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**Staff Analysis of Proposed Amendment to the  
Dane County Water Quality Plan,  
Revising the Northern Urban Service Area Boundary and  
Environmental Corridors in the Villages of DeForest and Windsor**

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**1) Existing Conditions****a) Land Use**

The requested amendment area is located northwest of the I-39/90/94 and State Highway 19 interchange in the Village of DeForest and the Village of Windsor (see Map 1). The 178 acre site is contiguous to the Northern Service Area along its southern and eastern edges. The proposed amendment is consistent with the [Village of DeForest Comprehensive Plan](#), the [2012 North Yahara Future Urban Development Area Study](#), the [DeForest-Windsor Cooperative Plan](#), and the [Village of Windsor Comprehensive Plan](#). The amendment area is also already within the [Madison Metropolitan Sewerage District Service Area](#).

Surrounding Land Uses Include:

- North—Agriculture, Open Space
- South— Agriculture, Open Space, Institutional, Vacant (platted); Planned Commercial and Industrial
- West— Agriculture, Open Space;
- East—Commercial and Industrial (across I-39/90/94)

<b>Land Use</b>	<b>Existing (Acres)</b>	<b>Env. Corridor (Acres)</b>	<b>Proposed (Acres)</b>
Residential, Single-Family	2.7		
Residential, Mixed			17.7
Commercial			86.3
Industrial			
Institutional			4.4
Rights-of-Way	25.5		33.5
Parks			
Stormwater Management		8.2	8.2
Open Space	149.3	27.4	27.4
<b>TOTAL</b>	177.5	35.6	177.5
<b>NET DEVELOPABLE<sup>1</sup></b>	116.4		

Southwest of the amendment area and bisected by State Highway 19, are 81 acres owned by Dane County and managed as the [Cherokee Marsh County Wildlife Area](#). County Wildlife Areas are sites designated by the Dane County Park Commission as open to public hunting and trapping as required by the WDNR Knowles Nelson Stewardship Program, and to other activities such as fishing, hiking and cross country skiing. These lands are not planned to be managed as parks or developed with trails, shelters, or facilities. On April 24, 2017, Dane County issued a [press release](#) announcing plans to purchase an additional 53 acres to the west of this area.

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<sup>1</sup> Net Developable = Total acreage – existing right-of-way – environmental corridor

## ***b) Cultural and Historic Sites***

The Wisconsin Historical Society has been contacted regarding the presence of any known archaeological sites or cemeteries within the amendment area. They have identified three previously recorded archaeological sites or cemeteries recorded within the amendment area. Their April 14, 2017 review letter recommends an archaeological survey of the amendment area. The development team is currently having an archaeological survey of the site conducted and expects it to be completed near the end of May.

## ***c) Natural Resources***

The proposed amendment area is located in the [Yahara River and Lake Mendota Watershed](#) (see Map 5). It drains to the Yahara River, southward through Cherokee Marsh, and then ultimately to Lake Mendota.

The northwest portion of the amendment area is identified in the [Dane County Parks and Open Space Plan](#) as part of the Cherokee Marsh Natural Resource Area Boundary (see Map 1). A Natural Resource Area Boundary consists of land that is specifically identified for the protection of a valuable natural environment and/or greenbelt corridor through a public process. This can include habitat protection and open space preservation. According to the plan, Natural Resource Area boundaries have no bearing on any zoning or land use decisions and participation by private landowners or local units of government to carry out any resource protection initiatives is on a voluntary basis.

Wastewater from the Village of DeForest is treated at the Madison Metropolitan Sewerage District (MMSD) Wastewater Treatment Facility and the treated effluent is discharged to Badfish Creek.

### Yahara River Upstream from Lake Mendota

The Yahara River originates in a marshy area of Columbia County near Morrisonville. About 25 percent of the watershed is in Columbia County. It meanders about 20 miles through extensively farmed land before reaching Lake Mendota. The Upper Yahara River Watershed has a mixture of agricultural, suburban, and urban lands. Dairying, corn and soybean production are the primary agricultural activities. The agricultural nonpoint sources of pollution include cropland erosion and livestock operations. The primary source of pollution is erosion from agricultural lands, contributing sediment and nutrients to tributary streams and the downstream Yahara Chain of Lakes. There are several growing communities in the watershed including the Villages of DeForest and Windsor. Large portions of the historic wetlands have previously been drained for agricultural purposes or for development. Cherokee Marsh, at nearly 2,500 acres, is the last large wetland complex in the watershed.

This section of the river, from its headwaters to its confluence with Token Creek in Cherokee Marsh (and beyond), is categorized as a Warm Water Sport Fishery by the DNR. Its condition is considered poor. This section of the river is listed as a 303(d) Impaired Water due to chloride and total phosphorus. A Total Maximum Daily Load (TMDL) has been established for this segment along with the other waters associated with the greater [Rock River Basin TMDL](#) project. The TMDL identifies phosphorus and sediment reduction targets needed to meet water quality goals. The Yahara River was the focus of a DNR Priority Watershed Nonpoint Source Pollution Control Project from 1998 to 2008. More recent efforts are being conducted through the Yahara CLEAN and [Yahara WINS](#) projects being coordinated among both public and private organizations and partners, including the Village of DeForest.

The primary water quality threats to the Yahara River are sediment and nutrient loading from both agricultural and urban sources. The draining of wetlands in the watershed and the straightening of small feeder streams coupled with the intensive agriculture of the watershed has resulted in large sediment and nutrient loading to the Yahara River, Lake

Mendota, and the Yahara Chain of Lakes. In addition, the Yahara Chain of Lakes have a long history of lake levels that frequently exceed the DNR lake level limits. This is because of the limited capacity of the system to convey large amounts of stormwater runoff, combined with the historic agricultural ditching of wetlands and the runoff from urban development in the watershed prior to current stormwater management requirements.

#### Oregon Branch / Badfish Creek

Treated effluent from the Madison Metropolitan Sewerage District is discharged to a ditch to the Oregon Branch of Badfish Creek. Its designated use is Limited Aquatic Life by the DNR and its current use is as a Fish and Aquatic Life waterbody. The ditch, Oregon Branch, and Badfish Creek are all included on the state 303(d) list of impaired waters for contaminated sediment and contaminated fish tissue due to historical PCB pollution. Badfish Creek is also on the 303(d) list for total phosphorus from nonpoint source pollution.

#### Wetlands

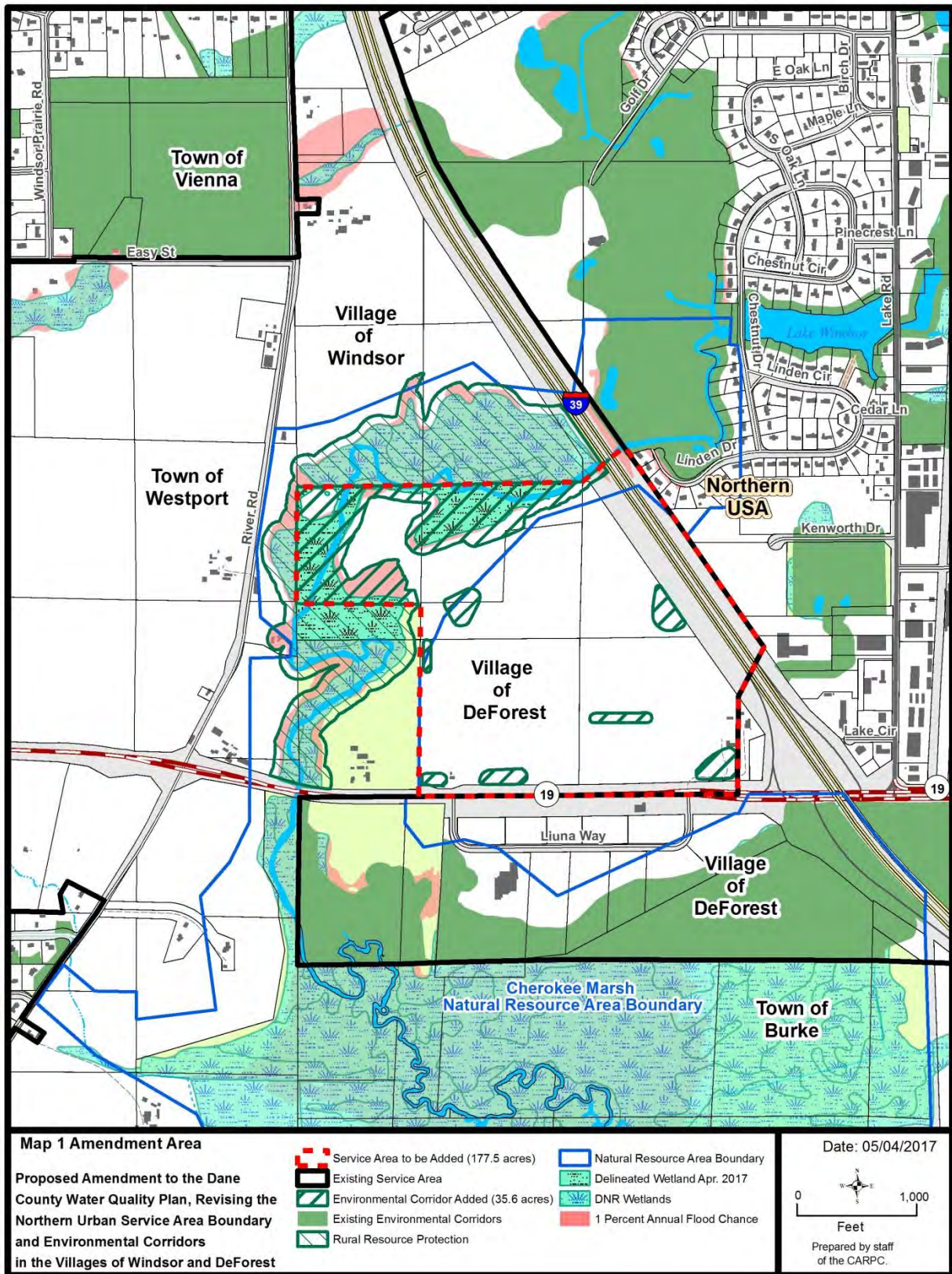
While many wetland areas formally associated with the Upper Yahara River have been drained, particularly in the headwaters area, there are still some wetlands buffering the stream including the large Cherokee Marsh complex. Cherokee Marsh is an extensive peat deposit along the Yahara River north of Lake Mendota and along the north and western portions of the amendment area. Covering nearly 2,500 acres, Cherokee Marsh is the largest wetland in Dane County and the major wetland in Lake Mendota's watershed. Cherokee Marsh contains a large expanse of open wet sedge meadow, varying to fen, prairie, bog, and shallow marsh in places. Also included are islands of upland support oak forest or open fields. The less accessible central areas probably retain the condition and appearance of many of the Yahara basin marshes a century ago, and therefore are considered an important regional reference site. Much of the marsh is in the public domain including a DNR fishery area and state natural area, Dane County parkland, and Madison Cherokee Conservancy. Cherokee Marsh features some of the best wetlands in the county as well as south central Wisconsin. The Wisconsin Wetlands Association has designated Cherokee Marsh as one of the [\*Wetland Gems\*](#)<sup>®</sup> in the state. It is used for outdoor environmental education as well as a scientific reference site.

North of Cherokee Marsh, the riparian wetlands immediately bordering the amendment area adjacent to the Yahara River include an association of emergent wet meadow and forested wetlands. They have been classified as a "Group III Wetland" in the [\*2008 Dane County Wetlands Resource Management Guide\*](#) (with Group I wetlands being the highest quality and Group V wetlands being the most degraded). While the wetlands in this group do not currently have outstanding values, they serve as support systems for those which do. Although substantially altered, these wetlands support wildlife and provide open space. While efforts should be made to ensure their protection, enhancement may be especially important to improve one or more degraded functions such as flood protection, water quality, and wildlife habitat.

A wetland delineation of the amendment area was conducted in April 2017, by Scott Taylor of Taylor Conservation, LLC. Mr. Taylor is one of the wetland professionals whose delineation work is assured by the DNR for purposes of state permits and state-mandated local programs. According to the delineation, there are approximately 17 acres of riparian wetlands long the Yahara River in the amendment area. The associated wetland delineation report is currently being prepared.

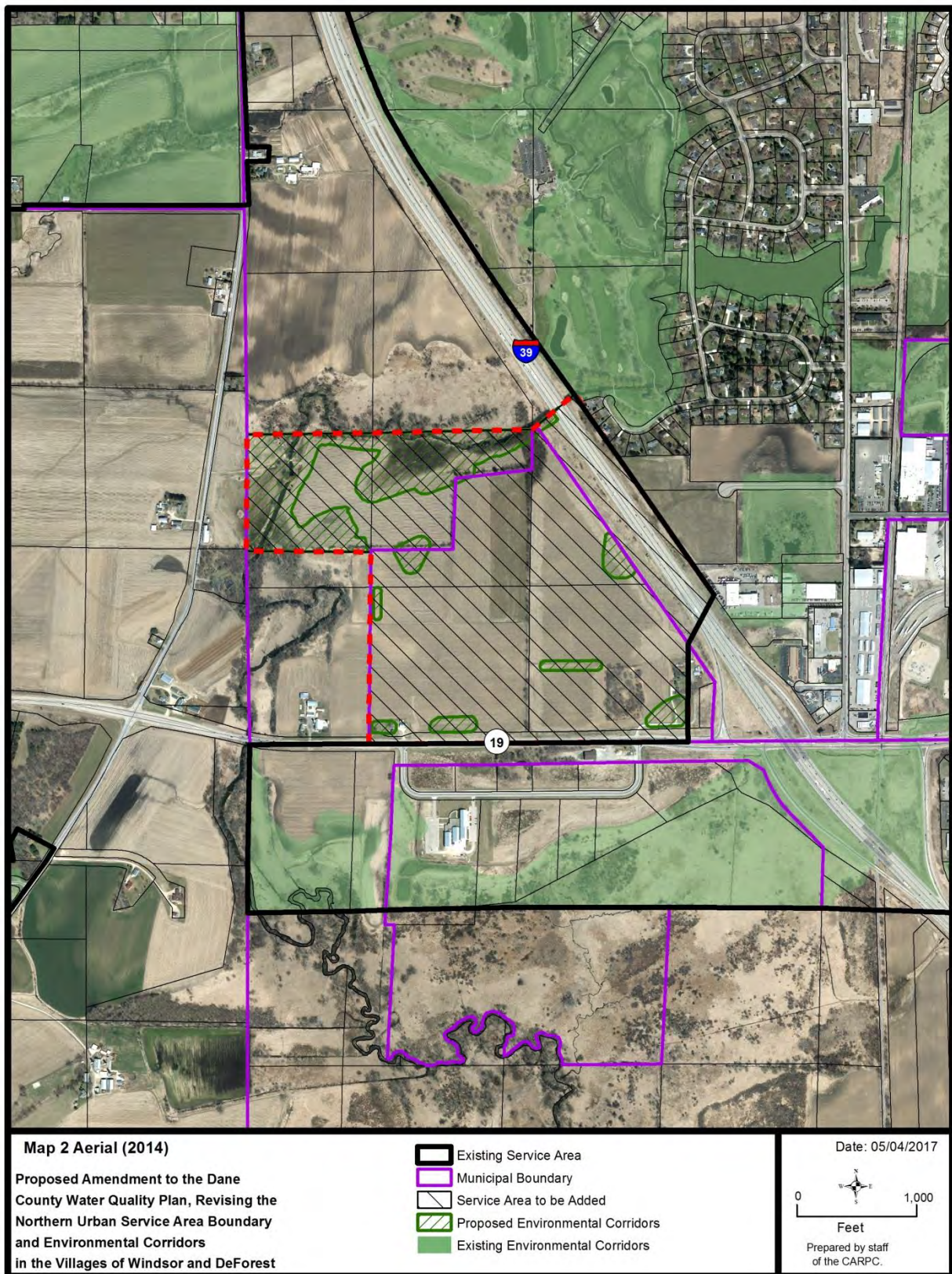


Map 1 - Amendment Area



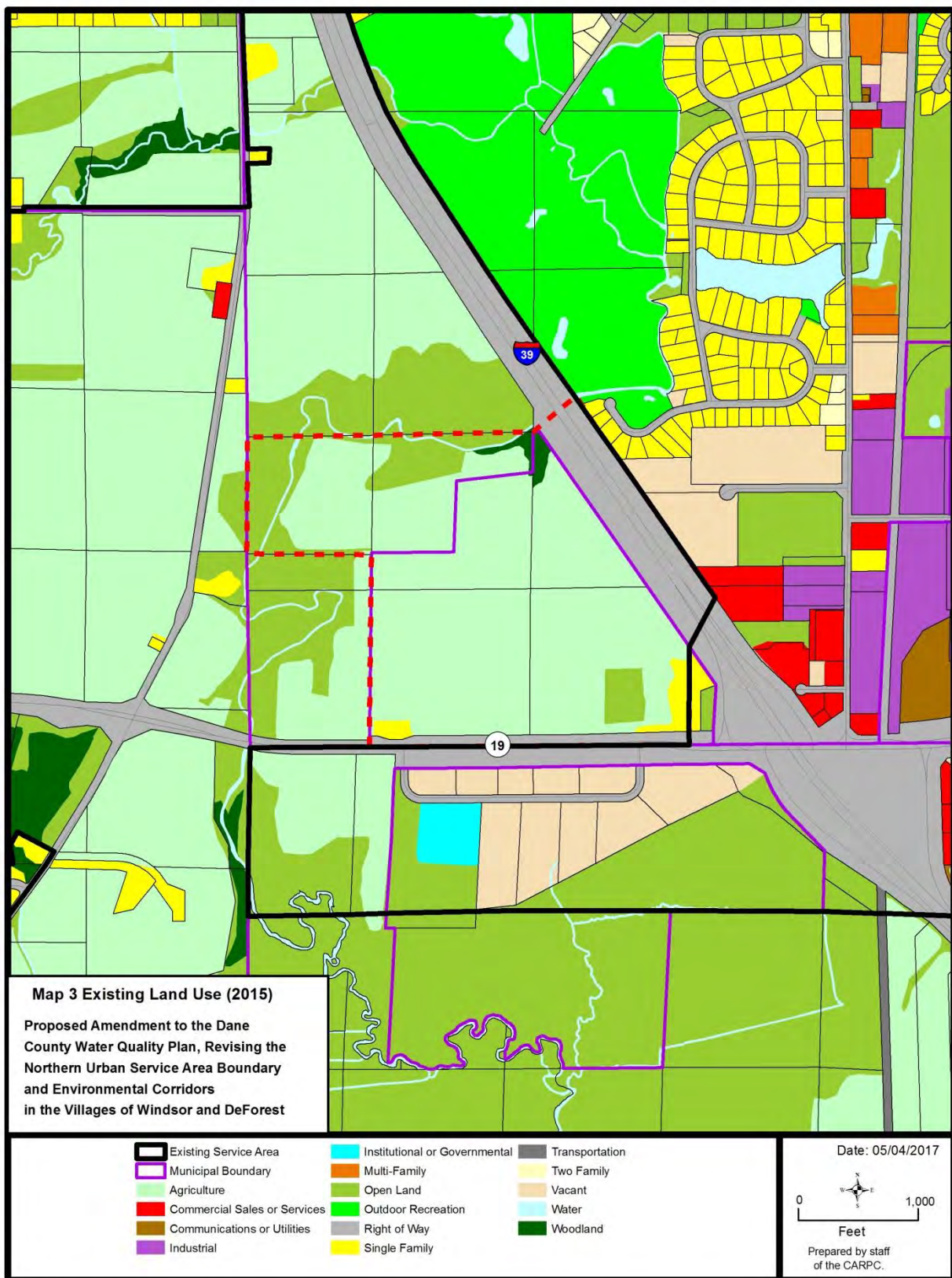


Map 2 – Aerial

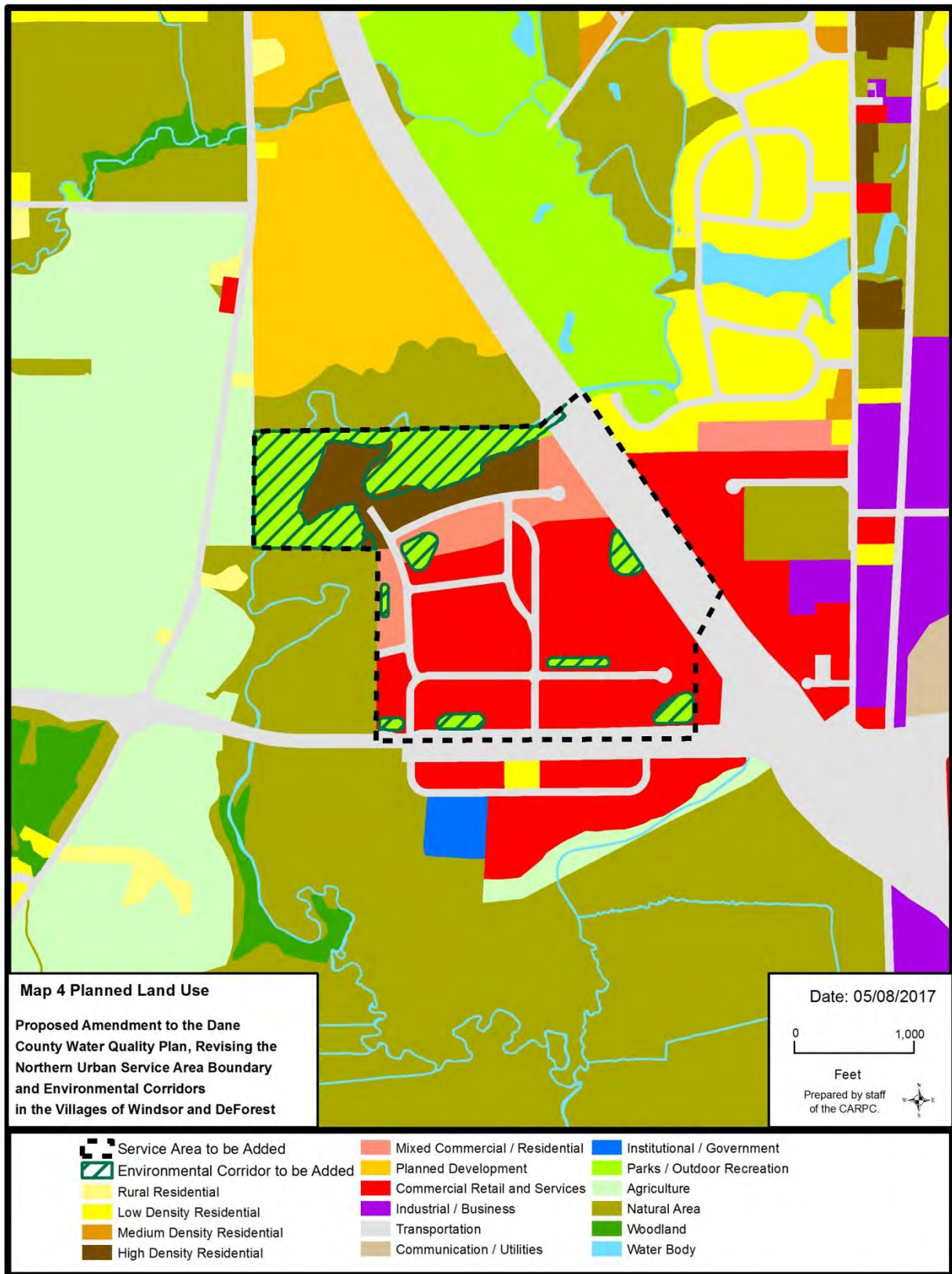




Map 3 – Existing Land Use

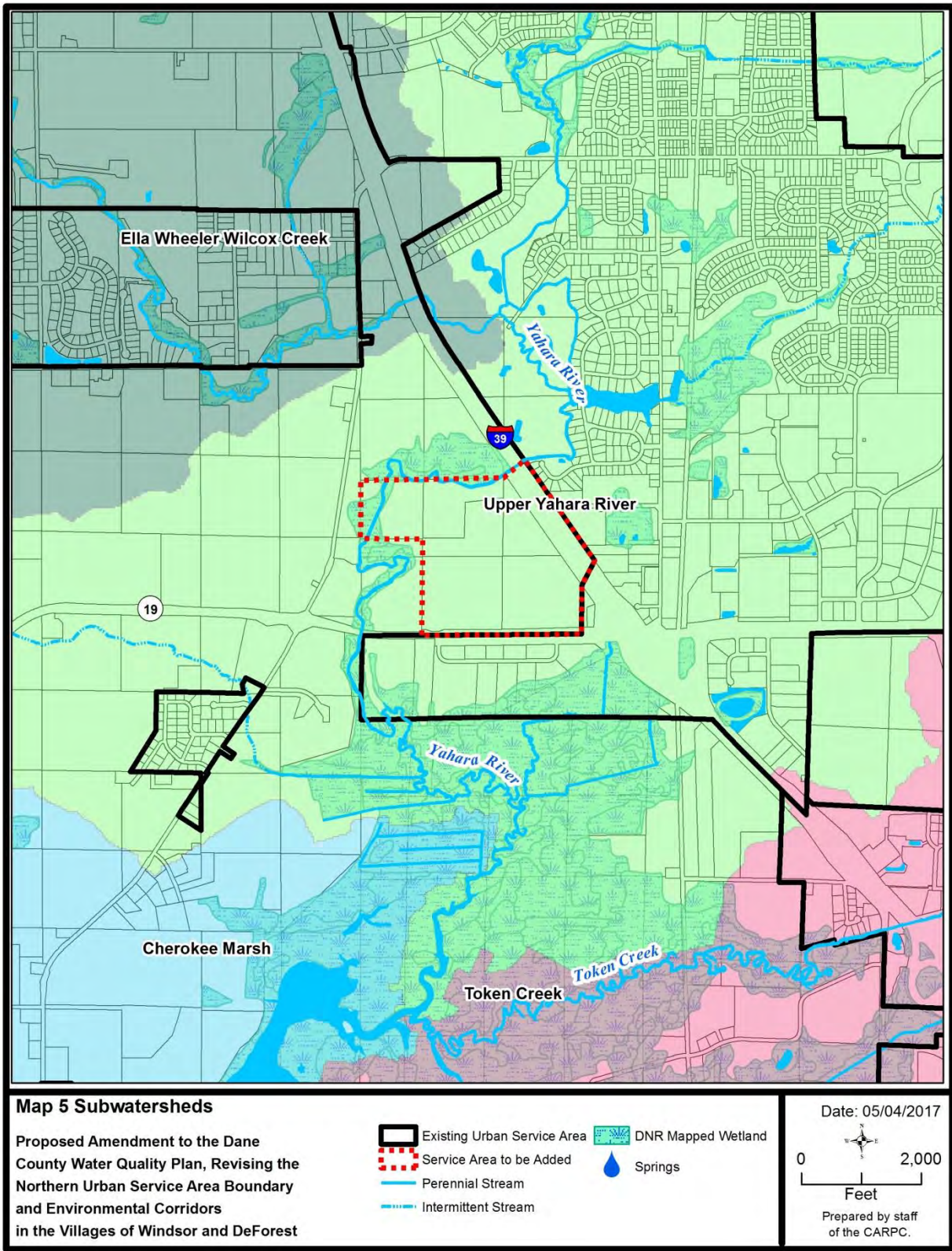


Map 4 – Planned Land Use





Map 5 - Subwatershed Map





### Groundwater

Groundwater modeling, using the [2016 Groundwater Flow Model for Dane County](#) developed by the Wisconsin Geological and Natural History Survey, shows that baseflow in the Yahara River downstream of the amendment area (see Map 10) has decreased from 23.5 cubic feet per second (cfs) during pre-development conditions (no well pumping) to 22.0 cfs in 2010. The modeling shows that baseflow in Token Creek at STH 51 (the groundwatershed location of the well for the south water system) has decreased from 19.9 cfs during pre-development conditions to 17.6 cfs in 2010. These reductions are due to the cumulative effects of well water withdrawals from multiple municipalities in the groundwatershed.

In 2012, the Wisconsin Geological and Natural History Survey published a report, [Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model](#), estimating the existing groundwater recharge rates in Dane County based on the soil water balance method. The study estimates that the existing groundwater recharge rate in the amendment area ranges from 9.1 to 10.1 inches per year.

### Endangered Resources

The DNR Bureau of Endangered Resources maintains a database representing the known occurrences of rare plants, animals, and natural communities that have been recorded in the [Wisconsin Natural Heritage Inventory](#). A screening review of this database conducted by REGIONAL PLANNING COMMISSION STAFF identified a threatened bird species, an endangered amphibian species, and three Natural Resource Communities (Northern Wet Forest, Shrub-Carr, and Southern Sedge Meadow) within a one-mile radius of the amendment area. According to the DNR Bureau of Endangered Resources “absence of evidence is not evidence of absence.” In other words, these species have the potential to occur in the proposed amendment area if appropriate habitat exists. It is recommended that the Village request a complete Endangered Resources Review by the DNR for potential impacts to endangered resources like rare plants, animals and natural communities in the amendment area.

### Soils and Geology

The amendment area is located in the Dane-Jefferson Drumlins and Lakes. The Land Type Associations of Wisconsin classifies the surficial geology of this area as undulating complex of till plains with drumlins, outwash plains, lake plains and muck deposits common. Soils are predominantly well drained silt and loam over calcareous sandy loam till, loamy lacustrine, or gravelly sandy outwash. Surface elevations in the amendment area range from around 858 feet to 936 feet. The amendment area includes some small scattered areas of steep (> 12%) slopes. There are also some very steep (>20%) slopes adjacent to the interstate right-of-way and adjacent to the Yahara River riparian zone in the northern part of the amendment area (see Map 6). Riparian steep slopes have been included in environmental corridors.

According to the Natural Resource Conservation Service (NRCS) Soil Survey of Dane County, the soils in the amendment area are in the Batavia-Houghton-Dresden Association. These soils are well drained and poorly drained; deep and moderately deep silt loams and mucks that are underlain by silt, sand, and gravel. Table 2 shows detailed classification for soils in the amendment area (see Map 7). Table 3 shows important soil characteristics for the amendment area (see Map 7).

There are hydric soils (the Af, Ho, Os, and Wa soil map units) within the amendment area (see Map 7). Their mapped location is generally consistent with those areas that have been delineated as wetlands.

The Batavia<sup>2</sup>, Hayfield, St. Charles<sup>2</sup>, and Virgil soils (the BbB, HaA, ScB, and VwA, map units) are not hydric, but they can have a seasonal (April to June) zone of water saturation within 5 feet of the ground surface. These soils are classified as well drained except for the Hayfield and Virgil soils which are classified as somewhat poorly drained. The poorly drained soils can have limited suitability for buildings with basements due to their seasonal high water table (zone of soil saturation), which can cause problems with groundwater induced flooding. These soils are located in the southern portion of the amendment area, which is in road right-of-way or proposed to be in commercial use. Therefore it will likely not have basements. The soils where the seasonal high water table is within 5 feet of the surface would limit infiltration within these areas to roof runoff or stormwater management practices using engineered soil with at least 10 percent fines.

According to Wisconsin Geological and Natural History Survey mapping, the bedrock just east of the center of the amendment area is in the Prairie du Chien Group, which is dolomite, minor sandstone, cherty dolomite; vuggy, sandy, and oolitic, consists of two formations, the Shakopee and the Oneota. Thickness is from 145 feet in eastern Dane County to 220 feet in western Dane County. Surrounding the Prairie du Chien group and making up the major portion of the eastern amendment area is the Trempealeau Group, which is quartz sandstone, dolomitic siltstone, silty dolomite, and sandy dolomite, consists of two formations including the Jordan and underlying St. Lawrence Formations, which were combined as one mapping unit. Thickness is about 75 feet, where not eroded. The remaining portion of the amendment area is in the Tunnel City Group, which is medium to very fine-grained quartz sandstone, locally very glauconitic, consists of two formations including the Lone Rock and Mazomanie Formations. Thickness is up to 150 feet thick. The depth to bedrock ranges from 2.5 to 50 feet in the majority (east-central) part of the amendment area and up to 250 feet deep in areas of the western part of the amendment area.

As is common throughout much of the upper Midwest, karst features such as enlarged bedrock fractures are prevalent in the local dolomite uplands. Karst features such as vertical fractures and conduits provide primary pathways for groundwater movement and can dramatically increase groundwater susceptibility when present. The location of karst features are difficult to predict, and the thickness and type of the overlying soil greatly affects how much water drains into them. Where clay soils are thick, infiltration rates are likely to be very low. However, where bedrock fractures are near the surface infiltration rates can be very high. Based on the WGNHS Karst Potential map, the east-central third of the amendment area is within an area where the depth to bedrock over potential karst units is 0 to 75 feet.

**Table 2**  
**Soils Classification**

<b>Soil</b>	<b>% of Area</b>	<b>General Characteristics</b>
<i>Whalan Silt Loam; WxB</i>	21.3	Moderately deep, gently sloping to steep, well-drained soils on dolomite-controlled upland. Soils have medium fertility, moderate permeability, and a moderate hazard of erosion. Poses severe limitations for development due to shallow bedrock and moderate bearing capacity.
<i>Batavia Silt Loam; BbB</i>	21.2	Deep, well drained, nearly level to sloping soils on high benches. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to shrink/swell potential.
<i>McHenry Silt Loam; MdC2</i>	14.1	Deep, well drained, gently sloping to moderately steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses slight to moderate limitations for development due to slopes, shrink/swell potential and low bearing capacity.

<sup>2</sup> This is a recent change in classification by the NRCS for these three soils types. They were not previously identified as having a seasonal high water table within 5 feet of the surface.



**Table 2**  
**Soils Classification**

<b>Soil</b>	<b>% of Area</b>	<b>General Characteristics</b>
<i>Dresden Silt Loam; DsC2</i>	6.9	Moderately deep, well drained, gently sloping to steep soils on benches in stream valleys. Soils have medium fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses slight to moderate limitations for development due to steep slopes and erosion potential.
<i>Boyer Sandy Loam; BoC2</i>	5.6	Well-drained, gently sloping to moderately steep soils on benches in valleys. Soils have low fertility, moderately rapid permeability and a moderate to severe hazard of erosion. Poses moderate limitations for development due to slope.
<i>Whalan Silt Loam; WxC2</i>	5.2	Moderately deep, gently sloping to steep, well-drained soils on dolomite-controlled upland. Soils have medium fertility, moderate permeability, and a moderate hazard of erosion. Poses severe limitations for development due to shallow bedrock and moderate bearing capacity.
<i>Alluvial Land, Wet; Af</i>	4.1	Poorly drained, stratified, silty and loamy stream deposits. Soils have high fertility, poor permeability and a severe hazard of erosion. Poses very severe limitations for development due to seasonal high water table, frequent flooding, high shrink/swell potential and low bearing capacity.
<i>Ringwood Silt Loam; RnB</i>	3.6	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses no limitations for development due to low bearing capacity.
<i>Houghton Muck; Ho</i>	3.4	Deep, very poorly drained, nearly level soils on low benches and bottoms in stream valleys. Soils have medium fertility and moderately rapid permeability. Poses severe to very severe limitations for development due to seasonal high water table, moderate bearing capacity and frost heave potential.
<i>Wacousta Silty Clay; Wa</i>	3.4	Deep, poorly drained, nearly level soils on low benches in old lake basins. Soils have low fertility, moderately slow permeability, and no hazard of erosion. Poses severe limitations for development due to ponding and depth to saturated zone.
<i>Pecatonica Silt; PeB</i>	2.7	Deep, well drained, gently sloping and sloping soils on glaciated uplands and high benches in streams. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses no limitations for development due to low bearing capacity.
<i>St. Charles Silt Loam; ScB</i>	2.2	Deep, well drained, sloping soils to moderately steep soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due to slopes, shrink/swell potential and low bearing capacity.
<i>Virgil Silt Loam; VwA</i>	2.2	Deep, nearly level and gently sloping, somewhat poorly drained soils on low benches on uplands and in stream valleys. Soils have high fertility, moderate permeability and a slight hazard of erosion. Poses severe to very severe limitations for development due to low bearing capacity, depth to saturated zone and shrink/swell potential.
<i>Orion Silt Loam; Os</i>	1.4	Deep, somewhat poorly drained, nearly level soils on flood plains and narrow stream bottoms. Soils have high fertility, moderate permeability, and a severe hazard of erosion. Poses very severe limitations for development due to flooding, seasonal high water table, moderate shrink/swell potential, and very low bearing capacity.
<i>Plano Silt Loam; PoB</i>	1.3	Deep, well drained and moderately well drained, nearly level to sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due low bearing capacity and erodibility.
<i>Warsaw Silt Loam; WxC2</i>	0.7	Gently sloping and sloping, well-drained soils on benches in stream valleys. Soils have medium fertility, moderate permeability, and slight to moderate hazard of erosion. Poses moderate limitation for development due to slope and moderate bearing capacity and shrink/swell potential.
<i>Dresden Silt Loam; DsB</i>	0.6	Moderately deep, well drained, gently sloping to steep soils on benches in stream valleys. Soils have medium fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses slight to moderate limitations for development due to steep slopes.
<i>Hayfield Silt Loam; HaA</i>	0.1	Somewhat poorly drained, nearly level soils on moderately low benches on outwash plains. Soils have medium fertility, low permeability, and a moderate hazard of erosion. Poses moderate to severe limitations for development due to moderate bearing capacity, seasonal high water table, and frost heave potential.

Source: Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service

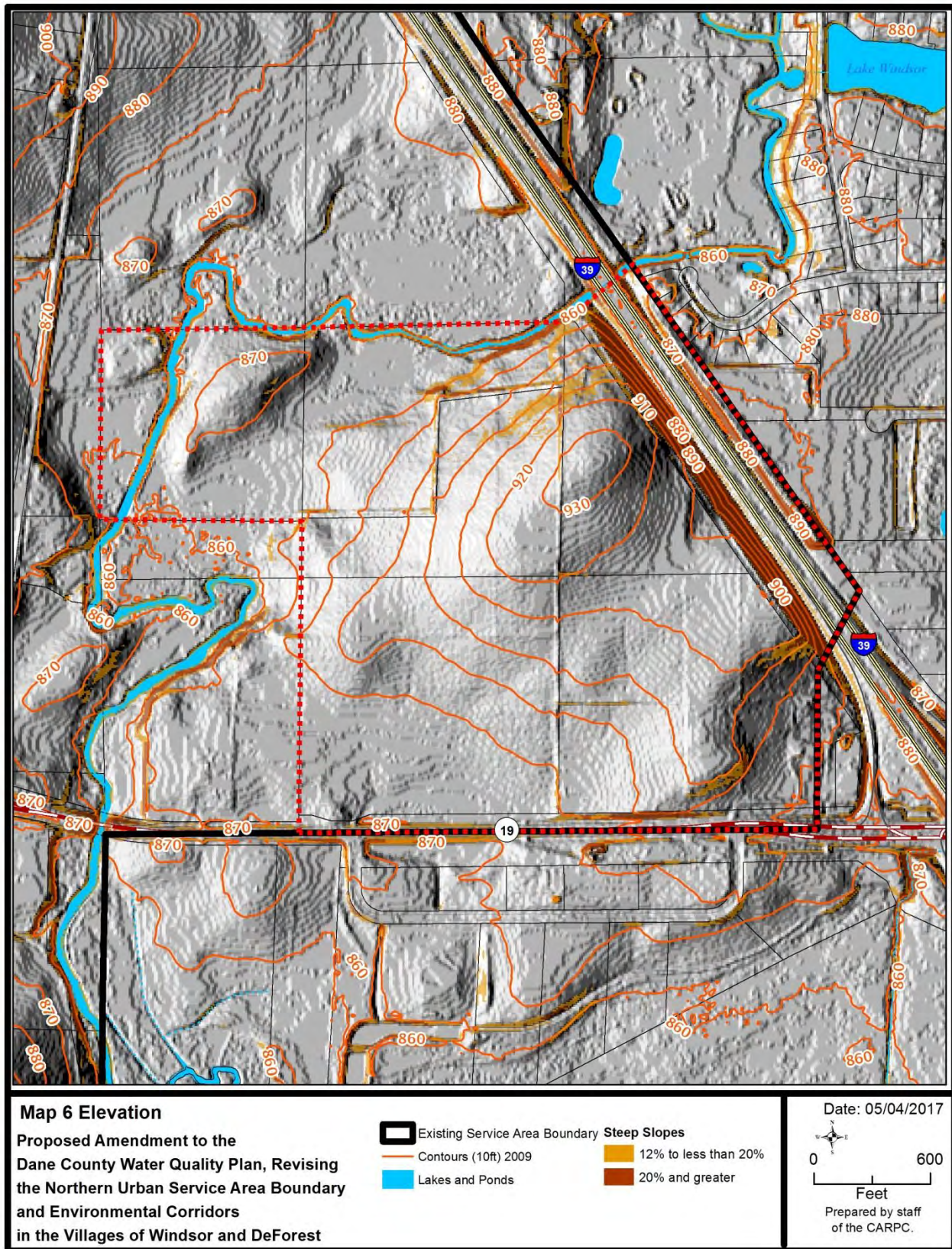
**Table 3**  
**Soils Characteristics**

<b>Characteristic</b>	<b>Soil Map Symbols (see Map 7)</b>	<b>% of Area</b>
Prime Agricultural Soils	BbB, DsB, HaA, PeB, PoB, RnB, ScB, VwA, WxB	55.1
Hydric Soils (Indicates Potential / Restorable Wetlands)	Af, Ho, Os, Wa	12.4
Soils with Seasonal High Water Table (< 5')	Af, BbB, HaA, Ho, Os, ScB, VwA, Wa,	38.1
Soils Associated with Steep Slopes (> 12%)	DsC2, WrC2, WxC2	12.8
Soils Associated with Shallow Bedrock (< 5')	WxB, WxC2	26.4
Poorly Drained Soils	Af, HaA, Ho, Os, VwA, Wa	14.7
Best Potential for High Rates of Infiltration in Subsoils	BbB, BoC2, DsB, DsC2, HaA, MdC2, PeB, PoB, RnB, ScB, WrC2	58.9

Source: Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service

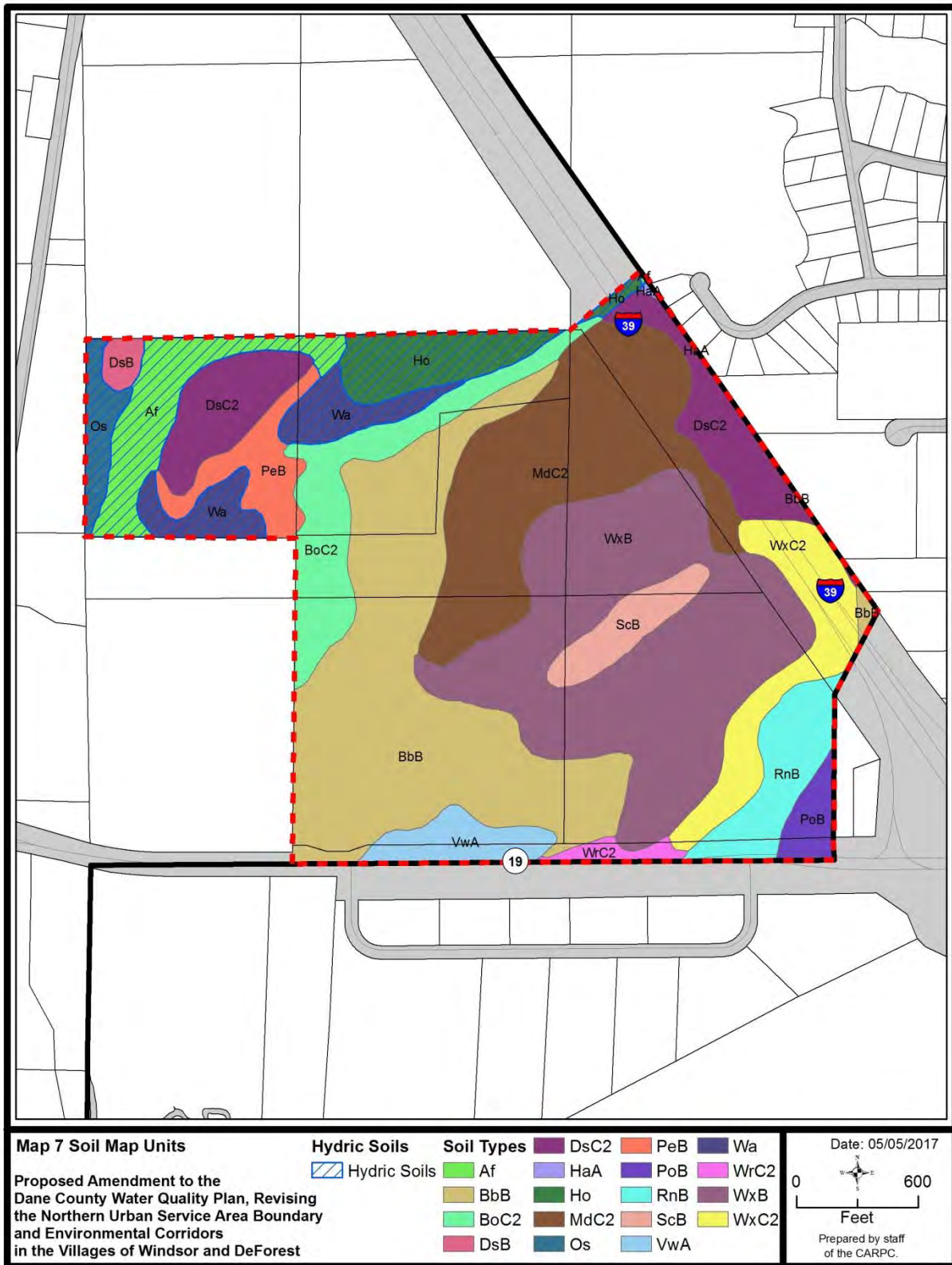


Map 6 - Elevations





Map 7 - Soil Type





## **2) Proposed Urban Services**

### **a) Parks and Open Space**

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.

The land use plan proposes to open space along the Yahara River, including all wetlands with their associated buffers and the 100-year floodplain.

### **b) Public Water System**

The Village water utility provides municipal water through two distinct systems. The proposed amendment area will be served by the south water system. The south system includes wells #1 and #5 (see Map 10). The average 2016 water use from well #1 (550 feet deep) was 46 gpm and from well #5 (765 feet deep) was 28 gpm, for a combined yield of 74 gpm. Storage for the south water system is provided by an elevated 200,000 gallon tank. The tank, at the middle of its operating capacity, provides static pressures ranging from 35 psi at the highest elevation within the amendment site to 55 psi at the lowest elevation.

The Village of DeForest will provide public water to the amendment area through two 12-inch extensions under Highway 19 to connect to existing 12-inch mains at the eastern and western intersections of Highway 19 and Liuna Way. The mains will be extended within the amendment area to the northern boundary (See Map 8).

The 2016 average demand for the south water system was 64,863 gpd (45 gpm) with a maximum day demand of 230,000 gpd (160 gpm). The estimated average daily water demand for the amendment area will be 125,200 gpd based on 400 residential units with a demand of 146 gpd per unit and 83.4 acres of commercial development, including institutional, office, commercial services, and retail, with a demand of 800 gal/acre per day. Using a peaking factor of 2, the current estimated peak hourly flow for the south system is 320 gpm and will increase to 590 gpm with the addition of the amendment area. This estimate is reasonably conservative based on the water utility's annual reports to the Public Service Commission.

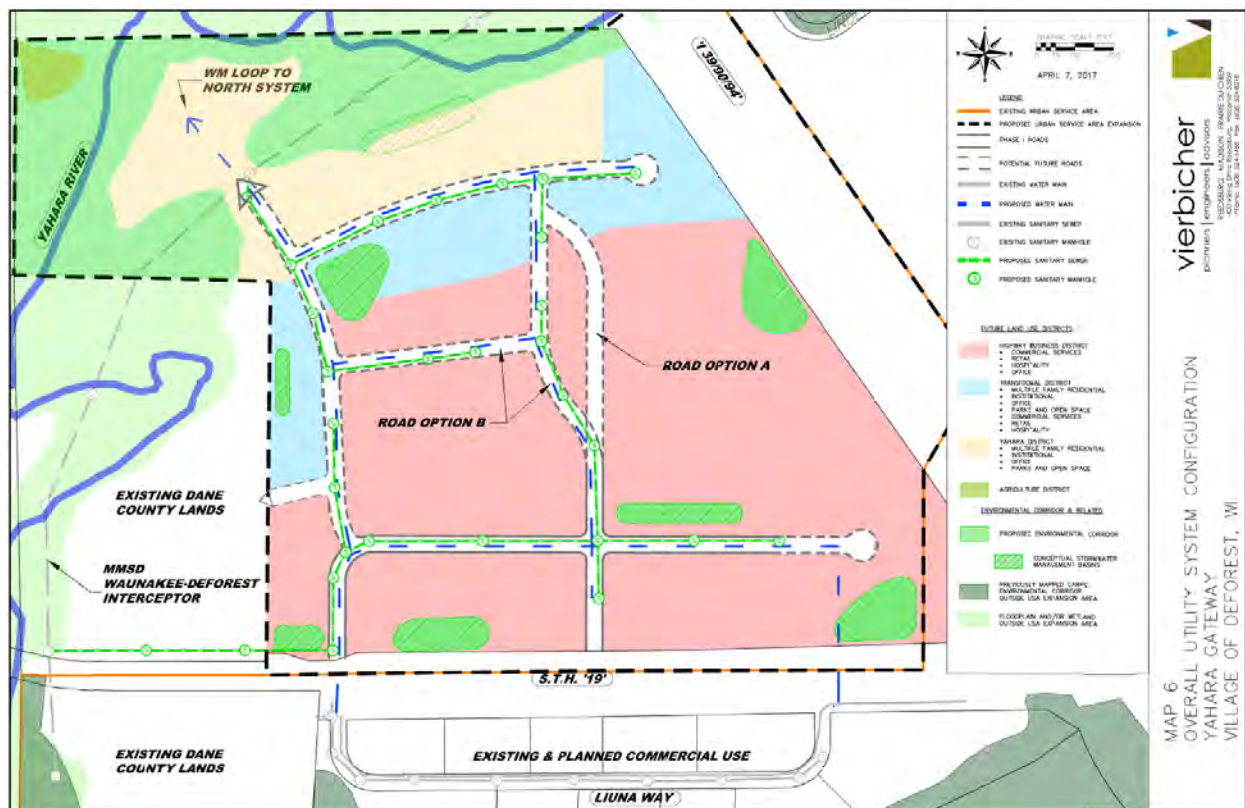
The Village Comprehensive Plan, adopted March 3, 2015, provides multiple provisions for improving the reliability of the water system. Included in the short-term planning is an emergency interconnection between the DeForest south water system and the Windsor Utility District # 1 system (2015-2024), a ground reservoir to well #5 (2015-2019), establishing a south water system loop, and establishing a connection between the north and south DeForest water systems along the North Towne Road corridor (2017-2022). The proposed 12-inch water main extension to the northern property boundary of the amendment area will complete part of the planned connection of the north and south DeForest water systems.

Water losses in the Village's distribution system have improved to 6% of net water supplied in 2016, after peaking at 11% in 2014. The Wisconsin Administrative Code PSC 185.85(4)(b) requires a utility with more than 1,000 customers to submit a water loss control plan to the Public Service Commission if the utility reports its percentage of water losses exceed 15%.

In 2004, the Village of DeForest and the DNR entered into a Memorandum of Understanding (MOU) regarding the use of new and existing wells and their impact on Token Creek. The Village has prepared a plan for operating their water system in

accordance with the terms of the MOU. The plan also lists the specific requirements of the MOU along with a description of how the Village intends to monitor and report on their compliance.

Map 8 – Planned Water and Sanitary Sewer Service



### c) **Wastewater**

Sanitary sewer service will be provided to the amendment area through a 1,100 foot extension of an 8-inch gravity main from Madison Metropolitan Sewerage District's Waunakee-DeForest Interceptor to the southwest corner of the amendment area (see Map 8). The Village's sewer will connect into the interceptor between manholes MH14-134 and MH14-143.

The Village estimates that the amendment area will generate an average of 128,000 gpd (89 gpm). Using a peaking factor of 4, it is estimated that the amendment area would generate a peak flow of 355 gpm. The estimate is consistent with historical wastewater generation rates in the Village. On behalf of MMSD, Strand Associates completed the Pump Station 14 Infiltration/Inflow Study in 2014. Flow monitoring at manhole MH 14-120, downstream of the proposed connection location showed the average daily flow was 1,600,000 gpd with an estimated peak hourly flow of 6,400,000 gpd, while the interceptor capacity is 9,630,000 gpd. The 2009 CARPC MMSD Collection System Evaluation indicates that the portion of interceptor that serves the amendment area will have adequate capacity beyond the year 2060. Therefore, there is available capacity in the existing MMSD interceptor collection system for the proposed amendment area.

#### Waste Water Treatment Facility

MMSD will provide wastewater treatment for the amendment area. MMSD Pumping Station 14 serves this area. Results indicate the average daily and estimated peak flows are below the interceptor capacity. The Nine Springs Treatment Facility has a design capacity of 50

million gallons per day (mgd) and received an average of 38.27 mgd in 2015, including infiltration and inflow. It is expected to reach 90% of current hydraulic design capacity around 2026 based on current projected growth rate assumptions. MMSD has completed a long-range plan that evaluated various options for expanded treatment capacity to serve its current and future service area. For the 20-year planning period, service to this area is expected to remain through current interceptor routes with expanded capacity of the system as the need is foreseen. MMSD has not had any issues meeting its WPDES permit limits for the quality of effluent discharged to Badfish Creek according to their 2015 Compliance Maintenance Annual Report.

**d) Stormwater Management System**

The preliminary stormwater management plan for the amendment area includes a system of seven stormwater management facilities. These facilities will generally be strategically located to adequately provide water quality treatment (80% TSS reduction) followed by volume reduction facilities, which will provide for annual stay-on (100% stay-on). It is anticipated that infiltration performance will further reduce TSS (and other pollutants such as Total Phosphorus) from stormwater discharges. Collectively, the stormwater facilities will provide peak discharge rate control to account for storms up to and including the 100-year rainfall event. The larger stormwater facilities serving multiple users generally will be owned and maintained by the Village of DeForest while the smaller stormwater facilities serving a single user are proposed to be privately owned and maintained. The Village of DeForest requires the recording of stormwater management maintenance agreements prior to the final approval of any stormwater management permit associated with stormwater facilities that are to be privately maintained.

Performance Standards

The Village of DeForest proposes stormwater management performance measures to meet or exceed standards required by the State of Wisconsin (NR 151), Dane County (Chapter 14), and Village of DeForest (Chapter 24) stormwater regulations, as follows:

- 1) Require post-construction sediment control (reduce total suspended solids leaving the site by at least 80%, with a minimum of 60% of that control occurring in a retention pond prior to infiltration) for the 1-year, 24-hour design storm. This is consistent with the standards currently required by Dane County.
- 2) Require post-construction peak runoff rate control for the 1-, 2-, 5-, 10-, 25- and 100-year, 24-hour design storms to “pre-development” peak runoff rates. This is consistent with the range of design storms currently required by Dane County.
- 3) Require post-development stay-on volume of at least 100% of pre-development stay-on volume. This is more protective than the stay-on standard for new development currently required by Dane County regulations.
- 4) Maintain pre-development groundwater annual recharge rate of 9.1 to 10.1 inches per year for this area as estimated by the Wisconsin Geological and Natural History Survey in a 2012 report titled “Groundwater Recharge in Dane County, Wisconsin Estimated by a GIS-Based Water Balance Model.” This is consistent with the standards currently required by Dane County.
- 5) Require post-construction oil and grease control for commercial developments. Storm water management facilities shall be designed to treat the first 0.5 inches of runoff using the best oil and grease removal technology available. This is consistent with the standards currently required by Dane County.



**EXISTING FARMLAND PLANNED NEIGHBORHOOD**

**Lake WINDSOR GOLF CLUB**

**YAHARA RIVER**

**EXISTING & PLANNED FARMLAND**

**EXISTING DANE COUNTY LANDS**

**S.T.H. 49**

**EXISTING & PLANNED COMMERCIAL USE**

**LUNA WAY**

**ROAD OPTION A**

**ROAD OPTION B**

**LEGEND:**

- EXISTING URBAN SERVICE AREA**
- PROPOSED URBAN SERVICE AREA EXPANSION**
- PHASE 1 ROADS**
- POTENTIAL FUTURE ROADS**
- POTENTIAL MAJOR BRIDGES**
- FUTURE LAND USE DISTRICTS**
  - HIGHWAY BUSINESS DISTRICT
  - COMMERCIAL SERVICES
  - OFFICE
  - MIXED-USE
  - TRANSITIONAL CORridor
  - MULTIPLE FAMILY RESIDENTIAL
  - OFFICE
  - PARKS AND OPEN SPACE
  - COMMERCIAL SERVICES
  - RETAIL
  - HOSPITALITY
  - WILDLIFE DISTRICT
  - MULTIPLE FAMILY RESIDENTIAL
  - WETLANDS
  - OFFICE
  - PARKS AND OPEN SPACE
- AGRICULTURE DISTRICT**
- ENVIRONMENTAL CORRIDOR & RELATED**
  - PROPOSED ENVIRONMENTAL CORRIDOR
  - CONCEPTUAL STORMWATER MANAGEMENT BASINS
  - PREVIOUSLY-MAPPED CARP ENVIRONMENTAL CORRIDOR
  - OUTSIDE UGA EXPANSION AREA
  - FLUORENCE AND/OR ACT/LAND OUTSIDE UGA EXPANSION AREA

**Scale:** 0' 100' 200'

**Date:** APRIL 7, 2017

**vierbicher**

**planners | engineers | architects**

**STUDIO: 1000 E. MAIN STREET, SUITE 200, MADISON, WI 53703-2000  
PHONE: 608.263.4478 FAX: 608.263.4478**

**MAP 5**

**YAHARA GATEWAY NEIGHBORHOOD PLAN,  
PREFERRED ALTERNATIVE**

The Village has worked with Regional Planning Commission staff prior to submitting this application to establish environmental corridors that meet the adopted policies and criteria of the *Dane County Water Quality Plan*. The environmental corridor includes the 100-year floodplain and floodway, delineated wetlands, and a 75-foot vegetative buffer for wetlands and the Yahara River. Approximately 35.6 acres of environmental corridors are proposed for environmentally sensitive areas (27.4 acres) and stormwater management areas (8.2 acres).

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### **3) Impacts and Effects of Proposal**

#### **a) Meeting Projected Demand**

Current projections for 2040 suggest that an additional 5,879 residents, 2,860 housing units, and 2,477 jobs can be expected in the Northern Service Area (2010—2040).

Land demand projections estimate a total of 790 additional acres of residential and 267 acres of non-residential (i.e. industrial, commercial, etc.) for the Northern Service Area. Rights-of-way serving all projected land uses come to a total of 167 acres. At the time of the 2015 Land Use Inventory, there were 790 acres of vacant, subdivided land and 1,203 acres of land under agricultural uses within the Northern Urban Service Area.

Roughly 1,000 residential lots (275 acres) are identified as being “under construction” or “vacant, subdivided” land. Visual inspection suggests around 700 of those future lots (194 acres) are still undeveloped. Building permit data seems to corroborate this observation. Between 2010 and 2015, DeForest added 166 single-family units. Windsor may have contributed as many as 30. At a rate of 30 houses added per year, the Northern Urban Service Area would fully utilize all available and proposed residential lots by approximately 2040. The proposed addition to the Northern Service Area would provide an estimated 400 units of mixed residential/commercial configuration at full build-out.

#### **b) Phasing**

Phasing of development is not explicitly delineated in the application nor is a timeline specified. However, rights-of-way are expected to be established first along the southern edge of the proposed amendment area adjacent to STH 19. Future “phases” (i.e. roadways) are expected to extend northwest to accommodate future development.

#### **c) Surface Water Impacts**

Development typically creates impervious surfaces (i.e., streets, parking areas, and roofs) and has the potential to alter the natural drainage system (e.g., natural swales are replaced by storm sewers) resulting in increased stormwater runoff rates and volumes, as well as reduced infiltration. Development can also cause substantial short-term soil erosion and off-site siltation from construction activities. Scientific research has well documented that without effective mitigation measures, the potential impacts of development on receiving water bodies can include the following:

- Flashier stream flows (i.e., sudden higher peaks)
- Increased frequency and duration of bankfull flows
- Reduced groundwater recharge and stream base flow
- Greater fluctuations in water levels in wetlands
- Increased frequency, level (i.e., elevation), and duration of flooding
- Additional nutrients and urban contaminants entering the receiving water bodies
- Geomorphic changes in receiving streams and wetlands

Natural drainage systems attempt to adapt to the dominant flow conditions. In the absence of mitigation measures, the frequency of bank-full events often increases with urbanization, and the stream attempts to enlarge its cross section to reach a new equilibrium with the increased channel forming flows. Higher flow velocities and volumes increase the erosive force in a channel, which alters streambed and bank stability. This can result in channel incision, bank undercutting, increased bank erosion, and increased sediment transport. The results are often wider, straighter, sediment laden streams, greater water level fluctuations, loss of riparian cover, and degradation of shoreland and aquatic habitat.

If left unmanaged, these changes in hydrology combined with increased urban pollutant loading, can have a dramatic effect on the aquatic ecosystem of streams. It is important to realize that flow is a major determinant of the physical habitat in a stream, which in turn

determines the biotic composition of stream communities. A growing body of literature documents that channel geomorphology, habitat structure, and complexity are determined by prevailing flow conditions, which in turn determine the biota that can inhabit the area. This is true for the fish as well as the aquatic insects upon which they feed. Studies of streams affected by urbanization have shown that fish populations either disappear or become dominated by rough fish that can tolerate the associated lower water quality levels.

The Village proposes to mitigate the urban nonpoint source impacts of the proposed development by implementing various stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, and groundwater recharge. This will reduce the likely impacts of the proposed development on the receiving waters. To its credit, the Village of DeForest has voluntarily adopted a more stringent stormwater management requirement for new development by requiring pre-development runoff volume conditions be maintained (100% stay-on). This is a model for other communities in further reducing the urban nonpoint runoff impacts of development on receiving waters.

#### **d) Groundwater Impacts**

Without effective mitigation practices, as natural areas are converted to urban development the ground/surface water balance in streams and wetlands shifts from a groundwater-dominated system to one dominated more and more by surface water runoff. This results in subsequent reductions in stream quality and transitions to more tolerant biological communities.

Groundwater modeling indicates that the cumulative effects of year 2010 water well withdrawals from all municipalities have resulted in a 1.5 cfs decline in baseflow in the Yahara River immediately below the amendment area (see Map 9 and Table 4) compared to the pre-development (no pumping) baseflow of 23.5 cfs. An additional 0.8 cfs decline is anticipated by the year 2040, according to modeling, reducing the baseflow to 21.2 cfs. According to the 2014 DNR report [Ecological Limits of Hydrologic Alteration in Dane County Streams](#), significant change in the fish community status from 2010 conditions is not expected to occur as a result of the projected 2040 reduction in baseflow in this section of the Yahara River.

<b>Table 4. All Municipal Wells</b>			
<b>Modeled baseflow results due to current and anticipated future municipal well water withdrawals (cfs)</b>			
<b>Stream</b>	<b>Pre-Development</b>	<b>2010</b>	<b>2040<sup>3</sup></b>
Upper Yahara River	23.5	22.0	21.2
Token Creek @ STH 51	19.9	17.6	16.4

The loss of baseflow from the cumulative effects of well water pumping is a regional issue, beyond the boundaries of a single Urban Service Area Amendment or even a single municipality. This is illustrated by the comparatively lower baseflow reductions due to just Village of DeForest municipal water well withdrawals shown in Table 5. This issue is discussed along with potential management options in the recently updated [Dane County Groundwater Protection Planning Framework](#) (Technical Appendix G of the Water Quality Plan).

<b>Table 5. DeForest Wells Only</b>
<b>Modeled baseflow results due to current and anticipated future</b>

<sup>3</sup> Assumes DeForest water system is operated in accordance with their 2004 MOU with DNR.



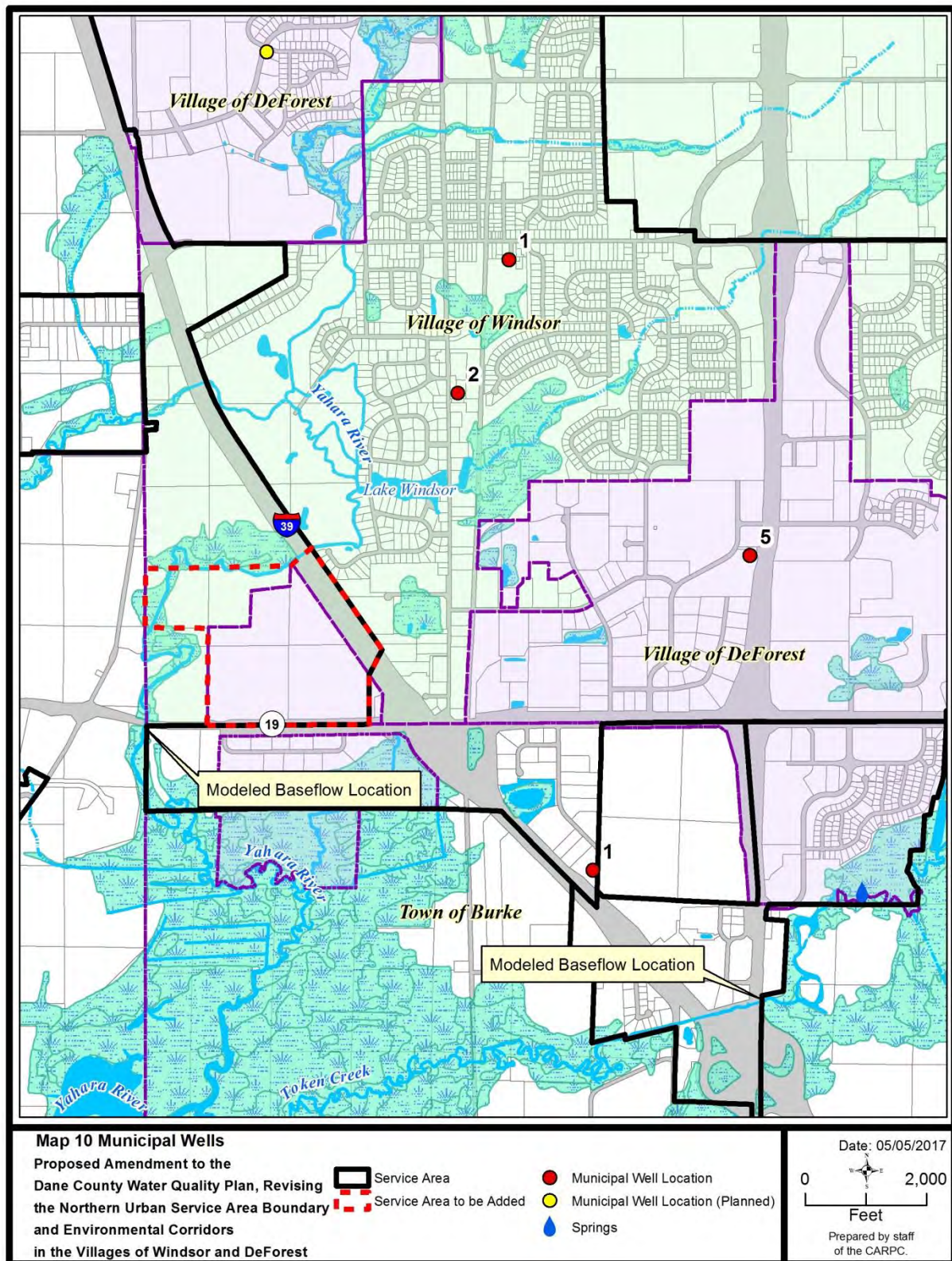
<b>municipal well water withdrawals (cfs)</b>			
<b>Stream</b>	<b>Pre-Development</b>	<b>2010</b>	<b>2040<sup>3</sup></b>
Upper Yahara River	23.5	22.8	22.7
Token Creek @ STH 51	19.9	19.7	19.7

Maintaining pre-development groundwater recharge also helps to maintain baseflow and mitigate this impact. The Village of DeForest proposes to maintain the pre-development annual recharge rate (estimated as 9.1 to 10.1 inches per year for this area according to the Wisconsin Geological and Natural History Survey study). Experience has shown that this criterion is generally met when 90% of pre-development runoff volume is maintained for the development area through infiltration measures. The Village of DeForest has adopted a 100% pre-development volume control standard for stormwater runoff which will provide additional groundwater recharge.

#### **4) Comments Received and Unresolved Issues**

The Village of DeForest sent notification of the proposed amendment to the Village of Windsor requesting feedback on the request. The Village of Windsor has provided a letter of support for the proposed amendment, noting that it is consistent with the Cooperative Plan between the Villages of DeForest and Windsor. As of the time of posting of this staff analysis, no other public comment related to this amendment request has been received.

Map 10 – Municipal Wells and Modeled Baseflow Locations



#### **4) Conclusions and Staff Water Quality Recommendations**

There is sufficient wastewater collection and treatment plant system capacity to serve the proposed amendment area.

The Village proposes to mitigate the urban nonpoint source impacts of the proposed development by implementing various stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, and groundwater recharge. This will reduce the likely urban nonpoint runoff impacts of the proposed development on the receiving waters. To its credit, the Village of DeForest has voluntarily adopted a more stringent stormwater management requirement for new development by requiring pre-development runoff volume conditions be maintained (100% stay-on). This is a model for other communities in further reducing the urban nonpoint runoff impacts of development on receiving waters.

Based on the WGNHS Karst Potential map, the east-central third of the amendment area is within an area where the depth to bedrock over potential karst units is 0 to 75 feet. Regional Planning Commission staff recommends the collection of site-specific data for an accurate assessment of karst potential in this area. If karst features are found, adequate protection measures must be taken to address the potential for groundwater contamination.

In 2004, the Village of DeForest entered into a MOU with the DNR regarding the use of new and existing wells and their impact on Token Creek and other area surface waters. In the MOU, the Village agrees that it will take all reasonable management steps to limit the impacts of their well system on Token Creek, as detailed in the MOU, including the connection of their north and south to allow greater pumping from wells furthest away from Token Creek. This will reduce the likely groundwater withdrawal impacts on the baseflow of area surface waters.

##### ***a) Conditions***

Regional Planning Commission staff recommends approval of this amendment, based on the land uses and services proposed, and conditioned on the commitment of the Village of DeForest to pursue the following:

1. Submit a detailed stormwater management plan for Regional Planning Commission staff review and approval (in conjunction with DCL&WCD staff) prior to any land disturbing activities in the amendment area. The stormwater management plan shall include the following:
  - a. Install stormwater and erosion control practices prior to other land disturbing activities. Protect infiltration practices from compaction and sedimentation during land disturbing activities.
  - b. Control peak rates of runoff for the 1-, 2-, 5-, 10-, 25- and 100-year 24-hour design storms to pre-development levels, in accordance with the Village of DeForest Stormwater Ordinance.
  - c. Maintain the post development stay-on volume to at least 100% of the pre-development stay-on volume for the one-year average annual rainfall period, in accordance with the Village of DeForest Stormwater Ordinance.



- d. Maintain pre-development groundwater recharge rates from the Wisconsin Geological and Natural History Survey's 2012 report, *Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model* (an average of 9.2 to 9.6 inches/year for the amendment area) or by a site specific analysis, in accordance with the Village of DeForest Stormwater Ordinance.
  - e. Provide at least 80% sediment control for the amendment area based on the 1-year, 24-hour design storm, with a minimum of 60% of that control occurring in a retention pond prior to infiltration, in accordance with the Village of DeForest Stormwater Ordinance.
  - f. Treat the first 0.5 inch of runoff from parking lots to control oil and grease, in accordance with the Village of DeForest Stormwater Ordinance.
2. Stormwater management facilities shall be placed in public outlots whenever feasible and designated as environmental corridor. Easements and perpetual legal maintenance agreements with the Village, to allow the Village to maintain stormwater management facilities if owners fail to do so, shall be provided for any facilities located on private property.
  3. Delineate environmental corridors to include wetlands, 75-foot wetland buffers, 100-year floodplains, streams and shoreland buffers, associated steep wooded slopes, and stormwater management areas to meet *Dane County Water Quality Plan* criteria for the delineation of environmental corridors. Submit plats showing environmental corridors for Regional Planning Commission staff review and approval prior to recording. Any environmental corridor on private property shall be protected by deed restrictions and neighborhood covenants.
  4. Submit the wetland delineation report for Regional Planning Commission staff review when it is completed.
  5. Continue to operate the municipal water system in compliance with the 2004 MOU between the Village of DeForest and the DNR regarding the use of new and existing wells and their potential impact on Token Creek.

## **b) Recommendations**

It is also recommended that the Village of DeForest pursue the following:

1. Require an archaeological survey be performed by a qualified archaeologist for the amendment area as recommended by the Wisconsin Historical Society (see attached letter) and take necessary protection measures if artifacts are found.
2. Based on the WGNHS Karst Potential map, the east-central third of the amendment area is within an area where the depth to bedrock over potential karst units is 0 to 75 feet. Regional Planning Commission staff recommends the collection of site-specific data for an accurate assessment karst potential in this area. If karst features are found, adequate protection measures must be taken to address the potential for groundwater contamination.
3. Request a formal [Endangered Resources Review](#) by the WDNR or one of their certified reviewers for potential impacts to endangered resources like rare plants, animals and natural communities and take necessary habitat protection measures if species are found.

4. Collaborate with Dane County Parks Division staff on opportunities associated with this proposed NUSA expansion; the preservation and sensitive development of land adjacent to the already-acquired Cherokee Marsh Wildlife Area and the advancement of Yahara River corridor protection and related recreational opportunities and access, in accordance with local and County plans.
5. Develop and implement a wetland restoration plan for the wetlands on the site to improve habitat and create a natural amenity for the development and the community.
6. Encourage the responsible use of deicers as part of the [WI Salt Wise Partnership](#).
7. Implement the water system improvements identified in the 2011 Joint Water Utility System Study and the Village's Comprehensive Plan. Interconnect Village's north and south (former Token Creek) water utility systems, which currently operate as separate systems.
8. Work with Regional Planning Commission staff to update the Village's Long Term Water Supply Plan using the Regional Groundwater Model.



14 April 2017

Mr. Sean Higgins  
Capital Area Regional Planning Commission  
City-County Building, Room 362  
210 Martin Luther King Jr. Boulevard  
Madison, WI 53703-2558

RE: DeForest Urban Service Area Expansion-2017, Dane County, Wisconsin-Expansion 4-12-2017

Dear Mr. Higgins:

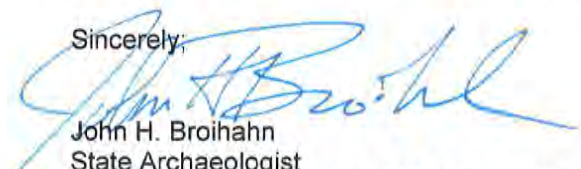
Three previously recorded archaeological sites have been recorded within the Village of DeForest-Village of Windsor parcel (DA-0485, DA-0445, and DA-430). Considering the presence of these American Indian campsites/villages, and the presence of the drainage and wetland, we recommend that an archaeological survey of the parcel be completed by a qualified archaeologist. When the archaeological field investigation is completed, please send two copies of the report to our office.

Under Wisconsin law, Native American burial mounds, unmarked burials, and all marked and unmarked cemeteries are protected from intentional disturbance. If anyone suspects that a Native American burial mound or an unmarked or marked burial is present in an area, the Wisconsin Historical Society should be notified.

If human bone is unearthed during any phase of a project, **all work must cease**, and the **local authorities must be contacted**. The police or sheriff will determine if the burial is a criminal matter or if it should be referred to the Wisconsin Historical Society at 1-800-342-7834 to be in compliance with Wis. Stat. § 157.70 which provides for the protection of all human burial sites. If we are contacted, **work cannot resume until the Wisconsin Historical Society gives permission**. If you have any questions concerning the law, please contact the Wisconsin Historical Society at 1-800-342-7834.

If you have any questions, or if you need additional information, please feel free to contact me.

Sincerely,



John H. Broihahn  
State Archaeologist  
State Archaeology and Maritime Preservation  
608-264-6496, [john.broihahn@wisconsinhistory.org](mailto:john.broihahn@wisconsinhistory.org)

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