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**Staff Analysis of a Proposed Amendment to the *Dane County Water Quality Plan*  
Revising the Central Urban Service Area Boundary and Environmental Corridors  
Requested by the Town of Middleton**

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### 1) History of the Central Urban Service Area

The Central Urban Service Area was established in 1971 with the adoption of the first sewer service plan and originally included about 29,000 acres. One hundred-nine changes have been made to the Central USA since that time totaling over 17,000 acres. This is only the second amendment requested by the Town of Middleton. The last time the Town requested amending the Central USA was in 1987 when 23.4 net acres (1 developable acre) was added.

### 2) Existing Conditions

#### a) Land Use

The requested amendment area is located along the boundary between the City of Madison and the Town of Middleton (see Map 1). The area is located at the southeast corner of the intersection of West Mineral Point Road and Pioneer Road. The 128 acre site is contiguous to the Central Urban Service Area along the site's east side, and is currently a golf course.

Surrounding Land Uses Include:

- North: Residential, gas station, greenhouse, elementary School
- S/W: Developed/Developing rural residential neighborhood
- East: Planned residential neighborhood (Pioneer/Midtown 2015-11)

Existing Land Use	Acres
Outdoor Recreation	127.0
Transportation, Communication, and Utilities	1.2
<b>TOTAL</b>	<b>128.2</b>

Proposed Land Use	Proposed Acres	Env. Corridor Acres
Outdoor Recreation / Stormwater	54.6	51.8
Low Density Residential	46.4	
Commercial Retail and Services	14.1	
Transportation	13.1	
<b>TOTAL</b>	<b>128.2</b>	<b>51.8</b>
<b>NET DEVELOPABLE</b>	<b>76.4</b>	

The Town has passed a resolution in support of this USAA application, and the City will be affirming the provision of sanitary sewer through adoption of a resolution approving a Sewer Service Agreement with the Town. The development is consistent with the *Town of Middleton Comprehensive Plan*, 2005 *Tumbledown Neighborhood Plan*, and the [City of Madison and Town of Middleton Cooperative Plan](#). The eastern half of the site is designated a “Transition Area” under the terms of this City of Madison/Town of Middleton intergovernmental agreement. Development within ¼ mile of the centerline of Pioneer Road is subject to density, unit-per-structure, and height limitations.

**b) Cultural and Historic Sites**

The Wisconsin Historical Society (WHS) has been contacted regarding the presence of any known archaeological sites or cemeteries within the amendment area. No previously identified sites are recorded within the amendment area. However, the West Middleton Burying Ground (DA-1247/BDA-257) is located just off the southeast corner of the requested amendment area (see Attachment 1).

**c) Natural Resources**

The proposed amendment area is located within the northern portion of the Lower Badger Mill Creek subwatershed (Map 5), a tributary of Badger Mill Creek (HUC 12: 070900040201) and the Upper Sugar River. Wastewater from the amendment area will be served by the City of Madison’s Lower Badger Mill Creek Sanitary Interceptor, which is ultimately treated at the Madison Metropolitan Sewerage District Wastewater Treatment Facility. The treated effluent is discharged to Badfish Creek and Badger Mill Creek, bypassing the Yahara Chain of Lakes.

Although the proposed amendment area is located in the Lower Badger Mill Creek subwatershed, which is part of the Sugar River Watershed, it is part of the Wisconsin River groundwatershed.

Intermittent Streams and Wetlands

There was a historic mapped intermittent stream that ran from the west and north through the amendment area until the construction of the golf course in 1993. The 10 golf course ponds are identified as wetlands in the DNR Wisconsin Wetland Inventory. However, historic imagery suggests these did not exist prior to the 1993 construction of the golf course. In June 2018, a Senior WDNR Water Regulation & Zoning Specialist conducted a site visit and reviewed the site. Her determination was that the mapped intermittent stream does not have a defined channel and is therefore determined to be not navigable/public. She also determined that the ponds were created for the golf course, have no stream history, and are not within 500 feet of a navigable waterway, and are therefore not jurisdictional.

There is one small delineated wetland (4,457 ft<sup>2</sup>) located in the northeast corner of the proposed amendment area. This wetland is not mapped on the Wisconsin Wetland Inventory, but was identified by DNR staff during their site visit and subsequently delineated by Theran Stautz, a WDNR Assured Delineator, with the consulting firm raSmith, on June 29, 2018. The wetland occurs at the low end of a swale and floods when water overflows the swale during heavy rain events. It also receives surface water from the surrounding golf course. The wetland delineator classified the wetland as a low susceptibility wetland for stormwater permitting. Low susceptibility wetlands, as defined by NR 151.12(d) are highly degraded with high (> 90%) prevalence of invasive species (reed canary grass in this case).

### Lower Badger Mill Creek

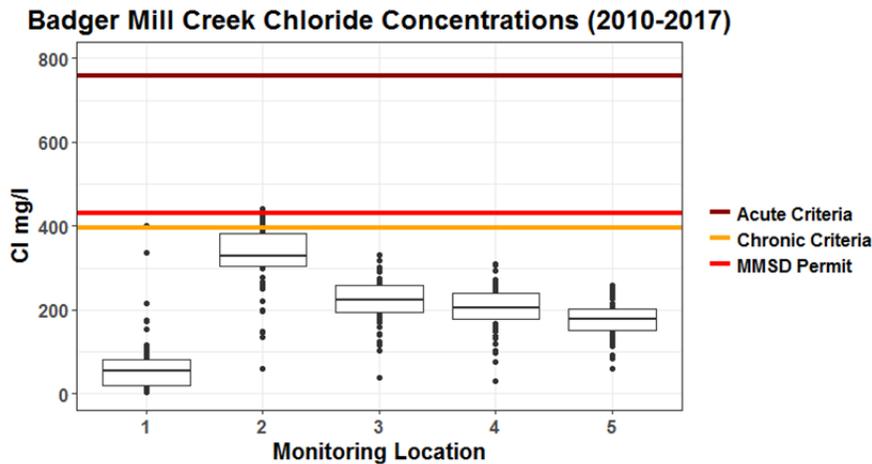
The amendment area is in the northern portion of the 11.1 square mile sub-watershed of Lower Badger Mill Creek. The creek, an intermittent tributary to Badger Mill Creek, is approximately 6 miles long and joins Badger Mill Creek 1.23 miles upstream from its confluence with the Upper Sugar River. The tributary is classified as an intermittent stream, meaning it flows only after rainfall or snowmelt, and as a result, is dry most of the year. Water quality and biotic index data are therefore not collected for Lower Badger Mill Creek. The Lower Badger Mill Creek sub-watershed is designated as a thermally sensitive area since it is a tributary to Badger Mill Creek, which supports brown trout populations.

### Badger Mill Creek

The main branch of Badger Mill Creek is designated as a Class II trout stream by the WDNR for fish management purposes, in accordance with NR 1.02(7). The creek flows 9.5 miles through the southwest side of City of Madison and bisects the City of Verona. Residential and agricultural land uses are the two most dominant land uses in the 29.6 square mile watershed, each occupying  $\frac{1}{4}$  of the area. Ongoing development in Madison and Verona continues to change land use in the area. Upstream of MMSD effluent discharge point, Badger Mill Creek is intermittent as it flows through the City of Madison and generally only flows when there is significant runoff. Downstream of the MMSD discharge point, Badger Mill Creek flows 4.9 miles until it combines with the Upper Sugar River. Because of the MMSD discharge, Badger Mill Creek is classified as a Variance Stream for Uses and Designated Standards [NR 104.05(2)], which allows the WDNR to modify certain water quality standards for this stream to allow discharge of treated municipal wastewater. These stream Use Standards are state water quality standards established to guide water quality planning under NR 121.

Since August 1998, MMSD has discharged about 3.3 mgd (5 cfs) of highly treated effluent to Badger Mill Creek as a way to maintain baseflow in the creek. This additional effluent compensates for groundwater extracted from the Sugar River basin by municipal wells. After groundwater is pumped and used, the wastewater is diverted to MMSD's Nine Springs treatment plant and discharged to Badfish Creek, in the adjacent Rock River basin, and Badger Mill Creek, in the Sugar River Basin. This return of treated effluent helps to restore the water balance between these two basins and, more importantly, improves aquatic habitat in Badger Mill Creek by removing low baseflow as a limiting habitat condition.

A variance in MMSD's discharge permit allows the effluent to have a chloride concentration of 430 mg/L, higher than the state water quality chronic criteria of 395 mg/L, but lower than the acute criteria of 757 mg/L. This variance also requires MMSD to develop a source reduction program for controlling chlorides coming into the plant. In each permit term, additional reductions are expected until a weekly average below 395 mg/L can be maintained. Chloride in the effluent is primarily associated with water softening and deicers. MMSD monitors chloride concentrations at five locations along Badger Mill Creek (Map 5). This boxplot, showing data collected every other month since 2010, illustrates that the highest chloride concentrations are just downstream of the MMSD discharge (monitoring location 2). Concentrations at monitoring location 2 occasionally exceed the Wisconsin chronic criteria for chloride but decrease downstream to consistently meet the chronic criteria standard.



The box shows the first and third quartiles (25th and 75th percentiles). Center line is median. All other points are plotted as outliers.

Despite being a Variance stream, Badger Mill Creek does not show biological impairments for macroinvertebrates or fish. In 1998, miles 2-5 of the creek were listed as impaired for total suspended solids by the DNR. In 2002, the creek was delisted when TSS was analyzed again. According to a 2017 fisheries assessment conducted by the DNR, MMSD effluent has helped support fish communities by maintaining steady baseflow in the creek, has not altered the fish community, and has not caused problematic thermal impacts. In DNR assessments for 2018, miles 0 to 5 of Badger Mill Creek did not show biological impairments but did show phosphorus impairments, prompting a proposal for the creek to be listed as an impaired water. Chloride and temperature were also assessed but did not result in any proposed additions.

Since Badger Mill Creek is a coldwater stream, it is sensitive to temperatures increases from uncontrolled urban runoff. The stream's watershed is therefore classified as a thermally sensitive area. Stormwater management practices are required for new development within the watershed to provide thermal controls so that warm water does not enter the stream and negatively impact the aquatic ecosystem.

[The United States Geological Survey \(USGS\) monitors flow, temperature, specific conductance and dissolved oxygen near the Bruce Street crossing in Verona.](#) Annual average discharge at this site as increased since monitoring began in 1996, including increased baseflow. This has led to concerns of more frequent flooding downstream in Badger Mill Creek in the Town of Verona.

### Springs

Springs represent groundwater discharge visible to the casual observer. The Wisconsin Geological and Natural History Survey (WGNHS) maintains an inventory of springs in Dane County and throughout the state. There are no inventoried springs in the proposed amendment area. The closest WGNHS inventoried spring to the proposed amendment area (WGNHS 130012) is located 5.7 miles northwest of the proposed amendment area and had a 0.93 cfs when surveyed in 2014.

### Groundwater

Groundwater modeling, using the [2016 Groundwater Flow Model for Dane County](#) developed by the WGNHS, shows that baseflow in Badger Mill Creek, at the confluence of the Lower Badger Mill Creek (See Map 5), has increased from 3.3 cfs during pre-development conditions (no well pumping) to 3.9 cfs in 2010 (Table 4). This increase is due to the effluent discharge from MMSD into Badger Mill Creek upstream of this confluence.

In 2012, the WGNHS 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 9.7 inches per year.

The 2015 report, [\*Characterizing the Sources of Elevated Groundwater Nitrate in Dane County, Wisconsin\*](#) provides interpolated values for groundwater nitrate concentration throughout Dane County, based on previous well test results. According to the report, nitrate concentrations in the proposed amendment area are likely to range from 6-8 mg/L in the southwest to 12-14 mg/L in the northeast (see Map 11). The drinking water standard is 10 mg/L. According to the regional groundwater model, the direction of groundwater flow in the amendment area is from the southwest to the northeast, which should limit the potential impact of the high nitrate area. However, the potential for high nitrate concentrations should be carefully considered when planning and installing wells in the amendment area.

#### 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 for species designated as endangered, threatened, or of special concern identified several species of special concern (insect, mammal and reptile) within a one-mile radius of the amendment area. It is recommended that the Town 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 within the West Johnstown-Milton Moraines. The Land Type Associations of Wisconsin classifies the surficial geology of this area as rolling hummocky moraine and outwash plain complex with scattered bedrock knolls. Soils are predominantly well drained silt and loam over sandstone or dolomite calcareous sandy loam till, or calcareous gravelly sandy outwash.

Surface elevations in the amendment area range from around 1100 feet to 1045 feet. The amendment area includes some very small, isolated, areas of steep (> 12%) and very steep (>20%) slopes associated with the golf course terrain features (see Map 6). While some of these steep slopes are adjacent to the existing golf course ponds, all of the ponds are artificial ponds that were created for the golf course.

According to the Natural Resource Conservation Service (NRCS) Soil Survey of Dane County, the soils in the amendment area are in the Plano – Ringwood – Griswold association. Plano – Ringwood – Griswold association soils are moderately well drained and well drained, deep silt loams and loams. The 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 no hydric soils within the amendment area (see Map 7). Hydric soils are good indicators of existing and former (drained) wetlands.

According to the [\*Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service\*](#), the Plano and Troxel soils (the PnA, PnB and TrB 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. All these soils are classified as well drained.

Soils with seasonal high water tables that are also classified as well drained or moderately well drained generally do not pose limitations for buildings with basements.

**Table 2  
Soils Classification**

Soil	% of Area	General Characteristics
<i>Plano Silt Loam; PnB</i>	29.3	Deep, well drained and moderately well drained, nearly level to sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due to low bearing capacity.
<i>Plano Silt Loam; PnA</i>	28.2	Deep, well drained and moderately well drained, nearly level to sloping 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 low bearing capacity.
<i>Troxel Silt Loam; TrB</i>	25.4	Deep, well drained and moderately well drained, gently sloping soils in draws, on fans, and in drainageways. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to shrink/swell potential and depth to saturated zone.
<i>Ringwood Silt Loam; RnB</i>	8.4	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to low bearing capacity and erodibility.
<i>Ringwood Silt Loam; RnC2</i>	4.3	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to slope, low bearing capacity, shrink/swell potential, and erodibility.
<i>Dodge Silt Loam; DnC2</i>	2.5	Deep, well drained, gently sloping and sloping 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 slope, shrink/swell potential and low bearing capacity.
<i>Kidder Loam; KdD2</i>	1.9	Deep, well drained, gently sloping to very steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a very severe hazard of erosion and are moderately droughty. Poses severe limitations for development due to steep slopes.

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

**Table 3  
Soils Characteristics**

Characteristic	Soil Map Symbols (see Map 7)	% of Area
<i>Prime Agricultural Soils</i>	<i>PnA, PnB, RnB, TrB</i>	<i>91.3</i>
<i>Hydric Soils (Indicates Potential / Restorable Wetlands)</i>	<i>None</i>	<i>0</i>
<i>Poorly Drained Soils with Seasonal High Water Table (&lt; 5')</i>	<i>None</i>	<i>0</i>
<i>Soils Associated with Steep Slopes (&gt; 12%)</i>	<i>KdD2</i>	<i>1.9</i>
<i>Soils Associated with Shallow Bedrock (&lt; 5')</i>	<i>None</i>	<i>0</i>
<i>Best Potential for High Rates of Infiltration in Subsoils</i>	<i>KdD2, PnA, PnB, RnB, RnC2, TrB</i>	<i>97.5</i>

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

According to WGNHS data, bedrock within a majority of the amendment area is in Ancell Group, which is quartz sandstone, dolomitic siltstone, silty dolomite, and sandy dolomite. It consists of two formations, the Jordan and the underlying St. Lawrence, which were combined as one mapping unit. The thickness is about 75 feet where not eroded. Bedrock in the northwest corner of the amendment area is within 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. According to WGNHS data, the depth to bedrock ranges from less than 5 feet to greater than 250 feet, with the deepest depths corresponding to a seam traversing from northwest to southeast across the amendment area (see Map 8).

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 data, karst features may be encountered in the northwest portion of the amendment area at a depth range from 65 to 90 feet. This is too deep for any potential karst features to be a concern for stormwater infiltration.

There is no minimum separation distance for roofs draining to surface infiltration practices. However, the Dane County ordinance requires infiltration practices to be located so that the separation distance between the bottom of the infiltration system and the elevation of seasonal high groundwater or the top of bedrock is at least 5 feet for residential arterial roads and 3 feet for other impervious surfaces.

Fourteen soil borings were conducted at the site in August 2018 as part of the initial work in developing a stormwater management plan. Water was encountered in 8 of the borings at depths ranging from 6 to 13.5 feet. All of the borings showed sand at depths ranging from 1 to 13 feet.

## **2) Proposed Urban Services**

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

The proposed redevelopment of the golf course will retain 51.8 acres of open space for continued use as golf course as well as stormwater management areas.

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

Potable water will be provided to the proposed development by private wells. It is anticipated that between 49 and 93 wells will be required to serve the 89 single family lots, 2 commercial properties, and the golf course club house. The quantity of wells will depend on whether the single family lots have individual wells or share a well between two lots. An existing well serving the existing golf course maintenance lot is planned to remain in service. New wells will be installed between a minimum depth of 150 feet and maximum depth of 400 feet with an anticipated average depth of 225 to 300 feet.

The 2015 report [Characterizing the Sources of Elevated Groundwater Nitrate in Dane County](#), indicates that the area to the northeast of the proposed development is a nitrate hotspot, with estimated nitrate levels in the upper aquifer in excess of the drinking water standard of 10 mg/L. The [Dane County Groundwater Protection Planning Framework](#) recommends

that private well owners test their water for bacteria and nitrates on a yearly basis, or whenever there are changes in taste, color or odor.

The Town of Middleton has proposed to address this potential nitrate concern by:

- 1) Including a notice in the Declaration of Covenants and Restrictions for the development that there is a concern with high nitrates in the area and recommend that lot owners perform annual testing for nitrates.
- 2) Including educational information in Town newsletters about the potential for nitrates in private wells in the Town and encourage residents to test their wells regularly for nitrates.
- 3) Developing a plan that recommends well depths and locations for each lot or pair of lots in the development.
- 4) Encouraging property owners with high nitrate wells to drill deeper wells or install reverse osmosis treatment systems.

### **c) *Wastewater***

Sanitary sewer service will be provided to the amendment area by the City of Madison Lower Badger Mill Creek public sanitary sewer interceptor through an intergovernmental agreement between the City of Madison and the Town of Middleton. The Phase 1 sanitary interceptor, located between Mid-Town Road and Valley View Road, is 27 inches in diameter and has a design capacity of 6,651 gpm. The Phase 2 sanitary interceptor, located between Valley View Road and Mineral point Road and along Pioneer Road, is 21 inches in diameter and has a design capacity of 3,187 gpm (see Map 9). These interceptors drain to the Mid-Town Lift Station located on Mid-Town Road between Meadow Road and Hidden Hill Drive. The lift station has a total capacity of 650 gpm. During the August 21, 2018 storm event, 9.62 inches of rainfall, the lift station average recorded flow was 123 gpm with a peak flow of 1,089 gpm. While the Lower Badger Mill Creek sanitary system was installed recently, it has been susceptible to inflow and infiltration entering into the system. As a comparison, a maximum flow rate of 247 gpd was recorded at the lift station during a February 2, 2018 storm event, 0.84 inches of rainfall. The lift station was designed to accommodate 1000 dwelling units. At the point in time that the lift station nears its capacity will be relieved by a MMSD owned sewer interceptor along the Lower Badger Mill Creek Corridor between Mid-Town Road and County Highway PD. MMSD is currently planning to provide this relief in 2024.

The City/Town estimates that the amendment area will generate an average of 37,283 gpd, or 26 gpm. Using a residential peaking factor of 4.0, it is estimated that the amendment area will generate a peak flow of 117,38, gpd, or 82 gpm. The estimated flow is based on the following land use assumptions: low density residential of 89 units at 3 persons per residence and 100 gpd per resident, and 14.11 acres of commercial at 740 gpd/acre. The estimate is consistent with historical wastewater generation rates in the City. The existing system has capacity to accommodate the additional flows from the amendment area.

MMSD Pumping Stations 12 and 16 currently serve the area near the amendment area. MMSD Pumping Station 17 will ultimately serve this area as the MMSD Lower Badger Mill Creek Interceptor is extended. The projected average daily and peak flows are below the capacity of the interceptors. MMSD has a regular capital improvement planning process to periodically evaluate their system capacity and expanded the capacity of the system as the need is foreseen.

#### Wastewater Treatment Facility

MMSD will provide wastewater treatment for the amendment area. The Nine Springs Treatment Facility has a design capacity of 50 million gallons per day (mgd) and received an average of 40.7 mgd in 2016, including infiltration and inflow. It is expected to reach 90

percent 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 at the existing wastewater treatment facility location with expanded capacity of the system as the need is foreseen.

Wastewater treatment at the district's Nine Springs Treatment Facility does not remove chloride and the concentration of chloride that arrives at the Nine Springs Plant can exceed the water quality standard. In 2015, AECOM completed a study for MMSD which determined that while possible, treatment would be cost-prohibitive, energy intensive, and involve other environmental impacts<sup>1</sup>. MMSD's Wisconsin Pollutant Discharge Elimination System (WPDES) permit which requires pollution prevention and source reduction initiatives for chlorides, such as the [Wisconsin Salt Wise Partnership](#). MMSD has not had any issues meeting its WPDES permit limits for the quality of effluent discharged to Badger Mill Creek according to their [2017 Annual Report](#). In 2017, the effluent monthly average Total Suspended Solids ranged from 3.2 to 7.6 mg/L, below the 10 to 16 mg/L permit limit for Badger Mill Creek. The effluent monthly average ammonia ranged from 0.13 to 0.59 mg/L, below the 1.1 to 3.8 mg/L permit limit for Badger Mill Creek. The effluent monthly average total phosphorus ranged from 0.22 to 0.38 mg/L, below the current 1.5 mg/L permit limit but not low enough to meet future water quality based effluent limits (WQBEL) for phosphorus. The total phosphorus monthly limit of 1.5 mg/L is an interim limit and will be reduced to 0.075 mg/L on a six month average and 0.225 mg/L on a monthly average. MMSD has implemented a Watershed Adaptive Management approach, leading a diverse group of partners called [Yahara Watershed Improvement Network \(Yahara WINs\)](#) in implementing phosphorus reducing practices in the watershed.

**d) Stormwater Management System**

The City of Madison completed the Lower Badger Mill Creek Stormwater Management Analyses in 2003 to address rapid urbanization within the watershed. Since adoption by the City, State, County and local stormwater ordinances have become more protective. As such, the preliminary stormwater management plan for the amendment area exceeds the recommendations from the 2003 report. The preliminary plan for the amendment area includes a regional detention basin along the Lower Badger Mill Creek Corridor, north of Mineral Point Road, along with multiple stormwater detention/infiltration facilities located strategically throughout the amendment area. In addition, a 75-foot wide drainage way will be built north of the regional facility, going north almost to Elderberry Road. These facilities will generally be located to adequately provide water quality treatment (80% TSS reduction) followed by volume reduction facilities, which will provide for annual stay-on (90% stay-on of the average annual storm). 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. All stormwater facilities are anticipated to be dedicated to the public upon completion.

Should development occur in portions of the amendment area prior to the City of Madison having ownership or easement rights to that area, the City will require post-developed runoff volume to match pre-developed runoff volume for all design events up to, and including, the 10-year, 24-hour design storm. This requirement attempts to minimize the potential of downstream hydrologic impacts associated with urbanization.

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<sup>1</sup> [Chloride Compliance Study Nine Springs Wastewater Treatment Plant Final Report, AECOM, 2015](#)

A majority of the topographic low points and valleys of the amendment area have the potential to experience a seasonal high water table between three and five feet of the surface, which will require care when siting infiltration practices so as to not impact groundwater quality. The DNR Conservation Practice Standard 1002 - Site Evaluation for Stormwater Infiltration requires field verification for areas of the development site considered suitable for infiltration. This includes a site assessment for karst features on the site to locate infiltration facilities appropriately so that performance can be maximized while protecting groundwater resources. As such, the City's stormwater management plan may require incorporation of volume reduction strategies (i.e. bioretention, porous pavement, green roofs, etc.) higher in the landscape should limiting conditions be found at the proposed stormwater management facilities locations along the edges of the site.

#### Performance Standards

The Town of Middleton proposes stormwater management performance measures to meet or exceed standards required by the State of Wisconsin (NR 151), Dane County (Chapter 14), Town of Middleton (Chapter 17), and City of Madison (Chapter 37) 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-, 10-, 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 90% of pre-development stay-on volume. This is consistent with the stay-on standard for new development currently required by Dane County regulations.
- 4) Include provisions and practices to reduce the temperature of runoff. This is consistent with the standards currently required by Dane County.
- 5) Maintain pre-development groundwater annual recharge rate of 9 to 10 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.
- 6) Meet the [City of Madison Stormwater Ordinance requirement for discharge off-site to other private lands](#). This exceeds the standards currently required by Dane County.

#### **e) Environmental Corridors**

There was a historic mapped intermittent stream that ran from the west and north through the amendment area until the construction of the golf course in 1993, a constructed drainage way is proposed for the amendment area along this route, which will have some associated floodplain. The amendment area does not contain any steep riparian areas.

The proposed amendment area includes a total of 51.8 acres of environmental corridor (See Map 1). This includes the delineated wetland located in the northeast corner of the amendment area, with its associated 75 foot buffer; a proposed stormwater drainage way through the amendment area, with its associated 100-year floodplain; and the portion of the golf course that is being retained as open space / recreation area.

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

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

Current projections suggest that an additional 61,000 residents and 38,000 housing units can be expected in the Central Urban Service Area between 2010 and 2040. Land demand projections in 2014 estimated that a total of 5,800 additional residential acres would be needed by 2040 to accommodate that growth. Department of Administration (DOA) population estimates for 2017 indicate that 328,000 residents call the communities of Fitchburg, McFarland, Madison, Maple Bluff, Monona, Middleton, and Shorewood Hills home<sup>2</sup> and that the population in those communities has increased by over 27,000 since 2010, faster than originally expected. If growth continues at this pace, the CUSA could gain an additional 75,000 residents by 2040. This would mean around 38,000 more people than the DOA projected.

#### ***b) Phasing***

All land within the proposed amendment area is expected to develop within 10 years.

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

Development creates impervious surfaces (i.e., streets, parking areas, and roofs) and typically alters the natural drainage system (e.g., natural swales are replaced by storm sewers). Without structural best management practices (i.e., detention basins and infiltration basins) this would result in increased stormwater runoff rates and volumes, as well as reduced infiltration. Without structural best management practices for erosion control, development would 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.

Since 2002, there have been stormwater management standards in effect at the state, county, and local level to require stormwater management and erosion control plans and structural best management practices designed to address the impacts of development on water quality, runoff volumes, peak flows, water temperature, and groundwater recharge.

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<sup>2</sup> Please note that this is a very rough approximation of CUSA. The CUSA includes areas in a handful of Towns. Additionally, the CUSA does not include some areas in the listed communities.

In 2011 county and local standards for runoff volume control were increased beyond state standards to further address the potential stormwater impacts of development. Since 2010 many communities adopted even higher standards for volume control through their own ordinances or as part of urban service area amendment agreements. In 2017, State statute 281.33(6)(a)(1) was changed to limit the ability of local governments to adopted higher standards for runoff volume through local ordinances.

The Town proposes to mitigate the urban nonpoint source impacts of the proposed development by requiring the implementation of various stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge to address the potential water quality impacts of stormwater runoff from the proposed development on the receiving waters. The Town has also agreed to meet the City of Madison's stormwater management requirements for this development. This includes the City's increased volume control requirements to match the existing volumetric discharges in storm events up to and including the 10-year storm for areas that discharge stormwater runoff onto property is neither under the applicant's control (via ownership, easement or agreement) nor publicly owned.

Regional partners including the City of Madison, the Madison Metropolitan Sewerage District, Madison Water Utility, and others, are actively working to address chlorides through the [Wisconsin Salt Wise Partnership](#). The Town of Middleton has participated chloride reduction trainings provided by WI Salt Wise. New development is not expected to exacerbate effluent chloride concentrations since the new high efficiency water softeners currently required by Wisconsin's plumbing code are substantially more efficient<sup>3</sup> than the old timer based softeners still found in many homes.

#### **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, with subsequent reductions in stream quality and transitions to more tolerant biological communities.

Groundwater modeling indicates that the cumulative effects of well withdrawals and effluent discharge from MMSD have resulted in a 0.6 cfs increase in baseflow in Badger Mill Creek at the confluence of Lower Badger Mill Creek between predevelopment (no pumping) and 2010. A 0.1 cfs decline is anticipated by the year 2040, according to modeling, reducing the baseflow to 3.8 cfs.

According to the 2014 DNR report [Ecological Limits of Hydrologic Alteration in Dane County Streams](#), Badger Mill Creek has a fish community that would be sensitive to reductions in baseflow, with American brook lamprey, brown trout, and mottled sculpin being the most sensitive to flow change. Therefore continuation of the MMSD effluent return, or some other method of maintaining baseflow, is important in this watershed.

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 issue is discussed along with potential management options in the recently updated [Dane County Groundwater Protection Planning Framework](#) (Technical

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<sup>3</sup> [The Reduction of Influent Chloride to Wastewater Treatment Plants by the Optimization of Residential Water Softeners, Madison Metropolitan Sewerage District.](#)

Appendix G of the Water Quality Plan). Maintaining pre-development groundwater recharge helps to maintain baseflow and mitigate this impact.

**Table 4**  
Modeled Baseflow Results  
Due to Current and Anticipated Future Municipal Well Water Withdrawals  
(All Municipal Wells)

Stream	No Pumping	2010	2040
<i>Badger Mill Creek</i>	<i>3.3 cfs</i>	<i>3.9 cfs</i>	<i>3.8 cfs</i>

**4) Comments at the Public Hearing**

A public hearing was held on the proposed amendment at the July 11, 2018 meeting of the Capital Area Regional Planning Commission. No members of the public spoke at the public hearing or provided written comments.

Key comments and questions from Commissioners at the public hearing were related to why sewered development was necessary for this level of density, concern with stormwater drainage through City of Madison neighborhoods to the southeast, and concern over additional stormwater flow to Badger Mill Creek. Rod Zubella, Engineer for the Town, stated that the Town has same density requirement for both sewered and unsewered development and that the City of Madison will review and approve the stormwater management plan. The developer, Jeff Haen, stated that the soils on many of the planned lots are not suitable for septic systems. Mark Moder from City of Madison Engineering commented that the City will acquire easements as lands develop.

Commission staff met subsequently met with Town representatives to discuss these concerns and options to address them. Actions have been recommended to the Town of Middleton to further improve water quality and environmental resource management in response to the issues raised.

**5) Conclusions and Staff Water Quality Recommendations**

There is sufficient existing treatment plant system capacity at MMSD to serve the proposed amendment area. There is also sufficient existing wastewater collection system capacity to serve the proposed amendment area.

Since 2002, there have been stormwater management standards in effect at the state, county, and local level to require stormwater management and erosion control plans and structural best management practices designed to address the impacts of development on water quality, runoff volumes, peak flows, water temperature, and groundwater recharge. In 2011 county and local standards for runoff volume control were increased beyond state standards to further address the potential stormwater impacts of development. Since 2010 many communities adopted even higher standards for volume control through their own ordinances or as part of urban service area amendment agreements. In 2017, State statute 281.33(6)(a)(1) was changed to limit the ability of local governments to adopted higher standards for runoff volume through local ordinances.

The Town of Middleton proposes to mitigate the urban nonpoint source impacts of the proposed development by requiring the implementation of stormwater best management

practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge to address the potential urban nonpoint source impacts of the proposed development on the receiving waters, including the City of Madison's stormwater requirement for discharge off-site to other private lands.

The Town of Middleton has been participating in trainings offered by regional partners actively working to achieve source reduction of chlorides by encouraging the responsible use of deicers and water softeners through the [Wisconsin Salt Wise Partnership](#).

It is the Regional Planning Commission staff's opinion that the proposed amendment is consistent with water quality standards under Wis. Stat. § 281.15, with the conditions of approval identified below. Additional actions have also been recommended below to further improve water quality and environmental resource management.

**a) Conditions**

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

1. Execute an agreement with the City of Madison for the provision of sanitary sewer service to the amendment area.
2. Submit a detailed stormwater management plan for Regional Planning Commission staff review and approval (in conjunction with DCL&WCD and City of Madison 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-, 10-, and 100-year 24-hour design storms to pre-development levels, in accordance with the City of Madison Stormwater Ordinance.
  - c. Provide at least 80% sediment control for the amendment area based on the average annual rainfall, with a minimum of 60% of that control occurring prior to infiltration, in accordance with the City of Madison Stormwater Ordinance.
  - d. Maintain the post development stay-on volume to at least 90% of the pre-development stay-on volume for the average annual rainfall period, in accordance with the City of Madison Stormwater Ordinance.
  - e. 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](#) (a range of 9 to 10 inches/year for the amendment area) or by a site specific analysis, in accordance with the Dane County Stormwater Ordinance.
  - f. Include provisions and practices to reduce the temperature of runoff, in accordance with the City of Madison Stormwater Ordinance.
  - g. Meet the City of Madison Stormwater Ordinance requirement for discharge off-site to other private lands.
3. Stormwater management facilities shall be placed in public outlots whenever feasible and designated as environmental corridor. Easements and perpetual legal maintenance

agreements with the Town, to allow the Town to maintain stormwater management facilities if owners fail to do so, shall be provided for any facilities located on private property.

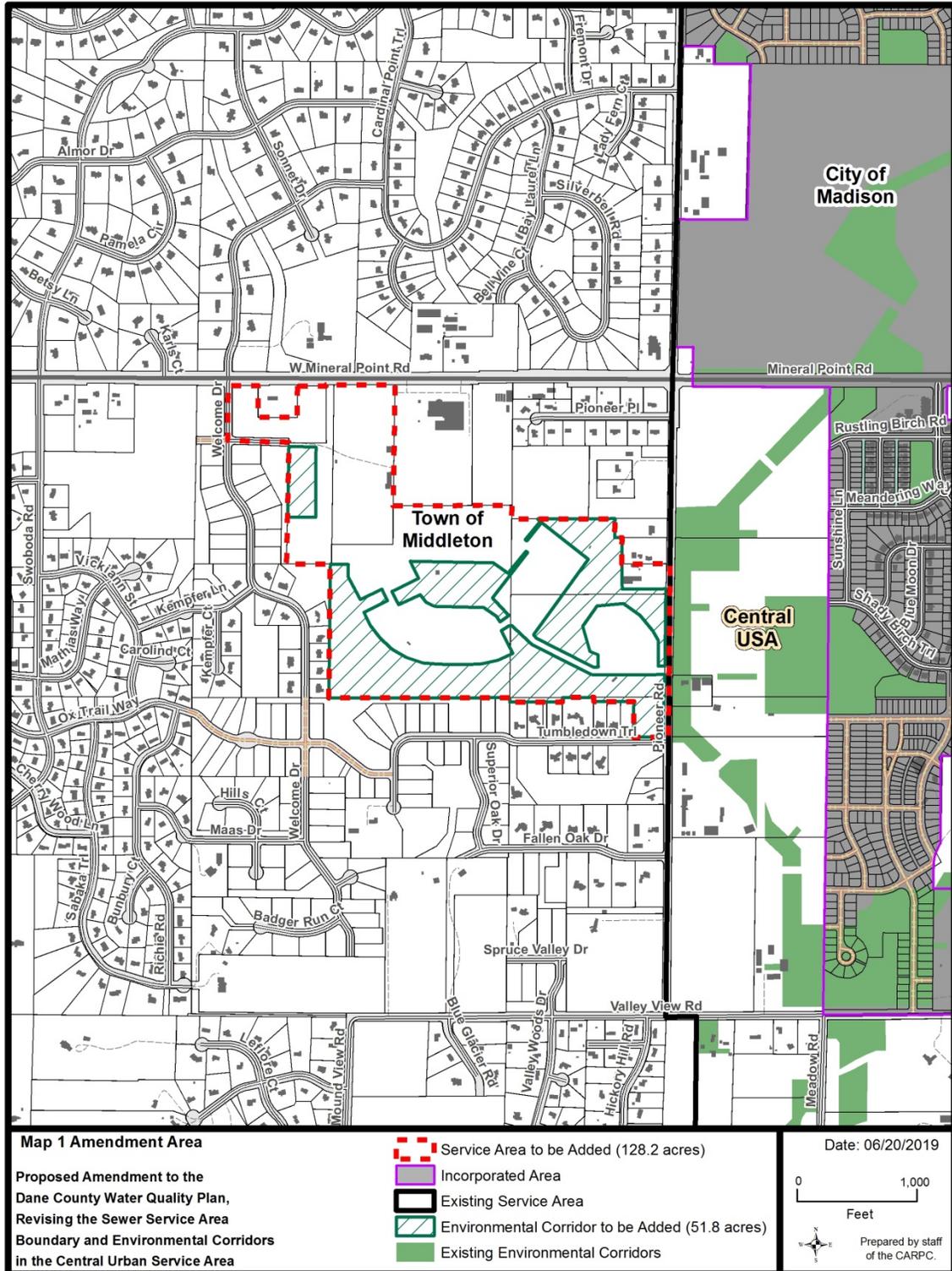
4. Delineate environmental corridors to include delineated wetlands and their buffers, the constructed drainageway and associated floodplain, stormwater management areas and open space to meet the [Environmental Corridor Policies and Criteria](#) adopted in the *Dane County Water Quality Plan*. Submit plats showing environmental corridors for Regional Planning Commission staff review and concurrence prior to recording.
5. Including a notice in the Declaration of Covenants and Restrictions for the development that states there is a potential concern with high nitrates in the area and that recommends property owners perform annual testing for nitrates.
6. Continue to encourage the responsible use of deicers and water softeners by participating in the trainings and outreach activities of the [Wisconsin Salt Wise Partnership](#).

**b) Recommendations**

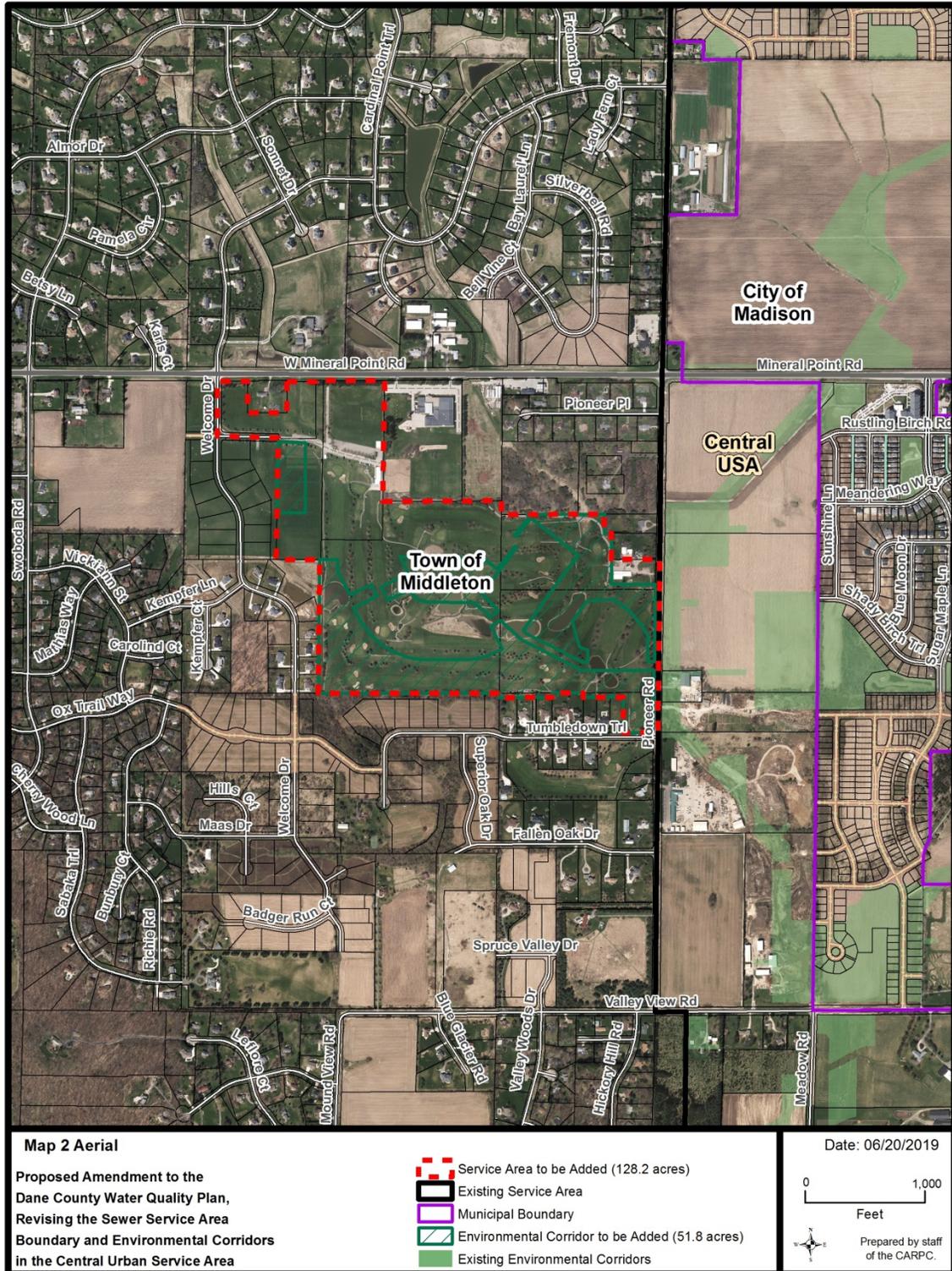
It is also recommended that the Town of Middleton pursue the following:

1. 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.
2. Collaborate with watershed-wide efforts to share information on activities and concerns within the Badger Mill Creek watershed and to coordinate efforts.
3. Work with the City of Madison to update the watershed model (XP –SWMM) for this part of the watershed to reflect post -development conditions.
4. Include educational information in Town newsletters about the potential for nitrates in private wells in the Town and encourage residents to test their wells regularly for bacteria and nitrates on a yearly basis, or whenever there are changes in taste, color or odor.

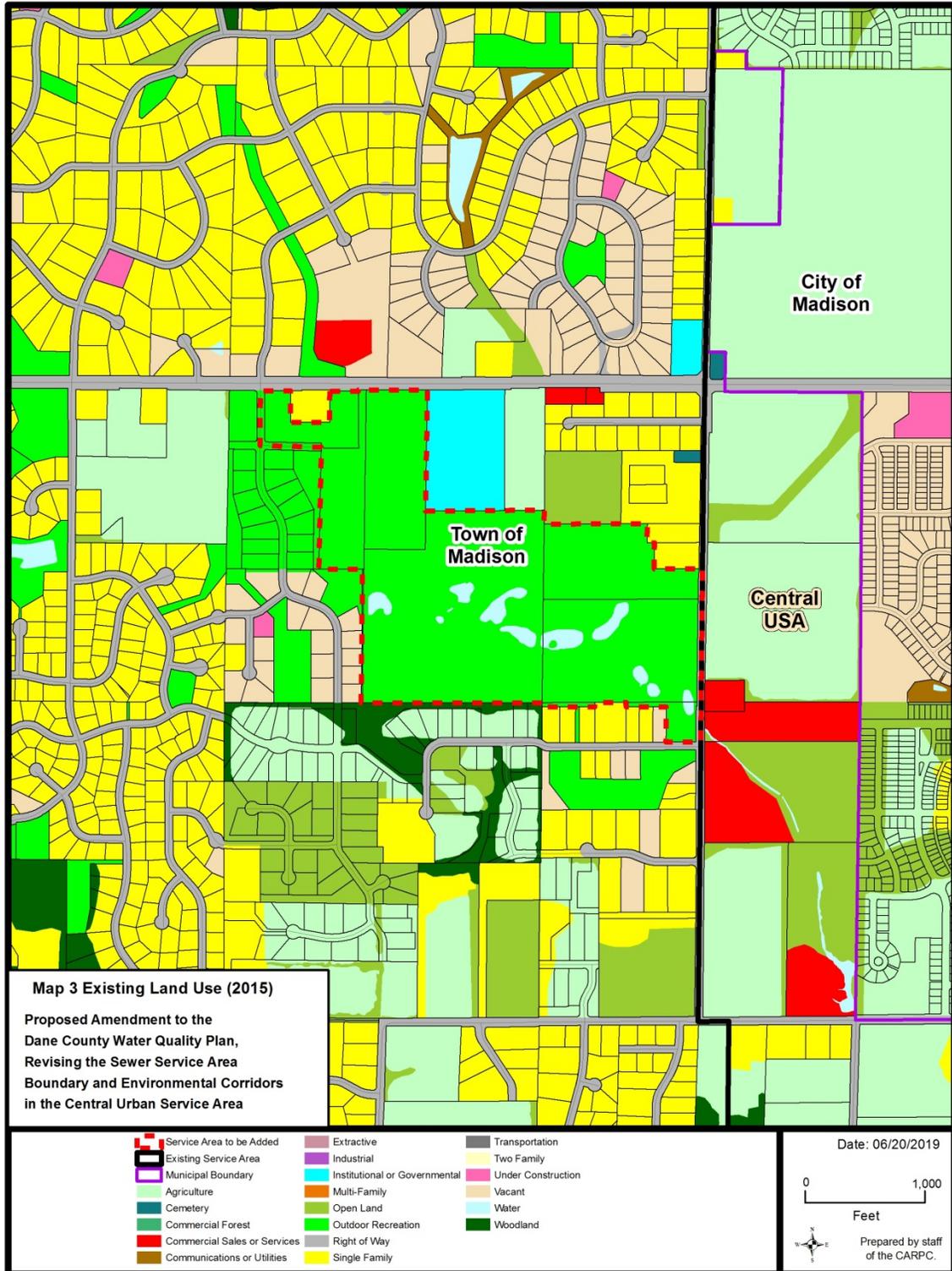
Map 1 - Amendment Area



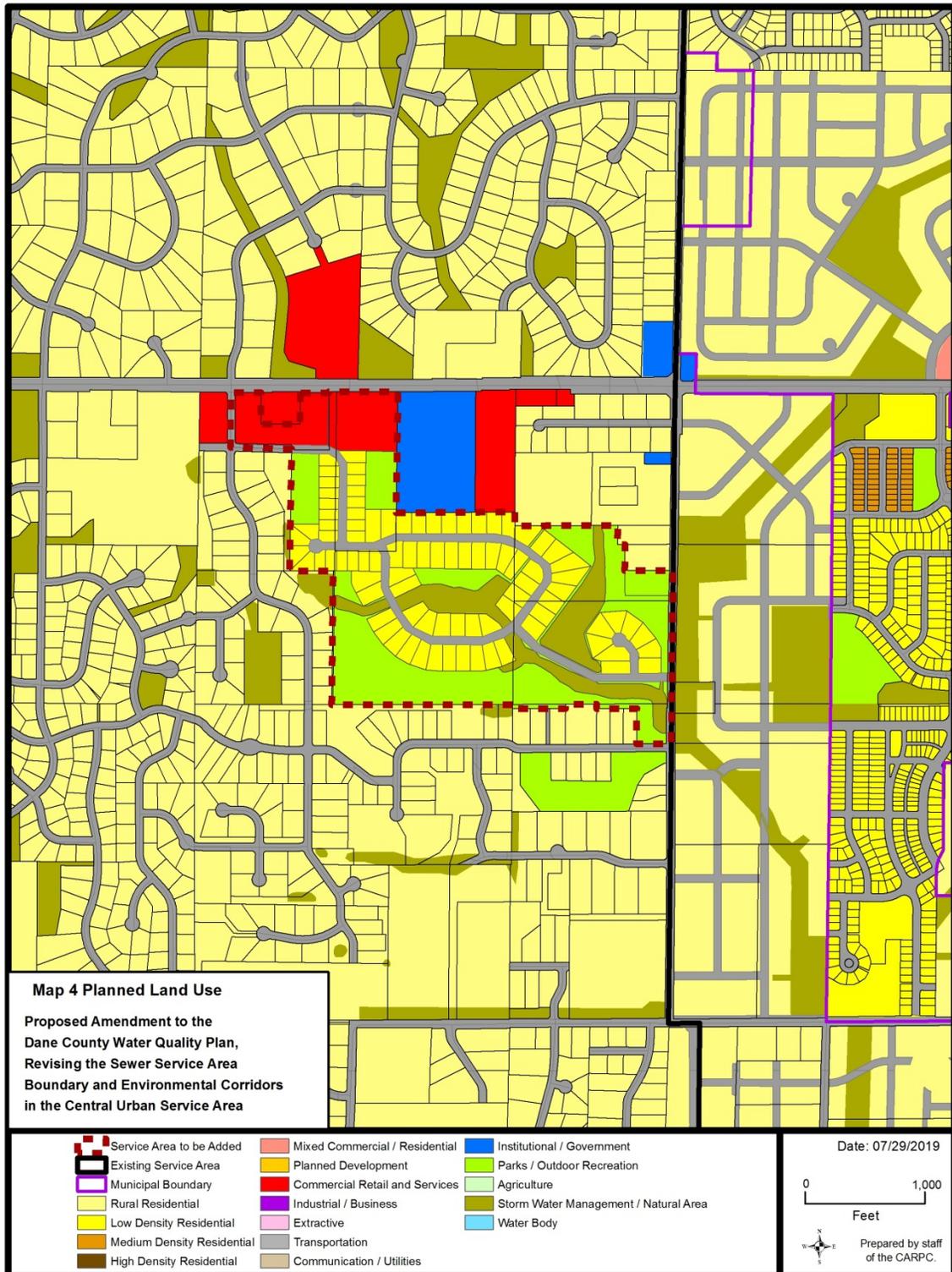
Map 2 – Aerial



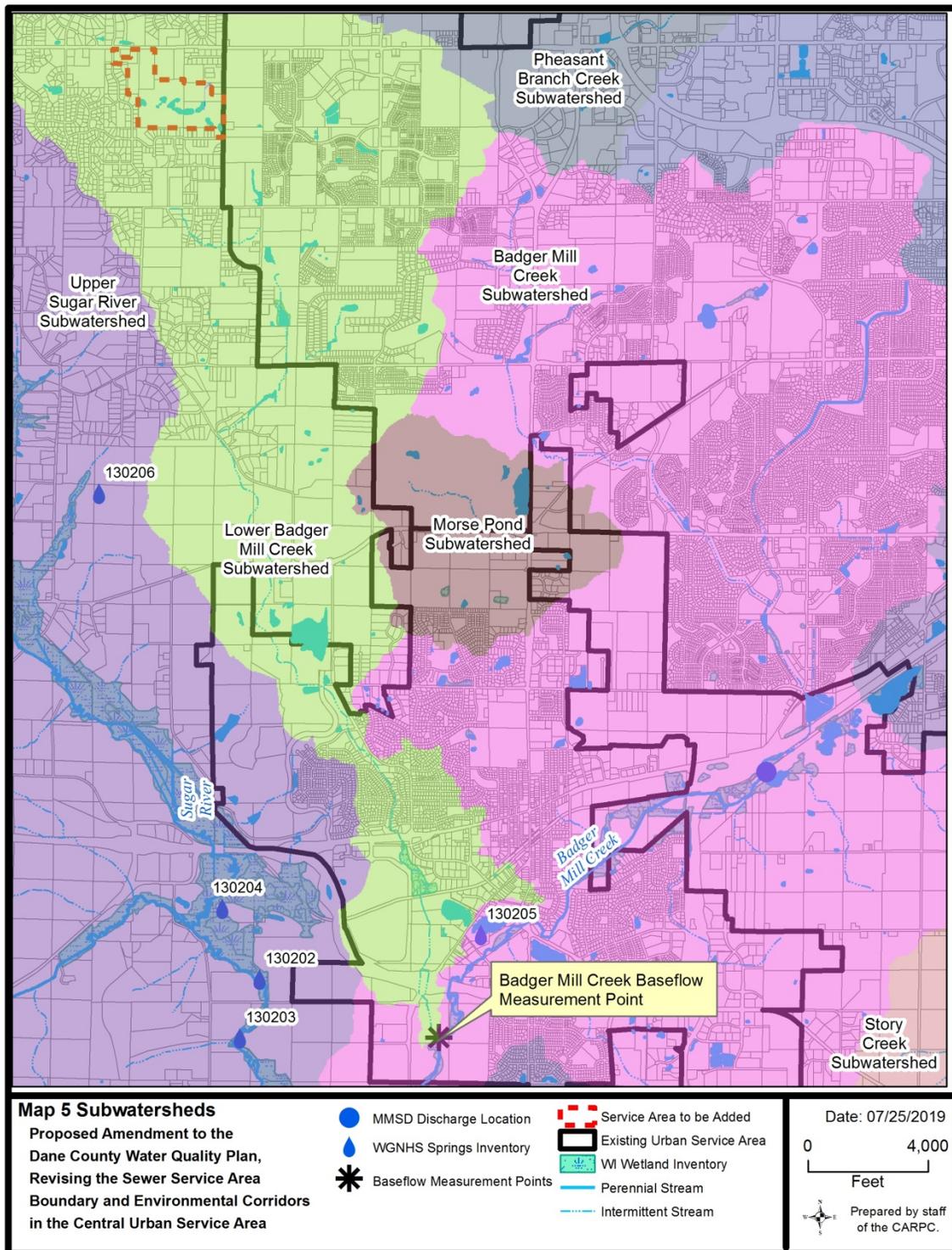
Map 3 – Existing Land Use



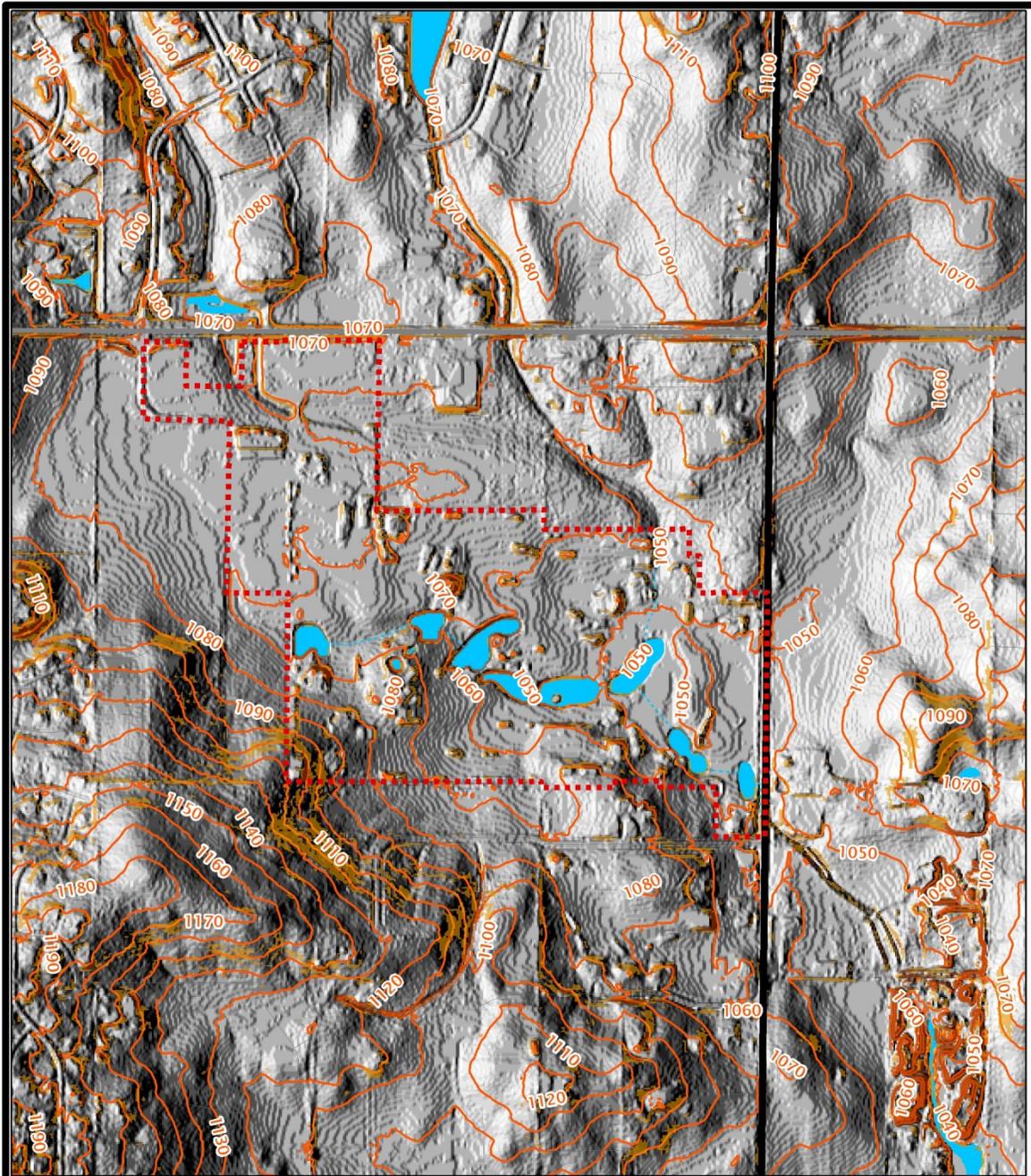
Map 4 – Planned Land Use



Map 5 - Subwatersheds



Map 6 - Elevations



**Map 6 Elevation**  
**Proposed Amendment to the**  
**Dane County Water Quality Plan,**  
**Revising the Sewer Service Area**  
**Boundary and Environmental Corridors**  
**in the Central Urban Service Area**

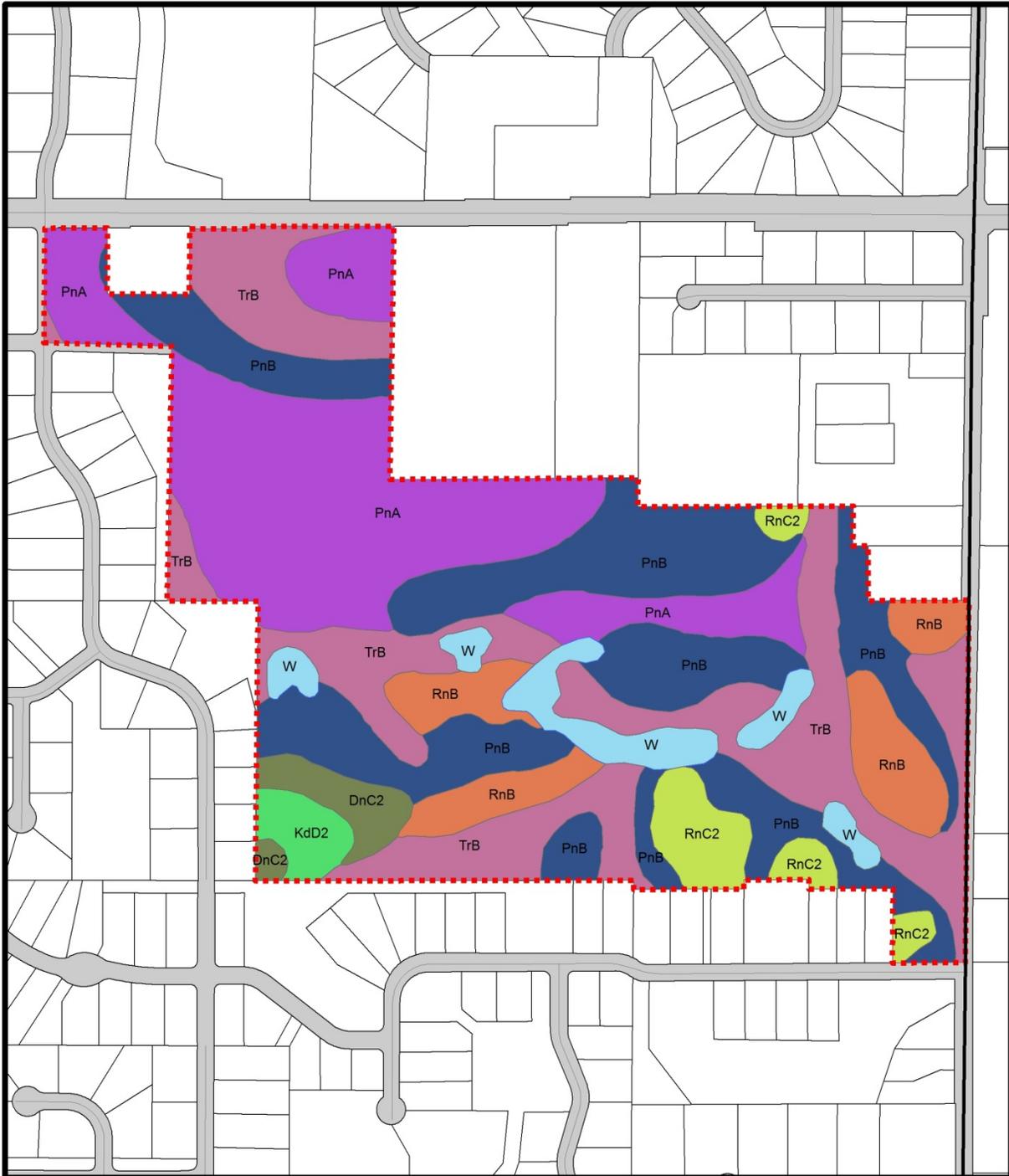
-  Existing Service Area Boundary
  -  Service Area To Be Added
  -  Contours (10ft) 2009
  -  Lakes and Ponds
- Steep Slopes**  
**Percent Slope**
-  12% to less than 20%
  -  20% and greater

Date: 07/25/2019

0 750  
 Feet

 Prepared by staff of the CARPC.

Map 7 - Soil Type

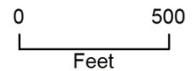


**Map 7 Soil Types**

**Proposed Amendment to the Dane County Water Quality Plan, Revising the Sewer Service Area Boundary and Environmental Corridors in the Central Urban Service Area**

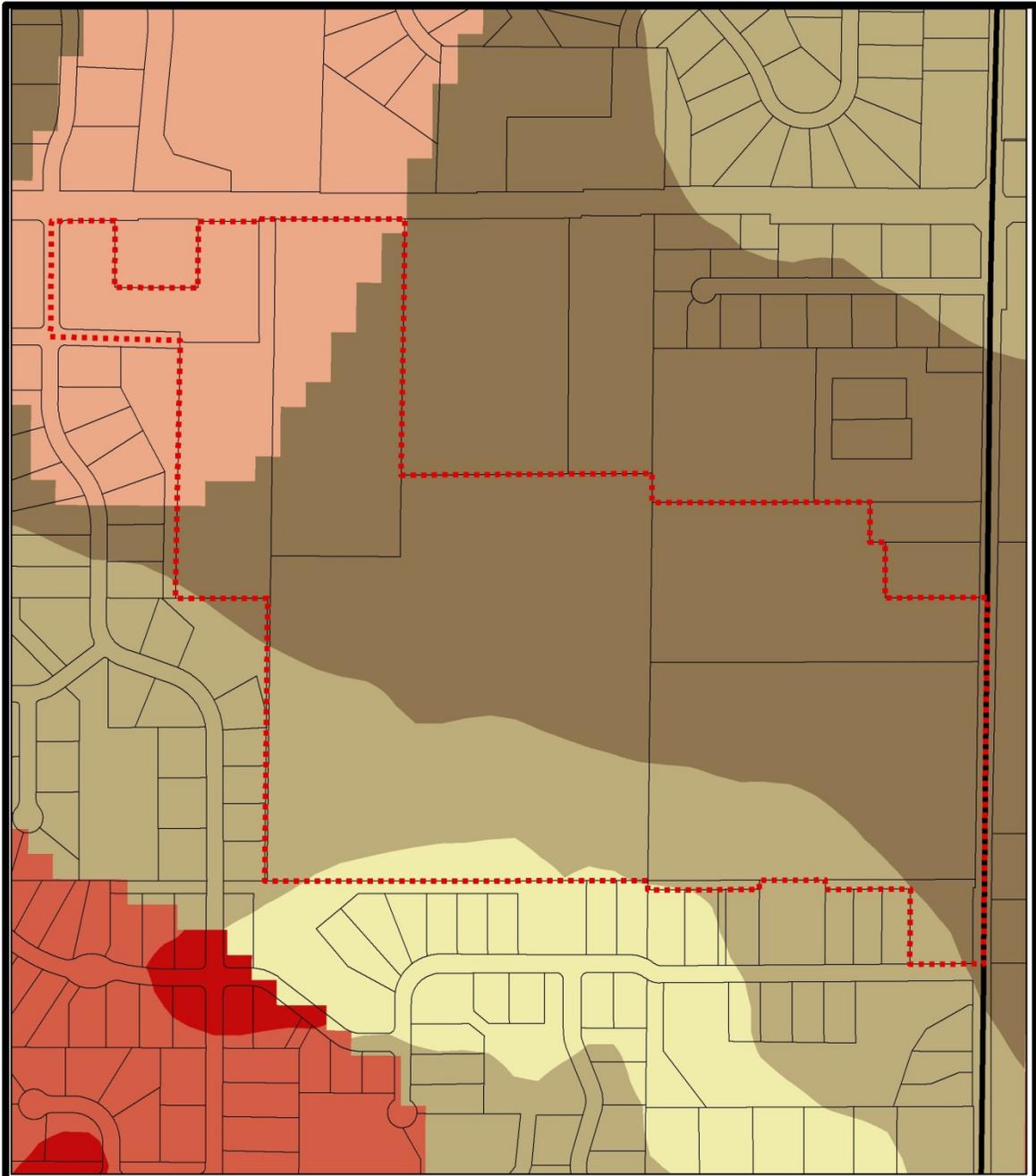
Soils	Soil Name	Soil Name
Poorly Drained	Dodge silt loam	Ringwood silt loam
Hydric Soils	Kidder loam	Ringwood silt loam
	Plano silt loam	Troxel silt loam
	Plano silt loam	Water

Date: 07/25/2019



Prepared by staff of the CARPC.

Map 8 – WGNHS Bedrock Depth and Potential Karst Features

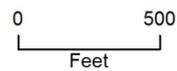


**Map 8 WGNHS Bedrock Depth and Potential Karst Features**

Proposed Amendment to the  
Dane County Water Quality Plan,  
Revising the Sewer Service Area Boundary  
in the Central Urban Service Area

Potential Karst Units (ft)		Depth to Bedrock (ft)	
	0 - 10		0 - 10
	10 - 50		10 - 50
	50 - 100		50 - 100
	100 - 400		100 - 400

Date: 07/22/2019

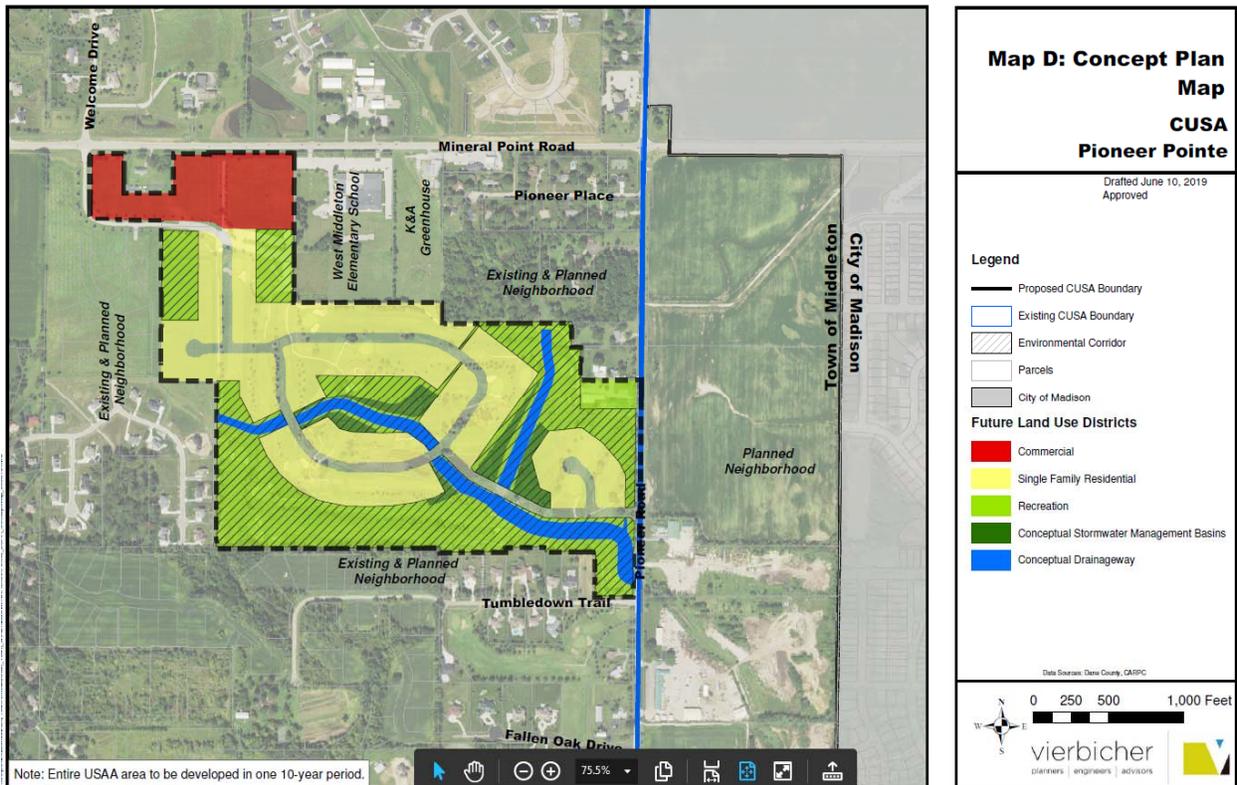


Prepared by staff  
of the CARPC.

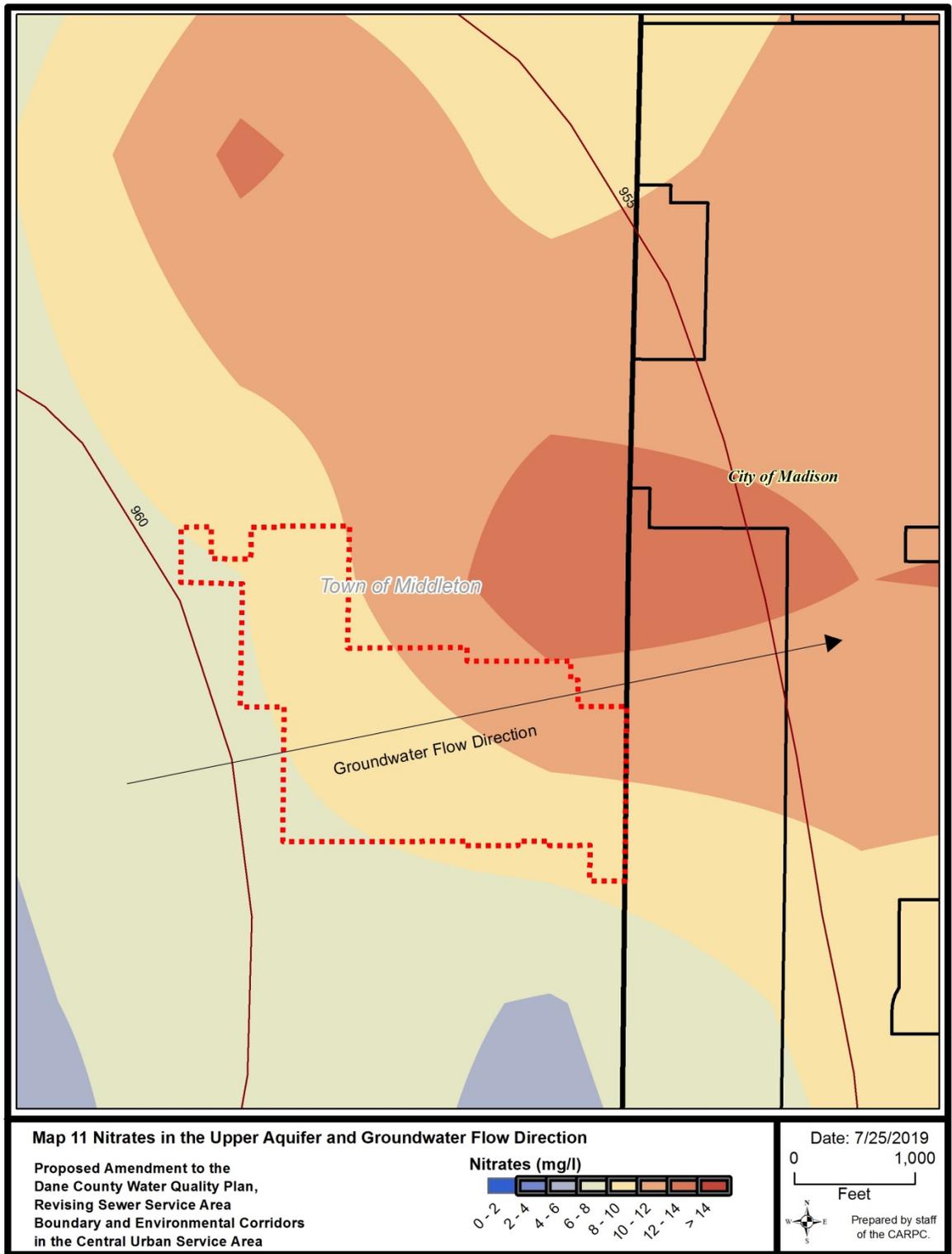
Map 9 – Planned Sanitary Sewer Service



Map 10 – Proposed Stormwater Management System



Map 11 – Nitrates in the Upper Aquifer and Groundwater Flow Direction





19 June 2019

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

RE: The Proposed Amendment to the Dane County Water Quality Plan, Revising the Sewer Service Area Boundary and Environmental Corridors in the Central Service Area, Town of Middleton, Dane County, Wisconsin

Dear Mr. Higgins:

No previously recorded archaeological sites have been recorded in, or adjacent to the parcels delineated in the amendment. A review of available evidence indicates that no wetlands, drainages, or other landscape features that are typical indicators of American Indian settlement are present. Therefore, we see no reason why the project cannot proceed as designed.

Please do note that the West Middleton Burying Ground (DA-1247/BDA-257) is located just off the southeast corner of the area, east of Pioneer Road .

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.

This letter does not constitute a Wisconsin Historical Society review for any project that may be governed by Federal or State Compliance laws, e.g. Section 106, Wis Stat. §44.40, Wis Stat. §66.1111, or Wis Stat. §157.70

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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