VILLAGE OF DEFOREST

120 S. STEVENSON STREET
DEFOREST, WI 53532
PHONE (608) 846-6751
WWW.VILDEFOREST.WI.US

April 7, 2017

Mike Rupiper, Director of Environmental Resources Planning
Capital Area Regional Planning Commission
City County Building, Room 362
210 Martin Luther King Jr. Blvd.
Madison, WI 53703

Dear Mike:

Attached is an application to add lands to the Northern Urban Service Area. The amendment area covers lands northwest if the interchange of Interstate 39/90-94 and Highway 19 ("Yahara Gateway Land").

In summary, the Yahara Gateway Land is bordered on the east and south by lands already in the Northern Urban Service Area. It is also within the North Yahara Future Urban Development Area and already in the MMSD service area. Through its comprehensive plan, the Village has also identified the Yahara Gateway Land as within the FUDA, and appropriate for short-term, commercial and mixed use development

The Village of DeForest has been working with area property owners on a neighborhood development plan and on utility, stormwater, transportation, and recreation planning for this land. The results of those efforts are included in the application. The application also includes resolutions from the Village Board and Planning and Zoning Commission that authorize submittal of a NUSA amendment application and find the request consistent with the Village's Comprehensive Plan.

Please let me know if you have any questions.

Sincerely,

Steve Fahlgren
Village Administrator

NORTHERN URBAN SERVICE AREA AMENDMENT APPLICATION

VILLAGE OF DEFOREST

This information supports the Village of DeForest's application to amend the Northern Urban Service Area to include several parcels plus public rights-of-way totaling 177.6 acres. These include parcels 0910-313-8500-2, 0910-313-8000-7, 0910-313-9500-0, 0910-313-8220-1, 0910-314-8622-1, and 0910-314-9141-1. The parcels, referred to as the "Yahara Gateway Land", are currently addressed at 4542 and 4684 State Highway 19, west of Interstate 39-90-94 and east of the Westport town line.

Submitted: April 10, 2017

Prepared by: MDRoffers Consulting and Vierbicher Associates

With support from the Village of DeForest staff

Table of Contents

1 Introduction

Map 1 indicates the proposed Northern Urban Service Area (NUSA) expansion area, including existing public rights-of-way. For purposes of this application, the proposed NUSA expansion area is referred to as the "Yahara Gateway Land" or "the Land." The Yahara Gateway Land encompasses 177.6 acres northwest of the interchange of Interstate 39-90-94 and State Highway 19, including 152.1 acres of private real estate and 25.5 acres of existing highway rights-of-way. The private real estate is within three separate ownerships: Yahara Hills LLC, Windsor Gateway LLC, and the Ballweg Family Limited Partnership.

The Yahara Gateway Land is ready for inclusion in the NUSA. The Land joins the existing NUSA boundary on its east and south sides. Development of the Land will provide an opportunity for the Village of DeForest to accomplish multiple goals, including the following:

- Develop a highway-oriented retail and commercial service district serving local and regional customers along the Interstate and Highway 19, but also integrated into a mixed use setting.
- Provide a setting for denser living options and institutional uses geared particularly to the Baby Boomer and Millennial populations.
- Interconnect Village's north and south (former Token Creek) water utility systems, which currently operate as separate systems.
- Manage stormwater and promote infiltration in accordance with the Village's stormwater management ordinances, which is one of the most progressive in the County including a 100% "stay-on" standard.
- Advance Yahara River corridor protection and related recreational opportunities and access, in accordance with local and County plans.
- Implement and dovetail with multiple plans for this area, including the N*orth Yahara Future Urban Development Area (FUDA) Study*, *Village of DeForest Comprehensive Plan*, *DeForest-Windsor Cooperative Plan*, and Wisconsin Department of Transportation (WisDOT) plans for the expansion of Highway 19 adjacent to the Land.

RIVER ROAD

94

90

39

19

LIUNA WAY

51

VILLAGE OF DEFOREST

MAP 1
YAHARA GATEWAY LAND, VILLAGE OF DEFOREST
PROPOSED URBAN SERVICE AREA AMENDMENT

Existing Urban Service Area Boundary

Amendment Area

N

W E

S

GRAPHIC SCALE FEET

0 125 250 500

APRIL 7, 2017

vierbicher
planners | engineers | advisors

REEDSBURG - MADISON - PRAIRIE DU CHIEN
400 Viking Drive Reedsburg, Wisconsin 53959
Phone: (608) 524-6468 Fax: (608) 524-8218

05 Apr 2017 - 10:45a R:\DeForest\ Village of\170008 - TID No. 8\200 - Urban Service Area\CADD\TID 8 - USA Map.dwg by: pjun

2 Plan Consistency and Need

The Village's Planning and Zoning Commission determined that the immediate addition of the Yahara Gateway Land to the NUSA is consistent with DeForest's *Comprehensive Plan* (see Commission resolution in Appendices). The Village's *Comprehensive Plan* is available online at www.vi.deforest.wi.us on the Planning, Zoning, and Development page. The proposed addition of the Yahara Gateway Land to the NUSA is also consistent with the 2012 *North Yahara FUDA Study*, the *DeForest-Windsor Cooperative Plan*, the *Village of Windsor Comprehensive Plan*, and other plans affecting the Land.

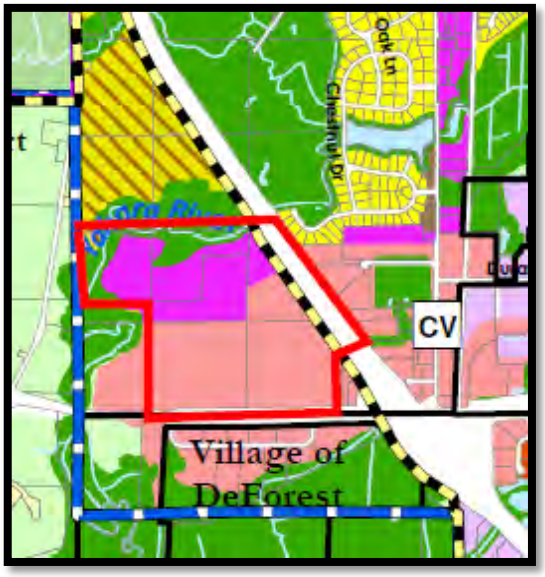
The proposed addition of the Yahara Gateway Land to the NUSA advances the recommended scenario within the *North Yahara FUDA Study*. As reflected on Map 2, the Yahara Gateway Land is shown as being within the Future Urban Development Area (FUDA). It is designated for a combination of mixed use and commercial land use. The FUDA effort was completed jointly with DeForest, Windsor, and Vienna—and with interaction with adjacent Westport and the *North Mendota FUDA Study*. This designation of the Yahara Gateway Land within the FUDA is echoed in the DeForest Comprehensive Plan (Map 3).

The Village of DeForest, through its *Comprehensive Plan*, also identifies this area for future "commercial" and "mixed use" development. Within the "commercial" future land use designation, the Village advocates:

- High-quality indoor retail, commercial service, office, health care, and institutional buildings.
- Developments providing access to and an attractive rear yard appearance for existing and future land uses behind these sites.
- Addressing off-site traffic, environmental, and neighborhood impacts as part of new development proposals.

Within the "mixed use" future land use designation, the Village advocates:

- A blend of commercial services, retail, office, multiple family residential, and/or institutional land uses, including mixed use sites and/or buildings, creating vibrant urban places and community gathering spots.
- Non-residential uses comprising a minimum of 50% of the land area within each "mixed use" area.



This image, a crop of the DeForest Comprehensive Plan Future Land Use Map, shows the Yahara Gateway Land in the context of existing and planned development on surrounding lands. The blue dotted line is the extent of the North Yahara Future Urban Development Area. The pink shaded areas indicate the "commercial" future land use designation, the purple shaded areas indicate the "mixed use" future land use designation, and the green areas represent preliminary environmental corridor areas.

- Integrating multiple family residential components in "mixed use" areas with the fabric of the surrounding neighborhood through design, pedestrian connections, landscaping, and scale.

Inclusion of the Yahara Gateway Land in the NUSA is also consistent with the growth phasing policy within the *DeForest Comprehensive Plan*. That policy indicates that the Village will utilize the following factors in making decisions on the timing of new development, including whether and when to request urban service area expansions. The Village's phasing policy points are in italics below, with commentary related to this application in normal type.

1. *The desire to promote an orderly, sequential pattern of land use and community development in order to ensure that the provision of public services, roads, and utilities keep pace with development*. Both DeForest and Windsor have long identified the land for future commercial and mixed use development. The Land is bounded on two sides by existing urban development, is at a freeway interchange, and the Village has sanitary sewer and water service along Highway 19 to the immediate south. As described later in this application, inclusion of the Land in the NUSA will also facilitate the long-intended interconnection of DeForest's north and south water systems.

2. *The projected impact on other Village goals of preserving agriculture or the natural environment in the same general area, if applicable.* Proposed development of the Land will meet the Village's strict stormwater ordinance and CARPC criteria for environmental corridor mapping. The Village also desires to thoughtfully transition and provide appropriate linkages to the Cherokee Marsh Wildlife Area to the southwest. The planned land uses for the Land are consistent with all County and local comprehensive and farmland preservation plans. In 2015, DeForest adopted a State-certified farmland preservation zoning district, which is mapped over most of its extraterritorial zoning area within the Town of Vienna.

3. *The projected impact on Village desires to redevelop or infill other parts of the Village.* The Land will facilitate larger scale and highway oriented commercial service, retail, hospitality, multiple family, and institutional uses that are not present and not viable on smaller redevelopment and infill sites. The Land is also 3+ miles south of the Village's downtown and Main Street area—the Village's primary redevelopment and infill areas identified in the *Comprehensive Plan*. This removes correlation between (re)development opportunities in these disparate parts of the Village.

4. *Whether the proposed development provides a unique asset or special amenity desired by the Village, as specified in Village plans or as otherwise indicated by the Village Board.* Through its *Comprehensive Plan* and marketing efforts, the Village has identified the expansion of local retail, restaurant, hotel, and office facilities as central to its economic interests and quality of life. The Village desires more locations to "shop locally," which the planned development of the Land will provide. The Village anticipates that the first development on the Land will include a major regional retailer. While there is other undeveloped land in DeForest, there are no available 20+ acre parcels to accommodate the needs of this or a similar or complementary user.

5. *The availability of public infrastructure such as road capacity, utility availability or capacity, and pedestrian and other public facilities to serve the proposed development.* At time of writing, WisDOT was re-decking the interchange and reconstructing and realigning ramps at the Interstate/Highway 19 interchange. Further, WisDOT will

reconstruct Highway 19 between the Interstate and River Road in 2020, providing a four-lane roadway adjacent to the Land. The Village is conducting a traffic impact analysis to determine appropriate improvements at the two planned road intersections with Highway 19. Map 5 delineates those intersections, plus an internal road network that becomes more conceptual heading north into the Land. Bike, pedestrian, and transit connections from the Land to areas beyond are more challenging, which is influencing the proposed land use pattern. Still, the Village plans for a future multiuse path along Highway 19 (WisDOT's Yahara River bridge reconstruction will include the necessary width) and some connection to the north crossing the Interstate at River Road/Windsor Road to link with the Village's existing path network. Also, the Village's *Comprehensive Plan* and regional plans suggest an express bus route to DeForest that may utilize the adjacent Interstate corridor (see Map 4). Internally, sidewalks and park/recreation facilities are required in new developments by DeForest subdivision ordinance. The Cherokee Marsh Wildlife Area and existing public utilities are directly adjacent.

6. *If such public infrastructure is unavailable, the projected timing of and funding for public infrastructure improvements to serve the proposed development.* Adjacent public infrastructure is currently available. Further, the proposed addition of the Land to the NUSA will facilitate the interconnection of the Village's north and south water systems—an improvement which has significant benefits beyond the NUSA expansion area.

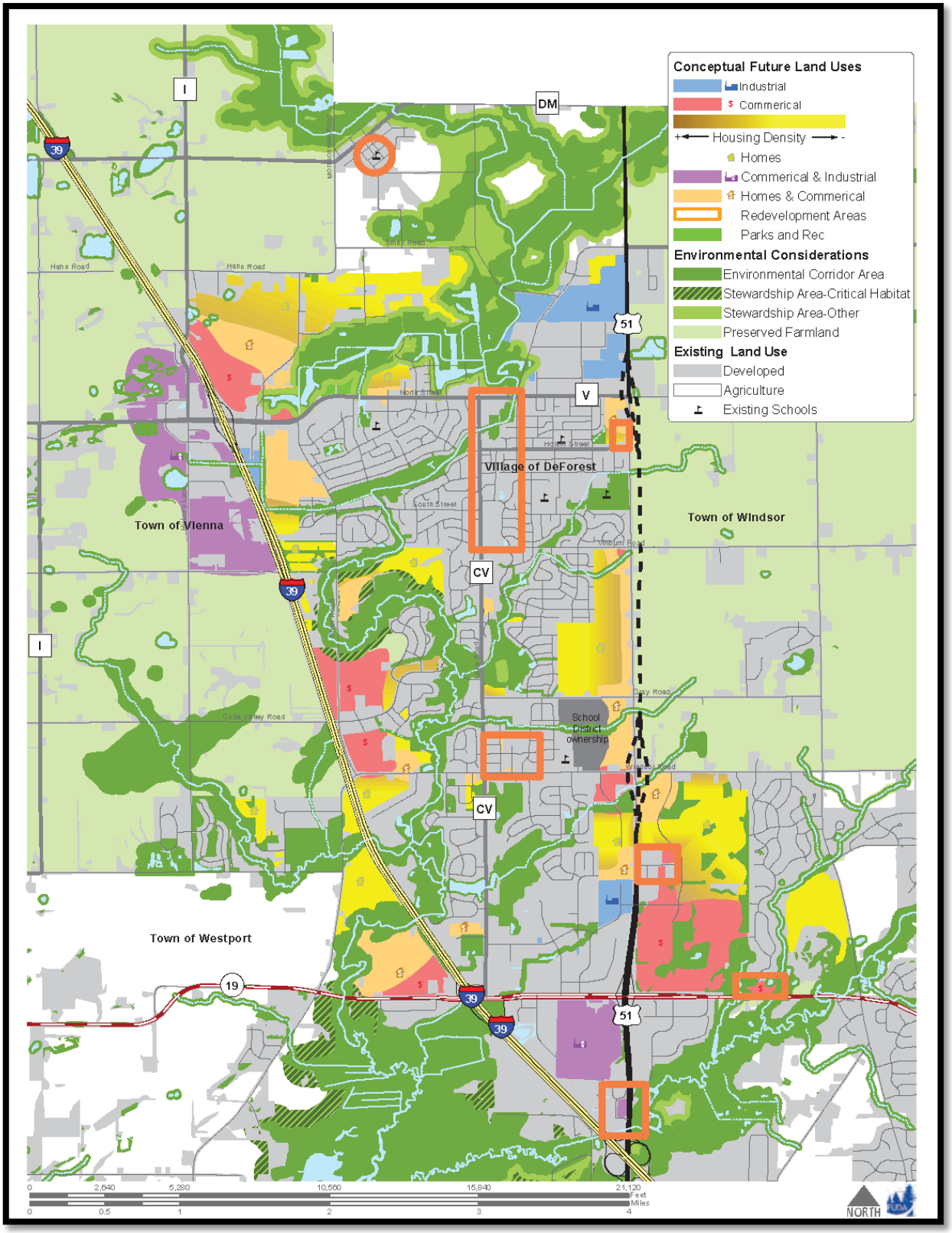
7. *The ability of the Village to cost-effectively provide community services to the proposed development or area, and the advice of other units of government such as the DeForest Area School District (DASD) to provide services under their control.* The Village already provides services along the Highway 19 corridor adjacent to and east of the Yahara Gateway Land. Enrollment impacts on the school district are likely to be manageable. Planned dwelling units are multiple family units, which generate fewer students per housing unit than a typical new single family housing development. The consultant projects a maximum of 50 students at build-out. The Land is within the DASD's Windsor Elementary School attendance area. The DASD will open an expanded and remodeled Windsor Elementary School in fall 2017 to serve this and other areas. "STEAM" additions to the middle and high schools have also recently been completed.

8. *Whether the proposed development area has been or will be annexed or attached to the Village, where annexation or attachment is specified by adopted intergovernmental agreements/cooperative plans or otherwise anticipated prior to development.* Parcels 0910-314-8622-1 and 0910-314-9141-1 (Windsor Gateway LLC) were attached to the Village of DeForest in January 2017, per the *DeForest-Windsor Cooperative Plan*. The rest of the real estate with the NUSA expansion area will also be attached to DeForest, per a locally-approved amendment to the *Cooperative Plan*.

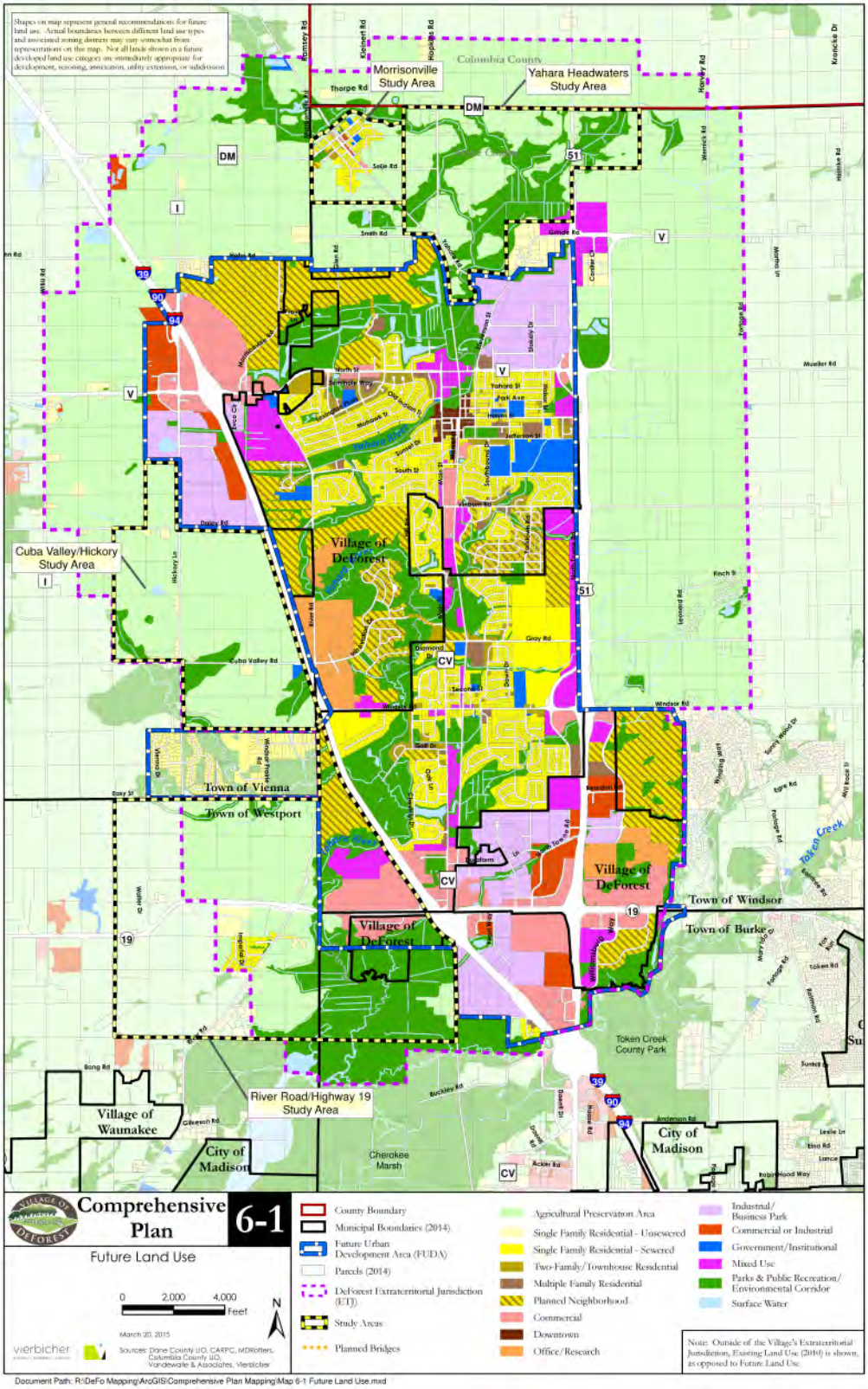
9. *The degree of compatibility with other aspects of adopted intergovernmental agreements/cooperative plans to which the Village is a party.* Compatible. See Section 3 of this application for more information.

10. *For proposed urban (publicly sewered) development, whether the proposed development area is within the Urban Service Area and MMSD boundary, or the Village reasonably expects the development area to be added to the Urban Service Area and MMSD boundary in the near term.* The Yahara Gateway Land is already in the regional and local FUDA and the MMSD service area.

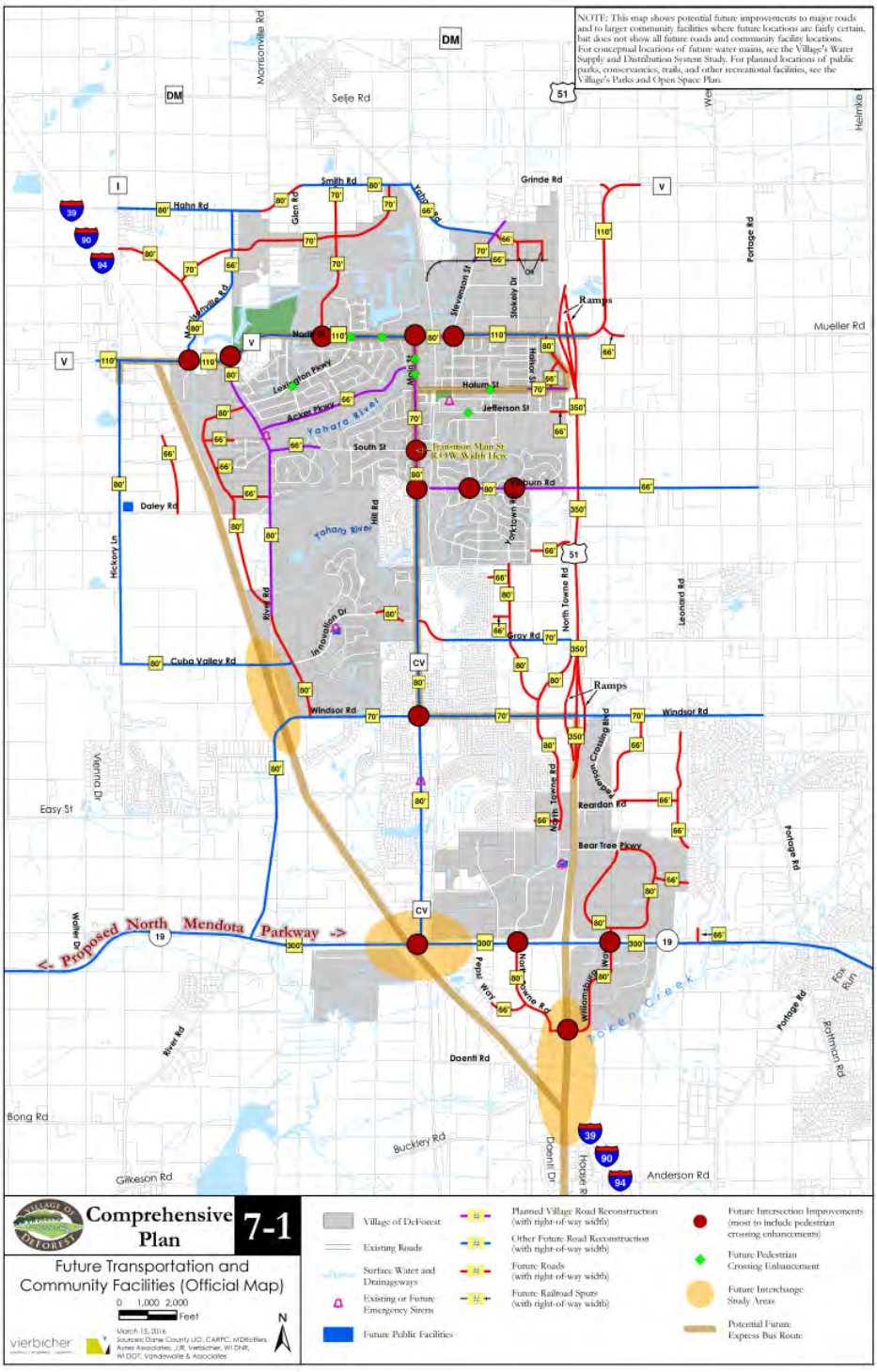
Map 2: Recommended Scenario, North Yahara FUDA Study



Map 3: Future Land Use, Village of DeForest Comprehensive Plan



Map 4: Future Transportation and Community Facilities, Village of DeForest Comprehensive Plan (also Village's Official Map)



3 Intergovernmental Cooperation

The Village has made special effort to unify its *Comprehensive Plan* and future development and preservation plans with those of adjacent communities, Dane County, and the region. The Village regularly engages with adjacent and overlapping communities on its planning efforts.

The Land is at the eastern edge of the much larger "River Road/Highway 19 Study Area" as shown on Map 3. Building upon advice in the *North Yahara* and *North Mendota FUDA Studies*, recommendations for this study area from the Village's *Comprehensive Plan* are as follows:

> *In conjunction with affected property owners and adjacent local governments, the Village intends to complete a neighborhood development plan for its planned development area between River Road, Highway 19 and the Interstate. That effort should consider compatible land use transitions, progressive stormwater management, preservation and enhancement of the Yahara River corridor, and transportation access. The Village also intends to work towards an intergovernmental agreement with Westport (and possibly others) to include issues and areas of mutual concern for lands west of River Road, including community separation. In general, the Village will work collaboratively to protect sensitive environmental resources in this study area, which connects with Cherokee Marsh. Such an effort will consider organism movement, habitat preservation, minimizing high traffic or disturbance near the environmental corridor, and invasive species removal and management in the corridor.*

Through its *Comprehensive Plan* the Village of DeForest has also identified pursuit of a boundary agreement with the Town of Westport as a "high priority" initiative. Westport's eastern boundary lies just west of the Yahara Gateway Land.

Based on these recommendations, the Village of DeForest and Town of Westport began in Winter 2017 discussing an intergovernmental boundary agreement. The Village anticipates that agreement to reinforce the community separation and farmland and natural area preservation west of the Yahara Gateway Land that is already embodied in local, County, and regional plans. The Village administration hopes to complete this agreement in 2017.

The Village has made Westport officials aware of this proposed urban service area application, and understands that Westport has no objection to the application. Westport may be concerned that possible future road extensions represented on Map 5 may eventually connect to River Road, but that is not the Village's intent.

South and west of the Yahara Gateway Land, and north of Highway 19, are 35.7 acres owned by Dane County. This is the northern edge of the Cherokee Marsh County Wildlife Area, which provides for public recreation uses along the adjacent sections of the Yahara River. The area immediately north of these 35.7 acres, which is part of the Yahara Gateway Land, is within the Cherokee Marsh Natural Resource Area Boundary, as designated in the *County Parks and Open Space Plan*.

The Village has begun engagement with Dane County Parks Division staff on collaboration opportunities associated with this proposed NUSA expansion, preservation and sensitive development of land adjacent to the already-acquired Cherokee Marsh Wildlife Area, and possible transportation interconnections.

In March 2017, the Village of DeForest and the Village of Windsor adopted the first amendment to the 2010 *DeForest-Windsor Cooperative Plan*. At time of writing, that amendment was pending State Department of Administration approval. This amendment reflects Windsor's incorporation as a village, simplifies agreement terms, and accelerates the transfer of certain identified lands from Windsor to DeForest. Among those are the Yahara Gateway Land and all other Windsor territory west of the Interstate. See the letter of support from Windsor included as an appendix for further information.

4 Land Use

Most of the developable acreage of Yahara Gateway Land is currently in agricultural use. The two recent farm residences on the Yahara Gateway Land have been recently been, or are in the process of being, torn down.

The Land slopes upward from Highway 19 towards the northeast corner, where a high point of 936 feet offers a vantage point over the Interstate. There is 1.1 acre of 12+% slopes near that high point, but no 12+% slopes in any other part of the Land. Areas close to the Yahara River are in combinations of floodplain and wetland. In collaboration with the three property owners, the Village has commissioned a wetland screening and determination on the Land, to be completed this spring.

The Village of DeForest and the property owners/developers have collaborated on a neighborhood plan map for the Yahara Gateway Land (Map 5). This Yahara Gateway Neighborhood Plan is consistent with and builds from the Village's *Comprehensive Plan*. Map 5 shows the preferred alternative for planned land uses and roads for the Land, and also existing and planned uses for surrounding lands.

The Neighborhood Plan is intended to guide future development of the Land and fulfill the goals of this NUSA application listed in Section 1. It suggests a predominately commercial development pattern extending north from Highway 19 ("Highway Business District"). Further from Highway 19 and closer to the Yahara River, the plan suggests a "Transitional District" and then close to the River an area that may be most appropriate for multiple family housing, senior housing, and/or institutional uses ("Yahara District"). The sizes, shapes, and locations of these three districts will vary depending on the actual future demand for different land uses on the Land. All lands will need to be rezoned and subdivided to enable development according to this Neighborhood Plan.

The Neighborhood Plan also suggests environmental, stormwater management, and recreational features. Conceptual stormwater management basins are indicated in appropriate general locations, each envisioned to serve either a large development site or multiple smaller sites. Actual locations and configurations of stormwater basins will likely vary. Beyond the basins, the proposed environmental corridor network is entirely focused along the Yahara River corridor. This network will complement the County Wildlife Area and reflect the Village's conservation commitment along the Upper Yahara River corridor within the developed parts of the Village. The proposed corridor network meets all CARPC standards. The environmental corridor may provide an appropriate location for a trail, perhaps in collaboration with the County and serving as a scenic connector between planned Highway 19 and River Road trails. Beyond the currently-mapped corridor network, an upland neighborhood park or mini-park may be established to serve planned multiple family residential uses.

As suggested in the legend on Map 5, a range of seven different traditional land uses (e.g., commercial services, multiple family residential) may potentially locate among the three broader development-based districts (e.g., Transitional District) in the manner indicated. Figure 1 dissects the map, providing the projected acreage of each of the proposed traditional land uses and rights-of-way for the Yahara Gateway Land.

Map 5 also suggests development staging. The Village and developers intend to install the "Phase I Roads" and associated utilities in 2017 to serve expected commercial development. Construction phasing of the "Potential Future Roads" and associated utilities will depend on market demand following Phase I construction.

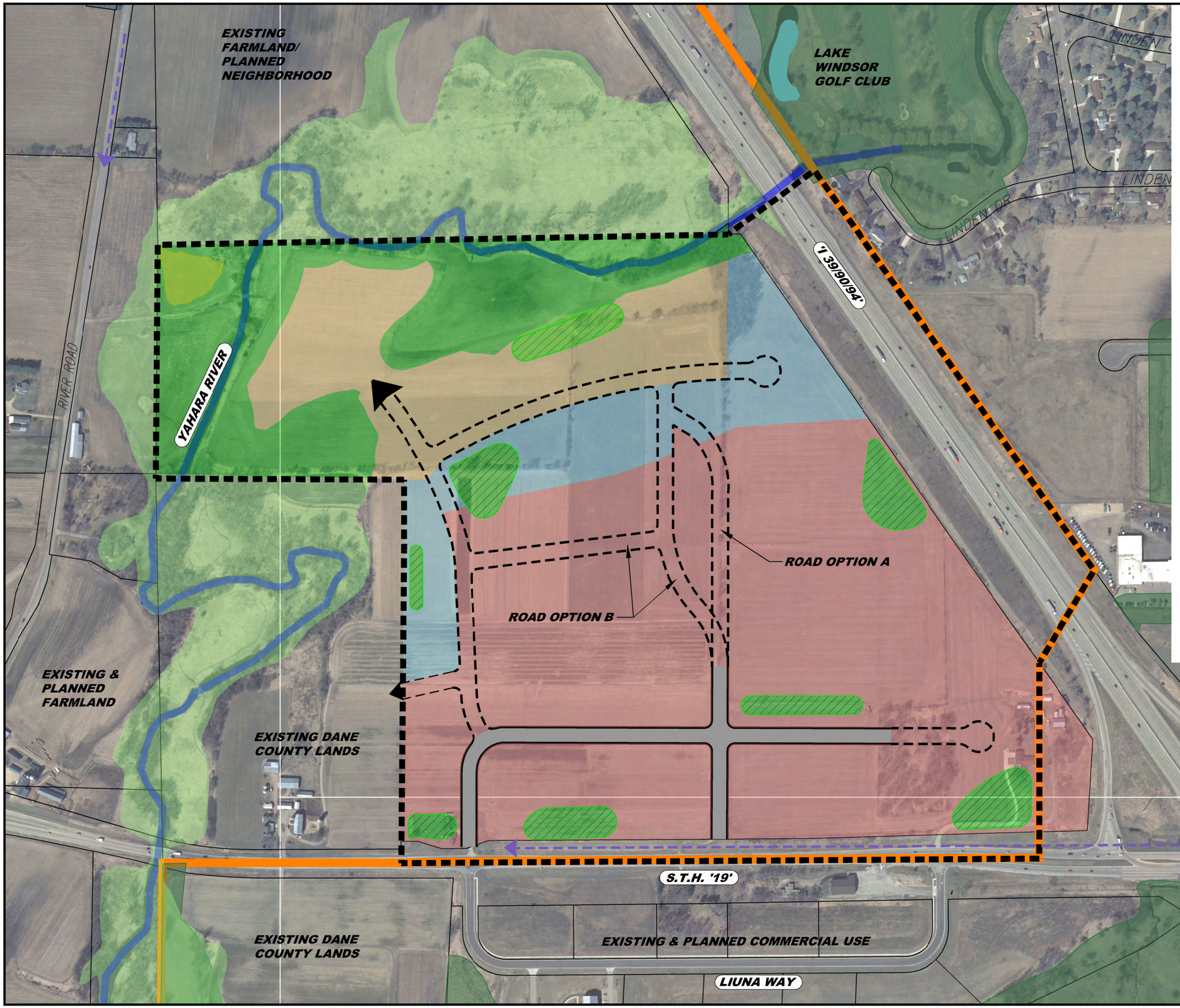
Figure 1: Northern Urban Service Expansion Area, Yahara Gateway Land, Village of DeForest

Proposed Land Use	Number of Acres			Number of Housing Units
	Total Area	Existing Development	Environmental Corridor	
Single Family Residential	0	2.7		
Other Type Residential	17.7			400
Residential Total	**17.7**	**2.7**		
Commercial	79.0			
Industrial	0			
Institutional	4.4			
Street R-O-W [1]	33.5	25.5		
Parks [2]	2.6			
Stormwater Mgmt.	14.1		14.1	
Other Open Space	26.3	149.4	25.3	
TOTAL	**177.6**	**177.6**	**39.4**	**400**

Notes:

[1] "Street R-O-W" includes all existing and proposed rights-of-way, including existing highway rights-of-way that establish contiguity to the existing NUSA, plus "Phase I Roads" and "Potential Future Roads" shown on Map 5.

[2] "Parks" are presumed to be a component of either or both of the "Transitional District" and/or "Yahara District" on Map 5. The particular location and size of public park space will depend on the location and amount housing development that occurs in these two districts. Upon dedication, public parks will be added to the environmental corridor network.



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APRIL 7, 2017

LEGEND

- EXISTING URBAN SERVICE AREA
- PROPOSED URBAN SERVICE AREA EXPANSION
- PHASE I ROADS
- POTENTIAL FUTURE ROADS
- POTENTIAL MAJOR TRAILS

FUTURE LAND USE DISTRICTS

HIGHWAY BUSINESS DISTRICT
- COMMERCIAL SERVICES
- RETAIL
- HOSPITALITY
- OFFICE

TRANSITIONAL DISTRICT
- MULTIPLE FAMILY RESIDENTIAL
- INSTITUTIONAL
- OFFICE
- PARKS AND OPEN SPACE
- COMMERCIAL SERVICES
- RETAIL
- HOSPITALITY

YAHARA DISTRICT
- MULTIPLE FAMILY RESIDENTIAL
- INSTITUTIONAL
- OFFICE
- PARKS AND OPEN SPACE

AGRICULTURE DISTRICT

ENVIRONMENTAL CORRIDOR & RELATED

- PROPOSED ENVIRONMENTAL CORRIDOR
- CONCEPTUAL STORMWATER MANAGEMENT BASINS
- PREVIOUSLY MAPPED CARPC ENVIRONMENTAL CORRIDOR OUTSIDE USA EXPANSION AREA
- FLOODPLAIN AND/OR WETLAND OUTSIDE USA EXPANSION AREA

vierbicher
planners | engineers | advisors
REEDSBURG - MADISON - PRAIRIE DU CHIEN
400 Viking Drive Reedsburg, Wisconsin 53959
Phone: (608) 524-6468 Fax: (608) 524-8218

MAP 5
YAHARA GATEWAY NEIGHBORHOOD PLAN, PREFERRED ALTERNATIVE

07 Apr 2017 - 11:18a R:\DeForest, Village of\170008 - TID No. 8\200 - Urban Service Area\CADD\TID 8 - Neighborhood Plan Map ALT I.dwg by: pjun

5 Economic and Housing Development

The Yahara Gateway Land is part of a larger economic development area along Highway 19 in "DeForest South." Nearly 80 acres of the Yahara Gateway Land is planned for commercial uses, including office, retail, hospitality, and other commercial uses. Nearly all planned commercial uses will be within the "Highway Business District" and "Transitional District" on Map 5.

The Village and owners of the Land will seek businesses that provide goods and services to area and regional residents, businesses, and visitors. The Land enjoys excellent visibility from Highway 19 and fair visibility and superior access from Interstate 39-90-94 immediately adjacent to an interchange. Businesses that benefit from such a combination of visibility and a location along a major highway, as well as residents seeking regional accessibility, will be attracted to the area. Commercial uses that may be promoted and marketable along this stretch include large scale retailers, a supermarket, restaurants, recreational complexes, hotels, multitenant commercial centers, convenience stores, and other service-oriented businesses such as banks and daycare centers. One of the first users is likely to be a large-scale retailer.

The Village also projects approximately 400 housing units on the Land. These units are all projected to be duplex or multiple family units in some configuration. Housing would be located within the "Transitional District" and the "Yahara District," consistent with these areas' "mixed use" future land use designation in the Village's *Comprehensive Plan*.

Families, singles, seniors, and persons with disabilities may be served. The location close to Interstate 39-90-94 provides easy access to the several industrial parks located in DeForest, Windsor, Waunakee, Sun Prairie, and Madison and within a 10 to 15 minute drive. The serene nature of the northern reaches of the Land seems appropriate for senior housing or a larger retirement community. Proposed commercial services and other retail opportunities may provide amenities for seniors and other residents. Health care providers are within ½ mile to the east along Highway 19, and a bit further southeast at the UW Hospital completed in 2016.

6 Natural, Cultural, and Agricultural Resources

The Land is in the Upper Yahara River Watershed. The Yahara River is designated by the WisDNR as a warm water sport fishery through the Land. Per the *North Yahara FUDA Environmental Conditions Report*, this stretch of the River plays an important role in providing spawning habitat for a wide variety of sport fish. The Land is not within a thermally sensitive area, as designated by the WisDNR.

Aside from stormwater basins, environmental corridor within the Yahara Gateway Land will be focused along the Yahara River. This corridor will continue to provide a habitat for local plants and wildlife, will provide as a land and/or water based recreational amenity, and may serve as a logical community growth edge.

The Village has worked with CARPC staff prior to submitting this application to establish environmental corridors that meet CARPC standards. Aside from the stormwater basins, the environmental corridor includes 100-year floodplain and floodway, WisDNR mapped wetlands, and a 75 foot vegetative buffer around the nearest navigable portion of the Yahara River or wetland edge.

The Village and property owners are having a wetland screening and delineation performed this Spring, which may impact the extent of environmental corridors.

Per the Wisconsin Historical Society, previous archaeological sites, Native American village/campsites DA-0485 and DA-0445, have been found on the Land. Another site, DA-430, is marked on nearby land. Per these findings and the recommendation of Wisconsin Historical Society and CAPRC staff, the Village and the property owners have commissioned an archeological survey to be conducted this Spring. Depending on its findings, environmental corridor boundaries and perhaps even development layout may be affected. The Village expects that any such impacts will be near the northern edges of the Land.

There is about 1.1 acre of slopes that barely exceed 12% near the high point of the Land. However, these steeper slopes are not connected to the water-based features of the Yahara River Corridor and are therefore not proposed as environmental corridor.

Per maps in the *North Yahara FUDA Environmental Conditions Report*:

- Depth to water table is greater than 6 feet over a vast majority of the Land.
- Depth to bedrock may be shallow in the eastern portions of the Land. This condition may be addressed through grading and filling. Further, these eastern portions are proposed to be in commercial use, and as such will likely not have basements.
- Groundwater recharge over a majority of the Land is 10+ inches per year. This is generally classified at the “medium” level, with the highest opportunities for recharge in the northwest parts of the Land, especially using engineered soils. These are the parts of the Land where impervious surfaces can be most easily controlled under the planned land use pattern.
- There are no known threatened or endangered species on the Land.

DeForest is committed to farmland preservation in the DeForest-Windsor-Vienna-Westport area. Village plans, boundary agreements, and extraterritorial zoning arrangements solidify long term agricultural preservation in vast areas west of Interstate 39-90-94 and east of Highway 51.

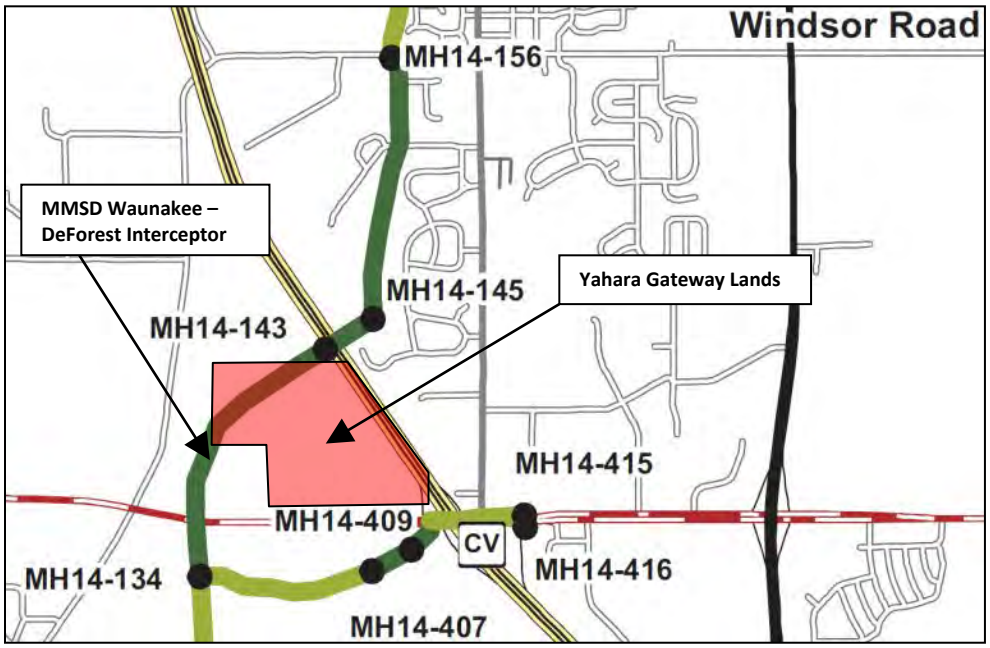
7 Utilities—Sanitary Sewer Service

The proposed sanitary sewer configuration is shown on Map 6: Overall Utility System Configuration.

All of the Land will be provided with gravity flow sewer service through proposed Village of DeForest sanitary sewers connected directly to MMSD's Waunakee-DeForest Interceptor, as shown on Map 6. The proposed sewers will connect to the interceptor between manholes MH14-134 and MH14-143 as shown in Figure 2.

The topography indicates a ridge line that runs northeast/southwest bisecting the Land. The elevation peaks on the ridge and falls off to the northwest and southeast. The placement of sewer lines will allow for a gravity sewer extension around the ridge that will allow the Land to be served entirely by gravity sewer.

Figure 2: MMSD Waunakee-DeForest Interceptor



CARPC completed an *MMSD Collection System Evaluation* in 2009, which included the Waunakee-DeForest Interceptor. The future service area for this interceptor included the Land. Through this evaluation, CARPC estimated that the interceptor would have adequate capacity beyond the year 2060. The interceptor capacity evaluation table from the *MMSD Collection System Evaluation* appears as Figure 3.

Figure 3: Northeast Interceptor – DeForest Extension Capacity Evaluation

Table 4-33: Northeast Interceptor – DeForest Extension

Flow Type	From	To	Length (ft)	Pipe Dia. (in)	Nominal Capacity (mgd)	*Peak Flows (mgd)* / Percent Nominal Capacity												Capacity Reached
						2000		2010 UF		2020 UF		2030 TAZ		2030 UF		2060 UF		
GR	MH14-209	MH14-196	4,386	21	3.39	*1.81*	53%	*2.00*	59%	*2.18*	64%	*2.01*	59%	*2.36*	70%	*3.09*	91%	> 2060
GR	MH14-196	MH14-193	1,203	21	3.39	*2.69*	79%	*2.99*	88%	*3.30*	97%	*3.16*	93%	*3.61*	106%	*5.19*	153%	2020-2030
GR	MH14-193	MH14-182	4,062	21	5.51	*2.86*	52%	*3.24*	59%	*3.62*	66%	*3.54*	64%	*4.00*	73%	*5.50*	100%	> 2060
GR	MH14-182	MH14-171	5,724	21	5.51	*2.97*	54%	*3.44*	62%	*3.91*	71%	*3.87*	70%	*4.32*	78%	*5.80*	105%	2030-2060
GR	MH14-171	MH14-166	2,351	21	5.51	*3.13*	57%	*3.60*	65%	*4.06*	74%	*4.02*	73%	*4.45*	81%	*5.92*	107%	2030-2060
GR	MH14-166	MH14-165	488	21	5.51	*3.76*	68%	*4.33*	79%	*4.84*	88%	*4.90*	89%	*5.35*	97%	*7.27*	132%	2030-2060
GR	MH14-165	MH14-162	1,401	24	7.01	*3.76*	54%	*4.33*	62%	*4.84*	69%	*4.90*	70%	*5.35*	76%	*7.27*	104%	2030-2060
GR	MH14-162	MH14-156	2,687	24	7.01	*3.81*	54%	*4.48*	64%	*5.11*	73%	*5.23*	75%	*5.72*	82%	*7.62*	109%	2030-2060
GR	MH14-156	MH14-145	4,625	27	9.17	*4.62*	50%	*5.27*	57%	*5.90*	64%	*6.01*	66%	*6.52*	71%	*8.38*	91%	> 2060
GR	MH14-145	MH14-143	964	30	9.18	*4.62*	50%	*5.27*	57%	*5.90*	64%	*6.01*	65%	*6.52*	71%	*8.38*	91%	> 2060
GR	MH14-143	MH14-134	4,895	36	9.63	*4.77*	50%	*5.47*	57%	*6.16*	64%	*6.17*	64%	*6.83*	71%	*8.77*	91%	> 2060
Junction with Highway 19 Extension (Table 4-34)																		
GR	MH14-134	MH14-102	16,679	36	9.63	*5.57*	58%	*6.60*	69%	*7.60*	79%	*7.45*	77%	*8.58*	89%	*10.74*	112%	2030-2060
Junction with Waunakee Extension (Table 4-35)																		

The estimated average daily flow from the Land is 128,000 gallons per day (gpd), with an estimated peak flow rate of 511,700 gpd as shown in the "Estimated Wastewater Flows – Yahara Gateway Land" table found in the Appendices. The sum of the estimated peak hourly flow from the Land and the current estimated peak hourly flow in the Waunakee-DeForest Interceptor shown in Figure 4 below is less than the interceptor capacity. Therefore, the interceptor has adequate capacity to serve the Land.

On behalf of MMSD, Strand Associates completed the *Pump Station 14 Infiltration/Inflow Study* in 2014. This study included flow monitoring at a manhole (MH14-130) downstream of the section of the MMSD interceptor (MH14-134 to MH14-143) that will serve the Land. The result of the flow monitoring is summarized in Figure 4 below. The measured average daily and the estimated peak hourly flows are well below the rated interceptor capacity, and also well below CARPC's 2009 estimates due to slower-than-projected growth.

Figure 4: Current Flows to MMSD's Interceptor

Monitoring Manhole	Measured Average Daily Flow (gpd)	MMSD Peaking Factor	Estimated Peak Hourly Flow (gpd)	Interceptor Capacity (gpd)
MH14-130	1,600,000	4.0	6,400,000	9,630,000

8 Utilities—Municipal Water Service

The Village of DeForest owns and operates two hydraulically separate water supply systems. The "DeForest North" system, which serves lands in the Village north of Windsor Road, includes active Wells No. 2, 3, 4. The "DeForest South" system was acquired from the Token Creek Sanitary District in 2005. This system includes Well Nos. 1 and 5. The Yahara Gateway Land is proposed to be served with water from the DeForest South system, but the Village intends to also interconnect the two water systems in conjunction with development of the Land. See the detailed discussion of that interconnection below.

Water Supply

Wells No. 1 and 5 have pumping capacities of 810 gallons per minute (gpm) and 1,600 gpm respectively, for a total well capacity of 2,410 gpm. Based on the year 2016 pumping records, the average daily demand of the DeForest South system is 64,863 gallons per day (gpd), and the maximum day demand was 230,000 gpd. Applying a peak hour to maximum day factor of 2.0 to the maximum day demand, the peak hourly demand is estimated to be 320 gpm.

Storage

Storage is provided by a 200,000 gallon elevated tank with an over flow elevation of 1,060 feet, a high water level of 1,058 feet, and a low operating level of 1,049 feet (USGS Datum). Even at the middle of its operating capacity, static pressures would range from 51 pounds per square inch (psi) at the highest elevation within the Land (936 feet) to 82 psi at the lowest elevation (865 feet). This range of static pressures falls within the acceptable range of 35 psi to 100 psi per Chapter NR 811 of the Wisconsin Administrative Code.

Distribution

Map 6 depicts the proposed water distribution system.

Currently, the Village of DeForest water distribution system is extended from east of the Interstate to the intersection of Highway 19 and Liuna Way with a 12" main.

To serve the Land, a new 12" water main will be extended across Highway 19 under a future north-south road across from the western intersection of Liuna Way and Highway 19. The 12" water main will be extended to the northern boundary of the Land as development continues. Water distribution mains (8", 10", 12") will be extended throughout the remainder of the Land as needed to meet the requirements of proposed development.

The distribution system will be looped within the Land, including a secondary connection into the development across from the eastern intersection of Liuna Way and STH 19. This development is called Union Conservancy Park.

System Evaluation

CARPC requires an available fire flow of 2,000 gpm for a duration of 2.5 hours to be provided under the peak hour demand condition. The current estimated peak hourly demand of the DeForest South System is 320 gpm. The Yahara Gateway Land is projected to generate an average daily demand of 125,200 gpd, a maximum day demand of 195,200 gpd, and a peak hourly demand of 270 gpm as shown in the "Estimated Water Demands – Yahara Gateway Land" table in the Appendices. Therefore, the total estimated peak hour demand of the current DeForest South System plus the proposed Yahara Gateway Land is 590 gpm.

An evaluation of the system capacity to provide the peak hourly demand plus fire flow follows:

Peak Hourly Demand:	590 gpm
Fire Flow:	+2,000 gpm
Pumping Capacity:	- 2,410 gpm
Rate Required from Storage:	180 gpm

Volume Required from Storage:

(180 gpm)(2.5 hrs)(60 min/hr) = 27,000 gallons

The Village presently has 200,000 gallons of total storage with the elevated tank completely full. Since the tanks are usually not operating completely full, the "effective" storage is considered to be 80% of total storage. This leaves approximately 160,000 gallons of available "effective" storage. With both well pumps in operation, 27,000 gallons of storage is required to provide the required fire flow for the required duration. The effective elevated storage of 160,000 gallons is greater than the required 27,000 gallons. Therefore, the system has adequate capacity to provide the required fire flow.

Computer modeling of extending the Village's water distribution system to the Yahara Gateway Land estimates an available fire flow of 2,080 gpm at a minimum residual pressure of 20 psi. Therefore, the Village's distribution system has adequate capacity to provide the CARPC required 2,000 gpm available fire flow. A summary of the computer modeling results can be found in the Appendices.

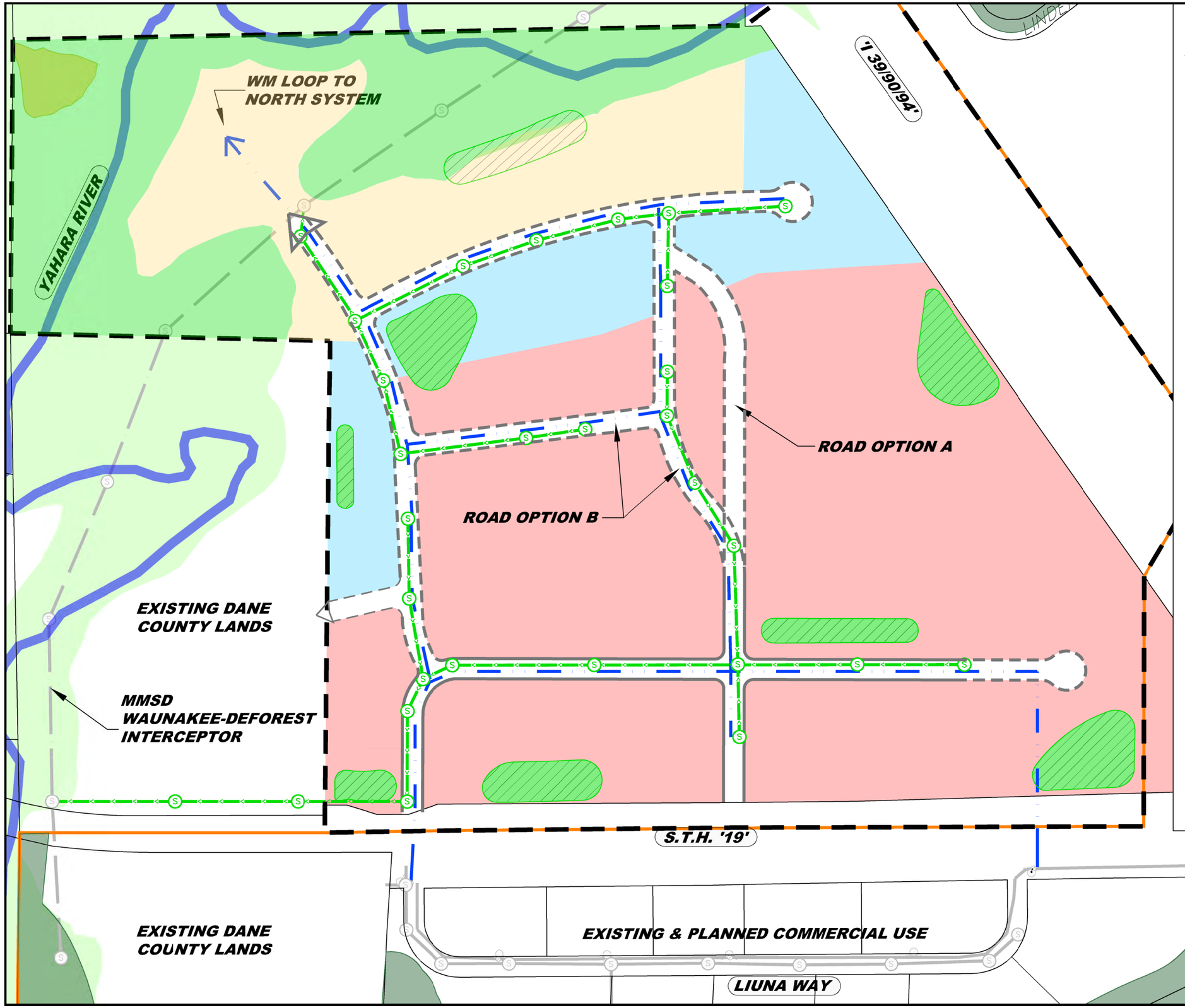
Water System Interconnection

The Village's 2006 *Water Supply and Distribution Study* includes recommended interconnection between the "DeForest North" and "DeForest South" water systems in the area of the Yahara Gateway Lands. The hydraulic grade line of the North system is above that of the South system. Therefore, the North system can contribute flow to the South system through the interconnection. Controlling the amount of flow can be achieved by use of a pressure control valve (PCV). The PCV can be set to allow flow from the North to South systems when pressure in the South system drops to a preset value. Once the pressure in the South system has been restored by flow from the North system to a preset value, the PCV will close and stop flow from the North system. In this way, the North system will provide redundant water supply and storage backup to the South system. This will also provide a viable looped connection to the Yahara Gateway Lands, and other developable lands west of Interstate 39-90-94.

The interconnection will also allow for the South system to provide water to the North system. In order to provide flow from the South system to the North system, a booster station will be required to overcome the hydraulic difference between the two systems. The South system booster station could be used in rotation with the wells in the North system. In this way, the South system can share its excess storage volume with the North system.

The interconnection facility incorporating the PCV and the booster station will be constructed and connected to the water main extended to the northern boundary of the Yahara Gateway Lands, as described in the "Distribution" subsection above. North of the Land, the water main providing the interconnection will follow a route to be determined along the west side of Interstate 39-90-94, crossing the Interstate near the River Road overpass and ultimately connecting to a water main within Conservancy Place.

Based on the recommendations of DeForest's Water Supply and Distribution Study, the Village anticipates interconnecting North and South systems in this area within approximately five years, depending on the actual pace and extent of development of the Yahara Gateway Land.



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GRAPHIC SCALE FEET

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APRIL 7, 2017

LEGEND

- EXISTING URBAN SERVICE AREA
- PROPOSED URBAN SERVICE AREA EXPANSION
- PHASE I ROADS
- POTENTIAL FUTURE ROADS
- EXISTING WATER MAIN
- PROPOSED WATER MAIN
- EXISTING SANITARY SEWER
- EXISITNG SANITARY MANHOLE
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE

FUTURE LAND USE DISTRICTS

HIGHWAY BUSINESS DISTRICT
- COMMERCIAL SERVICES
- RETAIL
- HOSPITALITY
- OFFICE

TRANSITIONAL DISTRICT
- MULTIPLE FAMILY RESIDENTIAL
- INSTITUTIONAL
- OFFICE
- PARKS AND OPEN SPACE
- COMMERCIAL SERVICES
- RETAIL
- HOSPITALITY

YAHARA DISTRICT
- MULTIPLE FAMILY RESIDENTIAL
- INSTITUTIONAL
- OFFICE
- PARKS AND OPEN SPACE

AGRICULTURE DISTRICT

ENVIRONMENTAL CORRIDOR & RELATED

PROPOSED ENVIRONMENTAL CORRIDOR

CONCEPTUAL STORMWATER MANAGEMENT BASINS

PREVIOUSLY MAPPED CARPC ENVIRONMENTAL CORRIDOR OUTSIDE USA EXPANSION AREA

FLOODPLAIN AND/OR WETLAND OUTSIDE USA EXPANSION AREA

vierbicher
planners | engineers | advisors
REEDSBURG - MADISON - PRAIRIE DU CHIEN
400 Viking Drive Reedsburg, Wisconsin 53959
Phone: (608) 524-6468 Fax: (608) 524-8218

MAP 6
OVERALL UTILITY SYSTEM CONFIGURATION
YAHARA GATEWAY
VILLAGE OF DEFOREST, WI

06 Apr 2017 - 9:00a R:\DeForest, Village of\170008 - TID No. 8\200 Urban Service Area\CADD\TID 8 - Utility Map ALT1.dwg by: pjun

9 Stormwater Management

These lands are within the Upper Yahara River watershed. The Land generally slopes off from a high point located in the northeast corner to the north, northwest, and southwest. Areas flowing to the north and northwest generally sheet flows to the Yahara River. Water to the southwest sheet flows to the Yahara River and to a ditch along Highway 19, which eventually flows to the Yahara River.

Stormwater management for the Land will be regulated by the Village of DeForest's Chapter 24 Erosion Control and Stormwater Management Ordinance and Section NR 151 of the Wisconsin Administrative Code. Stormwater management plans and practices will meet these local and State requirements for peak flow control, TSS removal, infiltration, and groundwater recharge. Village ordinance standards meet or exceed State and County requirements, and include:

- 100% volume control for all development conditions based on the Average Annual Rain Series for Madison.
- Groundwater recharge rates meeting or exceeding average annual recharge rates as estimated by the Wisconsin Geological and Natural History Survey in a report titled "Groundwater Recharge in Dane County, Wisconsin Estimated by a GIS-Based Water Balance Model."
- Maintain pre-development peak runoff rates for the 1-year, 2-year, 5-year, 10-year, 25-year, and 100-year, 24-hour storm events.
- Encourage use of low impact design techniques to treat storm water runoff at its source.

Plans for stormwater management and erosion control will include the installation of specific BMPs in strategic locations prior to any other ground disturbing activities. Erosion control practices will consist of BMPs necessary to limit sediment from leaving the site during ground disturbing activities. Ground disturbing activities will be limited to phases as much as practical to reduce the area of exposed soil. Temporary sedimentation basins may be constructed to prevent soil from leaving the site. Infiltration practices will be implemented following substantial grading and restoration of the site.

Conceptual stormwater basins are shown on Map 5, though precise configurations and locations are likely to change. These basins will, in certain cases, serve a single large user and on other occasions will serve multiple development sites and users. Where serving multiple development sites and users, the basins will generally be Village owned and maintained. Where serving a single user, the basins will generally be owned and maintained by that user. The Village requires the recording of stormwater management maintenance agreements prior to the finalization of any stormwater management permit associated with stormwater facilities that are to be privately maintained.

10 Transportation

WisDOT is in the process of developing plans for a proposed project on Highway 19 directly south of the Land. This budgeted project will convert Highway 19 from a two-lane to a four-lane highway from just west of River Road to the Interstate 39-90-94 interchange. Included with the project is the construction of a new Yahara River bridges and reconstruction of the River Road intersection as a roundabout. Final design plans for this expansion will begin in 2018 and road construction on Highway 19 is anticipated in 2020.

The planned road network shown on Maps 5 and 6 will serve the anticipated development within the Yahara Gateway Land and be in accordance with DeForest's Comprehensive Plan and Official Map. The Village is currently undertaking a traffic impact analysis to determine appropriate improvements for street intersections between the Land and Highway 19. At present, the Village envisions the western intersection (at Liuna Way) as a signalized intersection, and the eastern intersection with Highway 19 as a right-in, right-out intersection.

River Road is a minor arterial road west of Interstate 39-90-94. While River Road does not provide a direct connection to the Land, it does serve as a north-south route to downtown DeForest when heading west along on Highway 19. Another route providing access to the northern part of DeForest is Highway CV, just east of the Interstate interchange.

The Village's subdivision ordinance requires sidewalk along all public streets, which will be provided with the development of the Land. The Village's Park and Open Space Plan includes conceptual planned trails along Highway 19 and along River Road. These are also represented on Map 5. The Village would like to work with WisDOT, Dane County, the Town of Westport, and others to connect these two conceptual trails to each other and south to the Madison area.

The Land is not presently served by bus, taxi or designated carpool facilities. As represented on Map 4, DeForest and the Madison Area MPO envision an express bus route along Interstate 39-90-94.

As part of its June 2015 Southwest Region Park-and-Ride System Study, WisDOT advised improvements to the park-and-ride lot at the Interstate 39/Highway V interchange, about four miles north of the Land. Three potential future park-and-ride locations in the DeForest-Windsor area were also evaluated, included the Interstate 39/Highway 19 interchange area. Of these sites, the Interstate 39/Highway 19 location ranked among the top 50 in the Southwest Region (#9).

11 Community Facilities and Services

The Land will be provided with the full range of urban services. In conjunction with overlapping and adjacent districts, the Village of DeForest offers a full range of municipal services including public sanitary sewer, public water, police and fire protection, solid waste collection, streets and public works maintenance, and a park and open space system.

The recently-expanded Public Safety Building in downtown DeForest houses the DeForest Police Department, the DeForest/Windsor Municipal Court, and the DeForest Area Fire and EMS District. The Public Safety Building is located four miles north of the Yahara Gateway Land.

The DeForest Police Department does and will provide protective services to the Land. This is a full service department operating 24 hours a day, seven days a week with 17 full time police officers with plans to expand. The Department operates under the State Statute governing mutual aid, providing assistance to other departments when requested. In addition, the Dane County's Sheriff's Department, operating a satellite office in the Windsor Village Hall, provides assistance to the DeForest Police Department when requested if its officers are available.

The DeForest-Windsor Fire and EMS Department serves the Land. The station is staffed between the hours of 6 a.m. and 10 p.m. on weekdays. The Department consists of over 40 professional volunteers and four full-time employees. Most personnel are cross-trained as both Firefighters and Emergency Medical Technicians (EMTs). Average overall turn-out time (time from dispatch to enroute) for 2016 was 3:52 minutes.

The Village of DeForest contracts with Advanced Disposal Services for automated trash and recycling collection. Commercial and industrial users are expected to privately contract for waste and recycling collection.

Per the Village subdivision ordinance, the dedication of park land and park improvement fees are required with new residential development, based on the number and type of housing units. Housing units are not expected to develop here until after 2020, at which point a proposed mini park area may be most appropriately sited in the Yahara District, perhaps linked in some way to the Yahara River corridor. Typically, mini parks include specialized facilities that serve a specific population living nearby, such as children or senior citizens.

12 Appendices

A. Planning and Zoning Commission Resolution Verifying *Comprehensive Plan* Consistency
B. Village Board Resolution Authorizing Submittal
C. Letter of Support from Village of Windsor
D. Estimated Wastewater Flows - Yahara Gateway Land
E. Estimated Water Demands - Yahara Gateway Land
F. Fire Flow Simulation Results Summary Table – Yahara Gateway Land
G. 2006 Village of DeForest *Water Supply and Distribution Study* (separate document)

Appendix A

RESOLUTION 2017-905

A RESOLUTION INDICATING THAT A PENDING URBAN SERVICE AREA APPLICATION IS CONSISTENT WITH THE VILLAGE COMPREHENSIVE PLAN

WHEREAS, the Village administration and the owners of property within the area marked as "Proposed Urban Service Area Expansion" on the attached Exhibit A ("subject properties") desire for the Village to apply to the Capital Area Regional Planning Commission ("CARPC") to include the subject property within the Northern Urban Service Area ("NUSA"); and

WHEREAS, on March 21, 2017, the Village Board adopted Resolution 2017-023, authorizing the Village to submit an application to CARPC to expand the NUSA to include the subject properties; and

WHEREAS, CARPC requests that a determination of consistency within the municipal comprehensive plan to be submitted with any application to expand the NUSA; and

WHEREAS, the Village of DeForest Comprehensive Plan (hereinafter, "the Plan"), adopted on March 3, 2015 and most recently amended on March 16, 2016, makes recommendations for a future DeForest growth area west of the Interstate, north of Highway 19, and east of the Westport town line; and

WHEREAS, the Plan places the subject properties within the Village's "Future Urban Development Area" and, based on the factors to be used for making growth phasing decisions, the Planning and Zoning Commission has determined that it is timely to include the subject properties in the NUSA; and

WHEREAS, the Plan identifies the developable portions of the subject properties as appropriate for either "mixed use" or "commercial" development, with such future land use categories intended for commercial service, retail, office, residential, institutional, and mixed land uses served by public sewer and water systems, and the Commission finds the proposed uses describe in Exhibit A consistent with such future land use recommendations in the Plan; and

WHEREAS, the Commission has reviewed the application against other aspects of the Plan and found them to be consistent.

NOW, THEREFORE, BE IT RESOLVED that the Village of DeForest Planning and Zoning Commission hereby finds that the proposed application to add the subject properties to the NUSA is consistent with the Village's Comprehensive Plan.

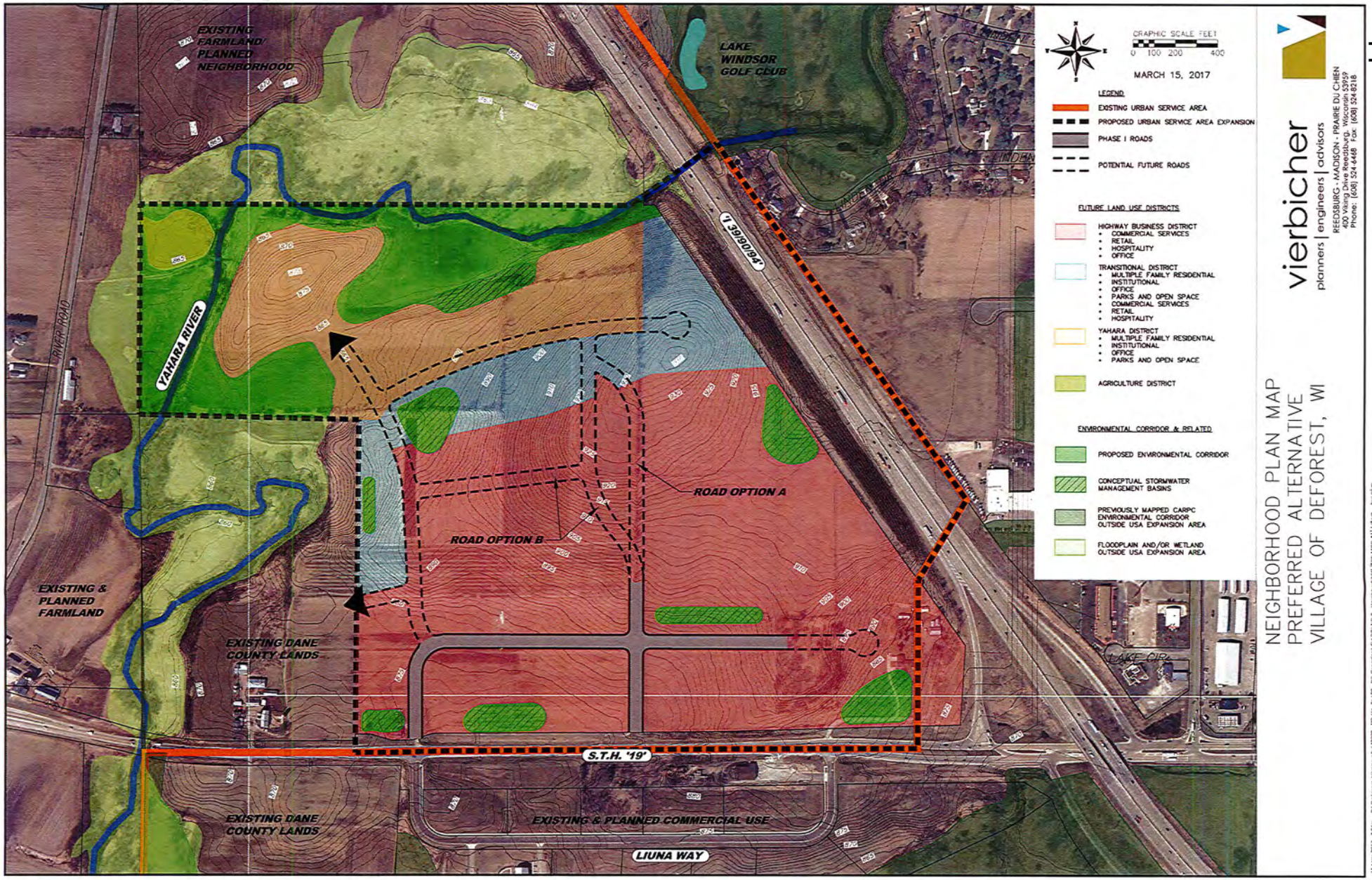
Adopted this 28th day of March, 2017.

Jason Kramar, Planning & Zoning Commission Chair

Attest: _____
Brandi Cooper, Zoning Administrator

Vote: 4-0

EXHIBIT A (1 page map)



Appendix A

Appendix B

RESOLUTION 2017-023

A RESOLUTION AUTHORIZING THE VILLAGE'S REQUEST TO CARPC TO AMEND THE NORTHERN URBAN SERVICE AREA TO ENCOMPASS LANDS NORTHWEST OF THE INTERSTATE AND HIGHWAY 19 PER THE VILLAGE'S COMPREHENSIVE PLAN

WHEREAS, the Village of DeForest Comprehensive Plan (hereinafter, "the Plan"), adopted on March 3, 2015 and most recently amended on March 16, 2016, makes recommendations for a future DeForest growth area west of the Interstate, north of Highway 19, and east of the Westport town line; and

WHEREAS, the area marked as "Proposed Urban Service Area Expansion" on the attached Exhibit A ("subject properties"), consisting of approximately 155 acres of real estate plus adjoining public rights-of-way, is within said DeForest growth area; and

WHEREAS, municipal sanitary sewer service may be extended to the subject properties only where such sewer extension is first within the Northern Urban Service Area ("NUSA"); and

WHEREAS, the Village administration and the owners of the subject properties desire for the Village to apply to the Capital Area Regional Planning Commission ("CARPC") to include the subject properties within the NUSA; and

WHEREAS, the Plan places the subject properties within the Village's "Future Urban Development Area" and, based on the factors for making growth phasing decisions included in the Plan, the Village Board has determined that it is timely to include the subject properties in the NUSA.

NOW, THEREFORE, BE IT RESOLVED that the Village of DeForest Board of Trustees hereby authorizes the Village's application to CARPC to amend the NUSA to include the subject properties, with a development pattern in general accordance with the conceptual neighborhood plan attached as Exhibit A.

Adopted at a regular Village Board meeting this 21st day of March, 2017.

Judd Blau, Village President

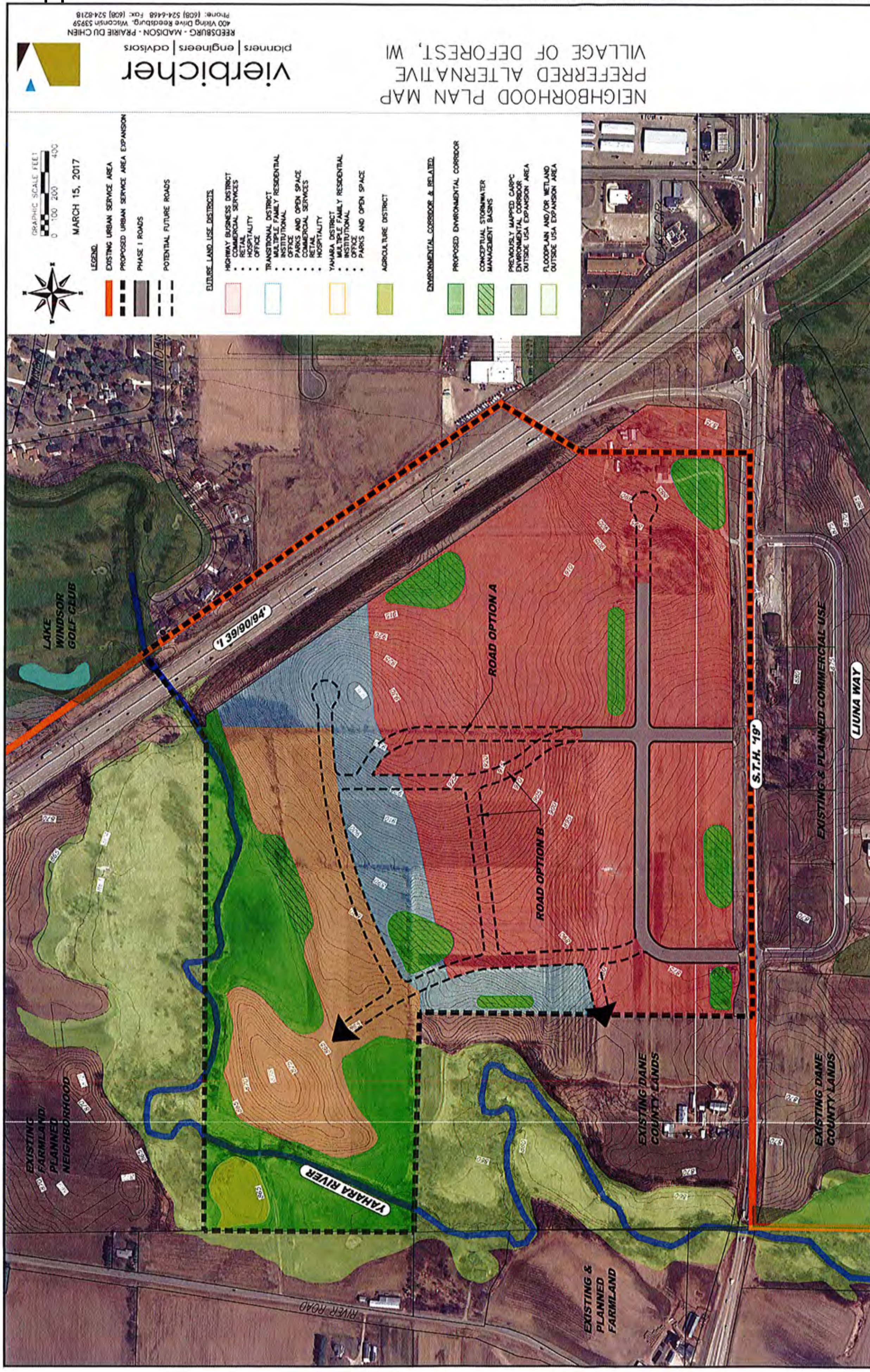
ATTEST: LuAnn Leggett
LuAnn Leggett, Deputy Administrator/Village Clerk

Vote: 5-0

Appendix B

EXHIBIT A: NEIGHBORHOOD PLAN MAP, PREFERRED ALTERNATIVE

Appendix B



NEIGHBORHOOD PLAN MAP
PREFERRED ALTERNATIVE
VILLAGE OF DEFOREST, WI
vierbicher
planners | engineers | advisors
REEDSBURG - MADISON - PRAIRIE DU CHIEN
400 Viking Drive Reedsburg, Wisconsin 53959
Phone: (608) 524-6468 Fax: (608) 524-8218
GRAPHIC SCALE FEET
0 100 200 400
MARCH 15, 2017
LEGEND
EXISTING URBAN SERVICE AREA
PROPOSED URBAN SERVICE AREA EXPANSION
PHASE I ROADS
POTENTIAL FUTURE ROADS
FUTURE LAND USE DISTRICTS
HIGHWAY BUSINESS DISTRICT
COMMERCIAL SERVICES
RETAIL
HOSPITALITY
OFFICE
TRANSITIONAL DISTRICT
MULTIPLE FAMILY RESIDENTIAL
INSTITUTIONAL
OFFICE
PARKS AND OPEN SPACE
COMMERCIAL SERVICES
RETAIL
HOSPITALITY
YAHARA DISTRICT
MULTIPLE FAMILY RESIDENTIAL
INSTITUTIONAL
OFFICE
PARKS AND OPEN SPACE
AGRICULTURE DISTRICT
ENVIRONMENTAL CORRIDOR & RELATED
PROPOSED ENVIRONMENTAL CORRIDOR
CONCEPTUAL STORMWATER MANAGEMENT BASINS
PREVIOUSLY MAPPED CARPC ENVIRONMENTAL CORRIDOR OUTSIDE USA EXPANSION AREA
FLOODPLAIN AND/OR WETLAND OUTSIDE USA EXPANSION AREA
LAKE WINDSOR GOLF CLUB
'I 39/90/94'
ROAD OPTION A
ROAD OPTION B
S.T.H. '19'
LIUNA WAY
EXISTING & PLANNED COMMERCIAL USE
EXISTING DANE COUNTY LANDS
EXISTING DANE COUNTY LANDS
YAHARA RIVER
EXISTING FARMLAND/ PLANNED NEIGHBORHOOD
EXISTING & PLANNED FARMLAND
RIVER ROAD

Appendix C

Windsor
Growing Forward

Capital Area Regional Planning Commission
Attn: Director for Environmental Resources Planning – Mike Rupiper
City County Building
210 Martin Luther King Jr. Blvd, Room 362
Madison, WI 53703

April 4, 2017

Dear Mr. Rupiper,

On behalf of the Village of Windsor, we wish to present you with a letter of support for the Village of DeForest Urban Service Area application for property north of Highway 19 and west of the I39/90/94.

Recently, the Village of DeForest attached the property known as Windsor Gateway LLC. This annexation was anticipated as part of the original Cooperative Plan between the Villages of Windsor and DeForest. The Yahara Hills and Ballweg property have not submitted an attachment/detachment request at this time, however, should a request come forward, the attachment/detachment would be consistent with Amendment #1 to the Cooperative Plan which is under review by the Department of Administration. Because these properties will ultimately be within the Village of DeForest Municipal Boundary and served by their utilities, we wish to express our support for the inclusion of all the subject properties at this time for the Urban Service Area request. In addition, the concept plan is consistent with the Village of Windsor Comprehensive Plan for the area.

Sincerely,

Amy Anderson Schweppe
Village of Windsor
Director of Planning and Development
amy@windsorwi.gov

Robert E. Wipperfurth
Village of Windsor
President
rwipperfurth@windsorwi.gov

Printed: 4/10/2017, 11:19 AM

Estimated Wastewater Flows
Yahara Gateway Lands

Land Use	Acres	Number of Units	Population	Average Daily Flow Rate (gpd)	Peak Flow Rate (gpd)	Peak Flow Rate (cfs)
Street Right-of-Way	33.50			0	0	0.000
Environmental Corridor Non-Stormwater	25.27			0	0	0.000
Environmental Corridor -Stormwater	14.14			0	0	0.000
Agricultural District	0.99			0	0	0.000
Multiple Family Residential	17.70	400	720	61,200	244,800	0.379
Institutional	4.39			3,512	14,048	0.022
Office	9.45			7,560	30,240	0.047
Commercial Services	20.61			16,488	65,952	0.102
Retail	34.06			27,248	108,992	0.169
Parks and Open Space	2.56			0	0	0.000
Hospitality	14.89			11,912	47,648	0.074
Totals =	**177.56**			**127,920**	**511,680**	**0.792**

Factors:

Multi-Family Residential Unit Density =	22.5 units/acre
Multi-Family Residential Capita per Unit =	1.8 persons per unit
Per Person Demand/Sewage Generation Rate[1] =	85.0 gals./day*person
Institutional/Office/Commercial/Retail/Hospitality Sewage Generation Rate[2] =	800.0 gals./acre*day
Parks & Open Space Sewage Generation Rate =	00.0 gals./acre*day
Residential Peaking Factor =	4.0
Commercial Peaking Factor =	4.0

Footnotes: (1) Per Table 2-9 Typical Wastewater Flow rates from Residential Sources, Wastewater Engineering, Metcalf & Eddy, 1991 Edition.

(2) Chapter 2, pages 26 & 27, Wastewater Engineering, Metcalf & Eddy, 1991 Edition.

Printed: 4/10/2017, 11:18 AM

Estimated Water Demands
Yahara Gateway Lands

Land Use	Acres	Number of Units	Average Daily Water Demand (gpd)	Maximum Day Water Demand (gpd)	Peak Hour Water Demand (gpm)
Street Right-of-Way	33.50		0	0	0
Environmental Corridor Non-Stormwater	25.27		0	0	0
Environmental Corridor -Stormwater	14.14		0	0	0
Agricultural District	0.99		0	0	0
Multiple Family Residential	17.70	400	58,400	91,104	127
Institutional	4.39		3,512	5,479	8
Office	9.45		7,560	11,794	16
Commercial Services	20.61		16,488	25,721	36
Retail	34.06		27,248	42,507	59
Parks and Open Space	2.56		0	0	0
Hospitality	14.89		11,912	18,583	26
Totals=	**177.6**		**125,120**	**195,187**	**271**

Factors:

Multi-Family Residential Unit Density =	22.5 units/acre
Per Residential Customer Water Demand[1] =	146.0 gals/day*customer
Institutional/Office/Commercial/Retail/Hospitality Demand [2] =	800.0 gals./acre*day
Parks & Open Space Water Demand =	00.0 gals./acre*day
Maximum Day/Average Day Factor =	1.6
Peak Hour/Maximum Day Factor =	2.0

Footnotes: (1) Per Village of DeForest year 2015 residential water sales reported to PSCW.

(2) Chapter 2, pages 26 & 27, Wastewater Engineering, Metcalf & Eddy, 1991 Edition.

Fire Flow Simulation Results Summary Table
Yahara Gateway

Fire Flow Node FlexTable: Fire Flow Report

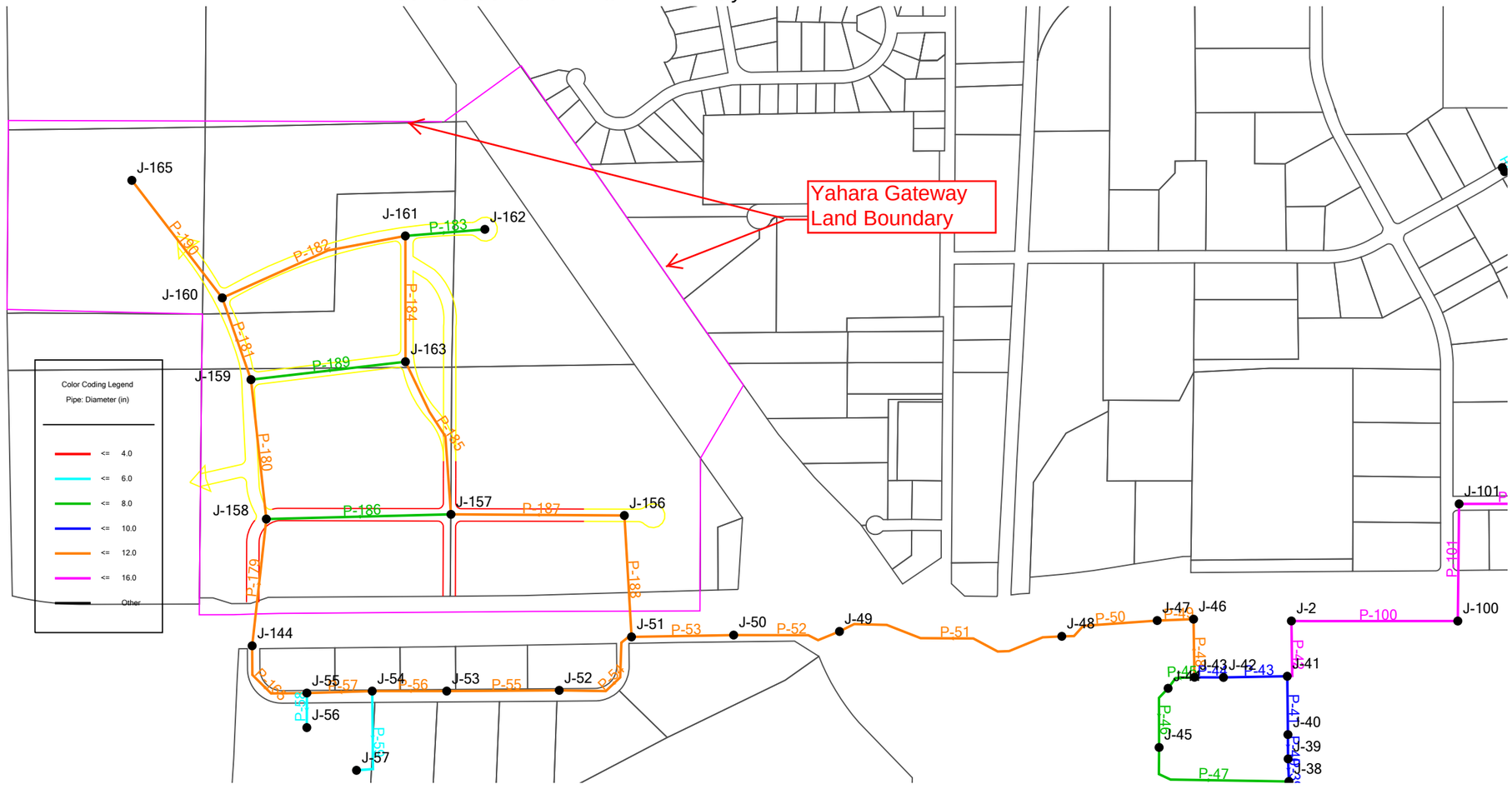
Active Scenario: Maximum Day

Label	Zone	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Available) (gpm)	Fire Flow (Needed) (gpm)	Flow (Total Available) (gpm)	Flow (Total Needed) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Residual Lower Limit) (psi)	Pressure (Zone Lower Limit) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Junction w/ Minimum Pressure (System)	Is Fire Flow Run Balanced?
J-156	<None>	23	True	2,699.30	2,000.00	2,715.40	2,016.10	32.5	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-157	<None>	23	True	2,634.07	2,000.00	2,650.17	2,016.10	38.2	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-158	<None>	23	True	2,627.75	2,000.00	2,643.85	2,016.10	42.4	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-159	<None>	23	True	2,593.46	2,000.00	2,609.56	2,016.10	37.8	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-163	<None>	8	True	2,580.50	2,000.00	2,596.60	2,016.10	23.2	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-160	<None>	23	True	2,574.54	2,000.00	2,590.64	2,016.10	45.5	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-165	<None>	23	True	2,574.33	2,000.00	2,574.33	2,000.00	37.2	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-161	<None>	23	True	2,536.75	2,000.00	2,552.85	2,016.10	30.0	20.0	20.0	20.0	J-162	PMP-Well 5	True
J-162	<None>	4	True	2,081.22	2,000.00	2,097.32	2,016.10	20.0	20.0	20.0	36.0	J-163	PMP-Well 5	True
J-2	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-3	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-4	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-5	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-6	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-7	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-8	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-9	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-10	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-11	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-12	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-13	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-14	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-15	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-16	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-17	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-18	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-19	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-20	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-21	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-22	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-23	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-24	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-25	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-26	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-27	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-28	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-29	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-30	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-31	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
J-32	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False
WELL 1	Zone-1	(N/A)	False	(N/A)	2,000.00	(N/A)	(N/A)	(N/A)	20.0	20.0	(N/A)	(N/A)	(N/A)	False

System Conditions:
1. Elevated Tank Water Level = 1/2 way between Low Water Level & High Water Level
2. Wells 1 & 5 On
3. Maximum Day Demand

Scenario: Maximum Day

Active Scenario: Maximum Day



Appendix G

WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY 2006 UPDATE

Village of DeForest
Dane County, Wisconsin

Appendix G

WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY 2006 UPDATE
Village of DeForest
Dane County, Wisconsin

Prepared for:
Village of DeForest
P.O. Box 510
DeForest, WI 53532

Prepared by:
Vierbicher Associates, Inc.
999 Fourier Drive, Suite 201
Madison, WI 53717
(608) 826-0532

February 2007

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- Tables 15-20 & 22-23
- Figures 2-6
- Well Logs & Well Pump Discharge Head Curves
- Water Supply & Distribution System Master Plan Map

WATER SUPPLY AND DISTRIBUTION STUDY
VILLAGE OF DEFOREST

I. INTRODUCTION

Since the last update of the Water Supply and Distribution System Study was completed in January of 2001, changes in growth patterns and the Village boundaries have occurred. Also, the Village acquired what was the Token Creek Sanitary District water system. This system will be referred to as the DeForest South Utility. These changes warrant the need to re-assess the Village's existing water supply and distribution system's ability to provide adequate water supply and water quality to customers over the next 20 years. The Village of DeForest currently exists in two separate geographical regions. For purposes of this study update, these areas will be distinguished as DeForest North (Village) and DeForest South.

II. SCOPE

The primary purpose of this report is to summarize and evaluate the adequacy of the Village's existing water system, estimate future demand requirements, make recommendations for future system improvements and address a number of other topics related to the Village's water system. The scope of this report consists of the following tasks:

A. Evaluate the adequacy of the current water systems to meet current demands and provide acceptable water quality.

B. Project future water demands based on projected growth patterns.

C. Recommend future water supply, storage, and distribution system improvements required to meet future demands. These recommendations include location, timing, and an approximate range of costs for the recommended improvements.

D. Update the current Village water system model (WaterCAD) to bring the model up to date with improvements that have occurred since the last update. Perform ten to fifteen field hydrant flow tests to calibrate the water system model.

E. Obtain the current DeForest South water system model from Client and update as necessary.

F. Use the updated water system models to evaluate future improvements and make recommendations to the distribution systems (piping network) in existing areas as well as in future service areas.

G. Evaluate the addition of Well No. 5 to the DeForest South system and discuss options and timing for connecting this well to the existing DeForest South system.

H. Evaluate the logistics of connecting the DeForest North and DeForest South water systems including sizing of the connection, timing, and location.

I. Prepare a Master Plan Map for the Village (DeForest North) showing the locations and sizes of recommended improvements.

J. Prepare a Master Plan Map for DeForest South showing the locations and sizes of recommended improvements.

K. Discuss the use of Class A foam on fire fighting capabilities and evaluate the effects on the needs of the water system to provide fire protection.

L. Discuss the use of hydrants compatible with quick connect couplings (Stortz) including a cost analysis on going to this type of connection.

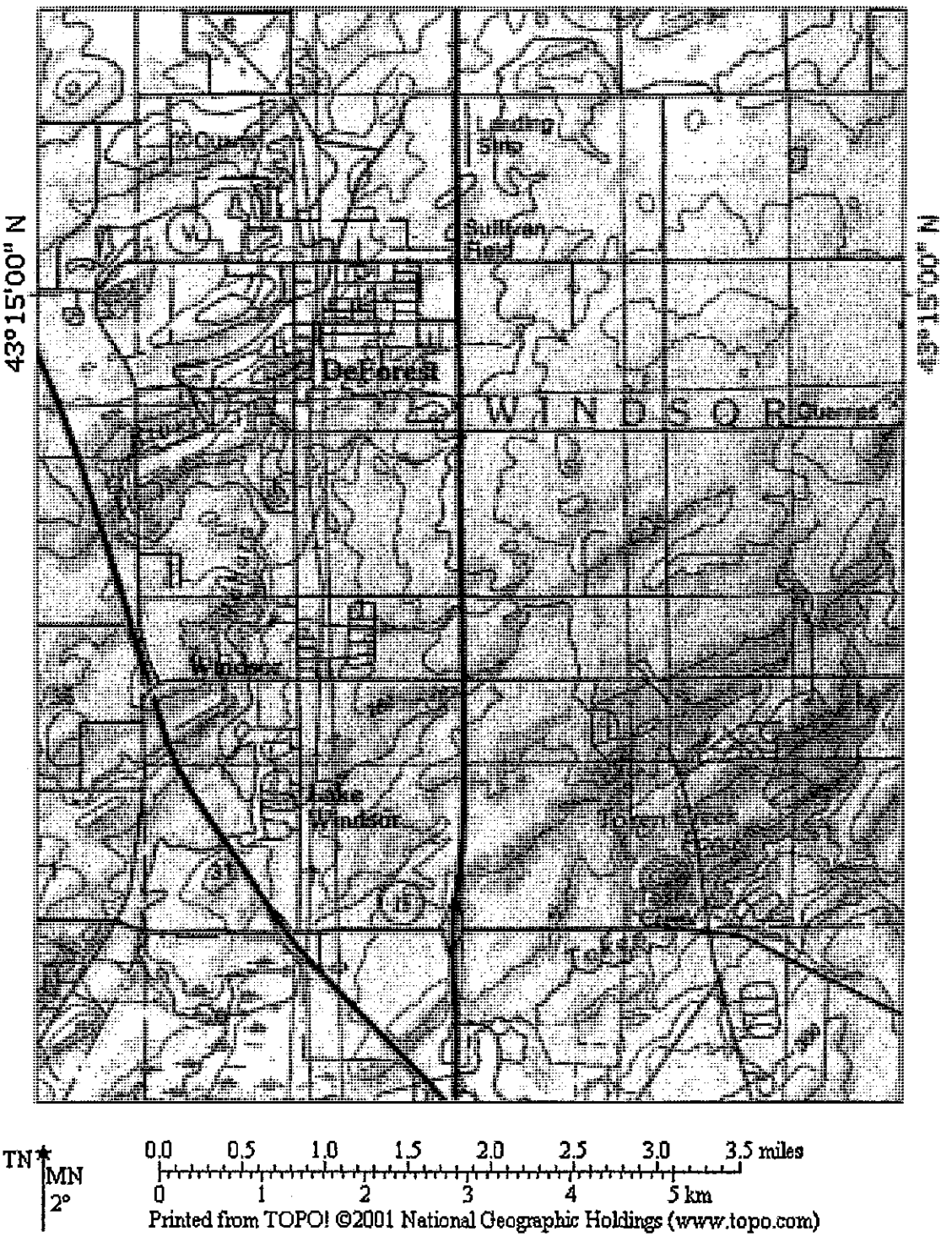
M. Discuss looping of water mains related to developments on the fringes of the Village and timing of such connections.

N. Investigate potential funding sources. Prepare a proposed financing strategy with recommended funding sources.

III. GENERAL STUDY AREA INFORMATION

The Village of DeForest is located between USH 51 and I 90/94 approximately six miles north of Madison, and 80 miles west of Milwaukee in Dane County, Wisconsin. The Village is located in the Yahara River Valley on ground moraine created by glacial deposits. A clay layer forms a mantle over bedrock. Underlying the clay layer is bedrock of the Paleozoic era consistency of limestone, shale, sandstone, and dolomite. The topography of the Village is hilly, with elevations ranging from 930 to 1,000 feet (USGS datum). ***Figure 1*** shows a portion of the USGS quad map of the area.

Figure 1 – General Study Area



IV. EXISTING WATER SUPPLY FACILITIES AND HISTORIC WATER DEMANDS

A. DeForest North

The current water supply, storage and distribution facilities consist of three wells, two elevated storage tanks, and a distribution system. The existing water supply system is shown on the Master Plan Map, which is included in the ***Appendix*** (found in the back of this report).

1. Water Supply

Well No. 1 was constructed in 1910 and was located on East Holum Street. This well was previously abandoned.

Well No. 2 was constructed in 1958 on Yahara Street just east of the intersection of Yahara Street and North Stevenson Street. The well is equipped with an 8-stage, Peerless brand pump capable of providing 300 gpm at a total dynamic head (TDH) of 205 feet, and it is powered by a 50 horsepower electric motor. The pump was installed in 1980, and it is currently pumping at a rate of 300 gpm.

Well No. 3 was constructed in 1978, re-cased in 1998, and is located on Acker Parkway near the intersection of Acker Parkway and Mohican Pass. The well is equipped with a 5-stage, Byron Jackson brand pump capable of providing 1,000 gpm at 275 feet of TDH, and it is powered by a 100 horsepower electric motor. The pump was installed in 1979, and it is currently pumping at a rate of 850 gpm.

Well No. 4 was constructed in 1991 and is located on Yorktown Road between Constitution Land and Rauls Trace. The well is equipped with a 4-stage, Simmons brand pump capable of providing 1,200 gpm at 255 feet of TDH, and it is powered by a 125 horsepower electric motor. The pump was installed in 1991 and it is currently pumping at a rate of 1,600 gpm.

Each well pump is controlled by the SCADA system, which automatically turns the pumps on and off, based on the water elevation in the elevated tanks.

Auxiliary engines have been installed at Well Nos. 3 and 4 to operate the well pumps in case electrical power is disrupted.

Existing well data is summarized in ***Table 1***. Well logs and construction reports for each well can be found in the ***Appendix.***

TABLE 1 – Existing Well Data – DeForest North

Well No.	2	3	4
Location	**408 Yahara Street**	**609 Acker Parkway**	**515 Yorktown Road**
Current Static Water Level (ft.)	30	27	23
Current Pumping Water Level (ft.)	38	58	40
Current Pumping Rate (gpm)	300	850	1,600
Current Specific Capacity (gpm/ft.)	37.5	27.4	94.1
Original Specific Capacity (gpm/ft.)	63.3	44	50
Pump H.P.	50	100	125
Well Depth (ft.)	412	665	695
Well Diameter	272'-12" open hole (sandstone)	534-23" open hole (sandstone)	230'-22" open hole 355'-19 ¼" open hole (sandstone)
Depth Cased	18" to 73'-6" 12" to 140'-4"	16" to 380'	24" to 110'
Emergency Power	None	Auxiliary Engine	Auxiliary Engine
Total Pumped in Yr 2004 (million gallons)	37.29	78.57	146.65
% of Total Pumped inYr 2004	14.21	29.93	55.86

2. Water Treatment

Sodium hypochlorite (NaOCl, chlorine) is added for disinfection, and hyrdofluosilicic acid (H_2SiF_6, fluoride) is added to prevent tooth decay at each well.

3. Water Storage

A 300,000-gallon single pedestal waterspheroid elevated tank, located at the intersection of Madison Street and Linde Street, provides water storage and static pressure. The tank was constructed in 1968 and is 90.5 feet tall with an overflow elevation of approximately 1091.00 feet (USGS Datum). The operating high water level is set at approximately elevation 1089.00 with the minimum possible low water level (bottom of tank bulb) at elevation 1058.50. The tank was last inspected in 2001 and was painted in 1999.

A 600,000-gallon single pedestal waterspheriod elevated tank is located near the intersection of CTH "V" and River Road. The tank was constructed in 1995 and is 126.5 feet tall with an overflow elevation set at elevation 1091.00 (USGS Datum). The operating high water level is set at approximately elevation 1089.00 with the minimum possible low water level (bottom of tank bulb) at elevation 1052.50. The tank was last inspected and painted in 2005.

TABLE 2 – Existing Storage Facilities Data – DeForest North

Location	519 Linde St.	103 River Road
Style	Waterspheroid Elevated Tank	Waterspheroid Elevated Tank
Capacity (gallons)	300,000	600,000
Year Constructed	1968	1995
Top of Foundation Elevation (ft./USGS Datum)	1000.50	964.50
Overflow Elevation (ft. / USGS Datum)	1091.00	1091.00
Operating High Water Level (ft. / USGS Datum)	1089.00	1089.00
Minimum Tank Water Level Elevation (ft. / USGS Datum)	1058.50	1052.50
Dimensions (ft.)	46.5 max. dia.	60 max. dia.

4. Water Distribution System

The distribution system is composed mainly of ductile iron piping / cast iron piping (80.3%) and plastic piping (19.1%) with a small percentage of asbestos-cement piping (0.6%).

The quantity of each size of water main as listed in the 2005 Annual Report to the Public Service Commission of Wisconsin (PSC) is shown in ***Table 3*** below.

TABLE 3 – Distribution System Piping – DeForest North – Year 2005 (Water Main)

Water Main Material	Quantity (feet)						% of Total
	4"	6"	8"	10"	12"	Total	System
Asbestos-cement	1,461					1,461	0.6%
Cast Iron/Ductile Iron		63,349	76,297	37,388	24,667	201,701	80.3%
Plastic		2,235	12,435	15,507	17,820	47,997	19.1%
Totals =	1,461	65,584	88,732	52,895	42,487	251,159	100.0%
Percent of Total System:	0.6%	26.1%	35.3%	21.1%	16.9%	100.0%	

5. Historic Water Demands

The water utility had a total of 2,969 customers in the year 2005, divided among residential, commercial, public and industrial users as follows:

- 2,713 residential (91.4% of total customers with 74.0% of water sold)
- 202 commercial (6.8% of total customers with 17.2% of water sold)
- 31 industrial (1.0% of total customers with 6.6% of water sold)
- 23 public (0.8% of total customers with 2.3% of water sold)

The average daily usage per customer in the Village for 2005 was as follows:

- Residential: 175 gallons/customer/day
- Commercial: 545 gallons/customer/day
- Industrial: 1,359 gallons/customer/day
- Public: 627 gallons/customer/day

As would be expected, the industrial and commercial customers have higher average daily usage per customer than residential customers.

Table 4 summarizes the Village's historic water pumpage from 2001-2005, based on reports submitted to the PSC. The water sales per customer from 2005 are shown in ***Table 5***. The largest water customers are listed in ***Table 6*** with their yearly water consumption.

TABLE 4 – Historic Water Pumpage 2001-2005 – DeForest North

Year	Population	Average Daily Pumpage (mgd) [1]	Average Consumption (gpcd) [2]	Maximum Day Pumpage (mgd)	Loss (%) [3]	Maximum Day/ Average Day Ratio
2001	7,475	0.776	104	1.454	4	1.87
2002	7,688	0.786	102	1.378	6	1.75
2003	7,997	0.855	107	1.378	5	1.61
2004	8,061	0.718	89	1.112	5	1.55
2005	8,288	0.690	83	1.375	6	1.99
Average		0.765	97	1.339	5	1.76

Footnotes: [1] Million gallons per day. [2] Gallons per capita per day. [3] Percent of pumpage unaccounted for.

TABLE 5 – 2005 Water Sales – DeForest North

Service	Gallons
Residential	172,950,000
Commercial	40,160,000
Public	5,300,000
Industrial	15,380,000

TABLE 6 – Largest Water Consumers – DeForest North – Year 2005

Name	Address	Annual Water Consumption (mg)
Anamax Grease Services	605 & 609 Bassett Street	3.484
Evco Plastics Amp Plant	110 Evco Circle	2.333
Holiday Inn Express	7184 Morrisonville Road	1.745
Evco Plastics	100 W. North Street	1.663
Auto Clean	420 North Main Street	1.538
DeForest High School	815 Jefferson Street	1.338
Evco Office Products	121 Evco Circle	1.327
Ball Corporation	HWY 51	1.065
Mc Donald's	981 W. North Street	1.047
Pick-N-Save	621 South Main Street	0.949
Keller Development	125 East Holum Steet	0.947
Vienna Tiger Market	7205 CTH HWY I	0.944
DeForest Housing Authority	509 North Main Street	0.913
Culver's	980 W. North Street	0.873
Redline Mobil	937 East Holum Street	0.824
DeForest Williamstown Bay	500 Bassett Street	0.760
DeForest Family Restaurant	505 W. North Street	0.733
Harbor Senior Center	206 North Main Street	0.652

B. DeForest South Utility

The current water supply, storage and distribution facilities consist of one well, one elevated storage tank and a distribution system. The existing water supply system is shown on the ***Water Supply and Distribution System Master Plan Map***, which is included in the ***Appendix.***

1. Water Supply

Well No. 1 was constructed in 1993, and re-cased in 1995. The well site is located approximately 395 feet south of the current southeast end of Pepsi Way. The well is equipped with an American Turbine brand pump powered by a 75 horsepower electric motor. The pump was installed in 1994, and it is currently pumping at a rate of 810 gpm.

The well pump is controlled by the SCADA system, which automatically turns the pumps on and off, based on the water elevation in the elevated tank.

The well pump is equipped with an auxiliary engine for emergency operation.

Well No. 5 was constructed in 2005 and is located on the future extension of Duraform Lane just west of USH 51. This well was originally drilled to 765 feet, but the bottom 18 feet was sealed with grout due to unacceptable radiation levels in water samples from the well. Therefore, the well is 747 feet deep. A well pump has not yet been installed in this well and it does not provide supply to DeForest South at this time.

Existing well data is summarized in ***Table 7***. The well logs and construction report for the well can be found in the ***Appendix.***

TABLE 7 – Existing Well Data – DeForest South

Well No.	1	5
Location	**Pepsi Way**	**Duraform Lane**
Current Static Water Level (ft.)	27	39
Current Pumping Water Level (ft.)	69	-
Current Pumping Rate (gpm)	810	-
Current Specific Capacity (gpm/ft.)	19.3	11.9
Original Specific Capacity (gpm/ft.)	19.7	11.9
Pump H.P.	75	None
Well Depth (ft.)	550	747
Well Diameter	272'-12" open hole (sandstone)	332'-22" open hole (sandstone)
Depth Cased	18" to 73'-6" 12" to 140'-4"	30" to 39' 24" to 415'
Emergency Power	Auxiliary Engine	-
Total Pumped in Yr 2004 (million gallons)	15.61	0
% of Total Pumped inYr 2004	100	0

2. Water Treatment

Sodium hypochlorite (NaOCl, chlorine) is added for disinfection, and a polyphosphate (Liqui Phos 2000) is added for iron sequestration.

3. Water Storage

A 200,000-gallon single pedestal spheroid elevated tank, located at 4205 Anderson Road, provides water storage and static pressure. The tank was constructed in 1994 and is approximately 118 feet tall with an overflow elevation of approximately 1060.00 feet (USGS Datum). The operating high water level is set at approximately elevation 1058.00 with the minimum possible low water level (bottom of the tank bulb) at elevation 1031.75. The tank was last inspected in 2005 and has not been repainted since its construction in 1994.

TABLE 8 – Existing Storage Facilities Data – DeForest South

Location	4205 Anderson Road
Style	Waterspheroid Elevated Tank
Capacity (gallons)	200,000
Year Constructed	1994
Top of Foundation Elevation (ft./USGS Datum)	948.00
Overflow Elevation (ft. / USGS Datum)	1060.00
Operating High Water Level (ft. / USGS Datum)	1058.00
Minimum Tank Water Level Elevation (ft. / USGS Datum)	1031.75
Dimensions (ft.)	41 (max. dia.)

4. Water Distribution System

The distribution system is composed completely of ductile iron piping / cast iron piping.

The quantity of each size of water main as listed in the 2005 Annual Report to the Public Service Commission of Wisconsin (PSC) is shown in ***Table 9*** below.

TABLE 9 – Distribution System Piping – DeForest South (Water Main)

Water Main Material	Quantity (feet)						% of Total
	6"	8"	10"	12"	16"	Total	System
Asbestos-cement						0	0.0%
Cast Iron/Ductile Iron	2,490	6,038	5,751	14,888	2,653	31,820	100.0%
Plastic						0	0.0%
Totals =	2,490	6,038	5,751	14,888	2,653	31,820	100.0%
Percent of Total System:	7.8%	19.0%	18.1%	46.8%	8.3%	100.0%	

5. Historic Water Demands

The water utility had a total of 58 customers in the year 2005, divided among residential, commercial, and industrial users as follows:

- 18 residential (31.0% of total customers with 6.2% of water sold)
- 38 commercial (65.5% of total customers with 92.5% of water sold)
- 2 industrial (3.4% of total customers with 1.2% of water sold)

The average daily usage per customer in 2005 was as follows:

- Residential: 136 gallons/customer/day
- Commercial: 957 gallons/customer/day
- Industrial: 244 gallons/customer/day

As would be expected, the industrial and commercial customers have higher average daily usage per customer than residential customers.

Table 10 summarizes the Utility's historic water pumpage from 2001-2005, based on reports submitted to the PSC. The water sales per customer from 2005 are shown in ***Table 11***. The largest water customers are listed in ***Table 12*** with their yearly water consumption.

TABLE 10 – Historic Water Pumpage 2001-2005 – DeForest South

Year	Average Daily Pumpage (mgd) [1]	Maximum Day Pumpage (mgd)	Loss (%) [2]	Maximum Day/ Average Day Ratio
2001	0.046	0.144	2	3.15
2002	0.049	0.173	2	3.56
2003	0.051	0.290	2	5.71
2004	0.043	0.200	-32	4.68
2005	0.047	0.214	15	4.55
Average	0.047	0.204	-2	4.33

Footnotes: [1] Million gallons per day
[2] Percent of pumpage unaccounted for

TABLE 11 – 2005 Water Sales – DeForest South

Service	MG
Residential	0.89
Commercial	13.28
Public	0
Industrial	0.18

TABLE 12 – Largest Water Consumers – DeForest South – Year 2005

Name	Address	Annual Water Consumption (mg)
Madison Travel Center	5901 HWY 51	4.060
Pine Cone Restaurant	6162 HWY 51	1.251
Days Inn	6311 Rostad Drive	1.096
Truckers Inn	6162 HWY 51	0.976
Rodeside Grill	6317 Rostad Drive	0.654
McDonald's	4409 STH 19	0.660
HWY 51 Citgo	6155 HWY 51	0.460
Pepsi	6179 Pepsi Way	0.345
Kwik Trip	6325 Pepsi Way	0.341
Truck Country	4195 Anderson Road	0.292
Wisconsin RV World	5920 Haase Road	0.264
Peterbilt of Wisconsin	4205 Anderson Road	0.248
Morris Material	4401 HWY 19	0.166
Welton Enterprizes- CZ Trucking	6175 Metro Drive	0.151
Wisconsin Laborers Union School	4633 Liuna Way	0.132
North American Mechanical	6175 Metro Drive	0.105
Servpro	5959 Haase Road	0.097
Polk Performance	5900 Haase Road	0.096
Egan Hoffman (Rex Recyc., A&M Bus. Interiors, Keystone Auto.)	5969 Haase Road	0.080
Badger Truck	6303 Pepsi Way	0.073

V. ADEQUACY OF EXISTING WATER SUPPLY SYSTEM

A. Engineering Design Criteria

The adequacy of the existing water supply system will be evaluated by applying the following design criteria.

1. The peak hourly demand*, excluding fire flow demand, should be provided by well capacity.

2. The peak hourly demand* plus fire flow should be available from wells and storage. This criterion addresses the worst case scenario of a fire occurring during a period of peak hourly demand.

3. An average daily demand should be available from total storage.

* Note that the peak hourly demand is determined by applying a peaking factor of 2 to the maximum day pumping rate.

B. Recommended Fire Protection Demands

In addition to meeting the demand for domestic water consumption, a water supply and distribution system should be able to provide adequate fire protection.

Considering the proposed land uses, the following fire flows are recommended:
- Residential: 1,500 gpm for a 2.0-hour duration
- Commercial: 2,500 gpm for a 2.0-hour duration
- Industrial: 3,500 gpm for a 3.0-hour duration

Typical recommendations given by the Commercial Risk Services (CRS) division of the Insurance Services Office (ISO) were considered in determining the above recommended fire flow demands. If a water system cannot provide the CRS recommended fire flow at a location, the home or building owner may have higher than usual insurance rates. This is of particular concern to the Village if the location is for a future commercial or industrial building. The higher insurance rates may make developing at that location economically unfeasible. This can be a problem if the Village desires new commercial and/or industrial growth at that location.

In some communities, such as DeForest South, it is difficult to provide the high fire flow required for industrial areas when low average daily demand exists. A large amount of storage may be required to provide the fire flow if the community has a low well capacity. However, storage should not exceed average daily demand due to freezing and water quality concerns. In these cases, it is recommended that storage is paced with average daily demand and/or additional well capacity is added.

C. DeForest – North

1. Wells

The largest maximum day pumping rate over the past five years was 1.454 million gallons per day (mgd), or 1,009 gallons per minute (gpm) (See ***Table 4***). As stated above, the peak hourly demand is estimated to be twice the maximum day pumping rate. Therefore, the peak hourly demand is estimated to be approximately 2,019 gpm. The combined current capacity of the wells is 2,750 gpm, which is 731 gpm more than the 2,019 gpm required.

However, the Village's firm well capacity (capacity with the largest well out of service) is 1,150 gpm, which is less than the estimated peak hourly demand of 2,019 gpm. Therefore, the Village's firm well capacity is 869 gpm short of the existing estimated peak hourly demand.

2. Water Storage

The second Criterion can be used to check the adequacy of the system's storage. As mentioned in section B above, the largest fire flow demand that the water system would be required to provide is 3,500 gpm for a 3.0-hour duration. Therefore, a fire flow demand of 3,500 gpm for a 3.0-hour duration will be used in the calculation.

Peak Hourly Demand:	2,019 gpm	(as shown in 1.)
Fire Flow:	+3,500 gpm	
Well Pumping Capacity:	-2,750 gpm	
Rate Required from Storage:	2,769 gpm	

Volume Required from Storage:

(2,769 gpm)(3.0 hrs)(60 min/hr) = 498,500 gallons

The Village presently has 900,000 gallons of total storage with the two elevated tanks completely full. Since the tanks are usually not operating completely full, the "effective" storage is considered to be 80% of total storage. This leaves approximately 720,000 gallons of available "effective" storage. With all three wells available, 498,500 gallons of storage is required to satisfy Criterion No. 2. The effective elevated storage of 720,000 gallons is greater than the required 498,500 gallons.

The third criterion is also used to check the adequacy of the system's total storage. It recommends the average daily demand to be available from storage. The greatest average daily water demand over the past five years was 854,715 gpd as indicated in ***Table 4***. This demand is 45,285 gallons less than the current total storage available.

3. Water Distribution System

The distribution system contains a small quantity (1,461 feet) of 4-inch diameter piping. Due to their small diameters, these mains create restrictions to flow, especially during a fire flow situation. In addition, Wisconsin Administrative Code NR 811.63(2) requires the minimum diameter of newly constructed water mains to be six inches. The amount of 4-inch water main in the system has decreased by 1,834 feet over the last five years. Accordingly, the percent of 4-inch water main in the distribution system has decreased from 0.9% in the year 2000 to 0.6% in 2005.

The majority of the system is 8-inch (35.3%) and 6-inch (26.1%) with a significant amount of larger 10-inch (21.1%) and 12-inch (16.9%) diameter water mains.

A grid of large diameter transmission mains should exist between the storage tanks, wells and the high demand commercial and industrial customers in the system to ensure adequate supply, fire flow and residual pressure.

A grid of 10-inch and 12-inch mains connects the 600,000 gallon storage tank and Well No. 3 on the west side of the village. There is also a fairly well established grid on the East Side connecting Well Nos. 2 and 4 to the 300,000-gallon storage tank. However, this grid is not completely composed of 10-inch and 12-inch mains, and it contains some sections of 6-inch and 8-inch mains.

There are several "dead end" mains in the system. These mains are found at the edges of the system (See the ***Water Supply and Distribution System Master Plan Map*** in the ***Appendix***). These mains can have long detention times, which can result in poor water quality. Also, "dead end" mains decrease flow through the system. If a break occurs in one of these mains, the area served by it is cut off from the rest of the system. Looping these dead end mains to other mains in the system can prevent water quality and reliability concerns.

An indication of the distribution systems adequacy is its ability to provide recommended fire flows.

Village staff assisted Vierbicher Associates, Inc. with performing fire flow tests at various locations within the Village. ***Table 13,*** summarizes the results and estimated flow rates at 20-psi residual pressure per DNR code. The table also shows typical fire flow rates recommended at each test location based on the district type.

TABLE 13 - Fire Flow Test Summary - DeForest North

TEST #	FLOW HYDRANT		RESIDUAL HYDRANT			CALCULATED FIRE FLOW at 20 psi[1] (gpm)	MINIMUM RECOMMENDED FIRE FLOW[2] (gpm)	DISTRICT TYPE
	LOCATION (JUNCTION)	FLOW (gpm)	LOCATION (JUNCTION)	STATIC PRESSURE (Before test) (psi)	RESIDUAL PRESSURE (During Test) (psi)			
1	County Hwy V & Gene St. (J-388)	1,155.0	North of CTY V on Gene St. (J-387)	55.0	48.0	2,754	3,500	Industrial
2	NW end of Springbrook Lane (J-399)	1,193.0	Springbook Lane & Springbrook Circle (J-177)	59.0	53.0	3,278	1,500	Residential
3	North end of Burton Blvd (J-301)	1,135.0	300' north of Burton Blvd on Burton Blvd (J-290)	43.0	40.0	3,409	3,500	Industrial
4	Halsor St. / Yahara St. (J-24)	1,045.0	Mabel St. / Yahara St. (J-28)	34.0	32.0	2,989	1,500	Residential
5	North end of Renata St. (J-40)	995.0	40' west of corner of Renata St. (J-435)	55.0	46.0	2,072	1,500	Residential
6	Yorktown Rd. / Southbound Dr. (J-96)	1,205.0	Southbound Dr. / Rosemal Ln. (J-95)	56.0	54.0	5,739	2,500	School
7	South end of Case Ln. (J-370)	1,135.0	Case Ln. / Flywheel Circ. / Mack Ln. (J-369)	65.0	60.0	3,718	1,500	Residential
8	Paradise Cir. / CTH CV (J-353)	1,300.0[3]	Oak Springs Circ. / CTH CV (J-352)	73.0	70.0	6,129	1,500	Residential
9	Chokecherry @ end of Cul-de-sac (J-272)	790.0	300' north of flowing hydrant on Chokecherry (J-436)	52.0	43.0	1,567	1,500	Residential
10	Sunset Dr. / Cora St. (J-264)	1,030.0	Sunset Dr. / Sanford St. (J-260)	49.0	47.0	4,365	1,500	Residential
11	Mohawk Tr. / Old Indian Tr. (J-157)	950.0	Seminole Way / Old Indian Tr. (J-145)	53.0	52.0	6,277	1,500	Residential
12	Eagle Nest Ln. / Eagle Watch Drive (J-196)	1,030.0	Eagle Watch Dr. / Overlook Terrace (J-195)	49.0	48.0	6,346	1,500	Residential
13	River Rd. / Daley Rd. (J-366)	1,193.0	River Rd. / Woods Glen Ct. (J-365)	63.0	60.0	5,024	1,500	Residential
14[4]	Innovation Dr. / River Rd. (J-414)	1,070.0	Conservancy Way / Innovation Dr. (J-411)	68.0	55.0	2,166	2,500	Commercial

Footnotes:

[1] $Q_{20} = Q_{test}\left(\frac{P_{static} - 20\,psi}{P_{static} - P_{residual}}\right)^{0.54}$

[2] Based on typical ISO recommendations.

[3] Flow reading for Test #8 exceeded the maximum reading on the gauge of 1,300 gpm.

[4] All three wells were operating during Test #14.

Comparing the calculated and recommended fire flows in the ***Table 13*** above shows there were three of the fourteen test locations where the available fire flow at 20 psi, residual pressure was less than the recommended fire flow for the location. These locations occurred at the edge of the distribution system with two of them on dead-end mains.

It should be noted that the "Calculated Fire Flow" values are based on a theoretical calculation which assumes the pressure at the hydrant drops to 20 psi. Therefore, this fire flow rate should not be expected from simply opening the hydrant, but would require a pumper truck to connect to the hydrant. Even then, the theoretical calculated flow may not be realized in the field due to restrictions from the hydrant lead pipe (6" diameter) and connecting hose. Therefore, the actual fire flow available at 20 psi at Test Locations 6, 8, 11, 12, and 13 may be less than what is shown in Table 13.

4. Water Quality

Wisconsin Administrative Code, Department of Natural Resources, Chapter NR 809, "Safe Drinking Water" establishes minimum standards for the quality of drinking water supplied by public systems. This Code sets primary and secondary standards. Primary standards protect public health, while secondary standards were established to avoid potential nuisance conditions. Primary standards set maximum contaminant levels (MCLs) for inorganic contaminants, synthetic organic contaminants, volatile organic compounds (VOCs), organic contaminants, microbiological contaminants, radioactivity, and disinfection byproducts. Secondary standards set levels for inorganic chemicals and physical properties which, if exceeded, may be objectionable to taste, but do not pose a risk to health.

Review of the most recent water quality test results available from the Wisconsin Department of Natural Resources (WDNR) indicated that no primary contaminates have exceeded the MCLs permitted by NR 809.

Likewise, review of the most recent water quality test results available indicated that all secondary standards have been met.

Finally, from review of most recent test results available, hardness of the well water has ranged from 260 to 312 mg/l as $CaCO_3$.

D. DeForest – South (Token Creek Sanitary District #1)

1. Wells

The largest maximum day pumping rate over the past five years was 0.29 million gallons per day (mgd), or 201 gallons per minute (gpm) (See ***Table 10***). As stated above, the peak hourly demand is estimated to be twice the maximum day pumping rate. Therefore, the peak hourly demand is estimated to be approximately 402 gpm. The current capacity of the wells is 810 gpm, which is 408 gpm more than the 402 gpm required.

Since the District has only one well, there is no firm well capacity available.

2. Water Storage

The second Criterion can be used to check the adequacy of the system's storage. As mentioned in Section V. B on page 15, the largest fire flow demand that the water system should be capable of providing is 3,500 gpm for a 3.0-hour duration. Therefore, a fire flow demand of 3,500 gpm for a 3.0-hour duration will be used in the calculation.

Peak Hourly Demand:	402 gpm	(as shown in 1.)
Fire Flow:	+3,500 gpm	
Well Pumping Capacity:	-810 gpm	
Rate Required from Storage:	3,092 gpm	

Volume Required from Storage:
(3,093 gpm)(3.0 hrs)(60 min/hr) = 556,560 gallons

The District presently has 200,000 gallons of total storage from the elevated tank when it is completely full. Since the tank is usually not operating completely full, the "effective" storage is considered to be 80% of total storage. This leaves approximately 160,000 gallons of available "effective" storage. With the well available, 556,560 gallons of storage is required to satisfy Criterion No. 2. The effective elevated storage of 160,000 gallons is 396,560 gallons less than the required 556,560 gallons.

Currently, with Well No. 1 and the existing elevated tank, the system can provide 1,297 gpm of fire flow for a 3.0 hour duration. When Well No. 5 is added, the system would provide a fire flow of 2,797 gpm for 3.0 hours.

The third criterion is also used to check the adequacy of the system's total storage. It recommends the average daily demand to be available from storage. The greatest average daily water demand over the past five years was 50,784 gpd as indicated in ***Table 10***. This demand is 149,216 gallons less than the 200,000 gallons of total storage available from the storage tank.

3. Water Distribution System

Wisconsin Administrative Code NR 811.63(2) requires the minimum diameter of newly constructed water mains to be six inches. The minimum diameter of water main in the distribution system is six inches.

The majority of the system is 12-inch (46.8%) water main with a significant amount of 8-inch (19%) and 10-inch (18.1%) water main. The system also contains 6-inch (7.8%) and 16-inch (8.3%) diameter water mains.

A grid of large diameter transmission mains should exist between the storage tanks, wells and the high demand commercial and industrial customers in the system to ensure adequate supply, fire flow and residual pressure.

There is no grid or loop between the well and elevated storage tank. A single 12-inch transmission main connects the storage tank to the well. There are only three places where looping occurs within the system and these loops do not provide looping between the well and storage tank.

The system is divided by I-90/94/39 with the well on the northeast side and the storage tank on the southwest side. There is only one connection between the two halves of the system across the interstate. If this connection would break, the northeast side would be disconnected from the storage tank and the southwest side would be disconnected from the well.

The distribution system is almost completely composed of "dead end" mains and has some very long dead end mains (See the ***Water Supply and Distribution System Master Plan Map*** in the ***Appendix***). "Dead end" mains can have long detention times, which can result in poor water quality. Also, "dead end" mains reduce the amount of flow through the system. The more dead end mains a distribution system has, the less reliable it is. If a break occurs in a dead end main the area served by it is cut off from the rest of the system. Looping these mains to other mains in the system can prevent these reliability and water quality concerns.

An indication of the distribution systems adequacy is its ability to provide recommended fire flows.

Village staff assisted Vierbicher Associates, Inc. with performing fire flow tests at various locations within the district. ***Table 14,*** summarizes the results and estimated flow rates at 20-psi residual pressure. The table also shows typical fire flow rates recommended at each test location based on the district type.

Appendix G

TABLE 14 - Fire Flow Test Summary - DeForest South

TEST #	FLOW HYDRANT		RESIDUAL HYDRANT			CALCULATED FIRE FLOW AVAILABLE at 20 psi[1] (gpm)	MINIMUM RECOMMENDED FIRE FLOW[2] at 20 psi (gpm)	DISTRICT TYPE
	LOCATION (JUNCTION)	FLOW (gpm)	LOCATION (JUNCTION)	STATIC PRESSURE (Before test) (psi)	RESIDUAL PRESSURE (During Test) (psi)			
1	East most hydrant on North Towne Road	1,275.0	Approx. 315' west of Flow Hydrant on North Towne Road	66.0	55.0	**2,761**	**2,500**	**Commercial**
2	West most hydrant closest to HWY 19 front to Wisc. Labor Training Fac.	1,275.0	Approx. 375' east of Flow Hydrant in front of Wisc. Labor Training Fac.	80.0	62.0	**2,443**	**2,500**	**Commercial**
3	North End of Metro Drive	1,250.0	Approx. 560' south of Flow Hydrant on Metro Drive	80.0	68.0	**2,981**	**2,500**	**Commercial**
4	Approx. 550' north Haase Rd. / E. Anderson Rd Intersection on Haase Road	1,288.0	Intersection of Haase Road & E. Anderson Road	57.0	55.0	**6,226**	**2,500**	**Commercial**
5	460' south of Rostad/ Pepsi Way intersection on Pepsi Way	1,275.0	Approx. 378' south of Flow Hydrant on Pepsi Way	77.0	64.0	**2,832**	**2,500**	**Commercial**

Footnotes: [1] $Q_{20} = Q_{test}\left(\frac{P_{static} - 20\ psi}{P_{static} - P_{residual}}\right)^{0.54}$ [2] Based on typical ISO recommendations.

Comparing the calculated and recommended fire flows in **Table 14** above shows there was one of the five test locations where the available fire flow at 20 psi, residual pressure was less than the recommended fire flow for the location. This location occurred at the dead end of Metro Drive.

It should be noted that the "Calculated Fire Flow" values are based on a theoretical calculation which assumes the pressure at the hydrant drops to 20 psi. Therefore, this fire flow rate should not be expected from simply opening the hydrant, but would require a pumper trench to connect to the hydrant. Even then, the theoretical calculated flow may not be realized in the field due to restrictions from the hydrant lead pipe (6" diameter) and connecting hose. Therefore, the actual fire flow available at 20 psi at test location 4 may be less than what is shown in Table 14.

4. Water Quality

Wisconsin Administrative Code, Department of Natural Resources, Chapter NR 809, "Safe Drinking Water" establishes minimum standards for the quality of drinking water supplied by public systems. This Code sets primary and secondary standards. Primary standards protect public health, while secondary standards were established to avoid potential nuisance conditions. Primary standards set maximum contaminant levels (MCLs) for inorganic contaminants, synthetic organic contaminants, volatile organic compounds (VOCs), organic contaminants, microbiological contaminants, radioactivity, and disinfection byproducts. Secondary standards set levels for inorganic chemicals and physical properties which, if exceeded, may be objectionable to people, but do not pose a risk to health.

Review of the most recent water quality test results available from the Wisconsin Department of Natural Resources (WDNR) indicated that no primary contaminates have exceeded the MCLs permitted by NR 809.

However, the most recent test available (10/26/99) for manganese indicated a concentration of 140 ug/l = 0.14 mg/l. The secondary standard for manganese established by subchapter NR 809.60(2) of the Wisconsin Administrative Code is 0.05 mg/l, so the secondary standard for manganese was exceeded. Therefore, the manganese concentration in the water may be objectionable to some people, but does not pose a health risk according to Chapter NR 809 of Wisconsin Administrative Code.

Finally, from the most recent test results available, hardness of the well water was 290 mg/l as $CaCO_3$.

VI. FUTURE DEVELOPMENT AND PROJECTED WATER DEMANDS

A. Study Area

The study area includes the area within the DeForest North existing service area (2006 corporate boundaries), the DeForest South existing service area (2006 corporate boundaries), and potential future growth areas adjacent to the current corporate boundaries. These areas are outlined on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix***.

B. Future Demands

Future water demands can be estimated by taking an inventory of the intended land uses within planned developments and anticipated growth areas within and adjacent to the Village. The anticipated number of residential dwelling units, the acres of commercial land use, and the acres of industrial land use can then be multiplied by historical and typical factors to project the future water demands. The factors used in the water demand estimates are as follows:

- 2.74 persons per dwelling unit per Census 2000 data.
- 57.17 gallons per person per day based on the year 2005 residential water sales.
- 800 gallons per day per acre for office/commercial land use.
- 1,000 gallons per day per acre for industrial land use.
- 1.99 highest maximum day/average day ratio over the past five years.
- 2.0 peak hour/maximum daily demand ratio.

It should be noted that the projected and actual water demands will vary. Factors such as the strength of the residential housing market, which has experienced a slow down in the year 2006, can significantly effect future water demands. Also, water usage from commercial/industrial areas can vary significantly. For example, a warehouse would have very little water demand compared to a food processing plant. These projections are intended to give a conservative estimate of the future demands.

1. Village of DeForest North

There are four major developments within the Village which have received some form of review and/or approvals from Village Committees. These developments are Heritage Gardens, Conservancy Place, Chapel Green, and Country View Estates. Development plans for these developments suggest that build-out will occur over the next 12 years (2006-2018). Various phases of infrastructure construction have occurred in Heritage Gardens, Conservancy Place, and Chapel Green; however,

future phases remain. Country View Estates remains in the planning phase. These developments will add residential dwelling units and commercial area to the Village.

The Village's Comprehensive Plan, adopted on August 7, 2006, includes a Growth Phasing Map which indicates future potential growth areas within and adjacent to the Village boundaries. This map shows future potential growth areas on the west, northwest, northeast, east, and southwest sides of the Village. The Growth Planning Map also shows that the growth areas are expected to develop in three phases: Phase 1 (2006-2012), Phase 2 (2013-2019), and Phase 3 (2020-2025). For the purpose of this study, growth was evenly distributed among each year within the phases. The Comprehensive Plan also includes a Future Land Use Map. This map was used to determine future land use within each of the potential growth areas. Residential densities were obtained from the Comprehensive Plan and were utilized to estimate the number of future dwelling units for residential areas within the growth areas.

The ***Appendix*** includes several detailed tables that break down the projected future water demands within each of the planned developments and growth areas. A summary of these tables includes the following:

- ***Tables 15-18*** project future water demand for each of the known planned developments on a year-by-year basis.
- ***Table 19*** is a summation of the projected water demands from the currently planned developments.
- ***Table 20*** summarizes the future water demand generated by development within the future growth areas.
- ***Table 21*** (on the following page) is a summation of the existing water use and the projected water use in planned and future development areas.

Table 21 - Future DeForest North
Average Daily Demands & Peak Hourly Demands
Including Planned Developments
& Anticiapted Growth Areas

Year	Total Projected Average Daily Demand (gal./day)	Total Projected Peak Hourly Demand (gal./min.)
2006	851,090	2,098
2007	946,500	2,362
2008	1,030,933	2,595
2009	1,116,282	2,831
2010	1,212,491	3,097
2011	1,306,814	3,358
2012	1,390,160	3,588
2013	1,498,378	3,887
2014	1,611,569	4,200
2015	1,733,933	4,538
2016	1,818,307	4,771
2017	1,902,853	5,005
2018	1,975,506	5,206
2019	2,048,160	5,407
2020	2,085,550	5,510
2021	2,122,940	5,613
2022	2,160,330	5,717
2023	2,197,720	5,820
2024	2,235,110	5,923
2025	2,272,500	6,027

2. Village of DeForest South

One planned development has received approvals and is expected to be constructed within the DeForest-South corporate boundaries over the next ten years (2007-2017). This development, Savannah Brooks, will add residential dwelling units and commercial area to DeForest South. Construction of Savannah Brooks will be phased per the Final Development Plan (1/06) approved by the Village.

The Growth Phasing Map, found in the Village's Comprehensive Plan, shows areas to the west, southwest, north central, east central, and east that have potential for future growth. This map also indicates that the growth areas are expected to develop in three phases: Phase 1 (2006-2012), Phase 2 (2013-2019), and Phase 3 (2020-2025). The Future Land Use Map found in the Comprehensive Plan was used to determine future land use in the growth areas. Residential densities were utilized from the Comprehensive Plan to project the future number of dwelling units within the growth areas.

The ***Appendix*** includes two detailed tables that break down the projected water demands from the planned development and growth areas.

- ***Table 22*** shows projected water demands from Savannah Brooks.
- ***Table 23*** shows the projected water demands from the growth areas.
- ***Table 24*** (on the following page) shows the sum of the existing water use and the demands from the planned developments and growth areas.

Table 24 - Future DeForest South
Average Daily Demands & Peak Hourly Demands
Including Planned Developments
& Anticiapted Growth Areas

Year	Total Projected Average Daily Demand (gal./day)	Total Projected Peak Hourly Demand (gal./min.)
2006	82,841	491
2007	127,722	616
2008	173,933	744
2009	226,881	891
2010	279,828	1,038
2011	330,031	1,178
2012	379,604	1,315
2013	455,991	1,528
2014	532,378	1,740
2015	609,535	1,954
2016	682,913	2,158
2017	756,290	2,362
2018	829,667	2,566
2019	903,044	2,769
2020	930,867	2,847
2021	958,691	2,924
2022	986,514	3,001
2023	1,014,337	3,079
2024	1,042,161	3,156
2025	1,069,984	3,233

VII. EVALUATION OF POTENTIAL FUTURE WATER SUPPLY AND DISTRIBUTION SYSTEM FACILITIES

A. DeForest North

1. Wells

Engineering Design Criterion #1 (previously mentioned on page 15) recommends that the well capacity meets the peak hourly demand. The peak hourly demand for the year 2025 from the existing Village, planned developments, and future growth areas is estimated to be 6,027 gpm, as indicated in ***Table 21***.

The current year 2006 combined capacity of all the wells is 2,750 gpm. This well capacity would be 3,277 gpm less than the estimated 6,027 gpm for the year 2025 peak hourly demand.

The Village's firm well capacity (capacity with largest well out of service) would be 1,150 gpm, which is 4,877 gpm less than the estimated 6,027 gpm for the peak hourly demand for the year 2025.

The anticipated capacity of a new well is approximately 1,500 gpm. Therefore, two new wells will be needed to supply the year 2025 peak hourly demand as required by Engineering Design Criterion No. 1 assuming all wells are available. This also assumes water demands are in line with projections. Actual demands will vary.

2. Storage Facilities

Engineering Design Criterion No. 2 would require a storage volume for the year 2025 as follows:

Peak Hourly Demand	6,027 gpm
Fire Flow	+3,500 gpm
Well Capacity	-6,027 gpm
Rate Required from Storage	3,500 gpm

Volume Required from Storage = (3,500 gpm)(3 hrs)(60 min/hr)
= 630,000 gallons

The "effective" water storage among the two elevated tanks is 720,000 gallons, as mentioned previously. Therefore, the Village has an adequate amount of storage to meet Criterion No. 2 in the year 2025 assuming the well capacity meets the peak hourly demand as required by Criterion No. 1.

Engineering Design Criterion No. 3 recommends that the average daily demand is available from total storage. The storage volume recommended by this criterion for the year 2025 is 2,272,500 gallons. The existing storage facilities provide 900,000 gallons of total storage. Therefore, the Village will need to add 1,372,500 gallons of storage to meet Criterion No. 3 for the year 2025.

Growth of the future service areas will occur over an extended period of time. If the amount of elevated storage exceeds the average daily demand, freezing problems can occur in the winter months. Therefore, storage facilities should be added gradually to keep pace with growth in the future service areas. Spreading storage throughout the system improves the ability to provide fire flows. The probability of a fire occurring close to a storage tank increases as the number of storage facilities in the system increases.

Finally, calculations similar to those above were performed using the total projected average daily and peak hour demands for each year and the three previously mentioned Engineering Design Criteria to determine the recommended additional well and storage capacity for each year as shown in ***Table 25***.

Table 25 - Estimated DeForest North Additional Well & Storage Capacity Required Including Planned Developments & Anticipated Growth Areas

Year	Recommended Additional Storage Volume (gallons)	Recommended Additional Well Capacity (gpm)	Recommended Number of Additional Wells	Total Number of Wells (Existing + Recommended)
2006	0	0	0	3
2007	46,500	0	0	3
2008	130,933	0	0	3
2009	216,282	81	0	3
2010	312,491	347	0	3
2011	406,814	608	0	3
2012	490,160	838	1	4
2013	598,378	1,137	1	4
2014	711,569	1,450	1	4
2015	833,933	1,788	1	4
2016	918,307	2,021	1	4
2017	1,002,853	2,255	1	4
2018	1,075,506	2,456	2	5
2019	1,148,160	2,657	2	5
2020	1,185,550	2,760	2	5
2021	1,222,940	2,863	2	5
2022	1,260,330	2,967	2	5
2023	1,297,720	3,070	2	5
2024	1,335,110	3,173	2	5
2025	1,372,500	3,277	2	5

Footnotes: Recommendations are in addition to the current total storage volume of 900,000 gallons, current well capacity of 2,750 gpm, and in addition to current number of wells (3). A new well = 1,500 gpm.

3. Distribution System

The distribution system (pipe network) was analyzed through the use of a computer program called WaterCAD®. This program is a computer model that simulates the Village's water distribution system. Through input of various factors such as pipe lengths, pipe diameters, elevations, storage facility volumes and well capacities, the model reflects real life flow conditions through the distribution system. Field fire flow tests were performed and were compared to the computer simulated fire flow results. The computer model was calibrated by changing the roughness coefficient (factor of friction in the pipes) such that the model simulated fire flow results matched those observed in the field.

Once this model was calibrated, the flows and pressures in the system were analyzed. The program is also capable of analyzing a water system for extended period simulations such as a fire flow condition where the water levels in the system's storage reservoirs are considered. It was through this process that fire flow conditions were modeled to project the available fire flows at various locations throughout the system. By changing pipe sizes under proposed conditions, this program was used to easily evaluate fire flows available with different pipe sizes allowing one to choose the appropriate size of main based on the desired fire flow.

It should be mentioned that the model is used as a tool to compare options for proposed improvements and is used to determine which options are the most beneficial.

a. Static Pressures

Prior to simulating demands, the static pressures in the system should be evaluated. The static pressure in the distribution system should be no less than 35 psi per subchapter NR 811.63(1) of the Wisconsin Administrative Code. The maximum static pressure should not exceed 100 psi as required by subchapter NR 811.60(1). The following ***Table 26*** indicates the range of static pressures within the system.

Table 26 – Highest & Lowest Static Pressures – DeForest North

Location	Ground Elevation	Elevated Tank High Water Level Elevation	Static Pressure (psi)
Pocahontas Lane and Shawnee Court (Highest Elevation in System)	1004.56	1089.00	37
East end of Prairie Fire Court (Lowest Elevation in System)	887.99	1089.00	87

Assuming the tower level is at the high water level elevation of 1089.00, any areas with elevations over 1008.00 will have static pressures less than 35 psi minimum, and areas below 858.00 will have pressures above 100 psi.

b. Improvements

i. On-going Improvements

There is a small quantity (10%) of 4-inch diameter water main in the system. New water mains should have a minimum diameter of 6 inches. A minimum diameter of 8 inches is recommended. The existing 4-inch diameter mains should be replaced with 8-inch diameter piping as the existing streets are reconstructed. (See the ***Water Supply and Distribution System Map*** and ***Figures 2 and 3*** in the ***Appendix***.)

There is 4-inch water main on North Street between the railroad tracks and Stevenson Street. This 4-inch main is paralleled by 10-inch main and therefore, does not need to be replaced anytime soon. (See ***Figure 6*** in the ***Appendix***.)

Every effort should be made to connect "dead-end" mains to other mains when expansion of the system occurs. When new mains are needed to serve developing areas, they should be planned to eliminate existing "dead-end" mains and prevent new ones from occurring.

ii. Short Term Improvements

A grid of large (10-inch or more) diameter mains should be established between wells and storage. The grid should also be established to connect areas requiring large demands and fire flows (such as commercial and industrial areas) to the wells and storage. This will provide more flow and residual pressure during periods of large demands and/or fire flow conditions.

The short term distribution system improvements include replacing existing small mains with larger mains to provide a grid of looped, large diameter water main between the wells, storage and areas requiring improved fire flows and areas of high demand.

Locations and approximate length of the proposed improvements are listed in ***Table 27*** below and are shown in ***Figures 4 and 5*** in the ***Appendix***.

Table 27 – Water Distribution System Short Term Improvements – DeForest North

Location	Approximate Length (ft)	Construction Type
Main Street – Commerce Street to Pleasant Street	330	Replace 4" with 10" (road restoration)
South Street – Riverwood Bend to Hill Street	2,015	Replace 6" and 8" with 10" (road restoration)
Main Street – South Street to Murray Street	350	Replace 6" with 10" (road restoration)
Murray Street – Main Street to Market Street	480	Replace 8" with 10" (road restoration)

iii. Long Term Improvements

The Village has expressed interest in the feasibility of serving potential growth in west, northwest, northeast, east, and southeast areas of DeForest North. These areas are indicated on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix***.

The Master Plan Map also shows water main needed to supply the recommended fire flow for the land use found in each growth area and to maintain the grid of large diameter mains. The water system model was used to verify water main sizes.

B. DeForest South

1. Wells

Engineering Design Criterion #1 (previously mentioned on page 15) recommends that the well capacity meets the peak hourly demand. The peak hourly demand for the year 2025 from the existing DeForest South, proposed developments and future growth areas is estimated to be 3,233 gpm, as indicated in ***Table 24***.

Assuming Well No. 5 is on-line, the well capacity would be 2,310, which is 923 gpm less than the estimated 3,233 gpm for the year 2025 peak hourly demand.

DeForest South's firm well capacity (capacity with largest well out of service) would be 810 gpm, which is 2,423 gpm less than the estimated 3,233 gpm for the peak hourly demand for the year 2025.

The anticipated capacity of a new well is approximately 1,500 gpm. Therefore, one new well in addition to Well No. 5 will be needed to supply the year 2025 peak hourly demand as required by Engineering Design Criterion No. 1 assuming all wells are available.

2. Storage Facilities

Engineering Design Criterion No. 2 would require a storage volume for the year 2025 as follows:

Peak Hourly Demand	3,233 gpm
Fire Flow	+3,500 gpm
Well Capacity	-3,233 gpm
Rate Required from Storage	3,500 gpm

Volume Required from Storage = (3,500 gpm)(3 hrs)(60 min/hr)
= 630,000 gallons

The "effective" water storage of the elevated tank is 160,000 gallons, as mentioned previously. Therefore, an additional 470,000 gallons of storage would be needed to meet Criterion No. 2 in the year 2025, assuming the well capacity meets the peak hourly demand as required by Criterion No. 1.

Engineering Design Criterion No. 3 recommends that the average daily demand is available from total storage. The storage volume recommended by this criterion for the year 2025 is 1,069,984 gallons. The existing storage facility provides 200,000 gallons of total storage. Therefore, the Village will need to add 869,984 gallons of storage to meet Criterion No. 3 for the year 2025.

Growth of the future service areas will occur over an extended period of time. If the amount of elevated storage exceeds the average daily demand, freezing problems can occur during the winter months. Therefore, storage facilities should be added gradually to keep pace with growth in those areas. Spreading storage throughout the system improves the ability to provide fire flows. The probability of a fire occurring close to a storage tank increases as the number of storage facilities in the system increases.

Finally, calculations similar to those above were performed using the total projected average daily and peak hour demands for each year and the three previously mentioned Engineering Design Criteria to determine the recommended additional well and storage capacity for each year as shown in ***Table 28***.

Table 28 - Estimated DeForest South Additional Well & Storage Capacity Required Including Planned Developments & Anticipated Growth Areas

Year	Recommended Additional Storage Volume (gallons)	Recommended Additional Well Capacity (gpm)	Recommended Number of Additional Wells	Total Number of Wells (Existing + Recommended)
2006	0	0	0	1
2007	0	0	1	2
2008	0	0	1	2
2009	26,881	0	1	2
2010	79,828	0	1	2
2011	130,031	0	1	2
2012	179,604	0	1	2
2013	255,991	0	1	2
2014	332,378	0	1	2
2015	409,535	0	1	2
2016	482,913	0	1	2
2017	556,290	52	1	2
2018	629,667	256	1	2
2019	703,044	459	1	2
2020	730,867	537	1	2
2021	758,691	614	2	3
2022	786,514	691	2	3
2023	814,337	769	2	3
2024	842,161	846	2	3
2025	869,984	923	2	3

Footnotes: Recommendations are in addition to the current total storage volume of 200,000 gallons, current well capacity of 810 gpm, and in addition to current number of wells (1). A new well = 1,500 gpm.

3. Distribution System

The distribution system (pipe network) of DeForest South was analyzed through the use of a computer program called Water CAD ® just as the DeForest North System was. The calibrated model was used to determine future distribution system improvements.

a. Static Pressures

Prior to simulating demands, the static pressures in the system should be evaluated. The static pressure in the distribution system should be no less than 35 psi per subchapter NR 811.63(1) of the Wisconsin Administrative Code. The maximum static pressure should not exceed 100 psi as required by subchapter NR 811.60(1). The following ***Table 29*** indicates the range of static pressures within the existing service area.

Table 29 – Highest & Lowest Static Pressures – DeForest South

Location	Ground Elevation	Elevated Tank High Water Level Elevation	Static Pressure (psi)
Just East of Elevated Tank (Highest Elevation in System)	938.10	1058.00	52
Daentl Drive intersection – south of 51/I90/94 interchange (Lowest Elevation in System	858.10	1058.00	87

Assuming the tower level is at the high water level elevation of 1058.00, any areas with elevations over 977.00 will have static pressures less than 35 psi minimum, and areas below 827.00 will have pressures above 100 psi.

The Village has concerns with providing water service to three particular high elevation locations within DeForest South. These areas are labeled as high elevation area "A", "B", and "C" on the Water Supply and Distribution System Master Plan Map (see ***Appendix***). Location "A" has 0.83 acres with an average elevation of 964.00. If served by the DeForest South system, the static pressure at this location would be 40 psi which is greater than the

WDNR minimum required static pressure of 35 psi. Location "B" has 0.09 acres with an average elevation of 976.00. If it were served by the DeForest South system, the static pressure at this location would be 36 psi, which is greater than the 35 psi minimum. Location "C" has 5 acres between elevation 977.00 and 980.00. This area would have static pressures less than the minimum required 35 psi. Locations "B" and "C" are in areas scheduled to be "planned neighborhood" per the Village's Future Land Use Map. Location "A" is in an area to be "office/research" per the Village's Future Land Use Map. If these areas would be served by the DeForest North System, they would have static pressures of 54 psi, 49 psi, and 49 psi to 47 psi for Locations A, B, and C respectively.

b. Improvements

i. On-going Improvements

New water mains should have a minimum diameter of 6 inches, per Wisconsin Administrative Code NR 811. A minimum diameter of 8 inches is recommended for all water mains, except 6" hydrant leads would be acceptable.

Every effort should be made to connect "dead-end" mains to other mains when expansion of the system occurs. When new mains are needed to serve developing areas, they should be planned to eliminate existing "dead-end" mains and prevent new ones from occurring.

ii. Long Term Improvements

A grid of large (10-inch or more) diameter mains should be established between wells and storage. The grid should also be established to connect areas requiring large demands and fire flows (such as commercial and industrial areas) to the wells and storage. This will provide more flow and residual pressure during periods of large demands and/or fire flow conditions.

Future growth areas are identified on the Future Land Use Plan around the perimeter of DeForest South. These areas are indicated on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix***.

The Master Plan Map also shows water main needed to supply the recommended fire flow for the land use found in

each growth area and to establish a grid of large diameter mains. The water system model was used to verify water main sizes.

C. Well No. 5

As previously mentioned in Section IV, Well No. 5 has been constructed in DeForest South, but a pumphouse has not yet been built for this well. As was also previously mentioned, the DeForest South system has only one well and therefore, lacks firm well capacity. Bringing this well on-line would provide firm well capacity, increase system reliability, and improve available fire flow for the DeForest South System.

D. Interconnection of the DeForest North and DeForest South Systems

Ultimately, the Village intends to connect the North and South Water Systems. The interconnection would allow each of the systems to utilize the well and storage facilities of the other. This would supplement each system's ability to meet the future demands. The recommended steps to move toward the interconnection of the systems are as follows:

1. Construct a pumphouse at Well No. 5 and bring this facility on-line.
2. Acquire additional land adjacent to the well site to accommodate a future water storage ground reservoir.
3. Establish a pressure zone in DeForest South for areas that will ultimately operate on the North System hydraulic grade.

The interconnection would provide the following:

1. Well No. 5 would supplement both the North and South Systems.
2. A future reservoir at Well No. 5 would supplement both the North and South Systems and be located in the middle of the DeForest South future growth area.
3. Existing facilities in Deforest North would supplement DeForest South.
4. Existing facilities in Deforest South would NOT supplement DeForest North.

One of the obstacles in completing the interconnection is the difference in the North and South elevated tanks' operating elevations. The North System gains its static pressure from the elevated tanks which operate at an overflow elevation of 1091. The South System elevated tank operates at an overflow of 1060. To avoid overflowing the South elevated tank, the North elevated tanks would have to be kept at elevation 1060 or below. This would eliminate the majority of the storage capacity available in the North elevated tanks as well as reduce the static pressure available to customers in DeForest North.

Another obstacle to overcome is the distance of undeveloped land that currently exists between the systems. Currently, there exist approximately 2.5 miles on the east side and 2 miles on the west side between the North and South Systems (Heritage Gardens to Well No. 5). Concerns with the distance between the two systems include the following:

- Poor water quality due to long detention times in the main.
- The lack of dedicated right-of-way or easements to install the water main.
- Unplanned routes which could result in future changes being required due to location and elevation.
- The need to install oversized facilities in order to overcome friction losses created by a single line of transmission.
- The cost of installing the water main without development to fund the expense.

The difference in pressure caused by the differing elevated tank operating elevations can be overcome through the use of pressure control valves. These valves would allow the DeForest North System elevated tanks to remain at their higher operating levels. The valves would be set such that if the pressure in the South System dropped below a minimum set pressure, the valves would open and flow from the North System would increase the pressure in the South. When the minimum pressure was obtained in the South, the valves would close. Under this scenario, the existing elevated tank and Well No. 1 in DeForest South could not contribute to DeForest North.

The most efficient way to overcome the distance of undeveloped land between the two systems is to plan for the interconnection to occur over time as the land between the systems develop. This would address all of the concerns that are created due to the distance between the systems as follows:

- Development would create the water demand that would eliminate the problem of long detention times.
- Right-of-way and easements would be dedicated and constructed providing the needed route for the water main including establishing a final elevation.
- Water mains may be of reduced size as planned development would include looping of the water mains avoiding a long, single line scenario.
- The installation would be primarily developer funded.

While this is the ideal scenario, it is understood that it is unlikely that all the lands between the two systems will develop in the time frame recommended for the interconnection. Therefore, establishing a timeline for interconnecting the two systems is important such that the interconnection is completed in the most efficient manner to provide the necessary benefits to the overall water system while minimizing the concerns with the items noted above associated with the distance between the two systems.

The timing of the interconnection should be determined by analyzing when the interconnection will provide the most benefit to the Village in which the facilities in each separate system would otherwise require additional facilities. Currently, the North System has adequate storage (elevated tanks) available. There is more than sufficient storage capacity to meet fire flow recommendations. The storage capacity related to meeting the average daily demand is also sufficient, but at the low end. Well capacity is a point where the total capacity is sufficient; however, the "firm" capacity (largest well off line) is below the recommended capacity.

In DeForest South, the storage capacity is almost excessive when it comes to supplying the average daily demand; however, it is short when it comes to providing recommended fire flows. Well capacity is sufficient for providing the peak hourly demand. Because there is only one well operating in DeForest South, there is no "firm" capacity. The addition of Well No. 5 will provide DeForest South with adequate "firm" well capacity as well as supplement the deficiency in available fire flow, but not overcome it completely.

Using this information, it can be concluded that the North System would benefit from additional supply (well). The South System would benefit from additional storage. Interconnecting the two systems would provide each of the systems with the components that they are currently deficient in. From this point, the obstacles associated with the distance between the two systems need to be weighed in order to determine a time for the interconnection.

To determine a recommended time line for interconnecting the systems, we looked at the current needs of each system as well as the future needs of the systems based on the projected demands. The current status of each system is as follows:

1. North

   Wells:
   Total Capacity: 731 gpm excess
   Firm Capacity: 869 gpm shortage

   Storage:
   Capacity for Fire Flow: 498,500 gpm excess
   Capacity for Avg. Daily Demand: 45,285 gpm excess

2. South

   Wells:
   Total Capacity: 408 gpm excess
   Firm Capacity: N/A (408 gpm excess w/ Veil No. 5)

Storage:
Capacity for Fire Flow: 396,560 gpm shortage (126,500 gpm shortage with Well No. 5)
Capacity for Avg. Daily Demand: 149,216 gpm excess

Adding storage and well facilities requires balancing the need to maintain an adequate system to not adversely affect the health and safety of the water system customers, with being fiscally responsible and not creating problems with having too much capacity on hand. As such, planning for new facilities should begin as the adequacy of the system begins to drop with the understanding that new facilities will be most efficiently added when an amount is needed such that an efficiently sized facility can reasonably be added. For example, a typical well will provide 1,000 to 1,500 gpm, so a new well should be on-line when the system's well capacity is 500 to 700 gpm deficient. Likewise, a storage facility should be constructed when the demand is such that an efficiently sized facility can be added with the appropriate amount of demand to utilize the storage.

For the purposes of analyzing the Village's total water system, it is assumed that an efficient storage facility would be 750,000 to 1,000,000 gallons and would serve both the North and South. Based on the combined projected demands of DeForest North and DeForest South as shown in ***Table 30***, on page 45, additional storage in the amount of 750,000 to 1,000,000 gallons should be in place by the end of the year 2012 to meet the anticipated year 2013 average daily demand of 854,369 gpd. Planning and design efforts should begin at least two years prior in the year 2010. An additional reservoir should be in place by the year 2019.

It is doubtful FAA approval would be granted for a new elevated storage tank due to the proximity of the Dane County Regional Airport. A water storage ground reservoir should be constructed at the Well No. 5 site in DeForest South. It could be filled by Well No. 5 and booster pumps and piping could be installed at the reservoir such that water could be pumped to DeForest North and/or DeForest South. The new reservoir could be shared by DeForest North and DeForest South. This configuration would increase the available storage for fire flow in DeForest South and eliminate the stagnation concerns since DeForest North would also utilize the reservoir. Another benefit of the location of this reservoir is that it would be located in the middle of the DeForest South future growth area.

Based on the combined projected peak hourly demand of DeForest South plus DeForest North, and the current combined well capacity, new well facilities should be on-line in the years 2012 (Well No. 5), 2015, 2018, and 2022 as shown in ***Table 31*** on page 46.

The ***Water Supply and Distribution System Master Plan Map***, found in the ***Appendix***, shows two conceptual options to complete the interconnection. One option includes a large diameter main that would follow USH 51 on the east side of the Village. A second option is a north-south connection in the vicinity of I90/94 on the west side of the Village.

To analyze the options, the water system was modeled using the WaterCAD computer program. The available fire flow at a number of locations in DeForest South was modeled under the east, west and combined interconnection scenarios. The modeling results indicate an average 25% increase in the available fire flow with the east interconnection, a 42% increase with the west side interconnection and a 63% increase with both connections These comparisons are made to the available fire flow without the interconnection. ***Table 32***, on page 47, shows the results of the system modeling.

It should be noted that the computer simulated available fire flow results are based on a theoretical calculations which assume the pressure at the hydrant drops to 20 psi. Therefore, this fire flow rate should not be expected from simply opening the hydrant, but would require a pumper truck to connect to the hydrant. Even then, the theoretical calculated flow may not be realized in the field due to restrictions from the hydrant lead pipe (6" diameter) and connecting hose. The main purpose of the water system computer model is to compare the relative benefits of one alternative to another, more so than giving a completely accurate estimate of actual field results.

The water system computer model simulations indicate a west side interconnection would improve the available fire flows in DeForest South more than the east side connection. However, construction of a booster station would be required at the west side interconnection so that the DeForest South system could contribute to DeForest North. It was previously recommended that a water storage ground reservoir with booster pumps to supply both the DeForest North and DeForest South systems be constructed at Well No. 5. This reservoir with booster pumps would provide storage for DeForest North and DeForest South. In order to avoid the cost of the booster station on the west side interconnection, yet allow the reservoir at Well No. 5 to contribute to both systems, it is recommended that the Village pursue the east side interconnection first to obtain the most benefit for both the DeForest North and DeForest South systems with the least cost. The village could then pursue the west side interconnection with a less expensive pressure control valve, rather than the booster station, if further improvements in the available fire flow in DeForest South were desired.

Table 30 - Estimated DeForest South + Deforest North Additional Storage Capacity Required Including Planned Developments & Anticipated Growth Areas

Year	DeForest South Recommended Additional Storage Volume (gallons)	DeForest North Recommended Additional Storage Volume (gallons)	DeForest North + South Recommended Additional Storage Volume (gallons)
2006	0	0	0
2007	0	46,500	46,500
2008	0	130,933	130,933
2009	26,881	216,282	243,162
2010	79,828	312,491	392,319
2011	130,031	406,814	536,844
2012	179,604	490,160	669,764
2013	255,991	598,378	854,369
2014	332,378	711,569	1,043,948
2015	409,535	833,933	1,243,469
2016	482,913	918,307	1,401,219
2017	556,290	1,002,853	1,559,142
2018	629,667	1,075,506	1,705,173
2019	703,044	1,148,160	1,851,204
2020	730,867	1,185,550	1,916,417
2021	758,691	1,222,940	1,981,631
2022	786,514	1,260,330	2,046,844
2023	814,337	1,297,720	2,112,057
2024	842,161	1,335,110	2,177,271
2025	869,984	1,372,500	2,242,484

Footnotes: Recommendations based on average daily demand available from total storage.

Table 31 - Estimated DeForest South + Deforest North
Additional Well Capacity Required
Including Planned Developments & Anticipated Growth Areas

Year	DeForest North + South Peak Hourly Demand (gpm)	Combined DeForest North + South Well Capacity (gpm)	Recommended Added Well Capacity (gpm)	DeForest North + South Peak Hourly Demand less Well Capacity (gpm)
2012	4,903	5,060		-157
2013	5,415	5,060		355
2014	5,940	5,060		880
2015	6,492	6,560	1,500	-68
2016	6,929	6,560		369
2017	7,367	6,560		807
2018	7,771	8,060	1,500	-289
2019	8,176	8,060		116
2020	8,357	8,060		297
2021	8,537	8,060		477
2022	8,718	9,560	1,500	-842
2023	8,899	9,560		-661
2024	9,079	9,560		-481
2025	9,260	9,560		-300

Footnotes: Assumes Well No. 5 located in DeForest South would be pumping to Deforest North & DeForest South by the year 2012.

Table 32 - Comparison of Computer Simulated Available Fire Flow for DeForest North/South Systems Interconnection

Test Number	Computer Model Junction Number	Without Interconnection Fire Flow (gpm)	East Side Interconnection Fire Flow (gpm)	West Side Interconnection Fire Flow (gpm)	Both East & West Side Interconnections Fire Flow (gpm)
1	39	4,392	5,935	5,606	6,874
2	55	3,353	3,448	6,188	6,226
3	59	4,477	6,134	5,688	7,050
4	68	3,647	5,430	4,680	6,019
5	82	4,502	4,868	6,217	7,559
6	90	2,406	2,437	5,084	5,095
7	98	4,605	5,610	5,976	6,285
8	104	4,269	5,750	5,366	6,441
	Average:	3,956	4,952	5,601	6,444
	Percent Improvement:		**25%** [1]	**42%** [1]	**63%** [1]

Footnotes: (1) As compared to without an interconnection

E. Distribution System Looping

The Village has seen substantial growth through recent years. Much of this growth has occurred and will continue to occur on the fringes of the Village Corporate Boundary, and as such, on the fringes of the water distribution system. With development on the fringes, the need to extend water service to the developments has created a condition where long dead end lines extend service to new customers. Dead end lines are always discouraged from an engineering standpoint for the following reasons:

- They are inefficient as larger mains are required to obtain the same amount of flow and pressure due to high friction losses compared to a grid.
- Long dead end lines can create extended detention times resulting in poor water quality.
- Dead end lines are unreliable due to lack of a secondary feed should a break occur.

Setting a single criteria to require looping of water mains is difficult in that there can be several factors which complicate looping of the mains including financial, logistical, property ownership, municipal jurisdictions, and environmental considerations. One has to weigh all considerations in determining the timing for completing a loop in the water main. This could include the number of customers and types of customers who would be affected by the potential disruption in service. Also, considerations include the likelihood that an interruption will occur and the timing required to restore the connection, as well as the likelihood that an interruption could occur at a critical time such as during a fire. Interruptions in water service to a healthcare facility would be more significant than interruption to residential customers. An interruption during a fire condition could be more substantial depending on the type of buildings as well as other alternatives for fighting a fire.

Because of the multitude of considerations, the following are recommended guidelines for requiring looping of water mains. This does not apply to short dead ends where water service is available at distances of less than 800'.

1. It is recommended that looping occurs within five years from the onset of a new development where a significant loop is ultimately required.
2. All new water mains should be looped. Avoid all dead end mains as much as practical.
3. A loop should be considered immediately when the potential loss of service could significantly affect the health or well being of customers such as in a health care facility or similar.

These are intended to serve as guidelines while considering all factors that may affect the looping of the water main. These guidelines do not cover looping of short segments of water main where future extensions will occur or where looping would create an undesirable or unnecessary condition in the future.

F. Additional Fire Fighting Considerations

1. Use of Foam

The DeForest Fire Department utilizes a Class A foam product for assisting in residential, wild, and vehicle fires. This product has been an effective tool utilized by the department to offset normal delays faced by volunteer departments. The Village Board requested that the usefulness of this product be evaluated to determine if the use of this product would result in a lower total water storage recommendation related to providing adequate fire protection.

The amount of water recommended for storage is established by Commercial Risk Services, Inc. Based on the land use, they recommend that an amount of water be on hand through wells and storage facilities for a particular duration. For example, an industrial land use may have a recommendation of achieving a flow of 3,500 gpm for 3 hours. Commercial Risk Services, Inc. gives a community a rating on a point scale based on a number of factors. All of these are used to establish a rating for which insurance rates are then established for the community. The ability to provide the recommended fire flows in given areas affects this rating. A fire department's use of foam is also a factor in the community's overall rating. However, the use of foam affects the rating in the Engine Company Category. A department is given a credit of 6 points for having 15 gallons of foam available on the truck and another 6 points for having 15 gallons in storage at the station for a total of 12 points out of 654 in this category. The ability to provide a given flow for a particular duration is evaluated under a separate category and therefore does not affect the recommendation of water supply/storage on hand as determined by Commercial Risk Services.

2. Hydrant Quick Connections (Stortz)

The Village has had discussions regarding changing the hydrant hose connections to quick connection couplings. These quarter turn couplings developed in Europe and referred to as "Stortz couplings" are available for the 4-1/2 inch pumper truck nozzle, but not for the 2-1/2 inch hose nozzles. The advantage of these couplings is that they reduce the time required to connect the pumper hose to the hydrant. One potential disadvantage is that if other fire departments, which may assist the Village's department, are not equipped with the couplings, they could not connect to the hydrants or would have to screw couplings onto their fire

hoses to connect to the hydrants. Per First Supply of Madison, Waunakee and Deerfield are the only communities that have Stortz couplings installed on fire hydrants. Currently, there are 486 hydrants in the distribution system. First Supply of Madison estimates it would cost approximately $380 to purchase each coupling. Therefore, it would cost approximately $184,680 to add the couplings to each hydrant in the distribution system (not including Village staff time to install them).

G. Opinions of Probable Construction Costs

Opinions of Probable Construction Costs for the potential future system improvements (in year 2006 dollars) are given below. These costs include preliminary estimated engineering fees and 10% contingencies. More extensive preliminary design should be performed in the future to obtain more accurate estimates for each facility.

1. Wells

A well at 860-900 feet deep with well pump, discharge piping and valving, auxiliary natural gas engine, telemetry, update main SCADA panel, motor control center and building: $795,000 to $875,000

2. Storage Facilities

A 500,000 gallon elevated storage tank (110' tall) with telemetry, update to main SCADA panel and cathodic protection system: $1,160,000 to $1,180,000

A 750,000 gallon concrete storage reservoir with telemetry update to main SCADA panel: $955,000 to $1,100,000

3. Distribution System

Typical estimated water main unit costs are as follows:

- Replace with 10" water main (pavement restoration): $105/LF to $110/lf

  These costs include road restoration and hydrants, valves, and water service reconnection at typical spacing. These costs also include preliminary estimated engineering fees and 5% contingencies.

- New 12" water main (lawn restoration): $65/LF to $70/LF

  These costs include hydrants and valves at typical spacing. These costs also include preliminary estimated engineering fees and 5% contingencies.

- New 12" water main (pavement restoration): $114/LF to $120/LF

  These costs include pavement restoration and hydrants and valves at typical spacings. These costs also include preliminary estimated engineering fees and 5% contingencies.

H. Potential Funding Sources

State and federal sources of grant and loan funds can be used to finance water system improvements. The competition for these funds has become increasingly intense. The following paragraphs review potential sources of state and federal grant and loan funds that may be applicable to DeForest.

1. Tax Incremental Financing (TIF)

TIF can be used to pay for water system improvements if those improvements are included in an approved Project Plan. TID #1 was created in 1994 and included water system improvements. The Project Plan should be reviewed to see if an additional water system project may be funded through the TID or if the Project Plan could be amended to accommodate water system improvements. TID #1's equalized value is approximately 16% of the Villages equalized value which means the Village cannot amend the boundary of TID #1 or create a new TID unless TID #1 is terminated or reduced in size to less than 12% of the Village's equalized value.

2. Safe Drinking Water Act (SDWA)

The Department of Natural Resources and Department of Administration administer the SDWA. Communities with deficient water supply and distribution systems are eligible to apply for low interest loan funds. The current rate is 2.475%. Applicants are ranked based on the severity of the water system deficiencies. Intent to Apply forms are due December 31st of each year with final applications due April 30th of each year. To obtain funding, projects must address a severe health and safety issue.

3. Impact Fees

Impact fees are contributions paid by public facility users who create a need for increased capacity in the public facility. The Village can enact impact fees to pay for new, improved, or expanded water facilities caused by new development.

VIII. RECOMMENDATIONS

A. Update the recommended storage and supply facility needs on a bi-annual basis according to actual water usage information. This will provide a balance between the projected demands and actual demands without the need to complete a full Water Supply and Distribution System Study. Update the timing of the needed facilities accordingly.

B. Proceed as soon as possible with the activities required to bring Well No. 5 on-line to the DeForest South System. This will provide reliability to the South System as well as improve the fire fighting capabilities within DeForest South.

C. Pursue acquisition of a one acre (200' x 200' minimum dimensions) site adjacent to the Well No. 5 site for the addition of a future ground reservoir.

D. Budget for and plan the construction of a 750,000 to 1,000,000 gallon water storage ground reservoir adjacent to the Well No. 5 site in the year 2012.

E. Encourage the development of a 12" transmission main through Heritage Gardens and to the south to reduce the distance between the North and South Systems.

F. Budget for and plan the interconnection between the North and South Systems to occur in the year 2012 in conjunction with the construction of the water storage ground reservoir adjacent to the Well No. 5 site. This recommendation is based on the projected additional storage required for DeForest North plus DeForest South falling between 750,000 and 1,000,000 gallons in the year 2013 as shown in ***Table 30***.

G. Budget for and plan the construction of a 750,000 to 1,000,000 gallon reservoir by the year 2019 as shown in ***Table 30***.

H. Budget for and plan adding one new well in each of the years 2015, 2018, and 2022 to be located in DeForest North as shown in Table 31. This recommendation assumes the Well No. 5 pumphouse, a water storage ground reservoir adjacent to Well No. 5, and the system interconnection were constructed by the Year 2012 so that these new wells would provide supply to both DeForest North and DeForest South.

I. The location of the recommended new wells and storage facilities are indicated on the enclosed ***Water Supply and Distribution System Study Master Plan Map*** found in the ***Appendix***. These locations are based on the desire to have well and storage facilities located near where the new demand is occurring. These areas are not intended to be final recommendations and should be re-evaluated as new areas develop. The Village should remain familiar with the recommended locations so when land divisions (subdivision or CSM's) are requested, the Village is able to require the dedication of lands needed for these facilities.

J. Budget for and plan the replacement of 4-inch main on Main Street (Commerce Street to Pleasant View) with 10" main.

K. Budget for and plan the replacement of 4-inch main on Columbia Avenue (Stevenson Street to rail road tracks) with 8-inch main and the installation of new 8-inch main on Durkee Street (Holum Street to Columbia Ave.).

L. Dead end mains are shown on the enclosed ***Water Supply and Distribution System Study Master Plan Map***. They should be eliminated through looping when the opportunities present themselves. It is noted that completing loops in some of these areas may not be practical.

M. Prevent permanent dead end mains from being constructed in the future.

N. Use the following guidelines for looping water main in temporary dead end conditions:

1. It is recommended that looping occurs within five years from the onset of a new development where a significant loop is ultimately required
2. All new water mains should be looped. Avoid all dead end mains as much as practical.
3. A loop should be considered immediately when the potential loss of service could significantly affect the health or well being of customers such as in a health care facility or similar.

O. Replace existing smaller diameter mains with new 10-inch water main to improve fire flow and complete the grid of large diameter mains between the wells, storage, and areas of high demand on the west side of DeForest North. These improvements are referred to as "Short Term Improvements" and are listed in ***Table 27*** and shown on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix***.

P. Plan future developments to include the construction of 10" and 12" mains to accommodate anticipated growth in the existing DeForest North, planned developments, and the future growth areas. These future mains are shown on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix***.

Q. If areas with elevations greater than 1008.00 are to be served by the DeForest North System, a pressure zone system should be created for these areas to ensure available static pressures are greater than the minimum 35 psi allowed by code.

R. Plan future developments to include the construction of 10" and 12" mains to loop the DeForest South System and accommodate growth in the existing DeForest South, planned developments, and future growth areas. These future mains are shown on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix***.

S. Create a pressure zone in Deforest South to include elevations greater than 977.00 and the high elevation locations "A", "B", "C" as shown on the ***Water Supply and Distribution System Master Plan Map*** found in the ***Appendix.*** This pressure zone should be served by booster pumps which pump from a new water storage ground reservoir constructed adjacent to Well No. 5. The Well No. 5 pumphouse should be constructed to supply the reservoir. This pressure zone should also be supplied by the DeForest North System when the interconnection of the DeForest North and DeForest South Systems is made.

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APPENDIX

Appendix G

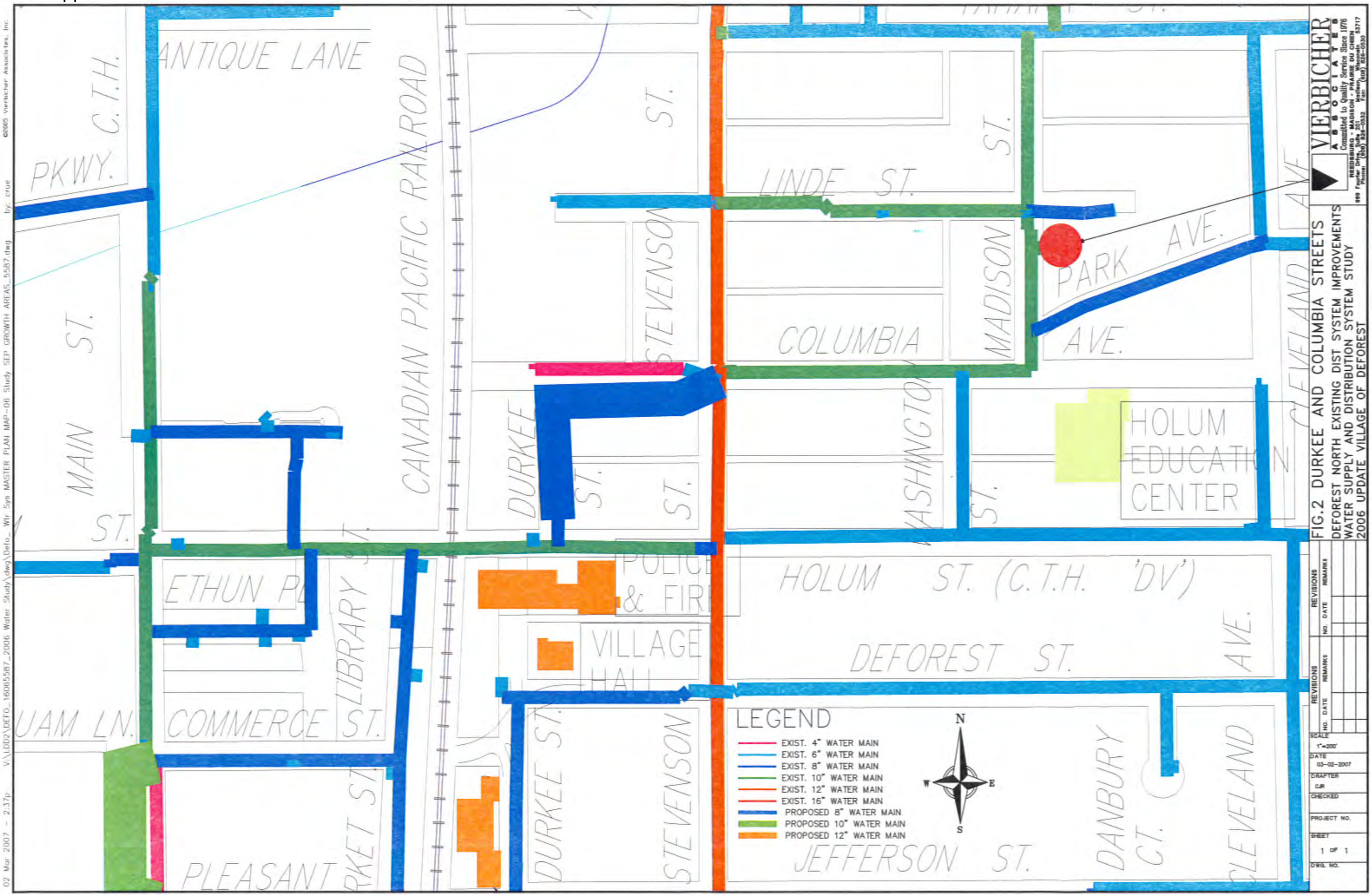

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FIG.2 DURKEE AND COLUMBIA STREETS
DEFOREST NORTH EXISTING DIST SYSTEM IMPROVEMENTS
WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY
2006 UPDATE VILLAGE OF DEFOREST

REVISIONS		
NO.	DATE	REMARKS

REVISIONS		
NO.	DATE	REMARKS

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DATE 03-02-2007
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Appendix G

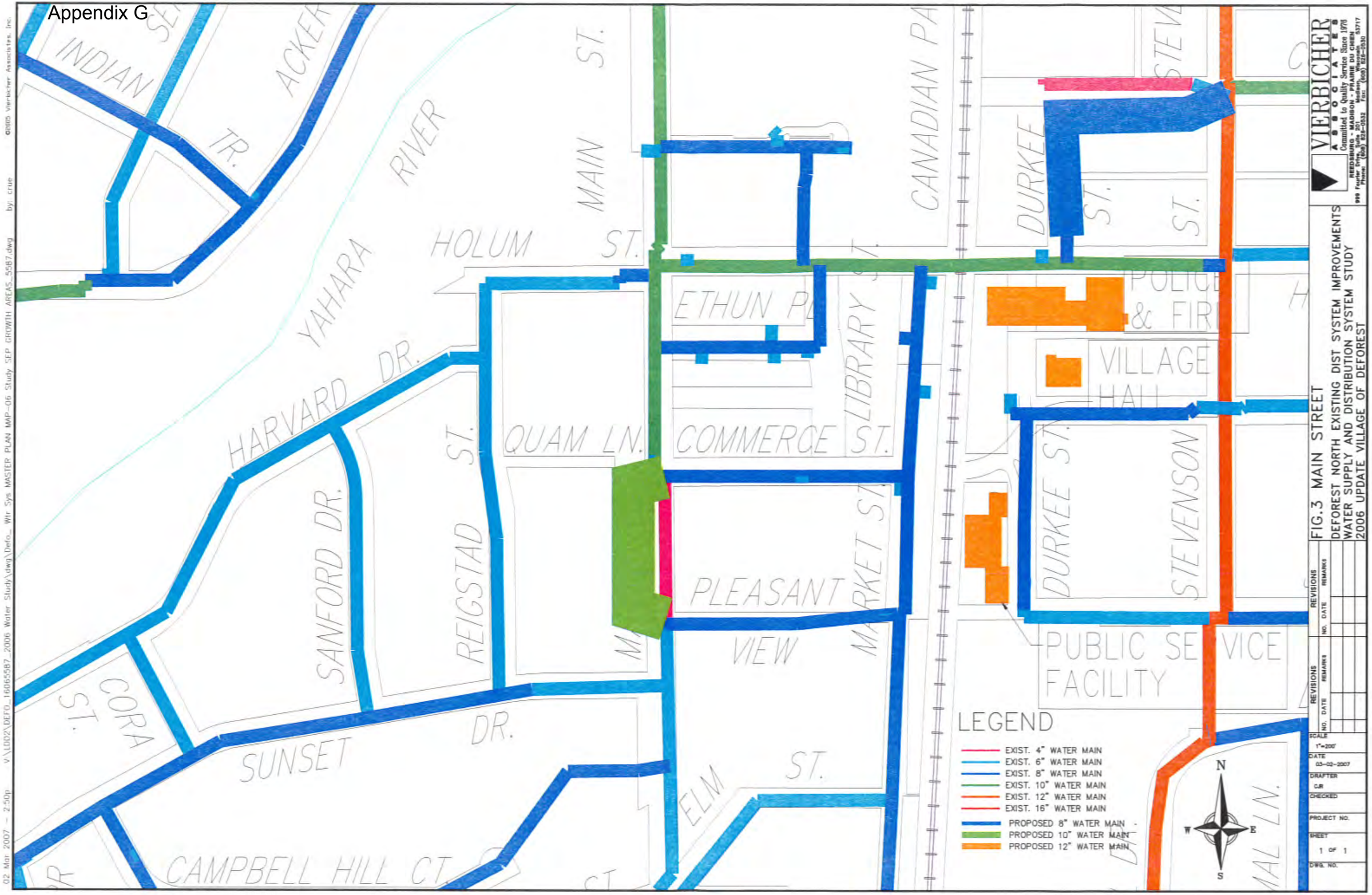

FIG.3 MAIN STREET
DEFOREST NORTH EXISTING DIST SYSTEM IMPROVEMENTS
WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY
2006 UPDATE VILLAGE OF DEFOREST

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Appendix G

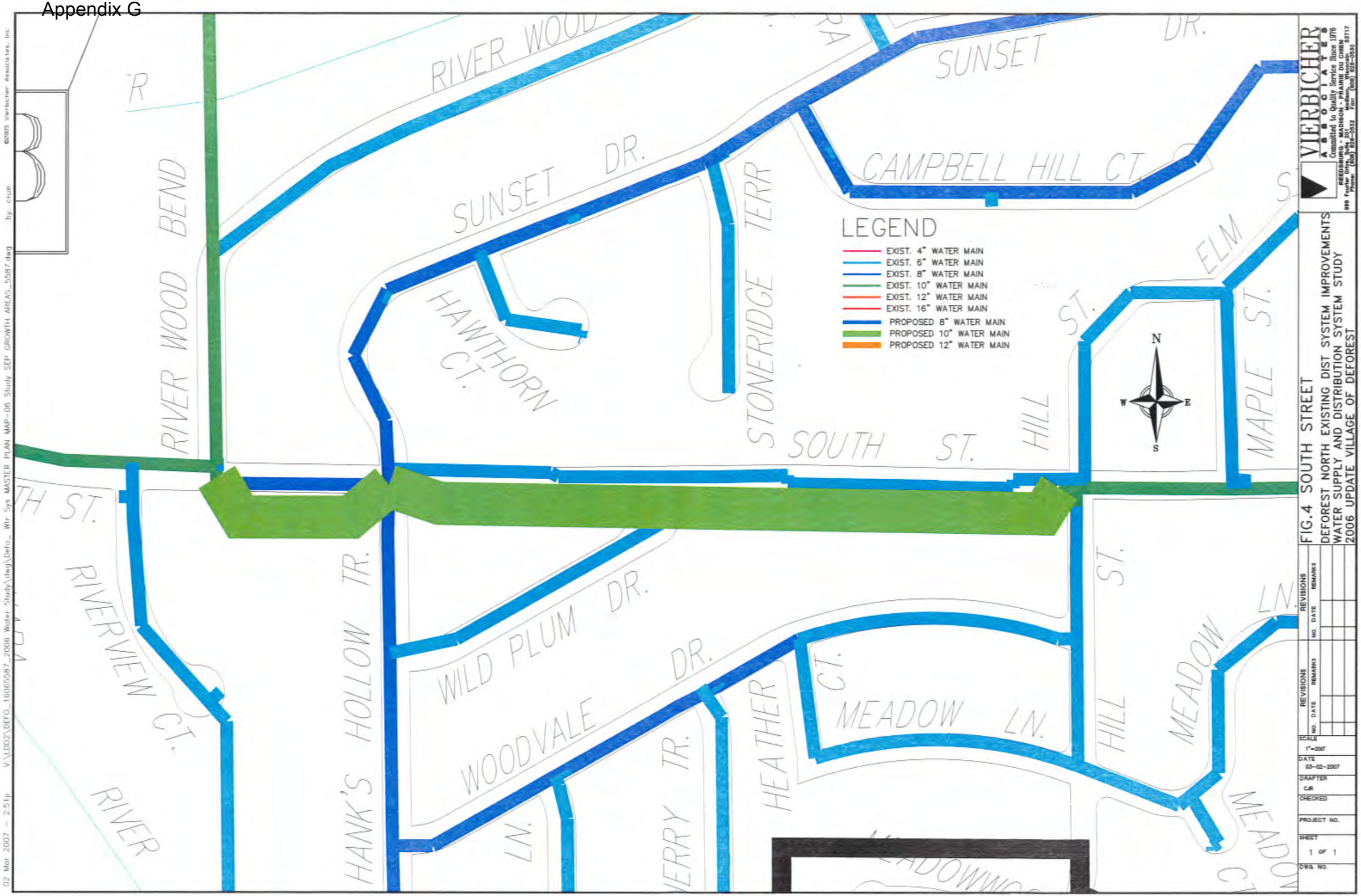

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FIG.4 SOUTH STREET
DEFOREST NORTH EXISTING DIST SYSTEM IMPROVEMENTS
WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY
2006 UPDATE VILLAGE OF DEFOREST

REVISIONS		
NO.	DATE	REMARKS

REVISIONS		
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DATE: 03-02-2007
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Appendix G

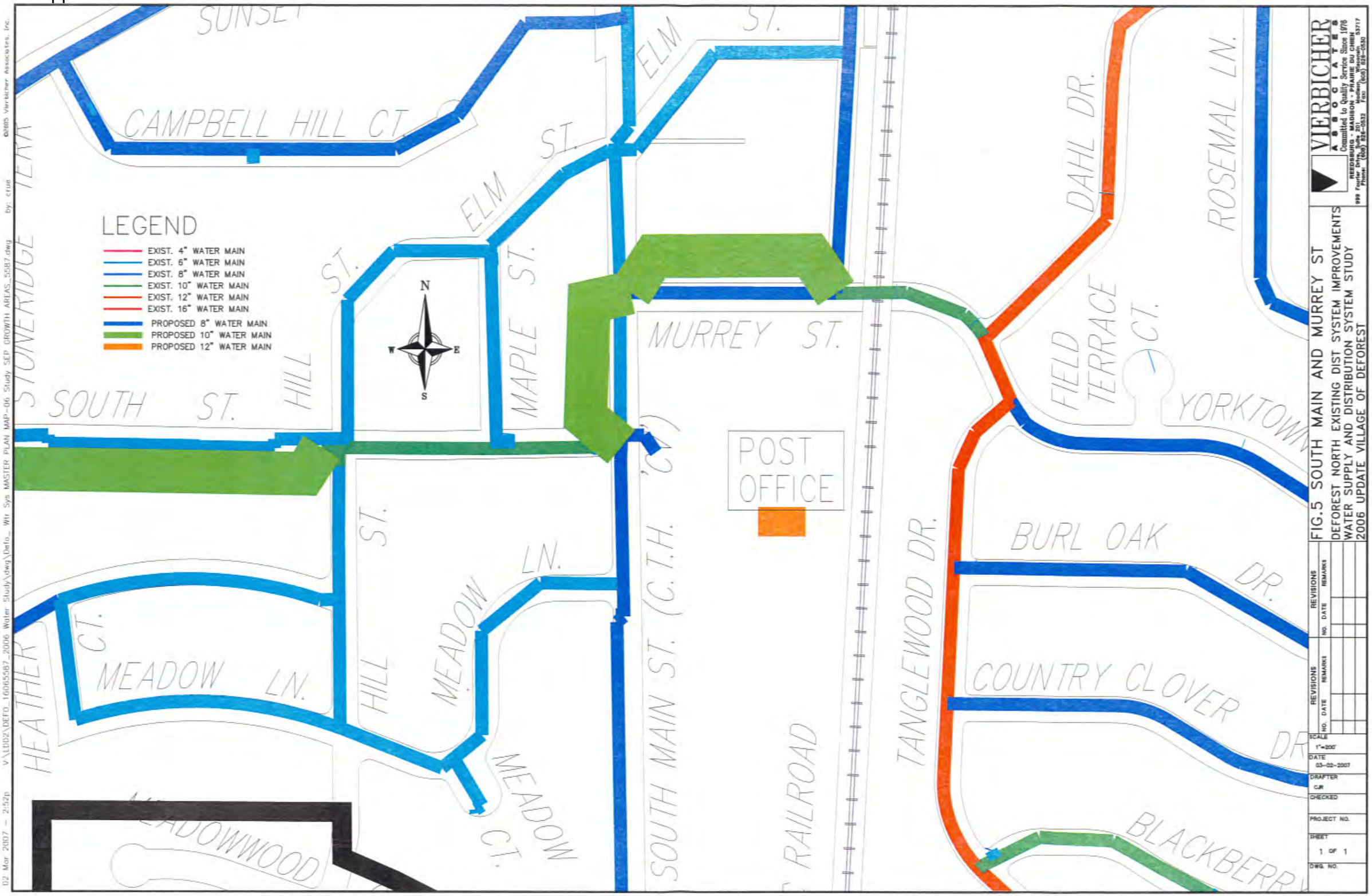

FIG.5 SOUTH MAIN AND MURREY ST
DEFOREST NORTH EXISTING DIST SYSTEM IMPROVEMENTS
WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY
2006 UPDATE VILLAGE OF DEFOREST

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Phone: (608) 826-0532 Fax: (608) 826-0530

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Appendix G

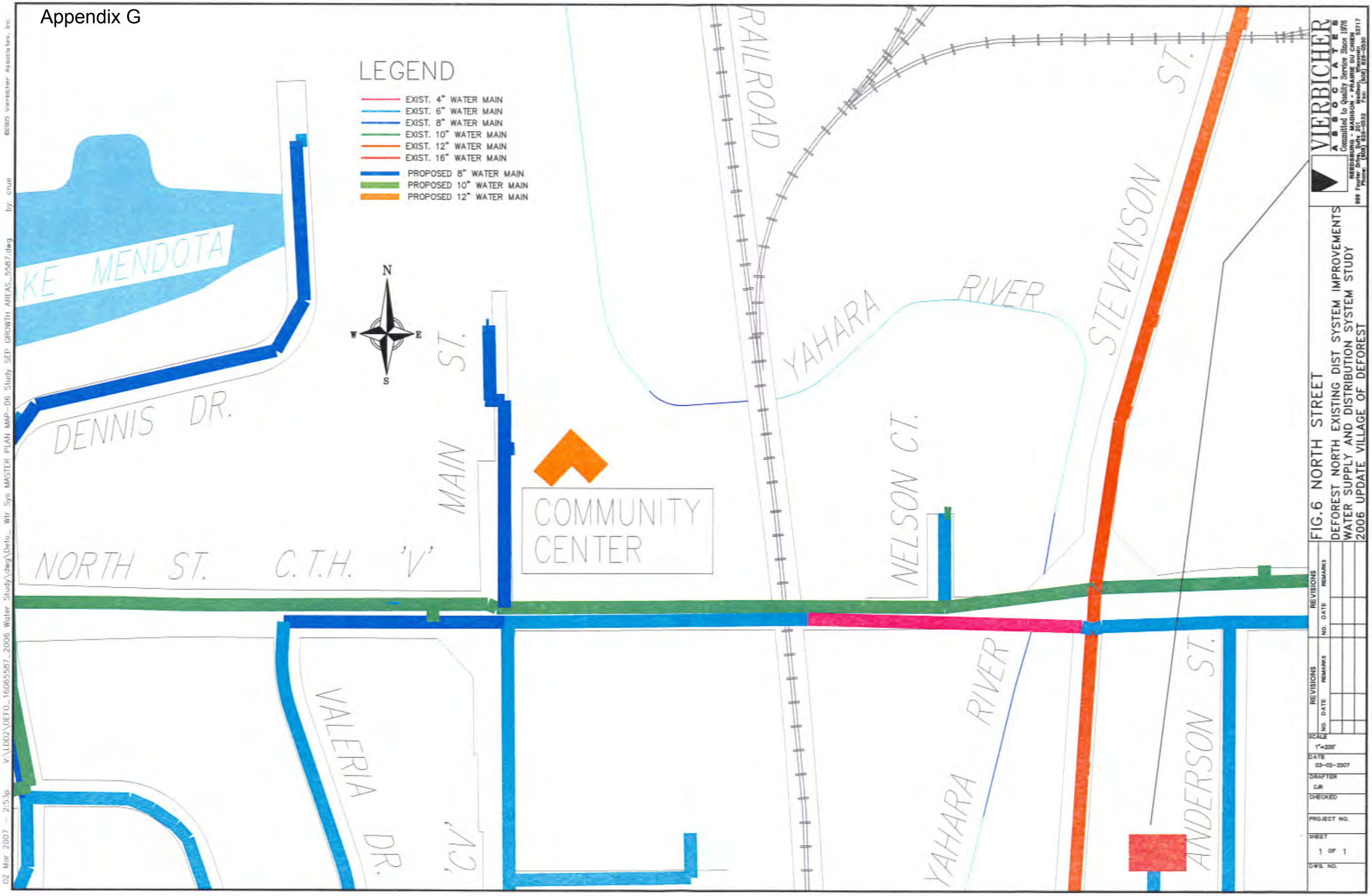

FIG.6 NORTH STREET
DEFOREST NORTH EXISTING DIST SYSTEM IMPROVEMENTS
WATER SUPPLY AND DISTRIBUTION SYSTEM STUDY
2006 UPDATE VILLAGE OF DEFOREST

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TABLES 15-20 & 22-23

Appendix G

Table 15 - Estimated Water Demands of Future Heritage Gardens Development - DeForest North

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Residential Dwelling Units													
Residential Dwelling Units Added =	35	47	46	46	54	54	38	38	35	35	40	40	468
Total Added Population[1] =	96	129	127	127	148	148	105	105	96	96	110	110	
Added Residential Average Daily Demand (gal./day)[2] =	5,489	7,375	7,261	7,261	8,462	8,462	6,003	6,003	5,489	5,489	6,289	6,289	79,872
Cumulative Added Residential Aver. Daily Demand (gal./day) =	5,489	12,864	20,125	27,386	35,848	44,310	50,313	56,316	61,805	67,294	73,583	79,872	
Commercial/Office (acres)													
Total Added Comm. Acres =	2.13												
Added Commercial Average Daily Demand (gal./day)[3] =	1,704	0	0	0	0	0	0	0	0	0	0	0	1,704
Cumulative Added Commercial Aver. Daily Demand (gal./day) =	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	1,704	
Cumulative Added Comm. + Res. Aver. Daily Demand (gal./day) =	7,193	14,568	21,829	29,090	37,552	46,014	52,017	58,020	63,509	68,998	75,287	81,576	
Cumu. Added Comm. + Res. Peak Hourly Demand (gal./min.)[4] =	20	40	60	80	104	127	144	160	176	191	208	225	

Footnotes:

[1] 2.74 persons/d.u. per Census 2000 data.

[2] 57.17 gallons per person per day based on 2005 residental water sales.

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 1.99 highest Max. Day/Aver. Day ratio over the past 5 years and based on a typical Peak Hour/Max. Day ratio of 2.00.

Appendix G

Table 16 - Estimated Water Demands of Future Conservancy Place Development - DeForest North

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Residential Dwelling Units													
Conservancy Place - Hawthorn Point:	65	64											129
Conservancy Place - Rivers Turn:	51	55	55	61	61	61	61	61	61	62			589
Conservancy Place - The Knolls:					12	12	12	12	47	47	35	36	213
Conservancy Place - Promenade:					35	35	35	35	35	35			210
Total Dwelling Units Added =	116	119	55	61	108	108	108	108	143	144	35	36	1,141
Total Added Population[1] =	318	327	151	168	296	296	296	296	392	395	96	99	3,127
Added Residential Average Daily Demand (gal./day)[2] =	**18,181**	**18,695**	**8,633**	**9,605**	**16,923**	**16,923**	**16,923**	**16,923**	**22,411**	**22,583**	**5,489**	**5,660**	**178,949**
Cumulative Added Residential Aver. Daily Demand (gal./day) =	**18,181**	**36,876**	**45,509**	**55,114**	**72,037**	**88,960**	**105,883**	**122,806**	**145,217**	**167,800**	**173,289**	**178,949**	
Commercial/Office (acres)													
Conservancy Place - Promenade:					3	3	3	3	3	3			18
Conservancy Place - Innov. Springs:	12.87	12.87	12.87	12.87	12.87	12.87	12.87	12.87	12.87	12.87			128.7
Total Added Comm. Acres =	12.87	12.87	12.87	12.87	15.87	15.87	15.87	15.87	15.87	15.87	0	0	146.7
Added Commercial Average Daily Demand (gal./day)[3] =	**10,296**	**10,296**	**10,296**	**10,296**	**12,696**	**12,696**	**12,696**	**12,696**	**12,696**	**12,696**	**0**	**0**	**117,360**
Cumulative Added Commercial Aver. Daily Demand (gal./day) =	**10,296**	**20,592**	**30,888**	**41,184**	**53,880**	**66,576**	**79,272**	**91,968**	**104,664**	**117,360**	**117,360**	**117,360**	
Rivers Turn Elem. School													
Cumulative Added Aver. Daily Demand (gal./day)[4] =	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	
Sch. Aver. Daily Demand (gal./day) =	**28,477**	**57,468**	**76,397**	**96,298**	**125,917**	**155,536**	**185,155**	**214,774**	**249,881**	**294,160**	**299,649**	**305,309**	
Cumu. Added Comm. + Res. +Sch. Peak Hourly Demand (gal./min.)[5] =	**79**	**159**	**211**	**266**	**348**	**430**	**512**	**594**	**691**	**813**	**828**	**844**	

Footnotes:

[1] 2.74 persons/d.u. per Census 2000 data.

[2] 57.17 gallons per person per day based on 2005 residental water sales.

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 450 student maximum capacity and 500 gpd average daily water demand per class room with 25 students per class room per Table A-83.43-1, Comm 83, Wisc. Admin. Code

[5] Based on 1.99 highest Max. Day/Aver. Day ratio over the past 5 years and based on a typical Peak Hour/Max. Day ratio of 2.00.

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Table 17 - Estimated Water Demands of Future Chapel Green Development - DeForest North

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Residential Dwelling Units													
Residential Dwelling Units Added =	17	17	17	17	16								84
Total Added Population[1] =	47	47	47	47	44	0	0	0	0	0	0	0	232
Added Residential Average Daily Demand (gal./day)[2] =	2,687	2,687	2,687	2,687	2,516	0	0	0	0	0	0	0	13,264
Cumulative Added Residential Aver. Daily Demand (gal./day) =	2,687	5,374	8,061	10,748	13,264	13,264	13,264	13,264	13,264	13,264	13,264	13,264	
Cumu. Added Peak Hourly Demand (gal./min.)[3] =	7	15	22	30	37	37	37	37	37	37	37	37	

Footnotes:

[1] 2.74 persons/d.u. per Census 2000 data.

[2] 57.17 gallons per person per day based on 2005 residental water sales.

[3] Based on 1.99 highest Max. Day/Aver. Day ratio over the past 5 years and based on a typical Peak Hour/Max. Day ratio of 2.00.

Appendix G

Table 18 - Estimated Water Demands of Future Country View Estates Development - DeForest North

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Residential Dwelling Units													
Residential Dwelling Units Added =		50	50	50	50	54							254
Total Added Population[1] =	0	137	137	137	137	148	0	0	0	0	0	0	696
Added Residential Average Daily Demand (gal./day)[2] =	0	7,833	7,833	7,833	7,833	8,462	0	0	0	0	0	0	39,794
Cumulative Added Residential Aver. Daily Demand (gal./day) =	0	7,833	15,666	23,499	31,332	39,794	39,794	39,794	39,794	39,794	39,794	39,794	
Commercial/Office (acres)													
Total Added Comm. Acres =	0	1	0	0	0	0	0	0	0	0	0	0	1
Added Commercial Average Daily Demand (gal./day)[3] =	0	800	0	0	0	0	0	0	0	0	0	0	800
Cumulative Added Commercial Aver. Daily Demand (gal./day) =	0	800	800	800	800	800	800	800	800	800	800	800	
Cumulative Added Comm. + Res. Aver. Daily Demand (gal./day) =	0	8,633	16,466	24,299	32,132	40,594	40,594	40,594	40,594	40,594	40,594	40,594	
Cumu. Added Comm. + Res. Peak Hourly Demand (gal./min.)[4] =	0	24	46	67	89	112	112	112	112	112	112	112	

Footnotes:

[1] 2.74 persons/d.u. per Census 2000 data.

[2] 57.17 gallons per person per day based on 2005 residental water sales.

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 1.99 highest Max. Day/Aver. Day ratio over the past 5 years and based on a typical Peak Hour/Max. Day ratio of 2.00.

Table 19 - Future DeForest North Average Daily Demands & Peak Hourly Demands Including Planned Developments

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
Residential Dwelling Units																					
Total Dwelling Units Added =	168	233	168	174	228	216	146	146	178	179	75	76									1,987
Total Added Population[1] =	461	639	461	477	625	592	401	401	488	491	206	209	0	0	0	0	0	0	0	0	5,445
Added Residential Average Daily Demand (gal./day)[2] =	**26,356**	**36,532**	**26,356**	**27,271**	**35,732**	**33,845**	**22,926**	**22,926**	**27,899**	**28,071**	**11,778**	**11,949**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**311,641**
Cumulative Added Residential Aver. Daily Demand (gal./day) =	**26,356**	**62,888**	**89,244**	**116,515**	**152,247**	**186,092**	**209,018**	**231,944**	**259,843**	**287,914**	**299,692**	**311,641**	**311,641**	**311,641**	**311,641**	**311,641**	**311,641**	**311,641**	**311,641**	**311,641**	
Commercial/Office (acres)																					
Total Added Com./Office Acres =	15.0	13.9	12.9	12.9	15.9	15.9	15.9	15.9	15.9	15.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	149.8
Added Com./Office Average Daily Demand (gal./day)[3] =	**12,000**	**11,096**	**10,296**	**10,296**	**12,696**	**12,696**	**12,696**	**12,696**	**12,696**	**12,696**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**119,864**
Cumulative Added Com./Office Aver. Daily Demand (gal./day) =	**12,000**	**23,096**	**33,392**	**43,688**	**56,384**	**69,080**	**81,776**	**94,472**	**107,168**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	**119,864**	
Rivers Turn Elem. School																					
Cumulative Added Aver. Daily Demand (gal./day)[4] =	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	**9,000**	
Cumulative Added Aver. Daily Demand (gal./day) =	**38,356**	**85,984**	**122,636**	**160,203**	**208,631**	**255,172**	**290,794**	**326,416**	**367,011**	**416,778**	**428,556**	**440,505**	**440,505**	**440,505**	**440,505**	**440,505**	**440,505**	**440,505**	**440,505**	**440,505**	
Cumu. Added Peak Hourly Demand (gal./min.)[5] =	**106**	**238**	**339**	**443**	**577**	**705**	**804**	**902**	**1,014**	**1,152**	**1,184**	**1,218**	**1,218**	**1,218**	**1,218**	**1,218**	**1,218**	**1,218**	**1,218**	**1,218**	
Total Projected Average Daily Demand (gal./day)[6,8] =	**803,309**	**850,937**	**887,589**	**925,156**	**973,584**	**1,020,125**	**1,055,747**	**1,091,369**	**1,131,964**	**1,181,731**	**1,193,509**	**1,205,458**	**1,205,458**	**1,205,458**	**1,205,458**	**1,205,458**	**1,205,458**	**1,205,458**	**1,205,458**	**1,205,458**	
Total Projected Peak Hourly Demand (gal./min.)[7,9] =	**1,966**	**2,098**	**2,199**	**2,303**	**2,437**	**2,565**	**2,664**	**2,762**	**2,874**	**3,012**	**3,044**	**3,078**	**3,078**	**3,078**	**3,078**	**3,078**	**3,078**	**3,078**	**3,078**	**3,078**	

Footnotes:

[1] 2.74 persons/d.u. per Census 2000 data.

[2] 57.17 gallons per person per day based on 2005 residental water sales.

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 500 gpd average daily water demand per class room with 25 students per class room per Table A-83.43-1, Comm 83, Wisc. Admin. Code.

[5] Based on 1.99 highest Max. Day/Aver. Day ratio over the past 5 years and based on a typical Peak Hour/Max. Day ratio of 2.00.

[6] Average of past 5 years Average Daily Demand = 764,953 gals./day.

[7] Average of past 5 years Peak Hourly Demand = 1,860 gals./min.

[8] Total Projected Aver. Daily Demand for year in question = Cumu. Added Comm. + Res. + Sch. Aver. Daily Demand from future developments + average past 5 years Aver. Daily Demand.

[9] Total Projected Peak Hourly Demand for year in question = Cumu. Added Comm. + Res. + Sch. Peak Hourly Demand from future developments + average past 5 years Peak Hourly Demand.

Table 20 - Estimated Water Demands of Anticipated Growth Areas - DeForest North

Comprehensive Plan Growth Phasing:	Phase 1							Phase 2							Phase 3						
Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
Residential Dwelling Units																					
West Area	96	96	96	96	96	96	96														675
Northwest Area								66	66	66	66	66	66	66	50	50	50	50	50	50	756
Northeast Area	0	0	0	0	0	0	0														0
East Area	13	13	13	13	13	13	13														90
Southeast Area	29	29	29	29	29	29	29	271	271	271	271	271	271	271	189	189	189	189	189	189	3231
Total Res. Dwelling Units Added =	138	138	138	138	138	138	138	337	337	337	337	337	337	337	239	239	239	239	239	239	4,752
Total Added Population[1] =	378	378	378	378	378	378	378	923	923	923	923	923	923	923	654	654	654	654	654	654	13,031
Added Residential Average Daily Demand (gal./day)[2] =	21,611	21,611	21,611	21,611	21,611	21,611	21,611	52,768	52,768	52,768	52,768	52,768	52,768	52,768	37,390	37,390	37,390	37,390	37,390	37,390	744,993
Cumulative Added Residential Aver. Daily Demand (gal./day) =	21,611	43,222	64,833	86,444	108,055	129,666	151,277	204,045	256,813	309,581	362,349	415,117	467,885	520,653	558,043	595,433	632,823	670,213	707,603	744,993	
Commercial/Office (acres)																					
West Area	11.4	11.4	11.4	11.4	11.4	11.4	11.4														80
Northwest Area								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Northeast Area	0.0	0.0	0.0	0.0	0.0	0.0	0.0														0
East Area	2.0	2.0	2.0	2.0	2.0	2.0	2.0														14
Southeast Area	4.3	4.3	4.3	4.3	4.3	4.3	4.3	24.9	24.9	24.9	24.9	24.9	24.9	24.9							204
Total Added Com./Office Acres =	17.7	17.7	17.7	17.7	17.7	17.7	17.7	24.9	24.9	24.9	24.9	24.9	24.9	24.9	0.0	0.0	0.0	0.0	0.0	0.0	298.0
Added Com./Office Average Daily Demand (gal./day)[3] =	14,171	14,171	14,171	14,171	14,171	14,171	14,171	19,886	19,886	19,886	19,886	19,886	19,886	19,886	0	0	0	0	0	0	238,400
Cumulative Added Com./Office Aver. Daily Demand (gal./day) =	14,171	28,343	42,514	56,686	70,857	85,029	99,200	119,086	138,971	158,857	178,743	198,629	218,514	238,400	238,400	238,400	238,400	238,400	238,400	238,400	
Industrial (acres)																					
West Area	0.6	0.6	0.6	0.6	0.6	0.6	0.6														4
Northwest Area								0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Northeast Area	14.4	14.4	14.4	14.4	14.4	14.4	14.4														101
East Area	0.0	0.0	0.0	0.0	0.0	0.0	0.0														0
Southeast Area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							0
Total Added Ind. Acres =	15.0	15.0	15.0	15.0	15.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	105.0
Added Industrial Average Daily Demand (gal./day)[4] =	15,000	15,000	15,000	15,000	15,000	15,000	15,000	0	0	0	0	0	0	0	0	0	0	0	0	0	105,000
Cumulative Added Industrial Aver. Daily Demand (gal./day) =	15,000	30,000	45,000	60,000	75,000	90,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	105,000	
Cumulative Added Total Aver. Daily Demand (gal./day) =	50,782	101,565	152,347	203,130	253,912	304,695	355,477	428,131	500,784	573,438	646,092	718,746	791,399	864,053	901,443	938,833	976,223	1,013,613	1,051,003	1,088,393	
Cumu. Added Total Peak Hourly Demand (gal./min.)[5] =	140	281	421	561	702	842	982	1,183	1,384	1,585	1,786	1,987	2,187	2,388	2,491	2,595	2,698	2,802	2,905	3,008	

Footnotes:

[1] 2.74 persons/d.u. per Census 2000 data.

[2] 57.17 gallons per person per day based on 2005 residental water sales.

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 1,000 gals./day per acre for industrial use.

[5] Based on 1.99 highest Max. Day/Aver. Day ratio over the past 5 years and based on a typical Peak Hour/Max. Day ratio of 2.00.

Appendix G

Table 22 - Estimated Water Demands of Future Savannah Brooks Development - DeForest South

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Totals
Residential Dwelling Units													
Single Family		35	35	22	22	22	22						158
Lot 157 & 158 - Duplex Condos		6	6	6	6								24
Part of Lots 118 & 164 - Senior Condos				16	16	16	16	16	16	20			116
Lots 142 & 163 - Condos		18	18	18	18	18	22						112
Part of Lots 118 & 164 - Penthouse Condos			7	7	7	7							28
Total Dwelling Units Added =	0	59	66	69	69	63	60	16	16	20	0	0	438
Total Added Population[1] =	0	160	179	187	187	171	162	44	44	54	0	0	1,183
Added Residential Average Daily Demand (gal./day)[2] =	**0**	**11,200**	**12,530**	**13,090**	**13,090**	**11,970**	**11,340**	**3,080**	**3,080**	**3,780**	**0**	**0**	**83,160**
Cumulative Added Residential Aver. Daily Demand (gal./day) =	**0**	**11,200**	**23,730**	**36,820**	**49,910**	**61,880**	**73,220**	**76,300**	**79,380**	**83,160**	**83,160**	**83,160**	
Commercial/Office (acres)													
Lot 118				7.72	7.72	7.72	7.72						30.88
Lot 164		2.03	2.03	2.03	2.03								8.12
Total Added Comm. Acres =	0	2.03	2.03	9.75	9.75	7.72	7.72	0	0	0	0	0	39
Added Commercial Average Daily Demand (gal./day)[3] =	**0**	**1,624**	**1,624**	**7,800**	**7,800**	**6,176**	**6,176**	**0**	**0**	**0**	**0**	**0**	**31,200**
Cumulative Added Commercial Aver. Daily Demand (gal./day) =	**0**	**1,624**	**3,248**	**11,048**	**18,848**	**25,024**	**31,200**	**31,200**	**31,200**	**31,200**	**31,200**	**31,200**	
Cumulative Added Comm. + Res. Aver. Daily Demand (gal./day) =	**0**	**12,824**	**26,978**	**47,868**	**68,758**	**86,904**	**104,420**	**107,500**	**110,580**	**114,360**	**114,360**	**114,360**	
Cumu. Added Comm. + Res. Peak Hourly Demand (gal./min.)[4] =	**0**	**36**	**75**	**133**	**191**	**241**	**290**	**299**	**307**	**318**	**318**	**318**	

Footnotes:

[1] Based on typical 2.70 persons/d.u.

[2] Based on typcial 70.00 gallons per person per day

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 2.00 Max. Day/Aver. Day ratio and based on a typical Peak Hour/Max. Day ratio of 2.00.

Table 23 - Estimated Water Demands of Anticipated Growth Areas - DeForest South

Comprehensive Plan Growth Phasing:	Phase 1							Phase 2							Phase 3						
Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Totals
Residential Dwelling Units																					
West Area								58	58	58	58	58	58	58							403
Southwest Area								0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Central Area	0	0	0	0	0	0	0														0
East Central Area	0	0	0	0	0	0	0	0	0	0	0	0	0	0							0
East Area															21	21	21	21	21	21	125
Total Res. Dwelling Units Added =	0	0	0	0	0	0	0	58	58	58	58	58	58	58	21	21	21	21	21	21	528
Total Added Population[1] =	0	0	0	0	0	0	0	156	156	156	156	156	156	156	57	57	57	57	57	57	1,434
Added Residential Average Daily Demand (gal./day)[2] =	0	0	0	0	0	0	0	10,920	10,920	10,920	10,920	10,920	10,920	10,920	3,990	3,990	3,990	3,990	3,990	3,990	100,380
Cumulative Added Residential Aver. Daily Demand (gal./day) =	0	0	0	0	0	0	0	10,920	21,840	32,760	43,680	54,600	65,520	76,440	80,430	84,420	88,410	92,400	96,390	100,380	
Commercial/Office (acres)																					
West Area								27.9	27.9	27.9	27.9	27.9	27.9	27.9							195
Southwest Area								21.7	21.7	21.7	21.7	21.7	21.7	21.7	0.0	0.0	0.0	0.0	0.0	0.0	152
West Central Area	12.6	12.6	12.6	12.6	12.6	12.6	12.6														88
East Central Area	11.4	11.4	11.4	11.4	11.4	11.4	11.4	15.3	15.3	15.3	15.3	15.3	15.3	15.3							187
East Area															10.0	10.0	10.0	10.0	10.0	10.0	60
Total Added Com./Office Acres =	24.0	24.0	24.0	24.0	24.0	24.0	24.0	64.9	64.9	64.9	64.9	64.9	64.9	64.9	10.0	10.0	10.0	10.0	10.0	10.0	682.0
Added Com./Office Average Daily Demand (gal./day)[3] =	19,200	19,200	19,200	19,200	19,200	19,200	19,200	51,886	51,886	51,886	51,886	51,886	51,886	51,886	8,000	8,000	8,000	8,000	8,000	8,000	545,600
Cumulative Added Com./Office Aver. Daily Demand (gal./day) =	19,200	38,400	57,600	76,800	96,000	115,200	134,400	186,286	238,171	290,057	341,943	393,829	445,714	497,600	505,600	513,600	521,600	529,600	537,600	545,600	
Industrial (acres)																					
West Area								0.0	0.0	0.0	0.0	0.0	0.0	0.0							0
Southwest Area								10.6	10.6	10.6	10.6	10.6	10.6	10.6	15.8	15.8	15.8	15.8	15.8	15.8	169
West Central Area	12.9	12.9	12.9	12.9	12.9	12.9	12.9														90
East Central Area	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							0
East Area															0.0	0.0	0.0	0.0	0.0	0.0	0
Total Added Ind. Acres =	12.9	12.9	12.9	12.9	12.9	12.9	12.9	10.6	10.6	10.6	10.6	10.6	10.6	10.6	15.8	15.8	15.8	15.8	15.8	15.8	259.0
Added Industrial Average Daily Demand (gal./day)[4] =	12,857	12,857	12,857	12,857	12,857	12,857	12,857	10,571	10,571	10,571	10,571	10,571	10,571	10,571	15,833	15,833	15,833	15,833	15,833	15,833	259,000
Cumulative Added Industrial Aver. Daily Demand (gal./day) =	12,857	25,714	38,571	51,429	64,286	77,143	90,000	100,571	111,143	121,714	132,286	142,857	153,429	164,000	179,833	195,667	211,500	227,333	243,167	259,000	
Cumulative Added Total Aver. Daily Demand (gal./day) =	32,057	64,114	96,171	128,229	160,286	192,343	224,400	297,777	371,154	444,531	517,909	591,286	664,663	738,040	765,863	793,687	821,510	849,333	877,157	904,980	
Cumu. Added Total Peak Hourly Demand (gal./min.)[5] =	89	178	267	356	445	534	623	827	1,031	1,235	1,439	1,642	1,846	2,050	2,127	2,205	2,282	2,359	2,437	2,514	

Footnotes:

[1] Based on typical 2.70 persons/d.u.

[2] Based on typcial 70.00 gallons per person per day

[3] Based on 800 gals./day per acre for office/commercial use.

[4] Based on 1,000 gals./day per acre for industrial use.

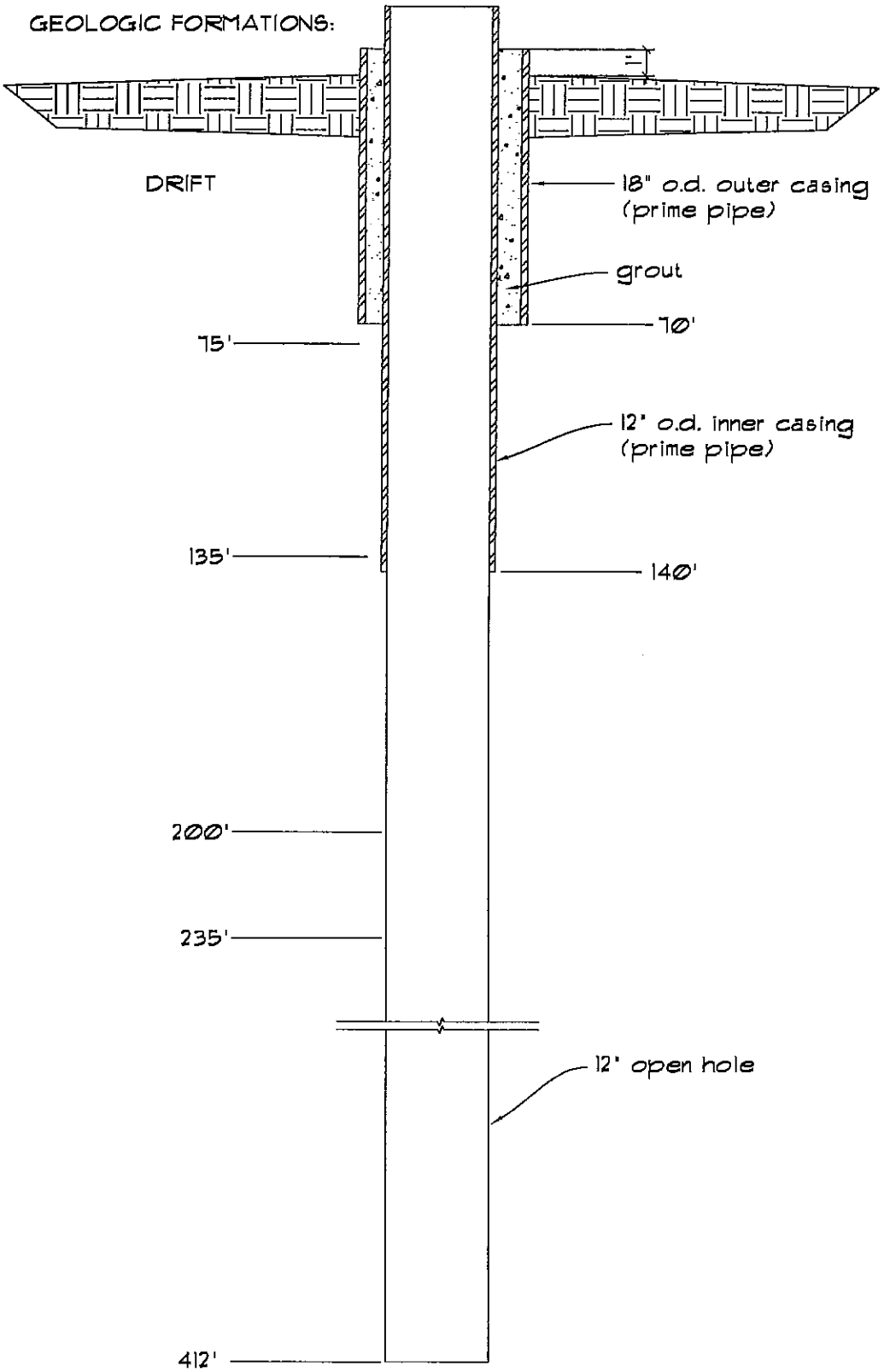
[5] Based on 2.00 Max. Day/Aver. Day ratio. Also, based on a typical Peak Hour/Max. Day ratio of 2.00.

Appendix G

WELL LOGS &
WELL PUMP DISCHARGE HEAD CURVES

Appendix G

WELL #2

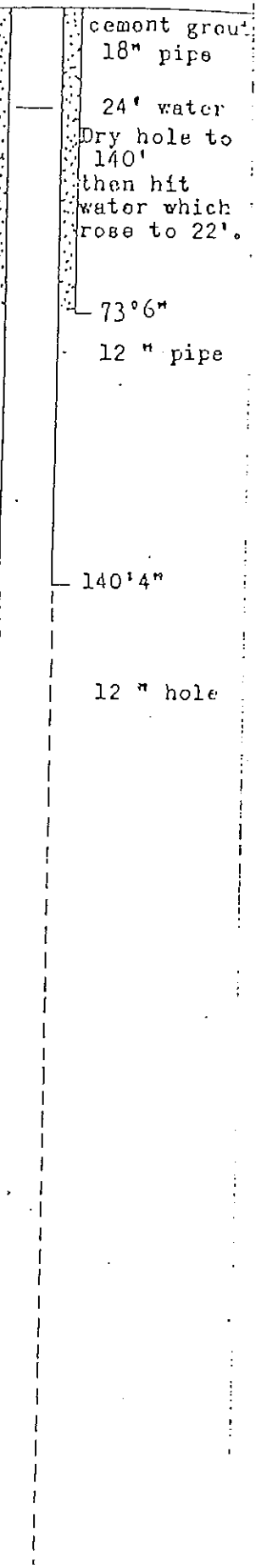


Appendix G

DEFOREST VILLAGE WELL, DEFOREST, WISCONSIN
Genoral Engineering Company, Engineers
Fasbonder Brothers, Driller, June 1958
Sample Nos. 201213-201293 - Examined by J. B. Steuerwald
Sec 17 T9N R10E

#2

1 - 75	75		Till, pink-brown-gray, sandy, stony, dolomitic, some silt and clay
75 - 135	60		Gravel, very fine, brown-gray, of angular dolomite, some white chert and quartz sand, silty 85-90 till? Samples may have had the clay washed out of them.
135 - 155	20		Sandstone, very fine and fine grained, much buff dolomite
55 - 175	20		Sandstone, fine grained, some medium grained, dolomitic, buff, little glauconite
175 - 200	25		Sandstone, fine grained, buff, dolomitic
200 - 210	10		Sandstone, fine grained, very little coarse grained, white
210 - 220	10		Sandstone, very fine and fine grained, very light tan
220 - 235	15		Sandstone, very fine to medium grained, very light tan
235 - 310	75		Sandstone, medium grained, some fine grained, little coarse grained, buff, dolomitic
310 - 350	40		Sandstone, fine to coarse grained, light buff-gray, slightly dolomitic
350 - 380	30		Sandstone, medium grained, buff

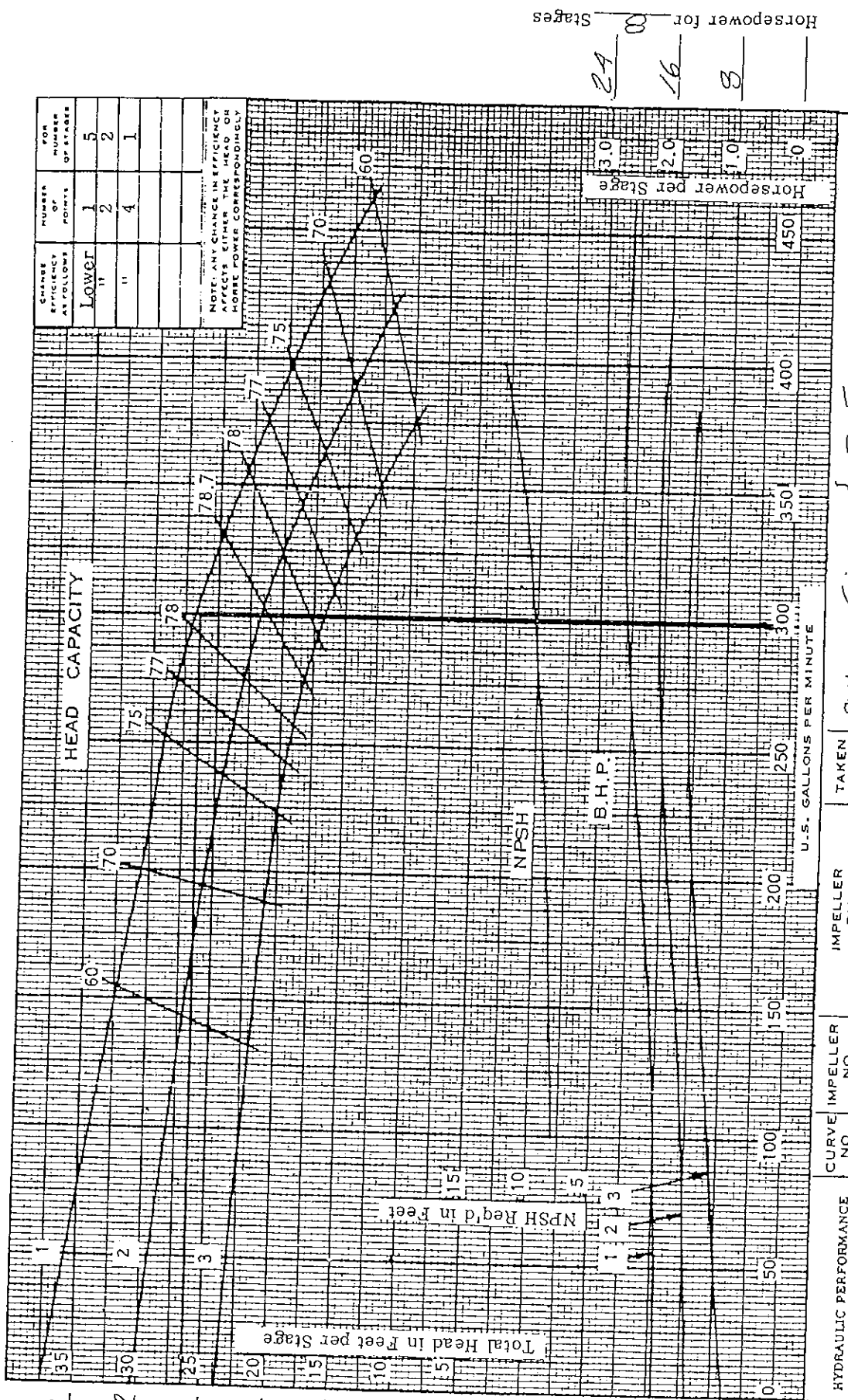


Appendix G

			then hit water which rose to 22'.
			73'6"
75 - 135	60	Gravel, very fine, brown-gray, of angular dolomite, some white chert and quartz sand, silty 85-90 till? Samples may have had the clay washed out of them.	12 " pipe
135			
135 - 155	20	Sandstone, very fine and fine grained, much buff dolomite	140'4"
155 - 175	20	Sandstone, fine grained, some medium grained, dolomitic, buff, little glauconite	12 " hole
175 - 200	25	Sandstone, fine grained, buff, dolomitic	
65			
200 - 210	10	Sandstone, fine grained, very little coarse grained, white	
210 - 220	10	Sandstone, very fine and fine grained, very light tan	
220 - 235	15	Sandstone, very fine to medium grained, very light tan	
35			
235 - 310	75	Sandstone, medium grained, some fine grained, little coarse grained, buff, dolomitic	
310 - 350	40	Sandstone, fine to coarse grained, light buff-gray, slightly dolomitic	
350 - 380	30	Sandstone, medium grained, buff	
380 - 412½	32½	Sandstone, fine to some medium grained, light tan-gray	
	412½	Total Depth	

first pumped for 79 hours at which time it filled up with sand to 291'. ell was cleaned out and tested for 5 hours at 200 g.p.m., 4 hours at 239 g.p.m., 3 hours .275 g.p.m., 2 hours at 285 g.p.m., and 23 hours at 380 g.p.m., specific capacity at d of test = 63.3 g.p.m./ft of drawdown.

VERTICAL TURBINE PUMPS



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
Lower 1"	1	5
"	2	2
"	4	1

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
1	T84234	5 21/32"	27794
2	T84234	5 7/16"	
3	T84234	5 3/16"	27752
4			

HYDRAULIC PERFORMANCE WARRANTY

Guaranteed at designated point only, and contingent on:

Proper flow to pump suction
Proper submergence
Fluid free of gas, air & abrasives
Proper lateral setting of impeller

Customer City of De Forest - well pump # 2

Item

Peerless Ref. No:

Laboratory Performance

SIZE 8 MA | RPM 1760 | BOWL T82376-E | CURVE 2826855R

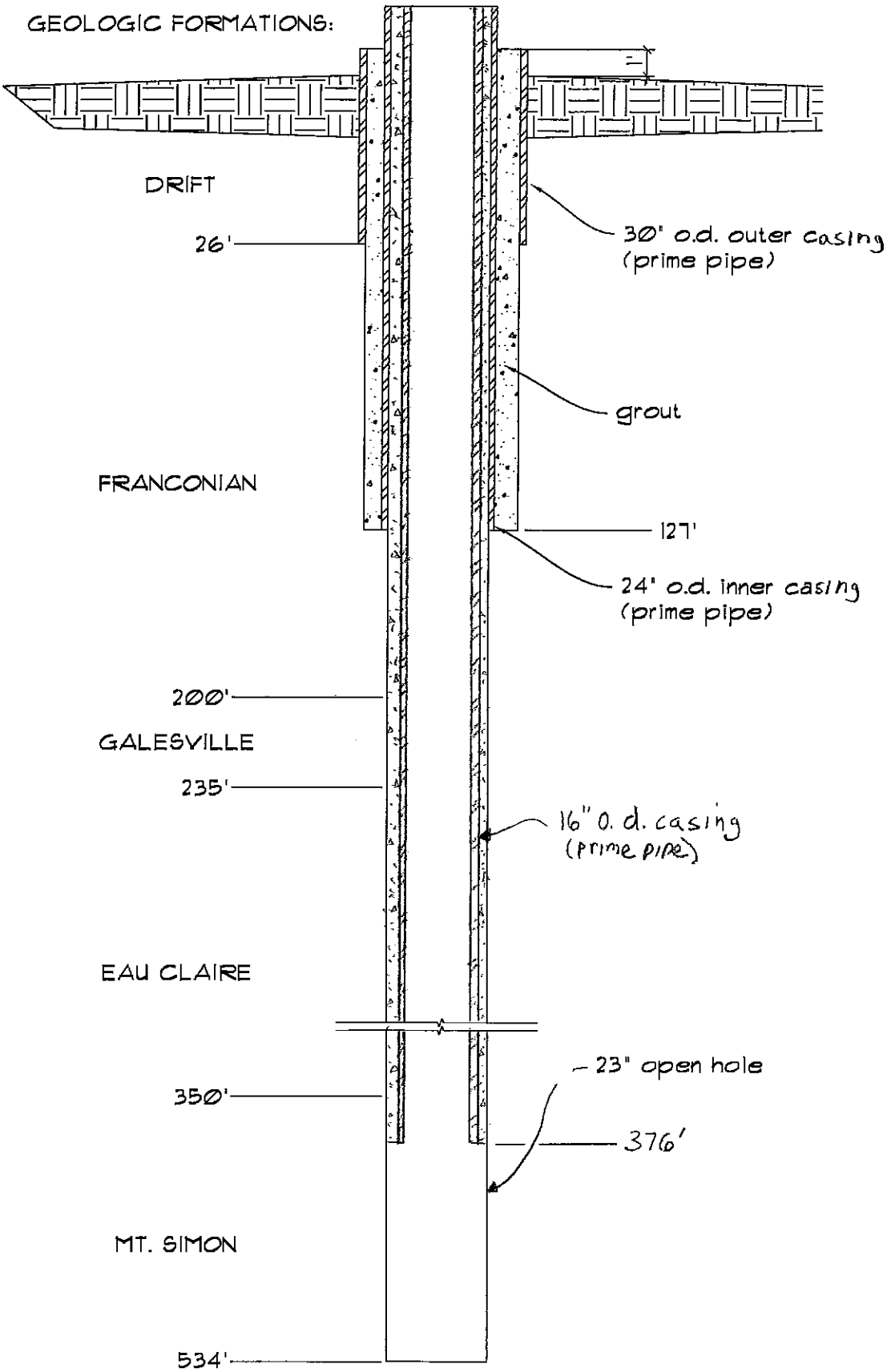
PUMP DESCRIPTION: Driver 50 Hp G.E. ; Head Byron-Jacksay; Column 6" x 13/16"

GUARANTEED BOWL ☒ PERFORMANCE: Capacity 300 gpm; Head 205 ft; Eff 78 %; BHP 12.9

FIELD ☐

Appendix G

WELL #3



Appendix G

Well Construction Reports

Help

WI Unique Well No:	KY571	**High Capacity Well No:**	77117
County Well Location:		**DNR Region:**	South Central
County:	Dane	**Muni Type:**	V
Municipality:	DEFOREST	**Completion Date:**	09/29/1998 **mm/dd/yyyy**
DNR Received Date:	11/18/1998	**Constructor:**	C T W CORP
Constructor Address:	21500 W GOOD HOPE RD	**Constructor City:**	LANNON
Constructor State:	WI	**Constructor Zip:**	53046-9720
Status:	Reconstruction	**Original Year:**	78
Replacement Reason:	WELL WAS BACTI UNSAFE	**Previous WI Well No:**	
Replacement WI Well No:		**Construction Type:**	1
Other Const. Type:		**Category:**	Municipal/Community
Well Depth:	661 ft	**# Services:**	
Facility Type:	VILLAGE OF DEFOREST	**Highest Point on Property:**	
In Floodplain:		**Rotary - Mud Circulation:**	
Rotary - Air:		**Rotary - Foam:**	
Reverse Rotary:		**Cable Tool Bit:**	
Cable Bit Diameter:	in	**Temp Outer Casing:**	
Temp Casing Diameter:	in	**Temp Casing Removed:**	
Why not removed?:		**Other Drilling method:**	
Other Drilling Description:		**Screen Diameter:**	inches
Screen Description:		**Screen From:**	feet
Screen To:	feet	**Sealant Method:**	PRESSURE VIA TREMIE
Static Water level:	31 feet	**Pumping level:**	74 feet
Pumping at:	200	**Pumping units:**	Minutes
For:	10 Hour(s)	**Well Starting Depth:**	10 inches Above Ground
Developed:	Yes	**Disinfected:**	Y
Capped:	Yes	**Proper Seal:**	
Seal Description:		**Contractor Signed on:**	11/16/1998
Rig Operator Signed on:	11/16/1998	**Geologic Log Number:**	DN1139
Common Well Number:	003	**Calculated Specific Capacity:**	4.7
DNR Facility ID:	113022140	**Well Name:**	WELL #3
Water Quality Comments:		**Water Quantity Comments:**	
Drilling Difficulty:		**Other Driller Comments:**	
Exception Areas:	Landfill	**Exception Area Comments:**	

Distances in Feet to Nearest Objects

No Records returned

Appendix G

Download

Drillhole Dimensions

Diameter (in)	From Depth (ft.)	To Depth (ft.)
30	0	127
23	127	660

Download

Casing & Liner

Diameter (inches)	Description	From Depth (ft.)	To Depth (ft.)
16	ASTM A53B 0375 WALL CTV STEEL 5 5 98 62 6# FT HT182 602	0	376
30	ORIGINAL CASING 0.5" WALL	0	26
24	ORIGINAL CASING BLK STEEL 0.375" WALL	0	127

Download

Grout or Other Sealant Materials

Kind of Sealing Material	From Depth (ft.)	To Depth (ft.)	Amount	Units
1:1 SAND CEMENT	0	231	2801	Sacks
ORIGINAL NEAT CEMENT	0	127		
NEAT CEMENT	231	376	400	Sacks

Download

Geology

Geology	Geology Description	Driller's Description	USGS Code	From Depth (feet)	To Depth (feet)
--T-	Till;	GLACIAL DRIFT		0	26
--N-	Sandstone;	FRANCONIAN SANDSTONE		26	200
--N-	Sandstone;	GALESVILLE SANDSTONE		200	235
----	----	EAU CLAIRE SANDSTONE		235	350
----	----	MT. SIMON SANDSTONE		350	661

Download

Samples

Sample Date	Collected By	Description	Laboratory	Lab Sample ID

Appendix G

09/29/1998		***VILLAGE AT DEFOREST*306 DEFOREST ST*DE FOREST, WI 53532*6088466751	KODIAK ANALYTICAL INC	002345

Record 1 of 1

Download

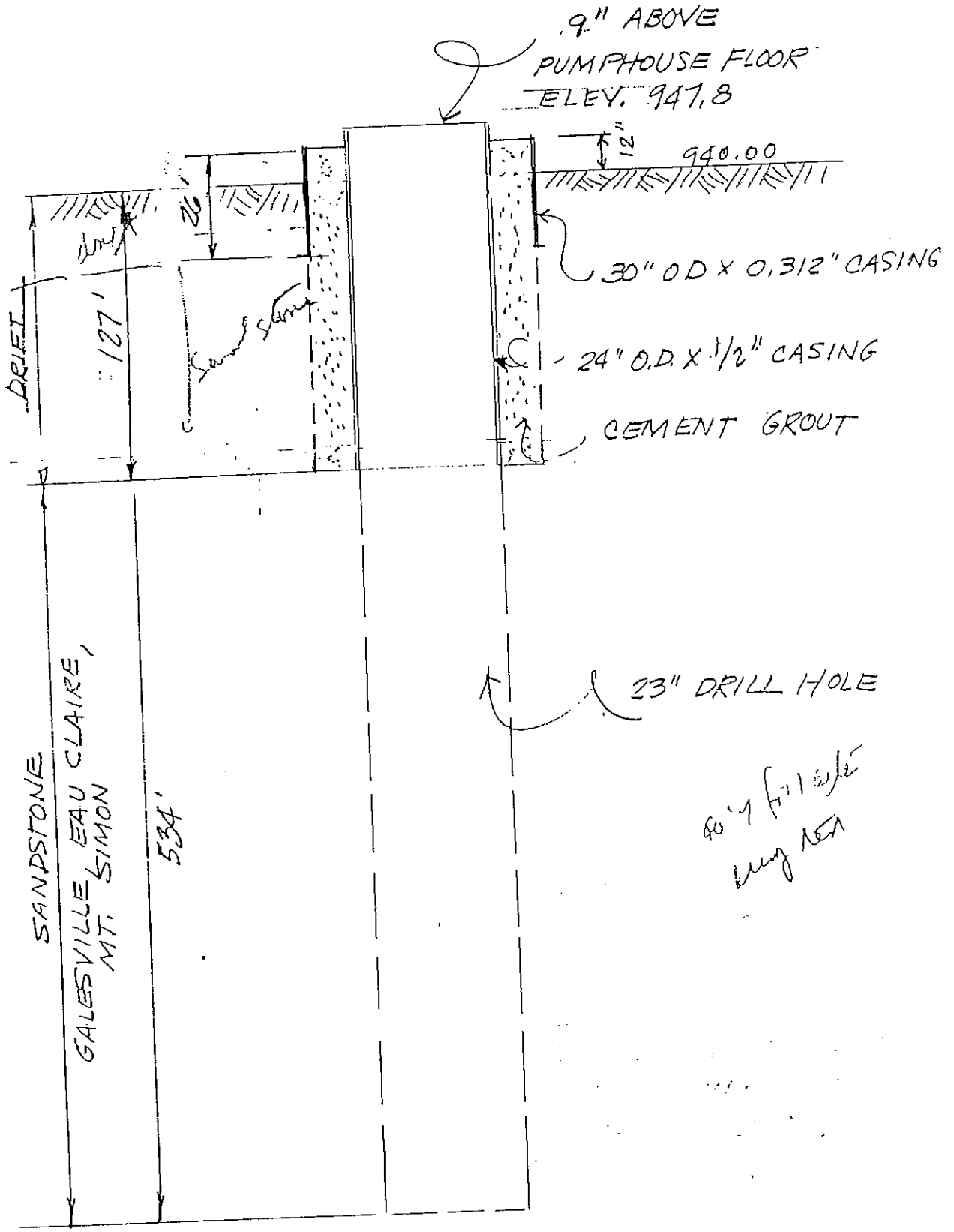
- Abandonment (0 Rows)
- Variances (0 Rows)
- Rehabilitation/Redevelopment (0 Rows)

- **Other DNR information on this Well**
  - Public Water Supply System
  - High Capacity Well Data
  - Groundwater Retrieval Network Data

Last Revised: 03/14/2006

Appendix G

WELL NO. 3
DEFOREST, WISCONSIN



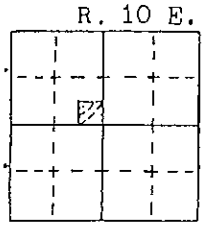
AS DRILLED 6/2.

ll name De Forest Village Well #3

County: Dane

r ... Village of De Forest
dress.. 113 S. Durkee St.
De Forest, WI 53562
iller.. Milaeger Well & Pump Co.
gineer. Lakeland Engineers, Inc.
Madison, Wisconsin

Completed... 6/78
Field check.
Altitude.... 940' ETM
Use..... Municipal
Static w.l.. 24'
Spec. cap... 44 GPM/ft



Quad. De Forest 7½'

Drill Hole						Casing & Liner Pipe or Curbing							
a.	from	to	Dia.	from	to	Dia.	Wgt.& Kind	from	to	Dia.	Wgt.& Kind	from	to
)"	0	127'				30"	bk. steel .375" wall	0	26'				
3"	127'	661'				24"	bk. steel 0.5" wall	+18"	127'				

Grout	from	to
Neat cement	0	127'

illing method: Cable Tool
mples from 0 to 650' Rec'd: 8/7/78

udied by: Mary J. Hartman

Issued: 8/14/84

rmations: Drift, St. Peter Sandstone (Tonti Member, Readstown Member), Tunnel City Group, Elk Mound Group.

marks: Well tested for 24 hours at 1500 GPM with 34 feet of drawdown. Driller reports total well depth of 661'.

F WELL:

Depths	Graphic Section	Rock Type	Color	Grain Size Mode	Grain Size Range	Miscellaneous Characteristics
0-5		Silt	Dark brown	—	—	Little sand, siliceous clay.
5-10		Clay	"	—	—	Much silt, Trace sand.
10-15		"	"	—	—	Same.
15-20		Sandstone	Pink	M	Vfn/C	Srnd, Tr v G sil cem,mfc incl,sand from abv, Mny sec qtz grwths, Ltl fros.
20-25		"	"	"	"	Same.
25-30		"	"	"	"	"
30-35		"	"	"	"	"
35-40		"	White	Fn	"	Srnd, Tr v G silica cement,mafic incl, Mny sec quartz grwths.
40-45		NO SAMPLE. Driller reports same as adjoining intervals.				
45-50		Sandstone	Yl brown	Vfn	Vfn/C	Sang, Mch v G calc cem,rd & bn sakg, Tr rd bn mot,pl gn sh.
50-55		Shale	Bn yellow	—	—	Dolomitic, Much silt,
55-60		"	"	—	—	Dolomitic, Much silt, Little sand, Trace hematitic shale,
60-65		"	"	—	—	Dolomitic, Much silt, Little sand, hematitic shale,
65-70	Hem	"	Bn yl&wk rd	—	—	Dolomitic(bn yl), Hematitic(wk rd), Much silt, Trace sand,
70-75	G G	"	Lt olive	—	—	Dolic, Mch Fn sand,silt,Fn glauconite. Locally banded yl & gn,
75-80	G G	"	"	—	—	Same,
80-85	G G	"	"	—	—	Same plus trace hematitic shale, G dol cem,mfc incl,
85-90	G G	Sandstone	Lt yl bn	M	Vfn/C	Srnd, Ltl P dolic sh cem,Fn/M glauc, Mny sec qtz grwths, Tr v
90-95	G G	"	Ol yellow	"	"	Srnd, Tr v G dol cem,hemic sh,mfc incl. Mny sec qtz grwths,
95-100	G G	"	"	"	"	Same but little glauconite, Mch Fn/M glauc,
100-105	G	"	"	"	Vfn/VC	Same but trace glauconite, Fn/M glauc,mfc incl, 60%C, 40%Fn,
105-110	G	"	"	Fn & C	"	Sang(Fn), Rnd(C), Ltl P to v G dol cem, Mny sec qtz grwths, Tr
110-115	G	"	"	M	"	Srnd, Ltl P to v G dol cem, Mny sec qtz grwths, Tr Fn glauc,
115-120	G	"	Yellow	"	Vfn/C	Same, mfc incl,
120-125	G	"	"	"	"	"
125-130	G	"	"	"	"	"
130-135	G	"	"	"	Vfn/VC	"
135-140		"	"	"	"	"
140-145	G	"	Bn yellow	"	Vfn/C	"
145-150		"	"	"	"	Same plus trace zircon grains,
150-155	G	"	"	"	"	Same,
155-160		"	"	"	"	Same but no zircon grains,

ell name: De Forest Village Well #3

Depths	Graphic Section	Rock Type	Color	Grain Size Mode	Grain Size Range	Miscellaneous Characteristics
160-165	G	Sandstone	Bn yellow	M	Vfn/C	Srnd, Ltl P to v G dol cem, Mny sec otz orwths, Tr fn glauc,
165-170	G	"	"	"	Vfn/VC	Same, mfc incl.
170-175	G	"	Lt bn yl	M & C	"	Rnd, Tr P dol cem,wh sh,fros,mfc incl,Fn glauc, Mny sec otz
175-180		"	"	"	"	Same plus trace green gray shale, zircon grains, orwths,
180-185	G	"	V dl brown	"	"	Same, Mny sec otz orwths
185-190	G	"	"	C	"	Rnd, Tr G sil cem,wh & gn gry sh,Fn glauc,zircon grns,mfc incl
190-195	G	"	"	M	"	Srnd, Tr G sil cem,wh & gn gry sh,Fn glauc,mfc incl, Mny sec
195-200		"	"	"	"	Same, otz orwths,
200-205	G	"	"	"	"	Same but no green gray shale,
205-210		"	"	"	"	Same plus trace green gray shale,
210-215	G	"	"	"	"	Same but no green gray shale,
215-220		"	"	"	"	Same,
220-225	G	"	"	"	"	Same plus trace zircon grains,
225-230	G	"	Lt yl bn	"	"	Srnd, Ltl P to v G sil cem, Mny sec otz orwths, Tr fn glauc,ol
230-235		"	"	"	"	Same but no pale green shale, gn & wh sh,fros,mfc incl,
235-240	G	"	"	"	"	Same plus trace zircon grains,
240-245		"	"	"	"	Same, Ltl fros,
245-250		"	Bn yellow	C	"	Wl rnd, Tr v G dol cem,wh cht,mfc incl, Mny sec otz orwths,
250-255		"	"	"	"	Wl rnd, Tr v G dol cem,wh sh,mfc incl, Mny sec otz grwths, Ltl
255-260		"	"	"	"	Same plus trace yellow dolomite, fros,
260-265		"	"	"	"	Wl rnd, Tr v G dol cem,wh & yl sh,mfc incl, Mny sec otz orwths
265-270		"	"	"	"	Rnd, Tr v G dol cem,wh & yl sh,wh cht,zircon grns, Ltl fros,
270-275		"	"	"	"	See end of log, mfc incl, Mny sec otz orwths, Ltl fros,
275-280	G	"	"	"	"	Rnd, Tr v G dol cem,wh sh,Fn glauc,mfc incl, Mny sec otz
280-285		"	"	M	"	Rnd, Tr v G dol cem,wh & yl sh,mfc incl, orwths, Ltl fros,
285-290		"	"	C	"	Same plus tr wh dolomite, Mny sec otz orwths, Ltl fros,
290-295		"	"	"	"	Rnd, Tr v G dol & calc cem,wh & yl sh,mfc incl, Mny sec otz
295-300		"	"	M	"	Same but no calcite cement, orwths, Ltl fros,
300-305	G	"	"	"	"	Same plus trace Fn glauconite,
305-310		"	"	C	"	Rnd, Tr v G dol cem,wh & yl sh,wh dol,zircon grns,mfc incl, Mny
310-315		"	"	M	"	Same but no white shale, sec otz orwths, Ltl fros,
315-320		"	Yl brown	"	"	Rnd, Ltl P sil sh cem, Tr v G dol cem,wh sh,mfc incl, Mny sec
320-325		"	"	"	"	Same, otz orwths,
325-330		"	"	"	"	Same plus trace white chert,
330-335		"	"	"	"	Same,
335-340		"	"	"	"	" dol,mfc incl,cvd trap,
340-345		"	Lt yl bn	"	"	Rnd, Ltl P sil sh cem, Mny sec otz orwths, Tr wh & pl gn sh,
345-350		"	"	"	"	Same, incl,cvd cyl,
350-355		"	"	"	"	Rnd, Ltl P sil sh cem, Mny sec otz orwths, Tr wh cht,dol,mfc
355-360		"	Bn yellow	"	"	Rnd, Ltl P sil cem, Mny sec otz orwths, Tr wh sh,zircon grns,
360-365		"	"	"	"	Same but no zircon grains, mfc incl,dol,
365-370		"	"	"	"	Same,
370-375		"	"	"	"	Same plus trace green gray shale, white chert,
375-380		"	"	"	"	Same but no green gray shale,
380-385		"	"	"	"	Same,
385-390	G	"	"	"	"	Rnd, Tr P sil cem,dol,Fn glauc,wh shale, Mny sec otz orwths,
390-395		"	"	"	"	Same but no dolomite, glauconite,
395-400		"	"	"	"	Rnd, Tr P sil cem,dol,wh sh,wh cht,mfc incl, Mny sec otz orwths,
400-405		"	V dl brown	"	"	Srnd, Tr P sil cem,wh shale,mafic incl, Mny sec quartz orwths,
405-410		"	"	"	"	Rnd, Tr P sil cem,rd bn sh,dol,mfc incl, Mny sec otz orwths,
410-415		"	"	"	"	Rnd, Tr v G dol cem,dol,wh & pl gn shale,mfc incl,cvd ovl, Mny
415-420		"	"	"	"	Same, sec otz orwths,
420-425		"	"	"	"	Rnd, Tr P sil cem,dol,mfc incl,cvd ovl, Mny sec quartz orwths,
425-430		"	Pl yellow	"	"	Same,
430-435		"	"	C	"	"
435-440		"	"	M	"	"
440-445		"	"	"	"	Rnd, Tr P sil cem,wh cht,zircon grns,wh sh,mfc incl, Mny sec
445-450		"	"	"	"	Same, otz orwths,
450-455		"	"	"	"	Same plus trace dolomite,
455-460		"	"	"	"	Same but no white chert,
460-465		"	"	"	"	Same, Mny sec otz grwths,
465-470		"	"	"	"	Rnd, Tr P to v G sil cem,v G dol cem,rd bn & pl gn sh,mfc incl,
470-475		"	"	"	"	Rnd, Tr P to v G sil cem,v G dol cem,rd bn & wh sh,mfc incl,
475-480		"	"	"	"	Same but no red brown shale, Mny sec otz orwths,
480-485		"	"	"	"	Same,
485-490		"	"	"	"	Rounded, Trace poor silica cement, white shale, dolomite, mafic inclusions, Many secondary quartz orwths,

ell name: DeForest Village Well #3

Depths	Graphic Section	Rock Type	Color	Grain Size		Miscellaneous Characteristics
				Mode	Range	
490–495		Sandstone	Pl yellow	M	Vfn/VC	Rnd. Tr P sil cem,wh shale,dol,mfc incl. Mny sec qtz grwths.
495–500		"	"	"	"	Same.
500–505		"	"	"	"	"
505–510		"	"	M/C	"	" sec qtz grwths.
510–515		"	Lt yl bn	"	"	Rnd. Tr P sil cem,zircon grns,wh & rd bn sh,dol,mfc incl. Mny
515–520		"	"	M	"	Same. Ltl fros.
520–525		"	"	M/C	"	Rnd. Tr P sil cem,wh sh,ool cht,mfc incl. Mny sec qtz grwths.
525–530		"	"	"	"	Rnd. Tr P sil cem,mafic incl. Mny sec quartz grwths. Ltl fros.
530–535		"	"	"	"	Rnd. Tr P sil cem,zircon grns,wh sh,mfc incl, Mny sec qtz
535–540		"	"	"	"	Rnd. Tr P sil cem,wh cht,wh sh,mfc incl. grwths. Ltl fros.
540–545		"	"	C	"	Rnd. Tr P sil cem,wh sh,yl dol, Mny sec qtz grwths, Ltl fros.
545–550		"	"	Fn&C	"	Same. mfc incl. Mny sec qtz grwths. Ltl fros.
550–555		"	"	"	"	Rnd(C). Srnd(Fn). Tr P sil cem,mfc incl. Mny sec qtz grwths.
555–560		"	"	C	"	Same plus trace politic chert. Ltl fros.
560–565		"	"	"	"	Rnd. Tr P sil cem,mafic incl. Mny sec quartz grwths. Ltl fros.
565–570		"	"	"	"	Same.
570–575		"	"	"	"	"
575–580		"	"	"	"	" fros.
580–585		"	"	"	"	Wl rnd. Tr P sil cem,wh sh,mfc incl. Mny sec qtz grwths. Ltl
585–590		"	"	"	"	Wl rnd. Tr P sil cem,yl dol,mfc incl. Mny sec qtz grwths. Ltl
590–595		"	"	"	"	Same plus trace white shale. fros.
595–600		"	"	"	"	Same.
600–605		"	"	"	"	"
605–610		"	Pl yellow	Fn&C	"	"
610–615		"	"	"	"	Rnd(C). Srnd(Fn). Tr P sil cem,wh sh,mfc incl,fros. Mny sec
615–620		"	"	"	"	Same plus trace zircon grains. qtz grwths.
620–625		"	"	"	"	Same but no zircon grains.
625–630		"	"	"	"	Same plus trace zircon grains.
630–635		"	Lt yl bn	"	"	Same.
635–640		"	"	"	"	Same plus trace caved soil.
640–645		"	"	C	"	Same but no caved soil. grwths, Ltl fros.
645–650		"	V pl brown	Fn&C	"	Rnd. Tr P sil cem,wh sh,zircon grns,mfc incl. Mny sec qtz
						Rounded (C). Subrounded (Fn). Trace P silica cement, white shale, zircon grains, mafic inclusions, caved soil. Many secondary quartz grwths. Little frosting.
			END OF LOG			
270–275		Sandstone	Bn yellow	C	Vfn/VC	Rounded. Trace very good dolomite cement, white & pale green shale, zircon grains, mafic inclusions. Many secondary quartz grwths. Little frosting.

Appendix G

...LL CONSTRUCTION REPORT

ORM 3300-15

NOTE
WHITE COPY – DIVISION'S COPY
GREEN COPY – DRILLER'S COPY
YELLOW COPY – OWNER'S COPY

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
Box 450
Madison, Wisconsin 53701

1. COUNTY: Dane

CHECK ONE: ☐ Town ☒ Village ☐ City

NAME: De Forest

LOCATION – ¼ Section | Section | Township | Range

OR – Grid or street no. | Street name: Acker Parkway

AND – If available subdivision name, lot & block no.

3. OWNER AT TIME OF DRILLING: Village of De Forest

ADDRESS: Village Hall

POST OFFICE: De Forest, WI 53532

4. Distance in feet from well to nearest: (Record answer in appropriate block)

BUILDING	SANITARY SEWER C. I.	SANITARY SEWER TILE	FLOOR DRAIN C. I.	FLOOR DRAIN TILE	FOUNDATION DRAIN SEWER CONNECTED	FOUNDATION DRAIN INDEPENDENT	WASTE WATER DRAIN C. I.	WASTE WATER DRAIN TILE

CLEAR WATER DRAIN C. I.	CLEAR WATER DRAIN TILE	SEPTIC TANK	PRIVY	SEEPAGE PIT	ABSORPTION FIELD	BARN	SILO	ABANDONED WELL	SINK HOLE

OTHER POLLUTION SOURCES (Give description such as dump, quarry, drainage well, stream, pond, lake, etc.)

5. Well is intended to supply water for: Municipal Water Supply

6. DRILLHOLE

Dia. (in.)	From (ft.)	To (ft.)	Dia. (in.)	From (ft.)	To (ft.)
30	Surface	127			
23	127	661			

7. CASING, LINER, CURBING, AND SCREEN

Dia. (in.)	Kind and Weight	From (ft.)	To (ft.)
30	blk.steel,.375"wall	Surface	26
24	" "0.5"wall	0	127

8. GROUT OR OTHER SEALING MATERIAL

Kind	From (ft.)	To (ft.)
Neat cement	Surface	127

9. FORMATIONS

Kind	From (ft.)	To (ft.)
Glacial Drift	Surface	26
Franconian	26	200
Galesville	200	235
Eau Claire	235	350
Mt. Simon	350	661

10. TYPE OF DRILLING MACHINE USED

☒ Cable Tool ☐ Direct Rotary ☐ Reverse Rotary
☐ Rotary – air w/drilling mud ☐ Rotary – hammer with drilling mud & air ☐ Jetting with ☐ Air ☐ Water

11. MISCELLANEOUS DATA

Yield test: 24 Hrs. at 1500 GPM

Depth from surface to normal water level: 24 ft.

Depth to water level when pumping: 58 ft.

Water sample sent to: Marquette University laboratory on: June 16 19 78

Well construction completed on: June 19 78

Well is terminated 18 inches ☒ above ☐ below final grade

Well disinfected upon completion ☒ Yes ☐ No

Well sealed watertight upon completion ☒ Yes ☐ No

Your opinion concerning other pollution hazards, information concerning difficulties encountered, and data relating to nearby wells, screens, seals, type of casing joints, method of finishing the well, amount of cement used in grouting, blasting, sub-surface pumprooms, access pits, etc., should be given on reverse side.

SIGNATURE

Registered Well Driller

COMPLETE MAIL ADDRESS: Milaeger Well & Pump Co., 20950 Enterprise Ave., Brookfield, WI 53005

Please do not write in space below

COLIFORM TEST RESULT	GAS – 24 HRS.	GAS – 48 HRS.	CONFIRMED	REMARKS

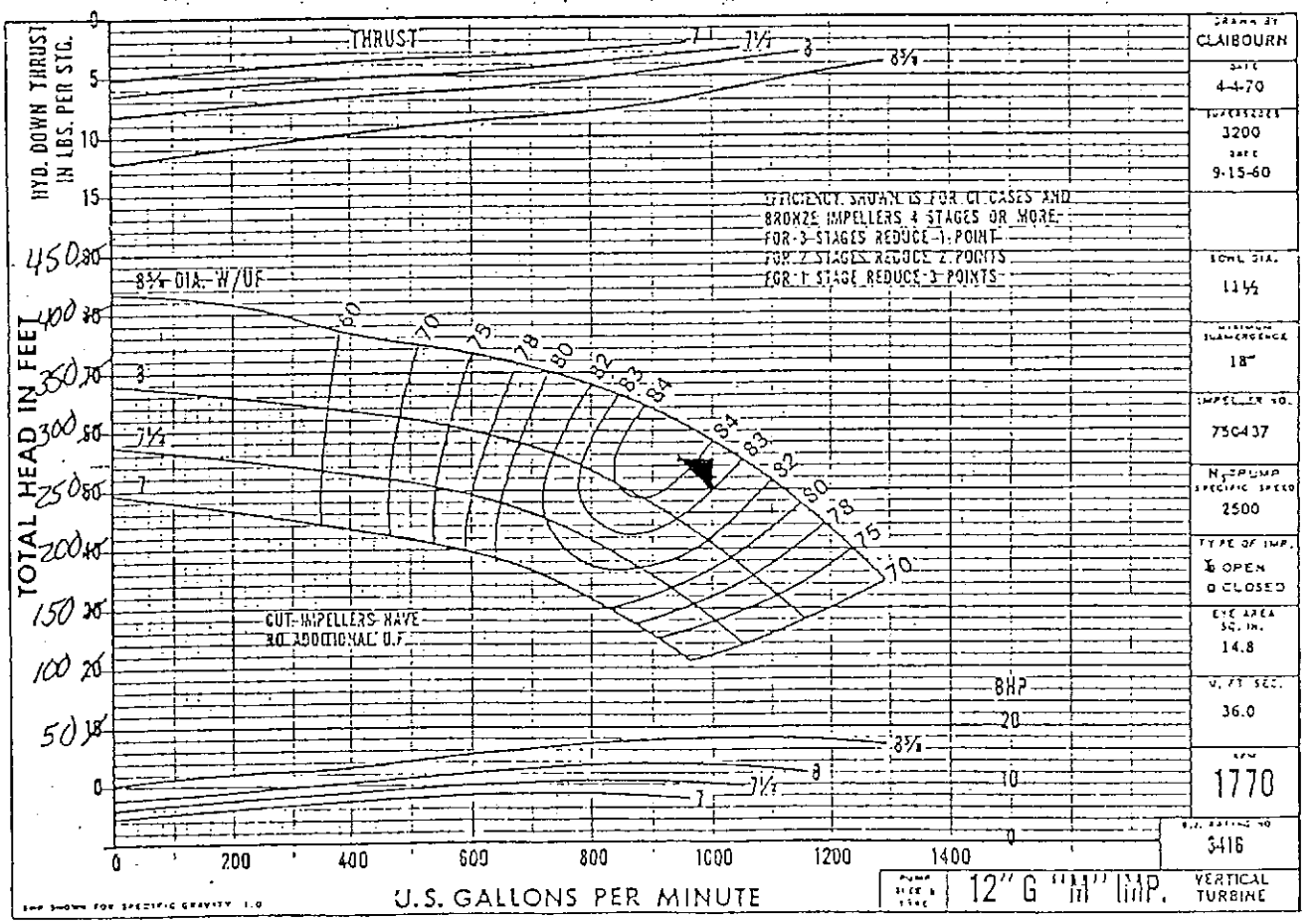
REV. 3-71

Byron Jackson Pump Division
BORG-WARNER CORPORATION

Effective SEPT. 70

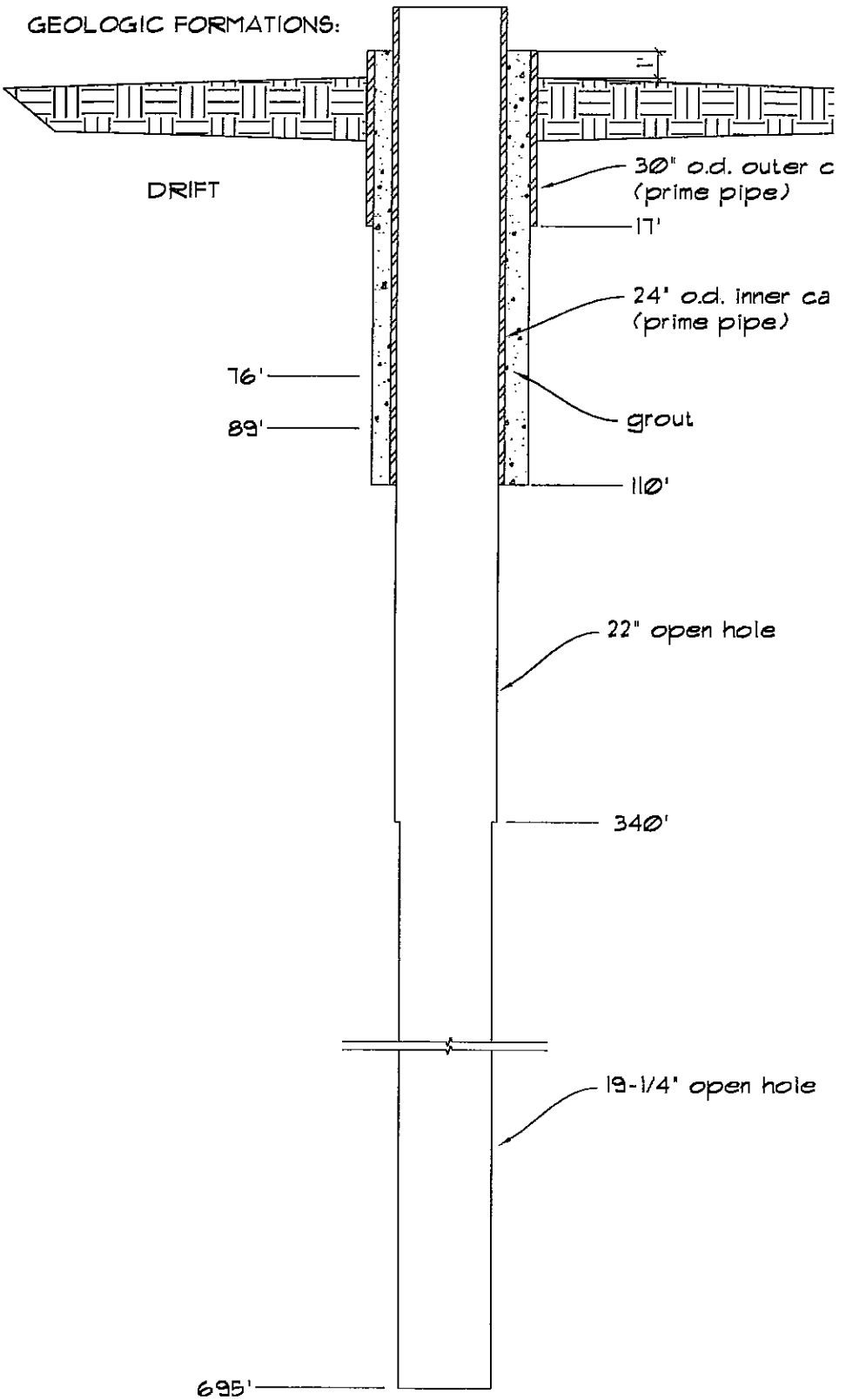
BY _____ DATE _____ SUBJECT _____ SHEET NO. _____ OF _____

CHKD. BY _____ DATE _____ JOB NO. _____



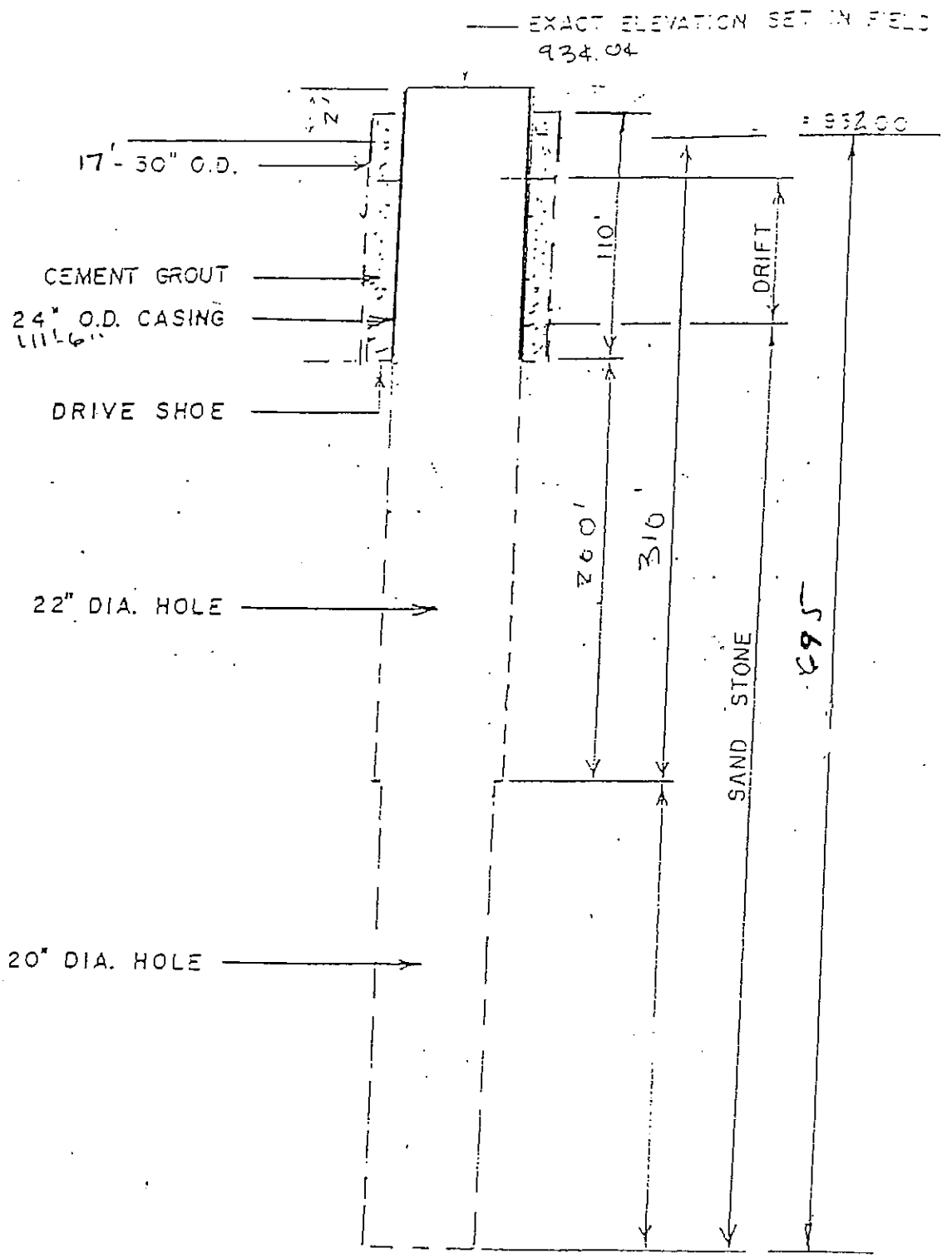
Appendix G

WELL #4



Appendix G

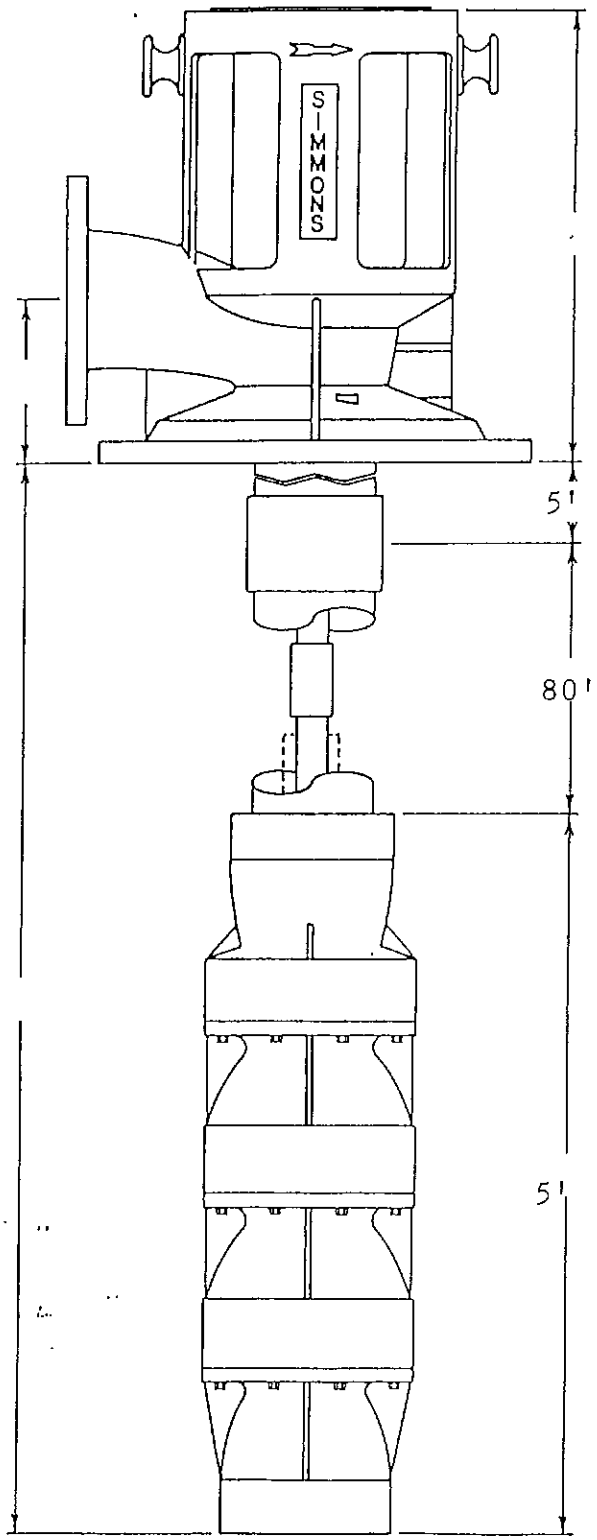
WELL NO. 4
DEFOREST, WISCONSIN



7/30/90
AS BUILT 4/19/91

SIMMONS

CTW CORPORATION submittal for
Village of DeForest
Deep Well Pump and Piping
for Well No. 4



ORDER # ---- QUOTE # 05-06-91

CUSTOMER DeFOREST, WI
JOB WELL #4 DATE 05-17-91
GPM 1200 TDH 254

MOTOR MAKE U.S. HP 125 VHS-VSS
PHASE 3 VOLTAGE 460 CYCLE 60
RPM 1800 NLS CLUTCH NRR ~~SRC~~
FRAME COUPLING 1-1/2"
OTHER ---
#CH110
GEARDRIVE MAKE JOHNSON HP 1 VHS-VSS
RATIO CLUTCH NRR
OTHER -- ROTATION #1

DISCHARGE HEAD SPC-10 MATERIAL CAST IRON
ASA FLANGE 10"
PACKING X ~~SEAL~~
HEADSHAFT SIZE 1-1/2" LENGTH --
HEADSHAFT MATERIAL 410 STAINLESS STEEL
BASE TUBE SIZE -- THREAD --
OTHER

DISCHARGE COLUMN SIZE 10 THREAD 8
LENGTHS 2 5' 8 10' -- 20'
WALL 0.279" OTHER

~~ENCLOSING TUBE SIZE THREAD~~
~~KIND RH-LH~~
~~MATERIAL~~

LINESHAFT SIZE 1-1/2" THREAD 8
WATER LUBE - ~~OIL LUBE~~
SLEEVE 1-11/16" OD x 7" LONG
MATERIAL STAINLESS STEEL

COUPLINGS SIZE 1-1/2" THREAD 10
MATERIAL SAE 1045

SPIDERS SIZE 10" QUANTITY 9
MATERIAL BRONZE

PUMP BOWL TYPE SJ12M STAGES 4
SERIAL# --- OTHER

SUCTION SIZE 10" LENGTH 10'

SCREEN TYPE CONE
SIZE 10" LENGTH 24"
MATERIAL GALVANIZED

OVERALL SETTING 90' TOP BOWLS

OTHER MATERIAL

REFERENCE CURVE 4-1-86-69C

REFERENCE DRAWING ---

Appendix G

Well Construction Report For WISCONSIN UNIQUE WELL NUMBER DR 124

Property Owner: Village of Dr Trust Telephone Number: 608 396-4751

Mailing Address: 113 South Dunbar

City: DeTrust | State: WI | Zip Code: 53532

County of Well Location: Dane | County Well Location Permit No.: W | Well Completion Date: 4/16/91 (M M D D Y Y)

Well Constructor (Business Name): Dane County Drilling | Registration #: 370

Address: Box 159

City: Randolph | State: WI | Zip Code: 53956

Department of Natural Resources
Private Water Supply — WS/2
Box 7921
Madison, WI 53707

1. Location (Please type or print using a black pen.)

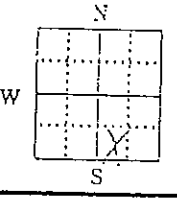
☒ Town ☐ City ☐ Village of DeTrust | Fire # (if available)

Grid or Street Address or Road Name and Number (if available): 1 Mile Hill Rd

Subdivision Name | Lot # | Block #

Gov't Lot # ____ or SW ¼ of SE ¼ of Section 17 ; T 9 N; R 12 ☒ E ☐ W

2. Mark well location in correct 40-acre parcel of section.



3. Well Type ☑ New ☐ Replacement ☐ Reconstruction

of unique well # _____ constructed in 19 ____

Reason for new, replaced or reconstructed well? municipal well WELL NO. 4

4. Well serves 1 # of homes and/or municipal (ex: barn, restaurant, church, school, industry, etc.)

High Capacity Well? ☒ Yes ☐ No

High Capacity Property? ☒ Yes ☐ No

☑ Drilled ☐ Driven Point ☐ Jetted ☐ Other ____

5. Well Located on Highest Point of Property, Consistent with the General Layout and Surroundings? ☑ Yes ☐ No If no, explain on back side.

Well Located in Floodplain? ☐ Yes ☒ No

Distance In Feet From Well To Nearest:

____ 1. Landfill
____ 2. Building Overhang
____ 3. Septic or Holding Tank
____ 4. Sewage Absorption Unit
____ 5. Nonconforming Pit
____ 6. Buried Home Heating Oil Tank
____ 7. Buried Petroleum Tank
____ 8. Shoreline/Swimming Pool
____ 9. Downspout/Yard Hydrant
____ 10. Privy
____ 11. Foundation Drain to Clearwater
____ 12. Foundation Drain to Sewer
____ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
____ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 15. Collector or Street Sewer
____ 16. Clearwater Sump
1 17. Wastewater Sump
____ 18. Paved Animal Barn Pen
____ 19. Animal Yard or Shelter
____ 20. Silo — Type ____
____ 21. Barn Gutter
____ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 23. Other Manure Storage ____ Other NR 112 Waste Source
____ 24. ____

Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
29	surface	110
25	110	340
9 1/4	340	695

Method of constructing upper enlarged drillhole only.

☒ 1. Rotary — Mud Circulation
☒ 2. Rotary — Air
☐ 3. Rotary — Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ____ in. dia.
☐ 6. Temp. Outer Casing ____ in. dia. Removed? ☐ Yes ☐ No If no, explain ____
☐ 7. Other ____

Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Mfg. & Method of Assembly	From (ft.)	To (ft.)
30	.375 wall VSP	surface	17
24	ASTM. A53-B FEL- DEL M/HD. - 50#		
	Unit 125.49 lbs/FT	0	110

Dia. (in.)	screen type and material	From	To

Grout or Other Sealing Material

Method: Tremie

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
Grout	surface	115	200

DNR USE ONLY	9. Geology Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
	Clay, Sand + Gravel	surface	70
	Sandrock - Shale	70	89
	Sandrock	89	695

10. Static Water Level: ____ ft. above ground level; 22 ft. below ground surface

11. Pump Test: Pumping Level 45 ft. below surface; Pumping at 1000 GPM for 4 hours

12. Well Is: 18 in. ☑ Above ☐ Below Grade

Developed? ☑ Yes ☐ No
Disinfected? ☑ Yes ☐ No
Capped? ☑ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells? ☐ Yes ☐ No If no, explain ____

14. Signature of Point Driver or Registered Driller: Date Signed: 4/30/91

Signature of Drill Rig Operator: Date Signed: 4/30/91

Make additional comments on reverse side about geology, etc.

WELL OWNER

WELL CONSTRUCTION REPORT

Appendix G

SIMMONS SJ12M

DeForest Well #4

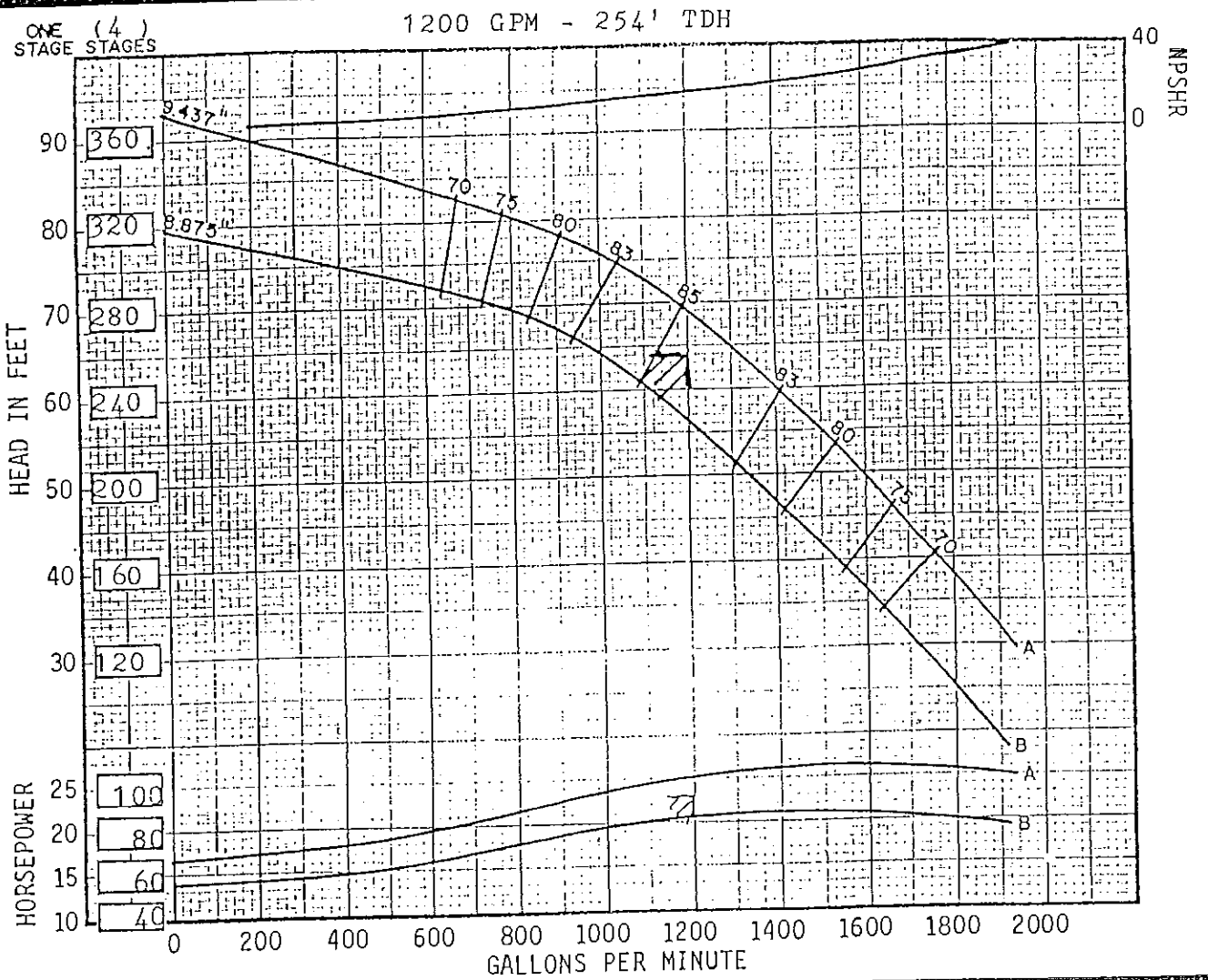
1770 R.P.M.

CTW CORPORATION
BOX 994
WAUKESHA, WI 53187

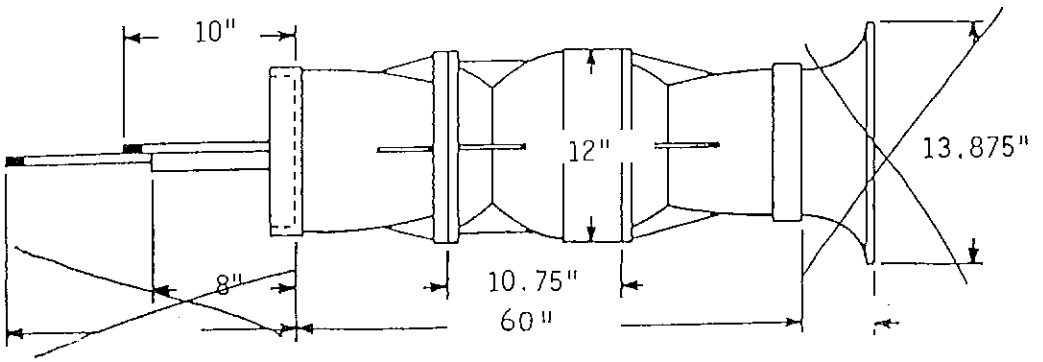
69C

04-91

4-1-86



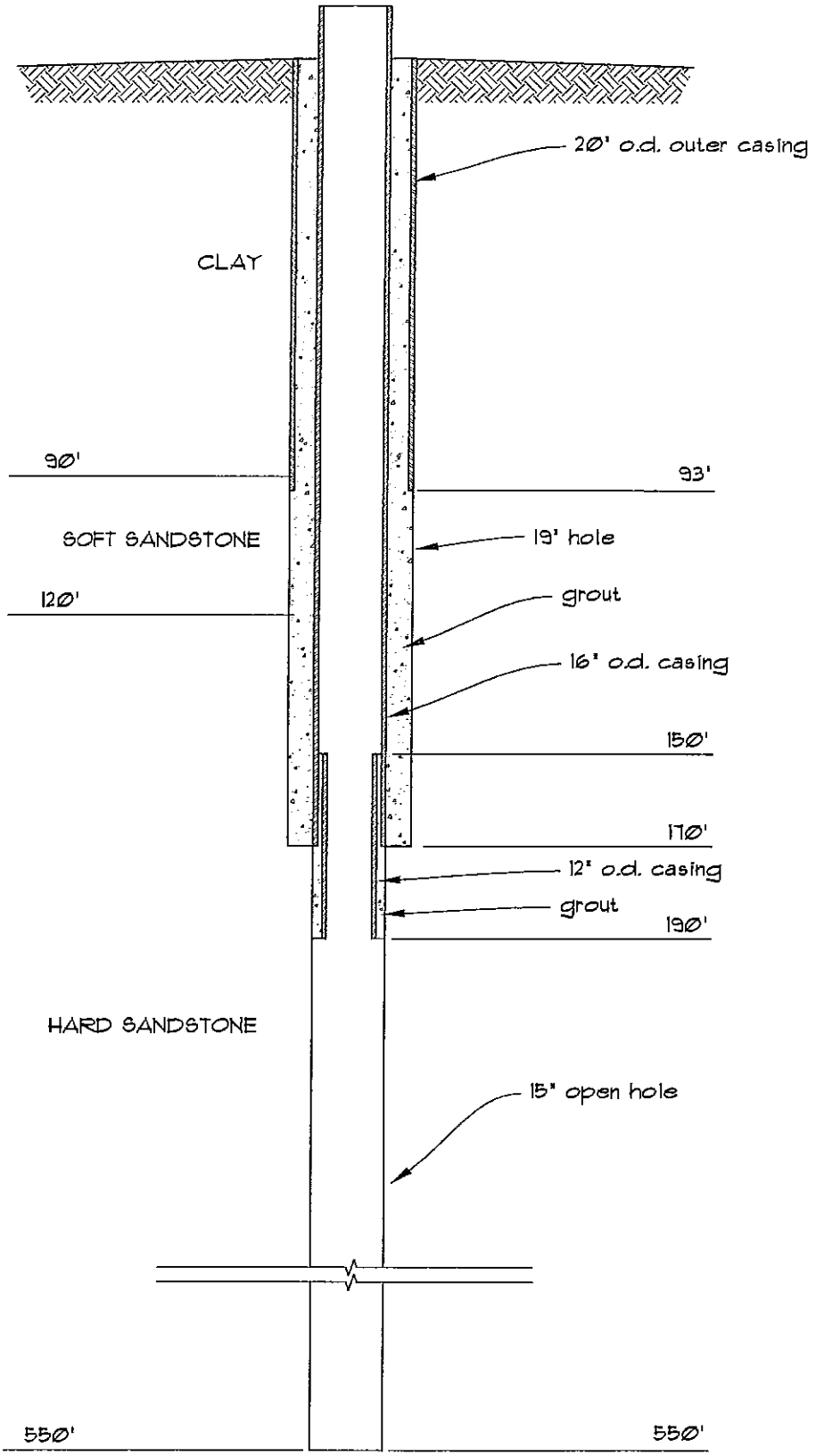
				NO. STAGES	EFF. CHANGE
STD. SHAFT DIA.	= 1.6875"	IMPELLER TYPE	= ENCLOSED		
STD. LATERAL	= 0.875"	IMPELLER NO.	= SJ12M	1	-2
DISCHARGE SIZES	= [illegible] 10"	MAX. SPHERE SIZE	= 0.875"	2	-1
SUCTION SIZE	= [illegible] 10"	K-FACTOR, MAX.	= 11.0	3	0
ONE STAGE WT.-LBS.	= 270	MAX. OPERATING P.S.I.	= 275	4	0 ←
ADD'L STAGE WT.	= 110	MIN. SUBMERGENCE	= 16"	5	0
IMPELLER WT.-LBS.	= 17.00	IMPELLER EYE AREA	= 28.24 Sq. In.		
ONE STAGE WR^2	= 0.804	SPECIFIC SPEED	= 2545		



Appendix G

TOKEN CREEK SANITARY DISTRICT - WELL NO. 1 PROFILE

Not to Scale



All information shown is based on Well Construction Reports.

VIERBICHER ASSOCIATES
Committed to Quality Service Since 1976
REEDSBURG - MADISON - SCHOFIELD - PRAIRIE DU CHIEN
999 Fourier Drive, Suite 201, Madison, Wisconsin 53717
Phone: (608) 826-0532 Fax: (608) 826-0530

PROJECT: 2006 Water Supply & Distribution System Study	DATE 3/06
LOCATION: Village of DeForest Dane County, Wisconsin	DWG. NO.
JOB NO.: 13065587	

20 Mar 2006 - 2:35p G:\DATA\MUNICENG\DEFO\013065587 - 2006 Water System Study\Defo South\TCSD Well No 1 Profile.dwg by: dpop

Appendix G

X136

Well Construction Report For WISCONSIN UNIQUE WELL NUMBER HI 769

DEC 8 1993

State of Wisconsin
Private Water Supply - WS/2
Department of Natural Resources
Box 7921
Madison, WI 53707 (Please type or print using a black pen.)

Property Owner: Token Creek Utility
Telephone Number:
Mailing Address: Town of Burke 4084E Washington Ave
City: Madison
State: WI
Zip Code: 53704
County of Well Location: Dane
Co. Well Permit No.: W93-080
Well Completion Date (mm-dd-yy): 11-12-93

13. Well Constructor (Business Name): Gee Well Drilling
License #: 393
Address: N9899 Hwy 93
City: Mt. Dells
State: WI
Zip Code: 53965

Token Creek Sanitary District well No. 1

2. Mark well location with a dot in correct 40-acre parcel of section.

1. Well Location: Please use decimals instead of fractions.
☒ Town ☐ City ☐ Village of Burke
Fire # (If avail.)
Grid or Street Address or Road Name and Number (If avail.): South End Martin Dr.
Subdivision Name: Lot #: Block #:
Gov't Lot # ____ or SE 1/4 of NW 1/4 of Section 15, T 8 N; R 10 ☒ E ☐ W

3. Well Type: ☒ New ☐ Replacement ☐ Reconstruction
of previous unique well # ____ constructed in 19 ____
Reason for new, replaced or reconstructed well?

4. Well serves ____ # of homes and or #1 (Ex: barn, restaurant, church, school, industry, etc.)
High Capacity: Well? ☒ Yes ☐ No; Property? ☒ Yes ☐ No

☒ Drilled ☐ Driven Point ☐ Jetted ☐ Other ____

5. Well located on highest point of property, consistent with the general layout and surroundings? ☒ Yes ☐ No If no, explain on back side.

Well located in floodplain? ☐ Yes ☐ No
Distance in Feet From Well To Nearest:
____ 1. Landfill
____ 2. Building Overhang
____ 3. Septic or Holding Tank (circle one)
____ 4. Sewage Absorption Unit
____ 5. Nonconforming Pit
____ 6. Buried Home Heating Oil Tank
____ 7. Buried Petroleum Tank
____ 8. Shoreline/Swimming Pool
____ 9. Downspout/Yard Hydrant
____ 10. Privy
____ 11. Foundation Drain to Clearwater
____ 12. Foundation Drain to Sewer
____ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
____ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 15. Collector or Street Sewer
____ 16. Clearwater Sump
____ 17. Wastewater Sump
____ 18. Paved Animal Barn Pen
____ 19. Animal Yard or Shelter
____ 20. Silo - Type ____
____ 21. Barn Gutter
____ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 23. Other Manure Storage ____ Other NR 112 Waste Source
____ 24. ____

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
20	surface	170
15	170	550

Method of constructing upper enlarged drillhole only.
☒ 1. Rotary - Mud Circulation
☒ 2. Rotary - Air
☐ 3. Rotary - Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ____ in. dia.
☐ 6. Temp. Outer Casing ____ in. dia. Removed? ☐ Yes ☐ No If no, explain ____
☐ 7. Other ____

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification, Manufacturer & Method of Assembly	From (ft.)	To (ft.)
16 OD	New Plyo P.E. ASTM F53	+3 surface	170
20	New Plyo	0	93

Dia. (in.) | screen type, material & slot size | From | To

8. Grout or Other Sealing Material

Method	Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
Conc + Water		surface	170	175

cc: SOD, WGNHS WELL LOG BOOK

DNR USE ONLY

9. Geology

Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
C Clay	Surface	90
SN Soft sandstone	90	120
HN Hard sandstone	120	550

Name: Well #1
Misc # 01223
Approved 5-26-93
Specific Capacity 19.7

10. Static Water Level: 27 ft. above ground surface / ____ ft. below ground surface

11. Pump Test: Pumping Level 95 ft. below surface; Specific 19.7; Pumping at 400 GPM for 22 hours

12. Well is: 30 in. ☒ Above ☐ Below Grade
Developed? ☒ Yes ☐ No
Disinfected? ☒ Yes ☐ No
Capped? ☒ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells? ☐ Yes ☐ No If no, explain None

14. Signature of Print Driver or Licensed Supervisory Driller: Gee Well Drilling MH Date Signed
Signature of Drill Rig Operator (Mandatory unless same as above): Mark Hoke Date Signed 11-29-93

Make additional comments on reverse side about geology, additional screens, water quality, etc.
Comments on reverse side ____ (Check √, if yes)

DNR

WELL CONSTRUCTION REPORT
Form 3300-77A Rev. 7-93

WGNHS ORIGINAL

Appendix G
Source: WISCONSIN UNIQUE WELL NUMBER

WELL CONSTRUCTION HO688

State of WI-Private Water Systems-DG/2
Department Of Natural Resources, Box 7921
Madison, WI 53707

Form 3300-77A
(Rev 02/02)bw

Depth 550 FT

Property Owner: TOKEN CREEK S D 1 | Telephone Number: - -

Mailing Address: 4018 E WASH AVE

City: MADISON | State: WI | Zip Code: 53704

County of Well Location: 13 DANE | Co Well Permit No: W | Well Completion Date: September 27, 1995

1. Well Location

T=Town C=City V=Village: T of BURKE | Fire#:

Street Address or Road Name and Number: SOUTH END OF MARTIN DR

Subdivision Name: | Lot#: | Block #:

Well Constructor: C T W CORP | License #: 364 | Facility ID (Public): 113243790

Address: 21500 W GOOD HOPE RD | Public Well Plan Approval#:

City: LANNON | State: WI | Zip Code: 53046 | Date Of Approval: 07/18/1995

Hicap Permanent Well #: 1223 | Common Well #: 001 | Specific Capacity: 14.1 gpm/ft

Gov't Lot: or SE 1/4 of NW 1/4 of Section 5 T 8 N;R 10 E

Latitude Deg. 43 Min. 11.2792

Longitude Deg 89 Min. 20.048

2. Well Type 3 (See item 12 below) | Lat/Long Method

1=New 2=Replacement 3=Reconstruction

of previous unique well # HI769 constructed in 93

Reason for replaced or reconstructed Well?

3. Well Serves: M (eg: barn, restaurant, church, school, industry, etc.) # of homes and or

M=Munic O=OTM N=NonCom P=Private Z=Other X=NonPot A=Anode L=Loop H=Drillhole

High Capacity: Well? Y Property? Y

1 1=Drilled 2=Driven Point 3=Jetted 4=Other

4. Is the well located upslope or sideslope and not downslope from any contamination sources, including those on neighboring properties? Y

Well located in floodplain?

Distance in feet from well to nearest: (including proposed)

1. Landfill
2. Building Overhang
3. 1=Septic 2= Holding Tank
4. Sewage Absorption Unit
5. Nonconforming Pit
6. Buried Home Heating Oil Tank
7. Buried Petroleum Tank
8. 1=Shoreline 2= Swimming Pool
9. Downspout/ Yard Hydrant
10. Privy
11. Foundation Drain to Clearwater
12. Foundation Drain to Sewer
13. Building Drain 1=Cast Iron or Plastic 2=Other
14. Building Sewer 1=Gravity 2=Pressure 1=Cast Iron or Plastic 2=Other
15. Collector Sewer: ___ units ___ in . diam.
16. Clearwater Sump
17. Wastewater Sump
18. Paved Animal Barn Pen
19. Animal Yard or Shelter
20. Silo
21. Barn Gutter
22. Manure Pipe 1=Gravity 2=Pressure 1=Cast iron or Plastic 2=Other
23. Other manure Storage
24. Ditch
25. Other NR 812 Waste Source

5. Drillhole Dimensions and Construction Method

Dia.(in.)	From (ft)	To (ft)
20.0	surface	170
15.0	170	550

Upper Enlarged Drillhole — Lower Open Bedrock

1. Rotary - Mud Circulation
2. Rotary - Air
3. Rotary - Air and Foam
4. Drill-Through Casing Hammer
5. Reverse Rotary
6. Cable-tool Bit in. dia
7. Temp. Outer Casing Removed ? in. dia. ____ depth ft.

Other

Geology Codes	8. Geology Type, Caving/Noncaving, Color, Hardness, etc	From (ft.)	To (ft.)
C	CLAY	0	90
SN	SOFT SANDSTONE	90	120
HN	HARDSTONE	120	550

6. Casing Liner Screen Material, Weight, Specification Manufacturer & Method of Assembly

Dia. (in.)		From (ft.)	To (ft.)
16.0	EXISTING	surface	170
12.0	SCH 80 F480 FLUSH JOINT PVC BEDROCK INDUSTRIES	150 98	190
20.0	EXISTING CASING	150 SURFACE	93

Dia.(in.)	Screen type, material & slot size	From	To

9. Static Water Level 27.0 feet B ground surface A=Above B=Below

10. Pump Test Pumping level 102.0 ft. below surface

Pumping at 1060.0 GP M 3.0 Hrs

11. Well is: 30 in. A Grade A=Above B=Below

Developed? Y

Disinfected? Y

Capped? Y

Grout or Other Sealing Material

Method PRESSURE TREMIE

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
NEAT CEMENT GROUT	surface	190.0	23 S

12. Did you notify the owner of the need to permanently abandon and fill all unused wells on this property?

If no, explain

13. Initials of Well Constructor or Supervisory Driller: TJC Date Signed: 10/3/95

Initials of Drill Rig Operator (Mandatory unless same as above) Date Signed

Additional Comments? Variance Issued?

Owner Sent Label? Y More Geology?

Batch 364

Appendix G

WATER SUPPLY & DISTRIBUTION SYSTEM MASTER PLAN MAP