additional storage, 0.42 MG is required by 2030. This water storage has been sited at the Primary Delivery Point A location. To provide redundancy and facilitate storage tank maintenance, two 0.75 MG tanks are proposed for a total storage of 1.5 MG at the Primary Delivery Point A location.

Figure 14 shows one possible future allocation of water storage throughout the water system, to meet the projected Ultimate Build-out water storage requirement of 6 MG. This includes a 0.75 MG reservoir at the Secondary Delivery Point B Location, a 1.0 MG standpipe at the Tertiary Delivery Point C Location, and 1.0 MG of elevated storage located in a future western development area to increase pressures and available fire flows as the Village expands westward.

E. Round 2 Modeling Results

1. Baseline

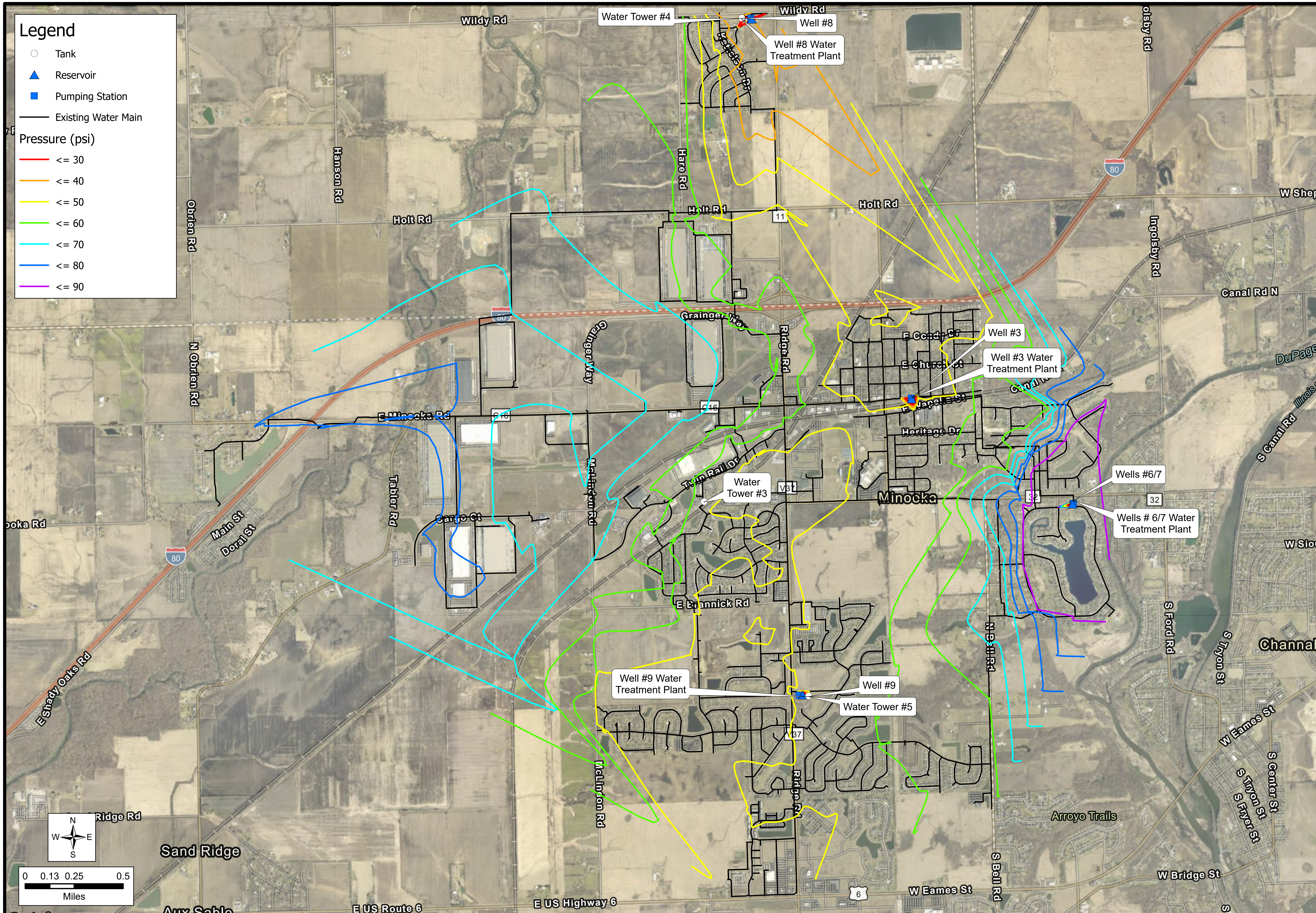
In Round 2 water modeling, the water level in the three elevated storage tanks was reduced to 10 feet below overflow, rather than being set at the overflow elevation, as was used in Round 1. All other baseline conditions to represent the current system supplied by existing wells using 2022 demands were consistent with Round 1 water modeling. Figures 15 and 16 were developed to display pressure contours and fire flows, respectively. Pressure contours reflect a reduction in system pressure of approximately 5 psi, particularly in the areas of the water towers in comparison to Figure 3. This is associated with the change in water tower water levels during water modeling.

Maximum day pressures remain greater than 30 psi throughout the Village, and available fire flows are sufficient except for reduced fire flows near Wapella Street due to an existing 4-inch water main. These 2022 maximum day demand pressure contours and available fire flows were used as a baseline for comparison in Round 2 water modeling discussions.

2. Two Delivery Points

Scenarios were run in the water model using Delivery Points A and B. Reservoirs and pump stations were inserted into the model in place of the negative demands used during Round 1 Modeling. Pump curves were inserted into the model based on anticipated flow and head conditions of the pumps. Water level within the elevated tanks was again set to 10 feet below overflow. Using these two delivery points, a steady state simulation was run in the water model for each of the 2030 and 2050 demands. Both maximum day pressure contours and available fire flows were reviewed.

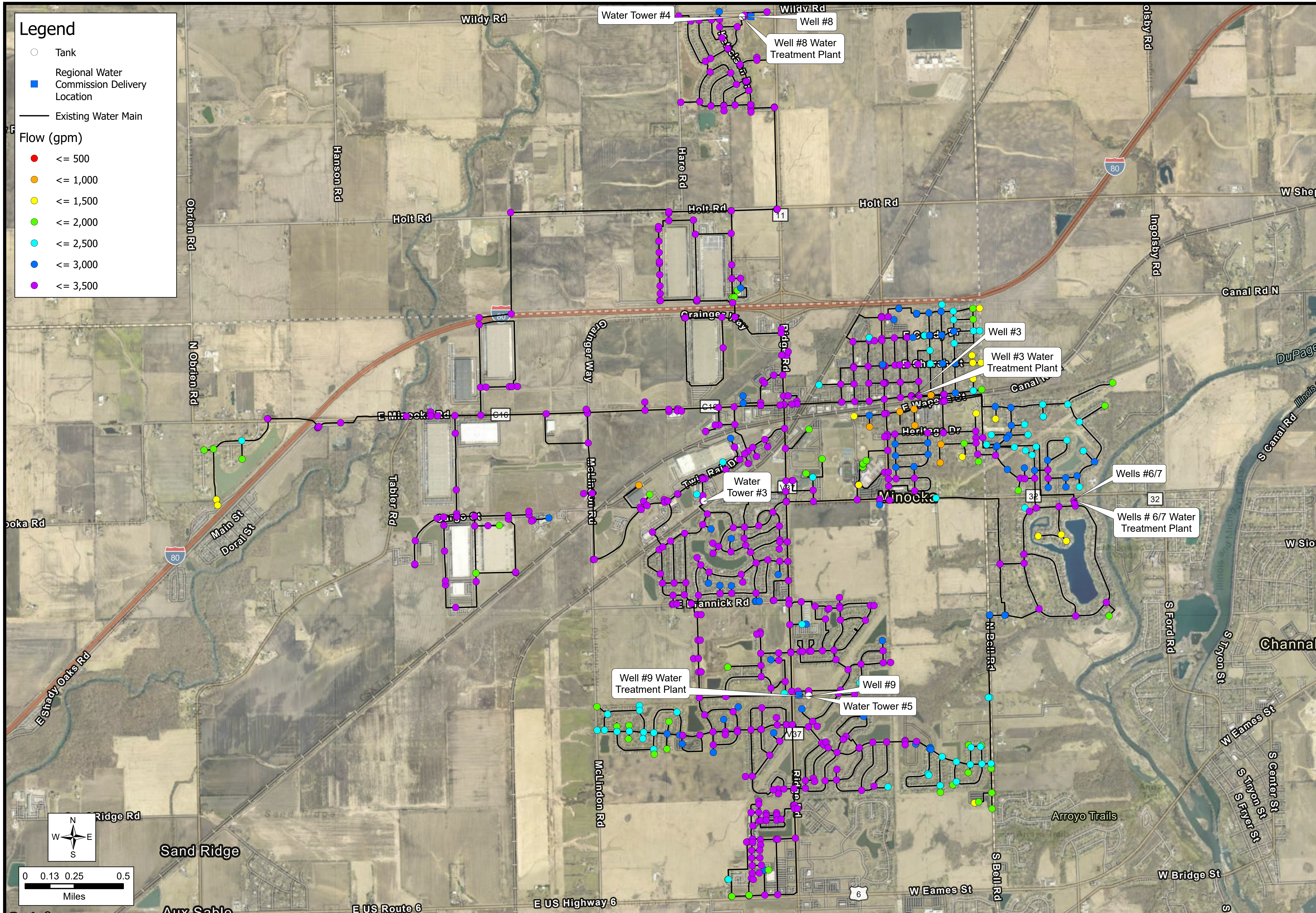
Under the scenarios for 2030 and 2050 demands, no significant difference in pressures were found when compared to the baseline scenario. Figures 17 and 18 display the 2030 and 2050 pressure contours, respectively, being met by Delivery Points A and B. The 2030 and 2050 pressure contours are consistent with the baseline pressure contours of Figure 15. In addition, the fire flows for 2030 and 2050 are improved from the 2022 fire flows. The 2030 and 2050 available fire flows are shown in Figures 19 and 20, respectively. These improved fire flows, relative to the baseline conditions shown in Figure 16, are a result of the water main improvements anticipated by 2030.



MAXIMUM DAY PRESSURE CONTOUR
2022 WELL SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

FIGURE 15
4368.014



AVAILABLE FIRE FLOW
2022 WELL SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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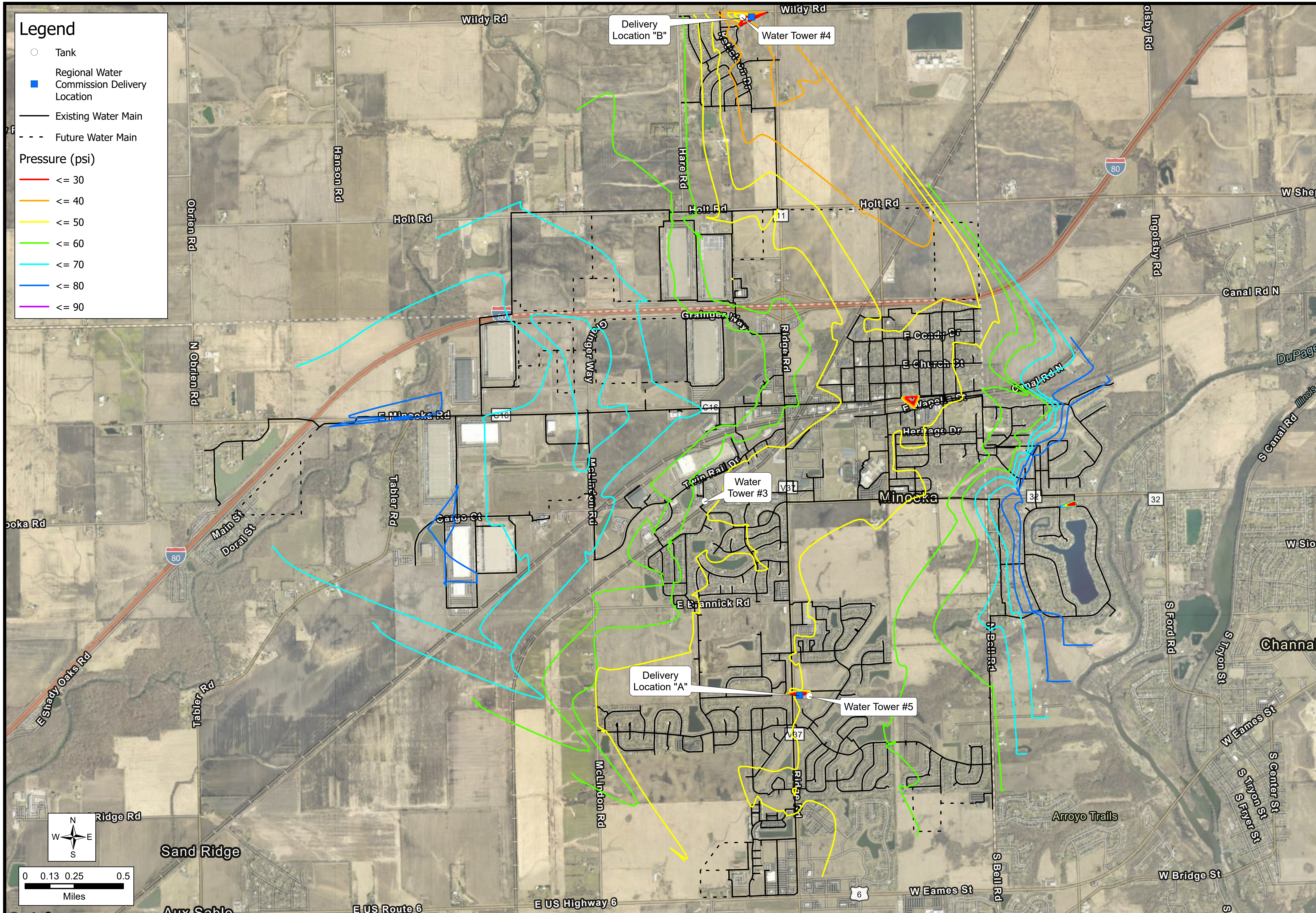
FIGURE 16
4368.014



MAXIMUM DAY PRESSURE CONTOUR
2030 REGIONAL WATER SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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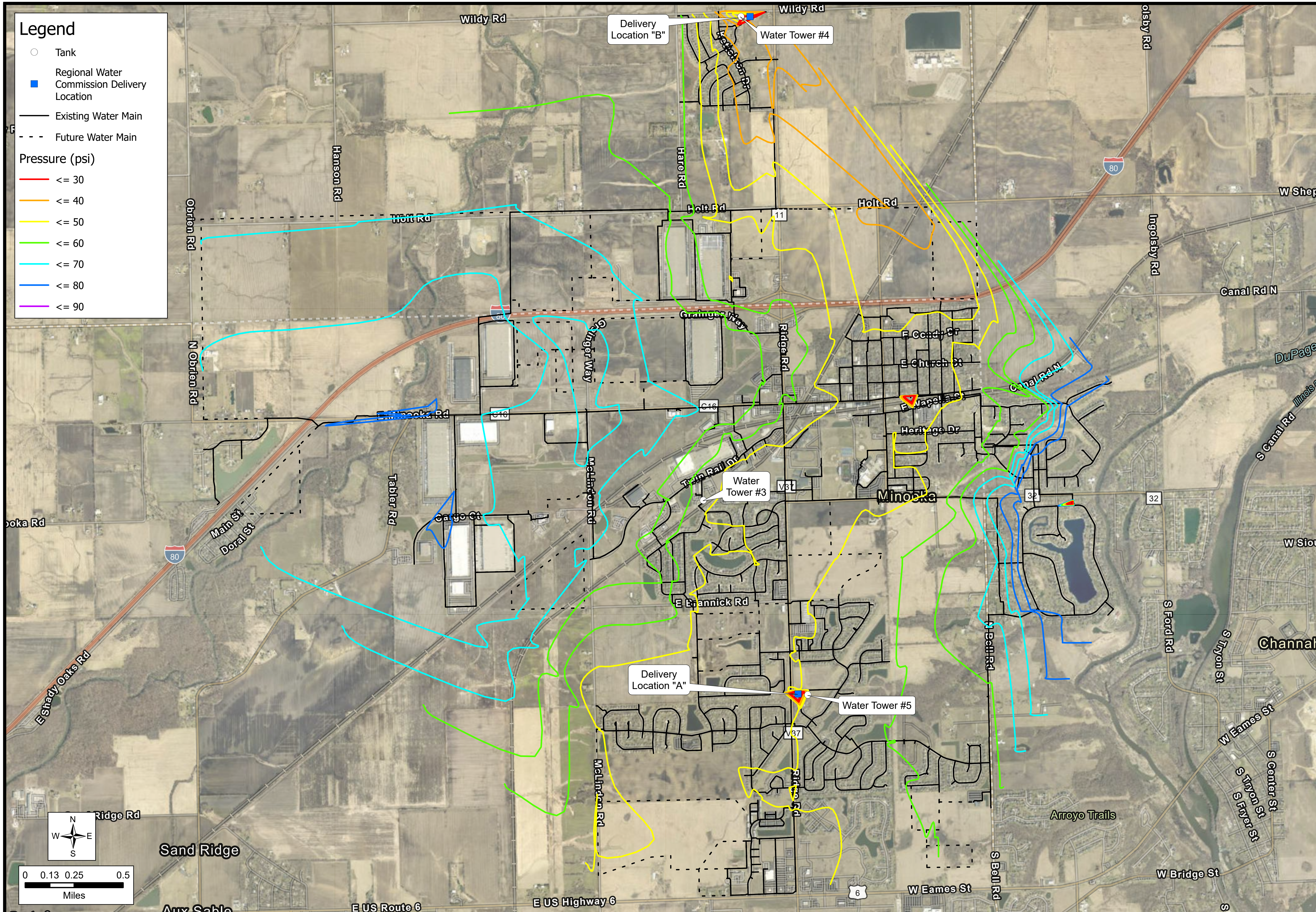
FIGURE 17
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 17 Pressure 2030 Regional 11x17 User: danc Date: 9/23/2022 Time: 10:30 AM



MAXIMUM DAY PRESSURE CONTOUR
2050 REGIONAL WATER SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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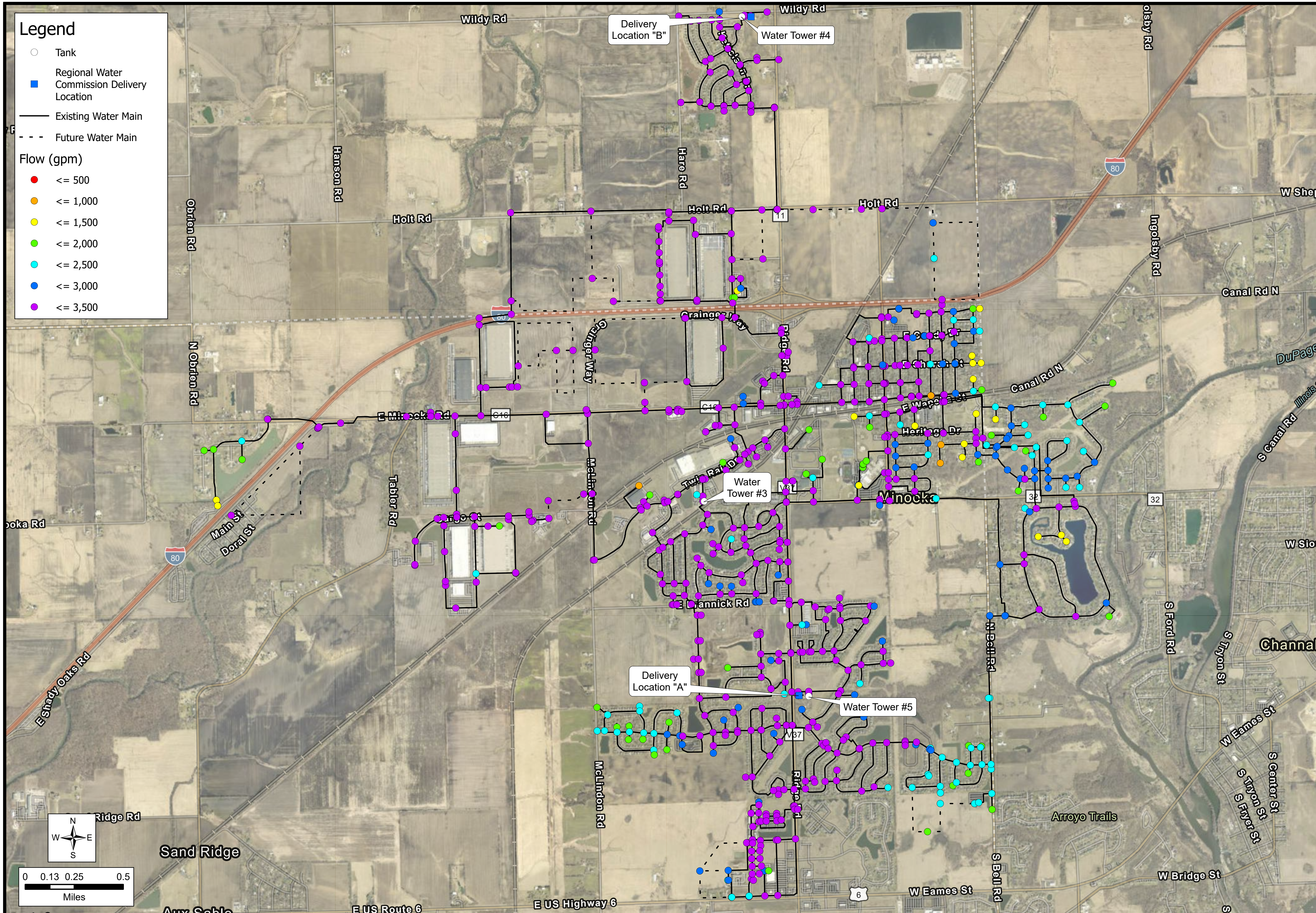
FIGURE 18
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 18 Pressure 2050 Regional 11x17 User: danc Date: 9/23/2022 Time: 10:30 AM



AVAILABLE FIRE FLOW
2030 REGIONAL WATER SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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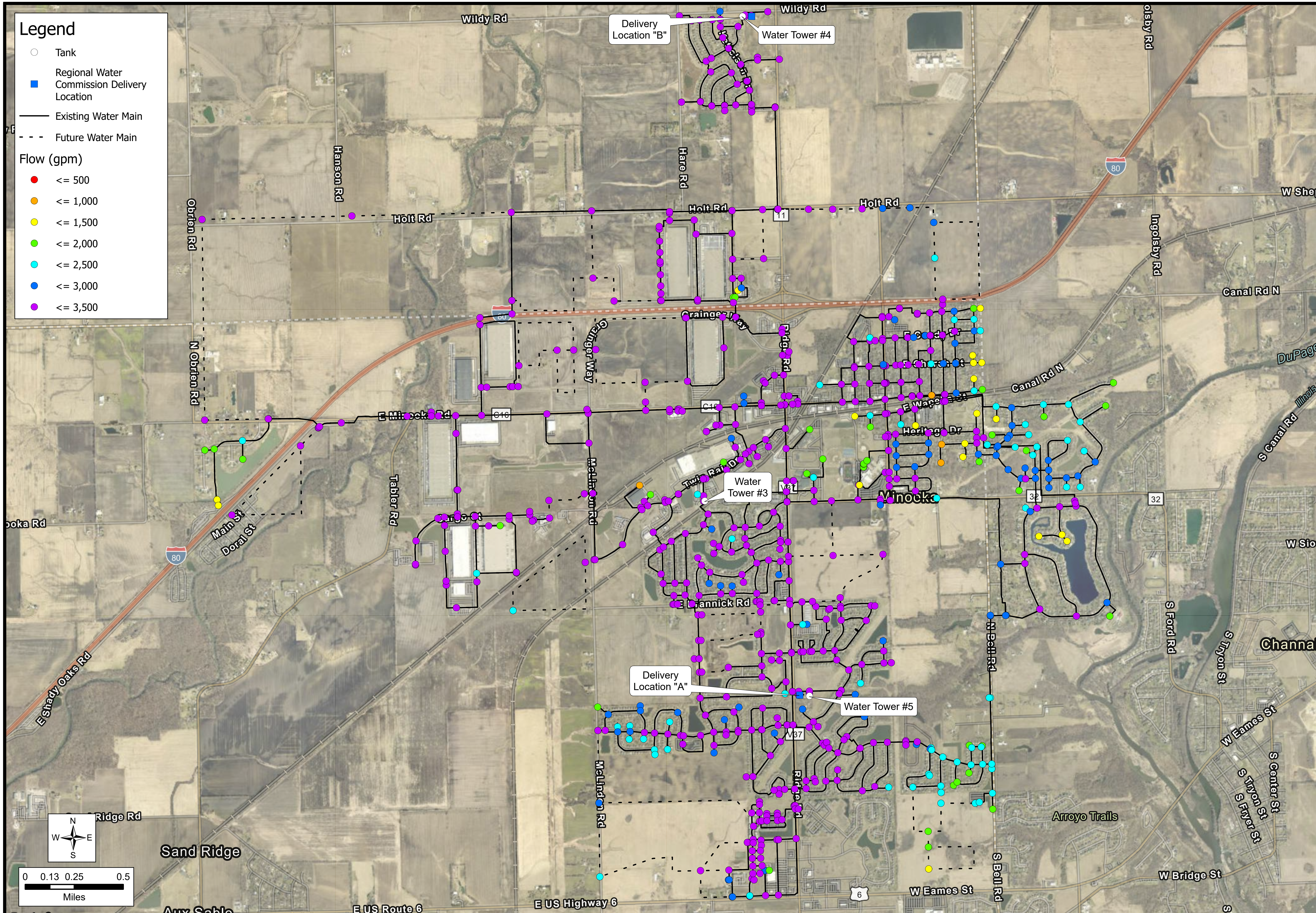
FIGURE 19
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 19 FF 2030 Regional 11x17 User: danc Date: 9/23/2022 Time: 10:30 AM



AVAILABLE FIRE FLOW
2050 REGIONAL WATER SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 20
4368.014

Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 20 FF 2050 Regional 11x17 User: danc Date: 9/23/2022 Time: 10:31 AM

With the critical water main infrastructure improvements included water modeling results for maximum day pressure contours and available fire flows indicate the Village is anticipated to be able to meet demands up to 2050 from two delivery points: Delivery Points A and B.

3. Three Delivery Points

Water modeling with supply from three delivery points included the Tertiary Delivery Point C in addition to Delivery Points A and B. This water modeling focused on the Ultimate Build-out demands. Figures 21 and 22 show the Ultimate Build-out pressure contours and available fire flow, respectively.

In reviewing Figure 21, the Ultimate Build-out pressure contours for the system with three delivery points shows that system pressures are maintained above 30 psi. The pressures are shown to decrease on the western side of the Village associated with the expanded growth of the Village to the west.

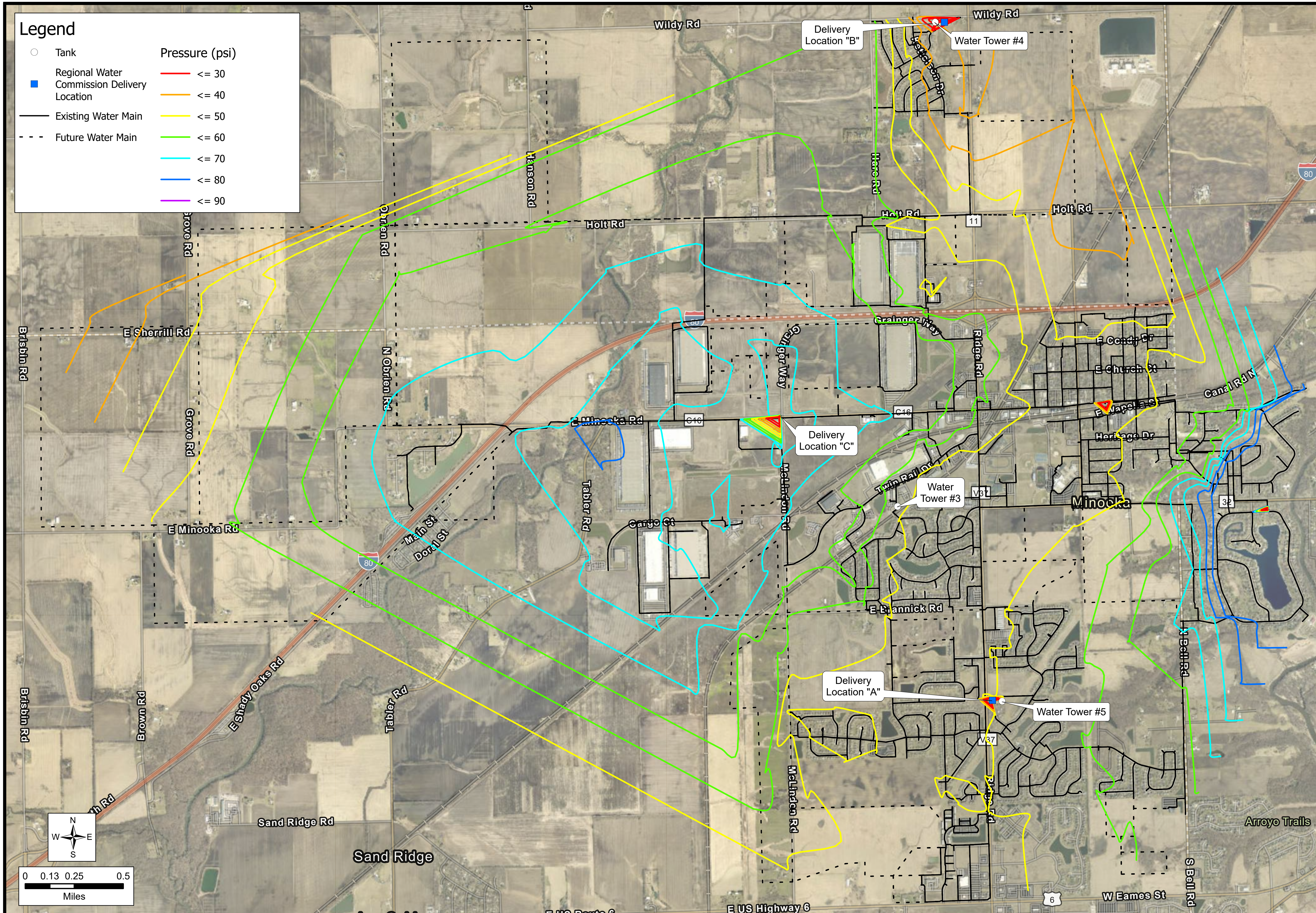
Figure 22 was developed to review available fire flows for Ultimate Build-out demands for the system with three delivery point. This figure shows that the available fire flows are generally maintained across the extent of the projected 2050 water system; however, Ultimate Build-out growth from Obrien Road to the west shows a steady decrease in available fire flows to conditions less than 500 gpm at the farthest extent west.

F. Round 2 Summary

GPWC supplies at Primary Delivery Point A and Secondary Delivery Point B will be needed by 2030 in order to meet the Village's projected 2030 maximum day demand of 2.66 MGD. Primary Delivery Point A Receiving and Pumping Station will be designed to convey 1,000 gpm firm capacity to the distribution system in 2030, with the ability to add additional pumping capacity to the station by 2050. Secondary Delivery Point B Receiving Station will serve as a direct connection from the GPWC transmission main with a PRV through 2050.

Based on the GPWC Delivery Structure Preliminary Design Conditions summarized in Table 5, the Village's Primary Receiving and Pumping Station at Location A and Secondary Receiving Station at Location B are sufficient to supply the Village through 2050.

With the additional proposed demands in the western portion of the Village associated with Ultimate Build-out, Tertiary Delivery Point C and a Receiving and Pumping Station at Location C are needed to meet the projected Ultimate Build-out maximum day demand of 9.39 MGD. Table 10 summarizes the Village's projected delivery point design capacities needed to meet projected 2030, 2050, and Ultimate Build-out maximum day demands. The Round 2 water modeling results under Ultimate Build-out conditions indicated a decrease in pressure and fire flows on the western extent of the Village. The two 0.75 MG reservoirs at Location A are sized to meet storage requirements through 2050, and additional water storage will be necessary to meet Ultimate Build-out conditions. Planning for elevated water storage located in the Village's western growth areas to help meet Ultimate Build-out storage requirements will improve both pressure contours and available fire flows in the western areas of the Village's projected growth.



MAXIMUM DAY PRESSURE CONTOUR
ULTIMATE BUILDOUT REGIONAL WATER SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 21
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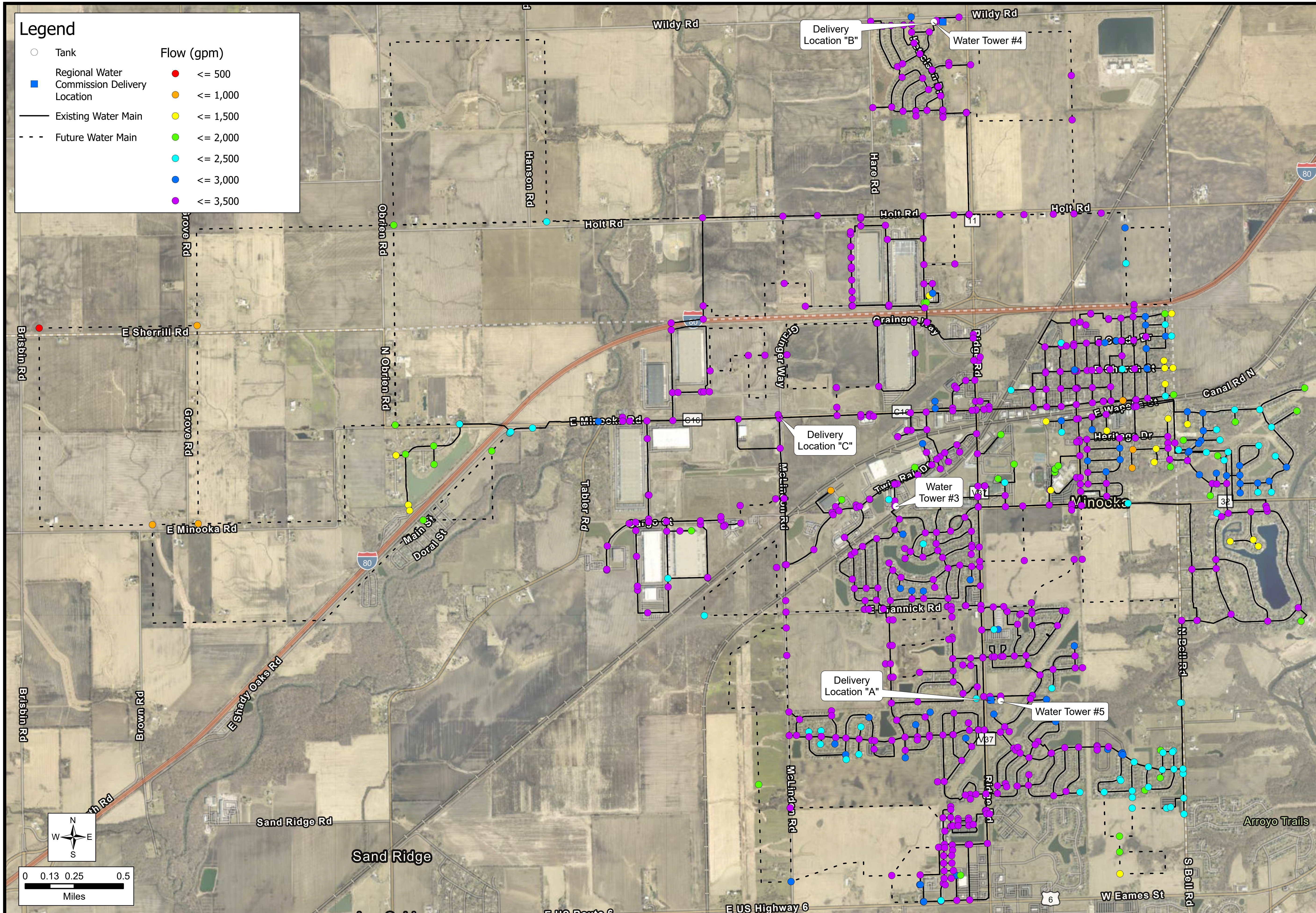
Path: S:\JOL\4300--4399\4368\014\Drawings\GIS\Minooka Water\Minooka Water.aprx\Fig 21 Pressure Ultimate Regional 11x17 User: danc Date: 10/25/2022 Time: 9:01 AM



AVAILABLE FIRE FLOW
ULTIMATE BUILDOUT REGIONAL WATER SUPPLY ROUND 2 MODELING

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 22
4368.014

Location	Units	2030 Flowrate	2050 Flowrate	Ultimate Build-out Flowrate
Receiving and Pumping Station at Location A	gpm	1,000	2,000	2,000
	MGD	1.44	2.88	2.88
Receiving (and Future Pumping) Station at Location B[1]	gpm	847	778	2,000
	MGD	1.22	1.12	2.88
Receiving and Pumping Station at Location C	gpm	0	0	2,550
	MGD	0	0	3.67
Total GPWC Supply	gpm	1,847	2,778	6,550
	MGD	2.66	4.00	9.43

[1]Secondary Delivery Point B is supplied with a direct connection to GPWC transmission main with a PRV though 2050. For Ultimate Build-out, a pump station is needed to increase the HGL to meet the Village's HGL.

Table 10 Receiving and Pumping Station Preliminary Design Firm Capacities

RECOMMENDED WATER SYSTEM IMPROVEMENTS

Based on the results of Rounds 1 and 2 Water Modeling, the following is a summary of infrastructure improvements needed for the transition to Lake Michigan water supply. This infrastructure is shown schematically in Figure 14. Preliminary floor plans for the receiving and pumping stations outlined in the following are shown in Figure 23.

A. Primary Delivery Point A Infrastructure

Recommended infrastructure for Delivery Point A by 2030 includes the GPWC primary delivery station, a 0.75 MG reservoir, and the Village's receiving and pumping station. For 2030 conditions, the pump station would include two 1,000 gpm pumps designed for an approximate total dynamic head (TDH) of 90 feet per pump, a flow control valve, a water meter, and chlorine addition equipment. For 2050 conditions, the pumping capacity of the pump station would need to increase by 1,000 gpm with the addition of a pump and the second 0.75 MG reservoir will be needed to meet storage requirements.

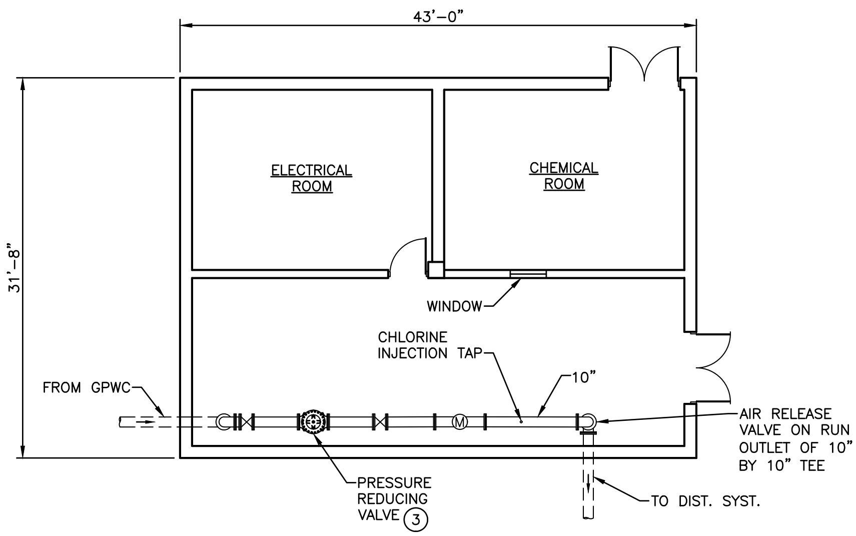
Table 11 summarizes the recommended infrastructure for the Village's Delivery Point A to received Lake Michigan Water.

GENERAL NOTES:

1. WATER SUPPLIED TO MINOOKA BY GRAND PRAIRIE WATER COMMISSION (GPWC).
2. RECEIVING AND PUMPING STATION FLOOR PLAN FOR TERTIARY DELIVERY POINT TO INCLUDE A BATHROOM.

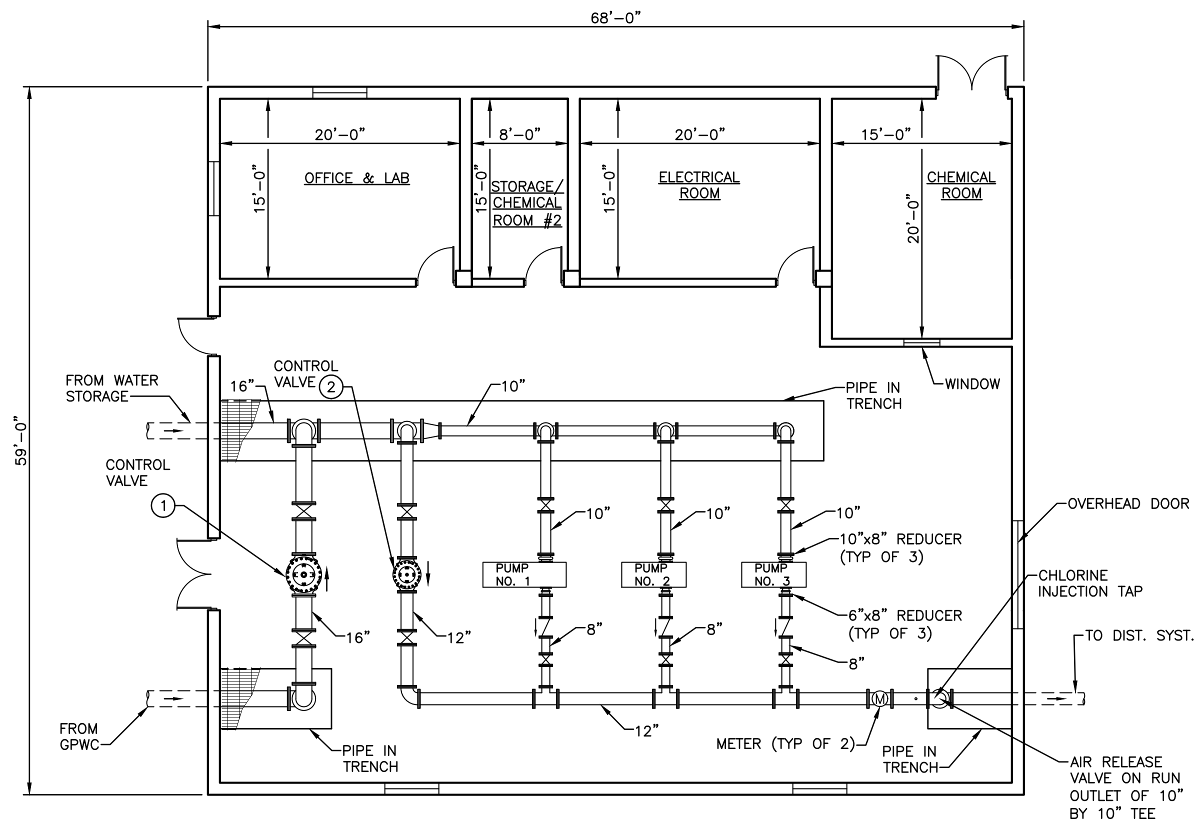
KEY NOTES:

1. CONTROL VALVE TO ALLOW FLOW TO BYPASS RESERVOIRS.
2. CONTROL VALVE TO ALLOW HIGH PRESSURE FROM GPWC TO DIRECTLY FEED DISTRIBUTION SYSTEM WITH INTEGRAL CHECK VALVE.
3. CONTROL VALVE TO REDUCE PRESSURE FROM GPWC TO SYSTEM PRESSURE. FLOW RATE CONTROLLED IN GPWC DELIVERY AND METER STRUCTURE.



RECEIVING STATION FLOOR PLAN

0 2' 4' 8' 16'



RECEIVING AND PUMPING STATION FLOOR PLAN

0 2' 4' 8' 16'

RECEIVING AND PUMPING STATION FLOOR PLANS

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 23

4368.014

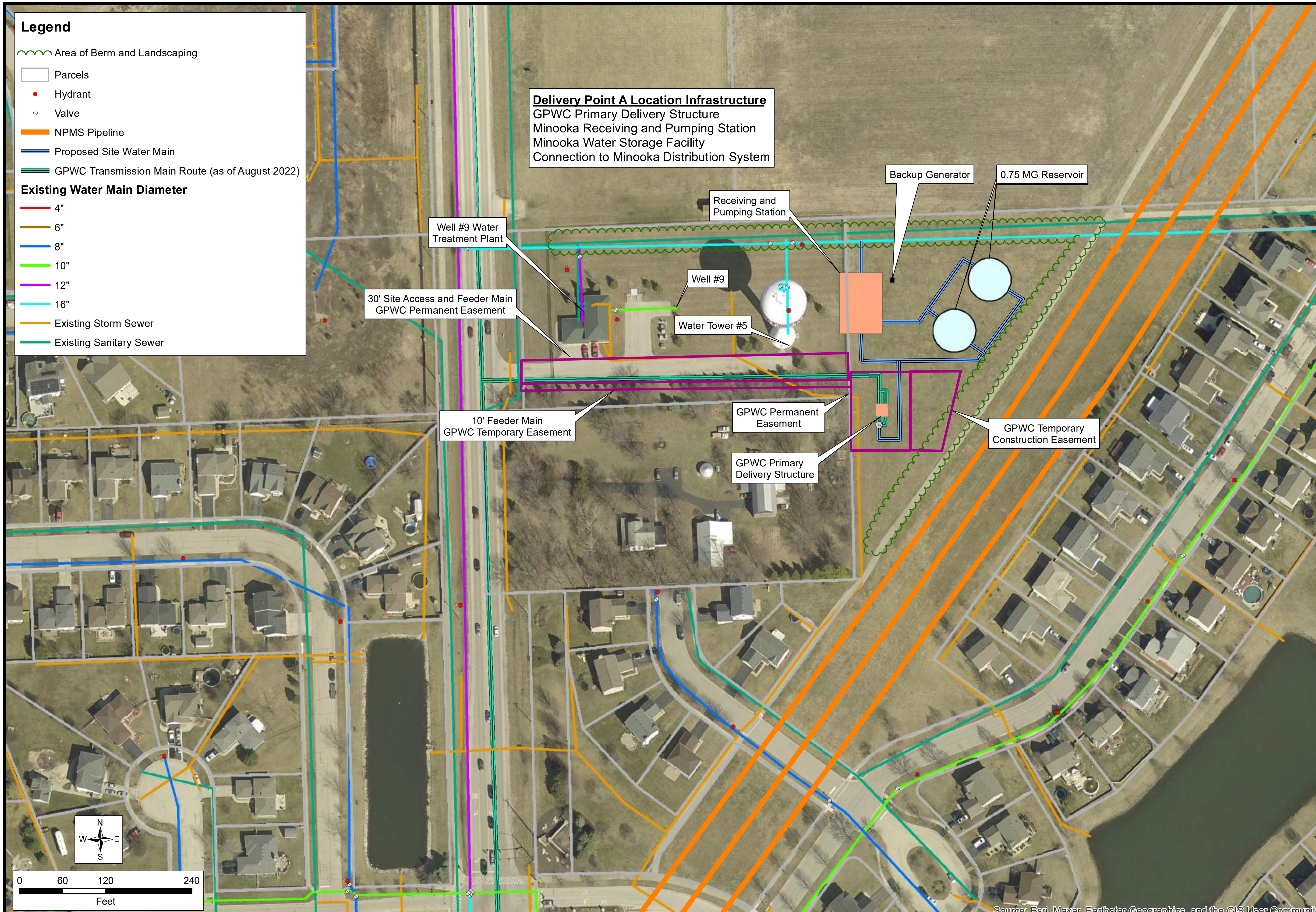
File: \\strand.com\projects\JOL\4300--4399\4368\014\Drawings\CAD\FIGURE 23.dwg Time: Oct 03, 2022 - 10:29am

Facility and Criteria	Parameters
GPWC Primary Metering Station	
Approximate Overall Footprint	25 x 25 feet
Flow Rate, Maximum	2,000 gpm
Yard Piping Size	14 inches
Flow Control Valve Type	Diaphragm with Electronic Controller or Motorized Ball Valve
Meter Type	Electromagnetic (Mag) Flow Meter
Water Storage[1]	
Type	Two Ground Level Reservoirs
Volume	0.75 MG each
Grade Elevation	609 feet MSL
Overflow	649 feet MSL
Height	40 feet
Diameter	60 feet
Yard Piping Size	16 inches
Receiving and Pumping Station	
Approximate Overall Footprint	60 x 70 feet
Reservoir Bypass Type	Flow Control Valve
Pump Type	Horizontal Centrifugal Single-Stage
Number of Pumps	2 (2030 and 2050); 3 (Ultimate Build-out)
Pump Capacity (each)	1,000 gpm
Pump Design TDH	90 feet
Pump Horsepower	60 horsepower
Pump Starter Type	Variable Frequency Drive (VFD)
Pump Bypass Type	Flow Control Valve
Meter Type	Electromagnetic (Mag) Flow Meter
Water Treatment(s)	Boost Chlorine Residual, Corrosion Control
Chlorination Type	Sodium Hypochlorite
Number of Chlorination Locations	1
Backup Power	On-Site Standby Generator

[1]One 0.75 MG reservoir is recommended by 2030. An additional 0.75 MG reservoir is recommended by 2050.

Table 11 Primary Delivery Point A Infrastructure Preliminary Design Criteria Summary

The Village's existing Well No. 9, Well No. 9 WTP, and Tower No. 5 site is located north of the intersection of Ridge Road and Misty Creek Drive. This is the location proposed for the Primary Delivery Point A. Preliminary infrastructure is shown in one potential layout for the Primary Delivery Point A on Figure 24.



EXISTING AND PROPOSED WATER SYSTEM
DELIVERY POINT A

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 24
4368.014

Path: \\strand.com\projects\JOL\4300--4399\4368\014\Drawings\GIS\Delivery Point A 11x17.mxd User: nathanw Date: 10/14/2022 Time: 11:35:43 AM

B. Secondary Delivery Point B Infrastructure

Recommended infrastructure for 2030 at Secondary Delivery Point B includes the GPWC delivery station and the Village's receiving station. This facility would include a PRV, water meter, and chlorine addition equipment. For Ultimate Build-out, a 0.75 MG Reservoir and a pump station including three 1,000 gpm pumps may be required.

Table 12 summarizes the recommended infrastructure for the Village's Secondary Delivery Point B to receive Lake Michigan Water through 2050 conditions, with conceptual Ultimate Build-out facilities outlined as future facilities.

Facility and Criteria	Parameters
GPWC Secondary Metering Station	
Approximate Overall Footprint	25 x 25 feet
Flow Rate, Maximum	2,550 gpm
Yard Piping Size	14 inches
Flow Control Valve Type	Diaphragm with Electronic Controller or Motorized Ball Valve
Meter Type	Electromagnetic (Mag) Flow Meter
Future (Ultimate Build-out) Water Storage	
Type	Reservoir
Volume	0.75 MG
Receiving Station	
Approximate Overall Footprint	37 x 43 feet
Meter Type	Electromagnetic (Mag) Flow Meter
Water Treatment(s)	Boost Chlorine Residual, Corrosion Control
Chlorination Type	Sodium Hypochlorite
Number of Chlorination Locations	1
Backup Power	Uninterrupted Power Supply (UPS) System and Portable Generator Mount
Future (Ultimate Build-out) Pumping Station	
Pump Type	Horizontal Centrifugal Single-Stage
Number of Pumps	3 (Ultimate Build-out)
Pump Capacity (each)	1,000 gpm
Pump Starter Type	VFD
Backup Power	On-Site Standby Generator

Table 12 Secondary Delivery Point B Infrastructure Preliminary Design Criteria Summary

The Village's existing Well No. 8, Well No. 8 WTP, and Tower No. 4 site is located west of the intersection of Ridge Road and Wildy Road. This is the location proposed for the Secondary Delivery Point B. Preliminary infrastructure is shown in one potential layout for the Primary Delivery Point B on Figure 25.

C. Tertiary Delivery Point C Infrastructure

Tertiary Delivery Point C may be necessary as the Village reaches Ultimate Build-out and should be reevaluated after 2050. Preliminary infrastructure outlined for Delivery Point C includes the GPWC primary delivery station, a 1.0 MG standpipe, and the Village's receiving and pumping station. The pump station would include four 850 gpm pumps, a flow control valve, a water meter, and chlorine addition equipment.

Table 13 summarizes the conceptual Ultimate Build-out facilities for the Village's Tertiary Delivery Point C to meet Ultimate Build-out conditions with the Lake Michigan Water supply.

Facility and Criteria	Parameters
Future (Ultimate Build-out) GPWC Tertiary Metering Station	
Approximate Overall Footprint	25 x 25 feet
Flow Rate, Maximum	2,550 gpm
Yard Piping Size	14 inches
Flow Control Valve Type	Diaphragm with Electronic Controller or Motorized Ball Valve
Meter Type	Electromagnetic (Mag) Flow Meter
Future (Ultimate Build-out) Water Storage	
Type	Standpipe
Volume	1.0 MG
Future (Ultimate Build-out) Receiving and Pumping Station	
Approximate Overall Footprint	60 x 85 feet
Pump Type	Horizontal Centrifugal Single-Stage
Number of Pumps	4 (Ultimate Build-out)
Pump Capacity (each)	850 gpm
Pump Starter Type	VFD
Backup Power	On-Site Standby Generator

Table 13 Tertiary Delivery Point C Infrastructure Preliminary Design Criteria Summary

The Village could purchase property near the intersection of East Minooka Road and Grainger Way for the Tertiary Delivery Point B site. Figure 26 shows the potential 5 acres the Village could purchase and one potential layout for the preliminary infrastructure at Delivery Point C.

D. Water Main Improvements

In addition to the water main installation needed to support continued Village growth, two water main improvements have been identified that are recommended by 2030. The first is the replacement of water main on Wapella Street to increase from 4- to 8-inch diameter to improve low fire flows in the area. The second is the crossing of I-80 with an 8-inch water main to boost available fire flows in the area between I-80 and East Mondamin Street.

Water modeling was also used to clarify potential water main improvements on the eastern side of the Village, north of I-80. Village projected 2030 improvements include 8-inch water main north of I-80 that can help to convey water from Delivery Point B across I-80 to the downtown area of the Village. Water modeling confirmed that the water main running east along Holt Road and connecting to the downtown area of the Village with the 8-inch I-80 crossing is a critical piece of future water main infrastructure. Additionally, water modeling suggested that increasing the proposed 10-inch water main on Holt Road from Ridge Road to County Line Road to a 12-inch main would help increase fire flow availability between I-80 and East Mondamin Street.

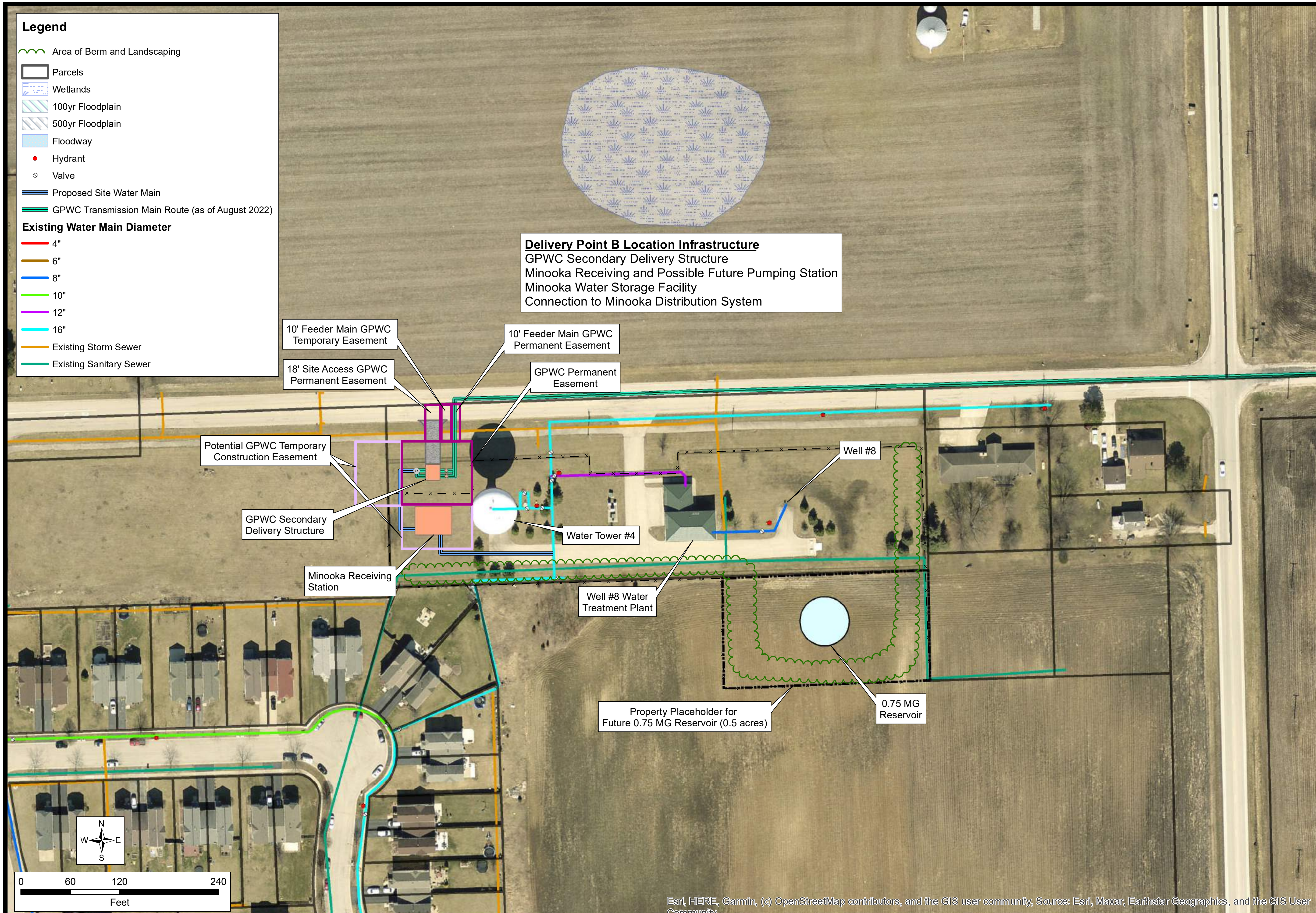
OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

An OPCC for recommended water system improvements to transition to treated Lake Michigan water supply in 2030 is summarized in Table 14. The OPCC is in accordance with the Association for the Advancement of Cost Engineering cost estimate Class 4 and is in 2022 dollars.

Projects by 2030	Total OPCC (2022 Dollars)
Location A Primary Receiving and Pumping Station	
Building with Electrical, Pumps, Piping and Valving	$2,060,600
Chemical Feed Equipment	$80,200
Site Piping	$100,400
Sitework–Pavement	$23,000
Sitework–Fencing	$8,800
Sitework–Drainage, Seeding, and Erosion Control	$21,100
Sitework–Landscaping	$50,000
Electrical–Site Electrical and SCADA	$103,400
Electrical–Standby Generator	$114,900
Subtotal	$2,562,400
Contractor's General Conditions (8%)	$205,000
Contingency (30%)	$768,700
Primary Receiving and Pumping Station Total OPCC	***$3,536,100***
0.75 MG Reservoir	
One Precast Concrete, Wire-Wound Reservoir	$2,622,741
Sitework	$150,000
Subtotal	$2,772,741
Contractor's General Conditions (8%)	$221,800
Contingency (30%)	$831,800
0.75 MG Reservoir Total OPCC	***$3,826,341***
Location B Secondary Receiving Station	
Building with Electrical, Piping and Valving	$679,400
Chemical Feed Equipment	$80,200
Site Piping	$80,300
Sitework–Pavement	$18,400
Sitework–Fencing	$7,000
Sitework–Drainage, Seeding, and Erosion Control	$16,900
Sitework–Landscaping	$50,000
Electrical–Site and Building Electrical and SCADA	$437,100
Electrical–Uninterrupted Power Supply and Portable Generator Stand	$79,400
Subtotal	$1,448,700
Contractor's General Conditions (8%)	$115,900
Contingency (30%)	$434,600
Secondary Receiving Station Total OPCC	***$1,999,200***
Total Capital Costs:	**$9,361,641**

SCADA=supervisory control and data acquisition

Table 14 2030 Infrastructure OPCC



EXISTING AND PROPOSED WATER SYSTEM
DELIVERY POINT B

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 25
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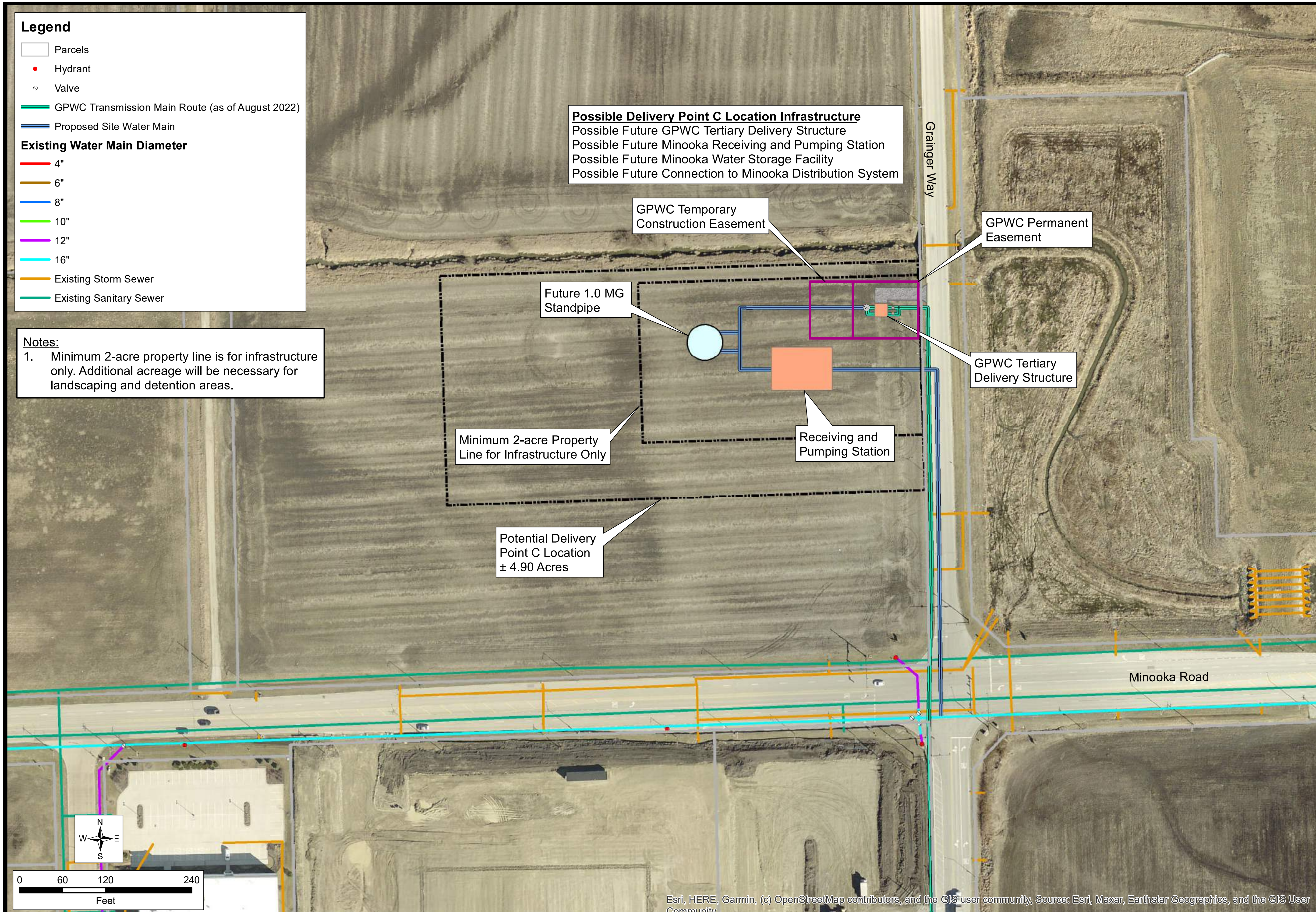

EXISTING AND PROPOSED WATER SYSTEM
POSSIBLE DELIVERY POINT C

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

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FIGURE 26
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Using the OPCCs summarized in Table 14, additional project costs were developed and are summarized in Table 15. The costs associated with studies for changing water sources and any corrosion control treatment are not included in the following overall opinion of project cost (OPC) summary.

Implementation Plan Item	OPC (2022 Dollars)
Location A Primary Receiving and Pumping Station OPCC	$3,536,100
Location A Primary Receiving and Pumping Station Professional Services for Design	$360,000
Location A Primary Receiving and Pumping Station Professional Services for Construction	$360,000
Primary Receiving and Pumping Station Total OPC	***$4,256,100***
0.75 MG Reservoir OPCC	$3,826,341
0.75 MG Reservoir Professional Services for Design	$390,000
0.75 MG Reservoir Professional Services for Construction	$390,000
0.75 MG Reservoir Total OPC	***$4,606,341***
Location B Secondary Receiving Station OPCC	$1,999 200
Location B Secondary Receiving Station Professional Services for Design	$200,000
Location B Secondary Receiving Station Professional Services for Construction	$200,000
Secondary Receiving Station Total OPC	***$2,399,200***
Total Project Costs:	**$11,261,641**

Table 15 2030 OPC Summary

CONSTRUCTION SCHEDULE

A proposed construction schedule for the recommended water system improvements to transition to treated Lake Michigan water supply is summarized in Table 16. This schedule compares the year the infrastructure item could begin operation with the year construction is recommended to begin for the item. This table includes the infrastructure being constructed by GPWC and the water main improvements identified by water modeling results as being necessary to transition from Village groundwater supply to the Lake Michigan water supply by 2030 and to meet projected demands to 2050.

Infrastructure Item	Year Operation Required	Year Construction Starts
Location A Delivery/Metering Station	2030	2025
Location B Delivery/Metering Station	2030	2025
Location A 0.75 MG Reservoir (first)	2030	2026
Location A Primary Receiving and Pumping Station	2030	2028
Location B Secondary Receiving Station	2030	2028
Required Water Main Improvements	2030	2028
Increasing Capacity of Primary Pumping Station	2050	2048
Location A 0.75 MG Reservoir (second)	2050	2050
Location B Secondary Pumping Station	TBD	TBD
Location B 0.75 MG Reservoir	TBD	TBD
Location C Tertiary Receiving and Pumping Station	TBD	TBD
Location C 1.0 MG Standpipe	TBD	TBD
Future Western Development 1.0 MG Elevated Tank	TBD	TBD

TBD=to be determined

Table 16 Proposed Construction Schedule Outline

The overall OPC Schedule in Table 17 breaks down the OPCs summarized in Table 15 and allocates them over the construction schedule outline summarized in Table 16. Construction for storage tanks, receiving and pumping stations, and delivery/metering stations is assumed to span two years with construction costs and professional services costs for construction being distributed evenly between the two years. Professional design services are assumed to take place the calendar year before the beginning of construction. The appendix shows the breakdown in costs for the required water main replacement and permanent and temporary easements. All costs shown are in 2022 dollars.

Implementation Plan Item	Item Subtotal	2024	2025	2026	2027	2028	2029
Location B Secondary Delivery/Metering Station OPCC*	$2,103,000		$1,051,500	$1,051,500			
Professional Services for Design	$210,000	$210,000					
Professional Services for Construction	$210,000		$105,000	$105,000			
Location A 0.75 MG Reservoir OPCC (first)	$3,826,341			$1,913,171	$1,913,171		
Professional Services for Design	$390,000		$390,000				
Professional Services for Construction	$390,000			$195,000	$195,000		
Location A Primary Receiving and Pumping Station OPCC	$3,536,100					$1,768,050	$1,768,050
Professional Services for Design	$360,000				$360,000		
Professional Services for Construction	$360,000					$180,000	$180,000
Location B Secondary Receiving OPCC	$1,999,200					$999,600	$999,600
Professional Services for Design	$200,000				$200,000		
Professional Services for Construction	$200,000					$100,000	$100,000
Land Acquisition–Permanent Easements	$229,500				$229,500		
Land Acquisition–Temporary Easements	$306,000				$306,000		
Required Water Main Improvements	$6,174,810					$3,087,405	$3,087,405
Professional Services for Design	$620,000				$620,000		
Professional Services for Construction	$620,000					$310,000	$310,000
Location A–Increasing Capacity of Primary Pumping Station OPCC	$200,000						
Professional Services for Design	$20,000						
Professional Services for Construction	$20,000						
Location A 0.75 MG Reservoir OPCC (second)	$3,826,341						
Professional Services for Design	$390,000						
Professional Services for Construction	$390,000						
Annual Infrastructure Cost (2022 Dollars)		**$210,000**	**$1,546,500**	**$3,264,671**	**$3,823,671**	**$6,445,055**	**$6,445,055**
Total Infrastructure Cost Through 2030 (2022 Dollars)		**$21,734,952**					

*Based on preliminary findings by Stantec.
All costs shown are in 2022 dollars.

Table 17 OPC Schedule Through 2030

The project costs outlined in this Implementation Plan and summarized in Table 17 are for the Village's projects identified as necessary for the Village to implement the transition to GPWC supplied Lake Michigan water. The Village will be responsible for additional costs outlined by the GPWC. Currently, the GPWC is planned to provide and cover the costs for the GPWC Primary Delivery Point for commission members. Each commission member is responsible for the cost of its additional delivery/metering stations. Each commission member is also responsible for its water commission infrastructure connection charge. This infrastructure design and its associated costs are being further developed in separate studies.

APPENDIX
ADDITIONAL COST BREAKDOWNS

Table 1 shows the total cost for permanent and temporary easements related to the installation of water main from Ridge Road to Chippewa Drive. This section of water main is required for 2030 water system operation.

Easement Type	Length (LF)	Assumed Width (feet)	Square Footage (SF)	Unit Price ($/SF)	Total Cost (2022 Dollars)
Permanent Easements	7,650	15	114,750	2	$229,500
Temporary Easements	7,650	20	153,000	2	$306,000
Total					**$535,500**

SF=square foot
$/sq=dollars per square foot

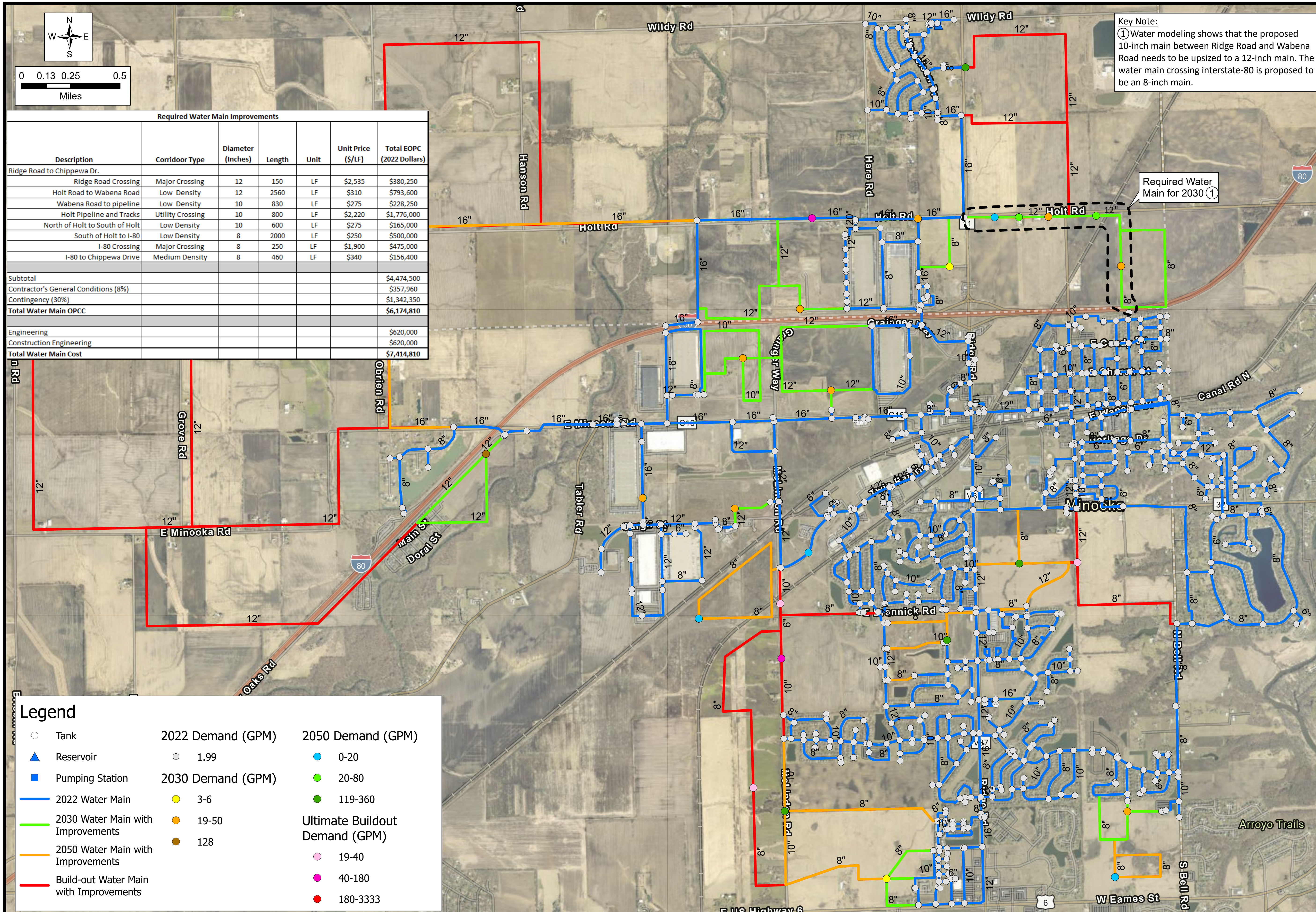
Table 1 Land Acquisition

REQUIRED WATER MAIN EOPC FOR 2030

ALTERNATIVE WATER SUPPLY IMPLEMENTATION PLAN
VILLAGE OF MINOOKA
GRUNDY, KENDALL, AND WILL COUNTIES

Required Water Main Improvements

Description	Corridoor Type	Diameter (Inches)	Length	Unit	Unit Price ($/LF)	Total EOPC (2022 Dollars)
Ridge Road to Chippewa Dr.						
Ridge Road Crossing	Major Crossing	12	150	LF	$2,535	$380,250
Holt Road to Wabena Road	Low Density	12	2560	LF	$310	$793,600
Wabena Road to pipeline	Low Density	10	830	LF	$275	$228,250
Holt Pipeline and Tracks	Utility Crossing	10	800	LF	$2,220	$1,776,000
North of Holt to South of Holt	Low Density	10	600	LF	$275	$165,000
South of Holt to I-80	Low Density	8	2000	LF	$250	$500,000
I-80 Crossing	Major Crossing	8	250	LF	$1,900	$475,000
I-80 to Chippewa Drive	Medium Density	8	460	LF	$340	$156,400
Subtotal						$4,474,500
Contractor's General Conditions (8%)						$357,960
Contingency (30%)						$1,342,350
Total Water Main OPCC						**$6,174,810**
Engineering						$620,000
Construction Engineering						$620,000
Total Water Main Cost						**$7,414,810**



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APPENDIX
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