
**Staff Analysis of Proposed Amendment to the
Dane County Water Quality Plan,
Revising the Sewer Service Area Boundary and Environmental Corridors
in the Central Urban Service Area (City of Madison / Northeast Neighborhood)**

History of the Amendments to 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. The first Madison amendment to the Central Urban Service Area occurred in 1985. There have been 115 amendments to this service area since its creation totaling roughly 8,700 acres of developable land and 4,000 acres of Environmental Corridor. The most recent amendment of the service area by the City was recommended by the Commission and approved by the WDNR in 2018.

Existing Conditions

Land Use

The City of Madison is requesting amendment to the Central USA south of Lien Road and east of Interstate 39 in the City of Madison and the Town of Burke. The amendment area is largely contiguous on all sides to the existing USA boundary. The amendment area is included in the City's *Northeast Neighborhood Development Plan* and is modeled in the Regional Development Framework's 2035 and 2050 growth scenarios. Existing land uses include open land, agriculture, and scattered rural residential and commercial developments. Planned land uses of the area are predominantly different mixtures of residential with densities ranging from six units per acre to 35 units per acre. The requested amendment area is just over 400 acres.

Surrounding Planned Land Uses Include:

- North: Mixed-use Neighborhood
- West: Interstate highway, existing neighborhood residential, Glacier Hill Park
- South: Interstate highway, mixed-use neighborhood
- East: Mixed-use neighborhood

**Table 1
Existing and Planned Land Use**

Land Use Category	Existing Land Use Acres (see Map 3)	Proposed Land Use Acres (see Map 4)
Agriculture	124.3	
Commercial	5.0	11.0
Institutional/Governmental		7.4
Open Land	112.6	54.4
Parks/Outdoor Recreation		11.8
Residential	56.4	188.2

Transportation, Communication, Utilities	68.1	134.4
Woodlands	40.8	
Total	407.2	407.2

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. This Central Urban Service Area amendment is not in proximity to any known sites and WHS does not recommend any further investigation. (Attachment 1).

Natural Resources

The proposed amendment area is in the Starkweather Creek (HUC 12: 070900020701) and Door Creek (HUC 12: 070900020901) watersheds (Map 5). There are no mapped wetlands or floodplains within the amendment area. There is a mapped wetland along the northeast edge of the amendment area.

Wastewater from the amendment area will be treated at the Madison Metropolitan Sewerage District (MMSD) Wastewater Treatment Facility. The treated effluent is discharged to Badfish Creek and Badger Mill Creek, bypassing the Yahara chain of lakes.

Wetlands

DNR's Wisconsin Wetland Inventory (WWI) shows one emergent / wet meadow wetland along the northeast edge of the amendment area west of Reiner Road. No recent wetland delineation has been conducted for this wetland. Therefore, one will be required at the time of development. The wetland inventory also includes open water, forested, scrub / shrub and emergent / wet meadow wetlands associated with Starkweather Creek to the north/northwest of the amendment area and emergent / wet meadow and forested wetlands associated with Door Creek to the east of the amendment area (Map 5).

Starkweather Creek

Approximately two-thirds of the proposed amendment area is within the Starkweather watershed, a subwatershed of the Lake Monona-Yahara River watershed (Map 5). The East Branch of Starkweather Creek ([WBIC 805100](#) / WATERSID 11668) 3.7 miles long and originates near East Towne Mall, draining the east side of Madison south of U.S. 151 and rural land east of Interstate 90-94. The 21.5 square mile watershed encompasses predominately highly developed land on the east side of the City of Madison and discharges to the northeast side of Lake Monona at Olbrich Park. The creek has been extensively channelized and water quality in the main stem and the east and west branches has historically been very poor. Starkweather Creek is a Limited Forage fishery with the potential of becoming a Warm Water Sport Fishery.

Starkweather Creek has been listed with chronic aquatic toxicity due to unspecified metals, degraded habitat due to sediment/total suspended solids, and low dissolved oxygen due to high biological oxygen demand since 1998. In 2016, portions of both branches of Starkweather Creek were listed as impaired by WDNR for chronic aquatic toxicity due to chloride. In 2019, stream sampling downstream of the airport also showed high concentrations of per- and polyfluoroalkyl substances (PFAS). There has been a Rock River Coalition / Yahara WINS monitoring location on Starkweather Creek at State Highway 30 ([Station ID 133070](#)) since 2014. Field measurements from 2021 indicated dissolved oxygen levels of 7.5 to 14.5 mg/L, transparency of 114 to 120 cm, and macroinvertebrate index scores of 2.4 to 2.8. Laboratory analysis of samples from 2021 showed ammonia (NH₃) levels from 0.11 to 0.20 mg/L, total phosphorus (P) from 0.04 to 0.12 mg/L, and total suspended solids (TSS) from no detect to

18.7 mg/L. Volunteer chloride monitoring has been conducted since the fall of 2020 as part of CARPC's *Starkweather Creek Watershed Chloride Management Plan* ([link to plan website](#)) Levels in the east branch typically range from about 200 mg/L in the summer to over 1,000 mg/L during spring melt events. The chronic toxicity level for chloride in WI is 395 mg/L and the acute toxicity level is 757 mg/L. A USGS baseflow monitoring station ([Station 05428650](#)) located on the East Branch of Starkweather Creek just south of Milwaukee Street has also been utilized to collect periodic water quality samples since the late 1980s.

Door Creek

The remainder of the amendment area is within the Door Creek watershed, a subwatershed of the Lake Kegonsa-Yahara River watershed (Map 5). Door Creek ([WBIC 802800](#) / WATERSID 11644) is a tributary to Lake Kegonsa. It begins as a small stream in the southeast corner of the Town of Burke and flows generally south to the Lake. Door Creek and its tributaries drain 29.5 square miles of land in the drumlin-marsh area of eastern Dane County. Much of Door Creek has been straightened and ditched to facilitate agricultural drainage. It is a relatively sluggish stream subject to low flows and high temperatures.

From its mouth at Lake Kegonsa (mile 0) upstream to its headwaters north of Interstate Highway 94 (mile 14.02), the DNR's current designated biological use of Door Creek is as a Limited Forage Fishery (the classification used to determine water quality criteria and effluent limits under NR 102 and NR 104). The current biological use of Door Creek is as warmwater forage fishery, and the attainable use is as a warmwater sport fishery.

Since April 2012, all of Door Creek has been included on the state 303(d) list of impaired waters for total phosphorus from unknown sources of urban or rural nonpoint source pollution. The DNR's 2018 assessments showed continued impairment by phosphorus however, available biological data do not indicate impairment. A Total Maximum Daily Load (TMDL) for phosphorus has been established for this segment of Door Creek associated with the greater Rock River TMDL project. There has been a Rock River Coalition / Yahara WINs monitoring location on Door Creek at Jahnke Road ([Station 10010911](#)) since 2016. Field measurements from 2021 indicated dissolved oxygen levels of 7.4 to 11.3 mg/L, transparency of 13 to 120 cm, and macroinvertebrate index scores of 1.7 to 2.4. Laboratory analysis of samples from 2020 showed total phosphorus (P) from 0.10 to 0.65 mg/L. There are no active USGS baseflow monitoring stations within this watershed

Springs

The Wisconsin Geological and Natural History Survey (WGNHS) maintains an inventory of springs in Dane County, and throughout the state. From 2014 and 2017, the WGNHS surveyed springs statewide that were expected to have flow rates at least 0.25 cubic feet per second (cfs). There are no known springs in the proposed amendment area. The nearest spring in the Starkweather Creek Watershed is Spring #18, approximately 0.4 miles northeast of the amendment area (Map 5). Spring #18 was surveyed in 2014 with a discharge rate of 0.24 cfs, specific conductance of 1104 µS/cm, temperature of 61° F, and a pH of 7.97. Springs represent groundwater discharge visible to the casual observer.

Groundwater

Groundwater modeling, using the 2016 Groundwater Flow Model for Dane County developed by the WGNHS ([link to website](#)), shows that baseflow in Starkweather Creek at Lien Road has decreased from 1.2 cfs during pre-development conditions (no well pumping) to 0.5 cfs in 2010 (Table 4). This decrease is due to the combined impacts of high capacity well groundwater withdrawals contributing to reduced stream baseflow.

In 2012, the WGNHS published a report, *Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model*, ([link to report](#)) 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 proposed amendment area ranges from approximately 9 to 10 inches per year.

Endangered Resources

The WDNR 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 ([link to website](#)). A screening review of this database conducted by Regional Planning Commission staff for species designated as endangered, threatened, or of special concern identified one threatened plant species, two plant species of special concern and one community within a one-mile radius of the amendment area. A 1-mile buffer was considered for terrestrial and wetland species and a 2-mile buffer for aquatic species. Therefore, it is recommended that a formal Endangered Resources Review be conducted by the WDNR or one of their certified reviewers for potential impacts to endangered resources and habitat protection measures be implemented if species are found.

The amendment area is within the High Potential Zone (species likely present) for the federally endangered Rusty Patched Bumble Bee. Section 7 of the Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service when any action that is carried out, funded, or permitted by a federal agency may affect a federally listed endangered or threatened species. However, much of the proposed amendment area currently consists of disturbed ground and row crops and is not considered to be suitable habitat for the Rusty Patched Bumble Bee. The WDNR typically recommends that projects within the High Potential Zone include native trees, shrubs, and flowering plants; plants that bloom spring through fall; and the removal and control of invasive species in any habitat used for foraging, nesting, and overwintering. The USFWS developed a list of plants favored by Rusty Patched Bumble Bee ([link to list](#)). Implementing these conservation measures should be coordinated with the WDNR Endangered Resources Review Program, as needed.

Soils and Geology

The amendment area is located within the Dane-Jefferson Drumlins and Lakes Land Type Associations of Wisconsin. The Association classifies the surficial geology of this area as undulating complex of till plains with drumlins, outwash plains, lake plains and muck deposits common.

Surface elevations within the amendment area range from around 900 feet to 1060 feet. There are some small, isolated areas of steep (> 12%) and very steep (>20%) slopes typically associated with the road embankment, and two areas of very steep slopes in the northern portion associated with wooded areas (Map 6). These small areas of steep slopes are not riparian and do not require inclusion in environmental corridors; however, portions of the steep slopes associated with wooded areas are mapped as environmental corridor for open space.

According to the Natural Resource Conservation Service (NRCS) Soil Survey of Dane County, the soils in amendment area are in Plano-Ringwood-Griswold association. These soils are moderately well drained and well drained, deep silt loams and loams. Table 2 shows detailed classification for soils in the amendment area (Map 7) while Table 3 shows important soil characteristics for the amendment area.

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 ([link to web soil survey](#)), the Plano, St. Charles, Troxel, Virgil and Batavia soils (the PnB, ScB, TrB, VrB and BbB map units) are not hydric, but they do have a seasonal (April to June) zone of water saturation within 5 feet of the ground surface. The Virgil soil is classified as somewhat poorly drained, which can pose a limitation for buildings with basements.

Table 2
Soils Classification

Soil	% of Area	General Characteristics
<i>Plano Silt Loam; PnB</i>	24.4	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 slight limitations for development due to shrink/swell potential and low bearing capacity.
<i>Kidder Silt Loam; KdC2</i>	14.6	Deep, well drained, gently sloping to very steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and severe hazard of erosion. Poses moderate limitations for development due to steep slopes.
<i>Ringwood Silt Loam; RnB</i>	12.7	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>St. Charles Silt Loam; ScB</i>	8.7	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>Dodge Silt Loam; DnB</i>	7.7	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 slope and shrink/swell potential.
<i>Rockton Silt Loam; RoC2</i>	6.3	Moderately deep, well-drained, gently sloping to moderately steep soils on dolomite-controlled uplands. Soils have medium fertility, moderate permeability, and a severe hazard of erosion. Poses severe limitations for development due to depth to bedrock.
<i>Rockton Silt Loam; RoB</i>	5.9	Moderately deep, well-drained, gently sloping to moderately steep soils on dolomite-controlled uplands. Soils have medium fertility, moderate permeability, and a severe hazard of erosion. Poses severe limitations for development due to depth to bedrock.
<i>Troxel Silt Loam; TrB</i>	3.9	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 severe limitations for development due to low bearing capacity.
<i>Virgil Silt Loam; VrB</i>	3.4	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 moderate hazard of erosion. Poses severe limitations for development due to low bearing capacity and depth to saturated zone.
<i>Dodge Silt Loam; DnC2</i>	3.1	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a severe hazard of erosion. Poses moderate limitations for development due to slope, shrink/swell potential, and low bearing capacity.
<i>Dunbarton Silt Loam; DuE2</i>	2.0	Shallow, well drained, gently sloping to steep soils on uplands. Soils have low fertility, moderately slow permeability, and a very severe hazard of erosion. Poses severe limitations for development due to depth to bedrock.
<i>Batavia Silt Loam; BbB</i>	1.8	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>Plano Silt Loam; PoB</i>	1.4	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 slight to moderate limitations for development due to low bearing capacity.
<i>Kidder Loam; KdD2</i>	1.3	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. Poses severe limitations for development due to slope.
<i>Griswold Loam; GwC</i>	1.0	Deep, well-drained gently sloping to moderate steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a severe hazard of erosion. Poses moderate limitations for development due to bearing capacity and shrink/swell potential.

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
Prime Agricultural Soils	PnB, RnB, ScB, DnB, RoB, TrB, VrB, BbB, PoB	66.5
Hydric Soils (Indicates Potential / Restorable Wetlands)	None	0
Poorly Drained Soils with Seasonal High Water Table (< 5')	VrB	3.4
Soils Associated with Steep Slopes (> 12%)	DuE2, KdD2	3.3
Soils Associated with Shallow Bedrock (< 5')	RoC2, RoB, DuE2	14.2
Best Potential for Infiltration in Subsoils	PnB, KdC2, RnB, ScB, DnB, RoC2, RoB, VrB, DnC2, BbB, PoB, KdD2, GwC	92.3

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

According to WGNHS data, bedrock within the northwestern corner of the amendment area is in the Trempealeau Group and Prairie du Chien Group. Bedrock in the Trempealeau Group 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. Bedrock in the Prairie du Chien Group is dolomite, minor sandstone, cherty dolomite; vuggy, sandy and oolitic. It consists of two formations including the Shakopee and Oneota Formation. Thickness is up to 145 feet in eastern Dane County. The central portion of the amendment area is in the Sinnipee Group. Bedrock in the Sinnipee Group is dolomite with some limestone and shale, and consists of three formations including the Galena, Decorah, and Platteville Formations. Thickness is less than 100 feet. The bedrock in the remainder of the amendment area is in the Ancell Group. Bedrock in the Ancell Group is medium-grained, mature quartz sandstone and consists of two formations including the Glenwood and St. Peter Formations. Thickness is about 100 feet. According to WGNHS data, the depth to bedrock in the amendment area ranges from a little as 0 feet to up to 46 feet, with the shallowest depths generally being in the northern western corner and central portion and deepest depths being in the north central portion of 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 is 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 amendment area at depths ranging from 0 to 46 feet in the northwestern corner and 0 to 37 feet in the central/east-central portion. Stormwater management practices are proposed in the east-central portion where shallow karst features may be found. The Wisconsin Department of Natural Resources 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 in this area. If shallow karst features are found, adequate protection measures are required to address any potential for groundwater contamination.

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. Soil test pits are required as part of the stormwater management plan to assure that infiltration practices are sited in locations that will not adversely affect groundwater quality.

Proposed Urban Services

Parks and Open Space

There are three proposed parks within the amendment area (see Map 4). An approximately 6-acre park is proposed on the northwest side of the amendment area. Another approximately 5 acres of a 20-acre area park is proposed by the Northeast Neighborhood's Development Plan along the south side of the proposed Lien Road extension, east of Reiner Road. A 1-acre neighborhood park is proposed along an environmental corridor. Proposed open space includes a green corridor along the Interstate to serve as a sound attenuation berm and wooded areas with steep slopes in the northern portion of the amendment area.

Water System

The Madison Water Utility provides municipal water through a public water distribution system which includes approximately 4,812,221 lineal feet of water main, 23 high-capacity wells (two of which are in-active), and 40 booster pumps. A primary pump within each well unit pumps into an onsite reservoir, while one or more booster pumps within each well unit pump into the distribution system. The active wells are at depths ranging from approximately 500 to 1,188 feet, with a capacity of 750 to 6,300 gallons per minute (gpm) entering the distribution system. In total, the gross capacity of all municipal well pumps is approximately 125,875 gpm (181 million gallons per day, MGD); however, the City reports that the maximum available capacity of the system is 46,875 gpm (67.5 MGD). The City has six elevated storage tanks, three standpipes, and 24 reservoirs, with a combined storage capacity of 43.0 million gallons. According to the 2020 Annual Report to the Public Service Commission of Wisconsin ([link to 2020 Annual Report](#)), the City pumped an average of 16,634 gpm (24.0 MGD), approximately 35% of its available pumping capacity. In 2020, the maximum amount pumped in any one day was 33.6 million gallons, which is reported to be due to extreme heat with little preceding rain.

Water losses in the City's distribution system was an average of 2,712,830 gpd (2.71 MGD) in 2020, which accounted for 11% of the net water supplied in 2020. Approximately 98% of this was due to unreported and background leakage, with the remaining due to reported leaks. In 2020, there were 146 main breaks and 35 service breaks which were repaired. Water losses in the City's distribution system was 13% in 2019 and 12% in 2018. 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 (PSC) if the utility reports its percentage of water losses exceeds 15%.

The amendment area is located within Pressure Zone 3. The firm capacity of the booster pumps in this area is 2,100 gpm and the Felland Road reservoir has a capacity of 6 million gallons. According to the City's application, current average daily demand within Pressure Zone 3 is 1,806 gpm, or 2,600,000 gpd (2.6 MGD). The estimated current peak hourly demand within Pressure Zone 3 is 6,320 gpm (379,167 gallons per hour, gph), based on the City's peak hourly demand factor of 3.5. This peak hourly demand factor (ratio of maximum hour to average hour) is derived from recent system-wide usage analyses over a ten-year period.

Water supply to parcels within the City of Madison will be provided by connection to the City's existing water distribution system, which includes water main running along Felland Road through the amendment area and within adjacent development. Water main will be extended

throughout the amendment areas as development occurs. The Water Utility's Master Plan includes a future well in the amendment area as demand forecasts are realized.

The City estimates the annual average daily water demand for the amendment area will be 241,908 gallons per day (gpd), or 168 gpm. The estimated peak daily demand is 425,760 gpd (296 gpm), based on the City's peak daily factor of 1.76; and estimated peak hourly demand is 35,280 gph (588 gpm), based on the City's peak hourly demand factor of 3.5. It is anticipated that the existing water supply system and Pressure Zone 3 will support the additional demand from the proposed amendment area. Additionally, the City reports that the system can provide 2,500 gpm over 3 hours for firefighting purposes.

Wastewater

Sanitary sewer service to parcels within the City of Madison will be provided by connection to the City's existing sanitary sewer collection system, which ultimately drains to the Madison Metropolitan Sewerage District's (MMSD's) system for collection and treatment. The amendment area is split into two sewersheds generally based on the area within the Starkweather Creek subwatershed and the Door Creek subwatershed (see Map 5). The area within the Starkweather Creek subwatershed, which comprises most of the amendment area, will gravity drain via sanitary sewer main and connect to existing stubbed sewer in the existing development to the north. This area is served by the City's Felland Road Interceptor, which connects to the MMSD's Northeast Interceptor. The area within the Door Creek subwatershed will gravity drain via sanitary sewer main and connect to existing sewer in the development to the south. This area is served by the City's Northeast Neighborhood Interceptor, which connects to the MMSD's Far East Interceptor.

The proposed development within the amendment area consists of a mix of residential housing types, mixed-use areas, employment uses, and institutional uses contributing to wastewater flows. The City estimates that the amendment area will generate an annual average of 441,500 gallons per day (gpd) of wastewater, or approximately 307 gallon per minute (gpm). It is estimated that the amendment area will generate a daily peak flow of 1,226 gpm. These figures assume an average wastewater generation rate of 100 gallons per capita per day (gpcd) for residential and mixed-use areas, 15 gpd per employee within employment and institutional areas, and a peaking factor of 4 for all areas.

Sanitary sewer within the amendment area will be designed as specific development dictates and sized to handle the specific loading of each respective sewershed. The City's Felland Road Interceptor is reported to have a capacity of 6.58 million gpd (MGD) and the MMSD's Northeast Interceptor is reported to have a capacity of 8.46 MGD. Accounting for the anticipated peak flow from the entirety of the amendment area (1.77 MGD) and the peak flow from existing development (0.37 MGD) contributing to these receiving sewers, the City estimated the receiving interceptor sewers will have 4.44 MGD and 6.32 MGD, respectively, of residual capacity after build-out of the amendment area. Specific loading calculations were not provided in the application for the area draining to the City's Northeast Neighborhood Interceptor. However, this sewershed is small compared to the sewershed draining to the City's Felland Road Interceptor and comprised of low-density, Housing Mix 1 residential areas only; and thus, the peak flow from this area is expected to be very small. Furthermore, the design of the sewer within the Jannah Village neighborhood immediately south of the amendment area has accounted for some future development within this area. The City will need to monitor future wastewater flow contributions to the receiving interceptors as additional areas development, but it appears the existing collection system has sufficient capacity to handle the additional peak flows from the amendment area.

Wastewater Treatment Facility

Madison Metropolitan Sanitary District (MMSD) will provide wastewater treatment for the amendment area. The Nine Springs wastewater treatment facility (WWTF) is located on Moorland Road, Madison, WI, and discharges treated effluent to Badfish Creek within the Badfish Creek Watershed (Lower Rock River Basin) and Badger Mill Creek within the Upper

Sugar River Watershed (Sugar-Pecatonica Basin). The rated monthly design flow capacity of the facility is 56.0 MGD and the maximum daily design flow capacity is 68.6 MGD. In the year 2020, the facility received an average monthly influent hydraulic loading of 41.9 MGD (75% of the 56.0 MGD design capacity), including infiltration and inflow, according to the 2020 Compliance Maintenance Annual Report (CMAR) ([link to 2020 CMAR](#)). It is expected to reach 90% of current hydraulic design capacity around 2026 based on current projected growth rate assumptions. This already occurs on occasion, although average flows did not exceed 90% design capacity for any month in 2020. 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, treatment for this area is expected to remain at the existing wastewater treatment facility location with expanded capacity of the system as the need is foreseen.

MMSD has not had issues meeting its WPDES permit limits for the quality of effluent discharged to Badfish Creek and Badger Mill Creek, according to their 2020 CMAR. Effluent quality summarized here refers to Badfish Creek, where approximately 95% of discharge is released. Below is a summary of the major effluents reported on in the 2020 CMAR:

- The biological oxygen demand (BOD) effluent quality for 2020 was below the monthly average limit, with a monthly average of 4.3 mg/L (22% of the limit) and a maximum of 10 mg/L (53% of the limit) for the months of January and February.
- The total suspended solids (TSS) effluent quality for 2020 was well below the monthly average limit, with a monthly average of 4.5 mg/L (23% of the limit) and a maximum of 6 mg/L (30% of the limit) for the month of January.
- The ammonia (NH₃) effluent quality for 2020 was below the monthly average limits (limits vary by month), with a monthly average of 0.50 mg/L (3-74% of the limit) and a maximum of 1.34 mg/L (74% of the limit) for the month of August.
- The phosphorus (P) effluent quality for 2020 was well below the monthly average limits (limits vary by month), with a monthly average of 0.36 mg/L (23-51% of the limit) and a maximum of 0.53 mg/L (35% of the limit).

Badfish Creek is a tributary to the Rock River, and thus the WPDES permit includes phosphorus and TSS limits to comply with the Total Maximum Daily Load (TMDL) developed for the Rock River Basin to protect and improve water quality. In addition to the TMDL limits, future water quality-based effluent limits (WQBEL) have been considered in the WPDES permit. The monthly limits to comply with the TMDL for TSS are easily met by MMSD, and in some cases, the current WPDES permit limits are more stringent than the TMDL limits. The interim limit for phosphorus is a 1.0 mg/L monthly average required beginning May 2020 (previous limit was 1.5 mg/L), with a final WQBEL of 0.225 mg/L. Additionally, an interim limit of 0.6 mg/L, expressed as a six-month average (May through October and November through April) is required beginning May 2020, with a final WQBEL of 0.075 mg/L. To meet the WQBEL for phosphorous, MMSD has implemented a Watershed Adaptive Management (WAM) approach, leading a diverse group of partners called Yahara Watershed Improvement Network (Yahara WINS) in implementing phosphorus reducing practices in the Yahara Watershed ([link to Yahara WINS website](#)).

The Nine Springs WWTF does not remove chloride from influent. A 2015 study completed by AECOM determined that while possible, treatment would be cost-prohibitive, energy intensive, and involve other environmental impacts ([link to report](#)). MMSD has been granted a variance from the chronic water quality standard for chloride required by NR 105. With this variance, the WPDES permit sets interim limits for winter and summer months and requires MMSD to implement chloride source reduction measures. One such source reduction initiative which MMSD participates in is the Wisconsin Salt Wise Partnership ([link to Salt Wise website](#)).

Stormwater Management System

The City of Madison stormwater management and performance standards are contained within Chapter 37 of the City of Madison Code of Ordinances. Dane County Code of Ordinances, Chapter 14, contains stormwater management and performance standards which apply to all areas of Dane County, and which were recently updated at the end of 2021. The amendment area will be required to follow the more stringent standards contained within the respective ordinances, as well as Wisconsin DNR requirements contained in NR 151 and 216.

Most of the amendment area is within the Starkweather Creek, generally draining north/northwest through agricultural, wooded, and urban development lands before being collected within an unnamed intermittent stream that drains into the East Branch Starkweather Creek. East Branch Starkweather Creek generally drains southwest and combines with West Branch Starkweather Creek shortly before discharging into Lake Monona approximately 3 miles southwest of the amendment area. The rest of the amendment area is within the Door Creek watershed, generally draining south through agricultural and rural development lands before being collected within Door Creek. Door Creek drains south and discharges into Lake Kegonsa approximately 9 miles south of the amendment area.

Detailed stormwater management design has not been completed for the amendment area due to the large scope of the proposed amendment; however, several areas have been identified on the proposed land use map for potential stormwater management. All development that occurs in the amendment area will be required to meet current stormwater regulations for peak rate control and attenuation, water quality, volume control (infiltration), and oil/grease control. In addition, to meet peak runoff rate requirements, City of Madison ordinances require green infrastructure practices to be used to capture at least the first ½-inch of rainfall over the total site impervious area. Depending on site conditions, green infrastructure practices may include infiltration and bioretention facilities, green roofs, pervious pavements, stormwater trees, or stormwater harvesting measures. These contribute to runoff volume and peak rate reduction through evapotranspiration and consumption/reuse. Public and regional stormwater management facilities are typically owned and maintained by the City of Madison. Private and site-level facilities, as well as green infrastructure practices, must be included in a stormwater management maintenance agreement which will be recorded with the Dane County Register of Deeds.

The City is currently conducting a watershed study for the Starkweather Creek watershed, scheduled to be completed in 2022 ([link to Starkweather Creek Watershed Study website](#)). This study will indicate if there is a need for regional stormwater management improvements within the watershed to meet watershed-wide goals and address flooding concerns. These are generally retrofit practices in existing urban areas, which are in addition the stormwater management requirements for new development in the amendment area.

A detailed stormwater management plan review and approval is required prior to beginning any development construction. The plan will be required to meet all stormwater management and performance standards of the City of Madison, as well as those of Dane County and Wisconsin DNR.

Performance Standards

The City of Madison proposes stormwater management performance measures to meet or exceed standards required by the State of Wisconsin (NR 151), Dane County (Chapter 14), and City of Madison (Chapter 37). The stormwater standards for new development are as follows:

1. Require post-construction sediment control (reduce total suspended solids leaving the site by at least 80%, as compared to no runoff management controls; with a minimum of 60% of that control occurring in a retention pond prior to infiltration for residential land uses and a minimum of 80% occurring prior to infiltration for commercial, industrial, and institutional land uses) for the average annual rainfall. This is consistent with the standards currently required by Dane County and City of Madison

ordinances.

2. Require post-construction peak runoff rate control for the 1-, 2-, 10-, 100-, and 200-year, 24-hour design storms (using NRCS MSE4 storm distributions) to match predevelopment peak runoff rates. This is consistent with the standards currently required by Dane County and City of Madison ordinances.
3. Require post-development infiltration (stay-on) volume of at least 90% of the pre-development infiltration (stay-on) volume for the average annual rainfall. This is consistent with the standards currently required by Dane County and City of Madison ordinances.
4. Maintain predevelopment groundwater annual recharge rates of approximately 9 to 10 inches per year, specific to the location within the amendment 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 and City of Madison ordinances.
5. Treat the first one-half inch of runoff to provide oil and grease control using the best available technology for commercial or industrial land uses and any other uses where the potential for pollution by oil or grease, or both, exists. This is consistent with the standards currently required by Dane County and City of Madison ordinances.

Impacts and Effects of Proposal

Environmental Corridors

The proposed amendment area includes approximately 64 acres of environmental corridor (See Map 11). This will include the three proposed parks, totaling 12 acres. The remaining 52 acres include the wooded area with steep slopes in northern portion of the amendment area, stormwater management areas in the central and southeastern portions, and a green corridor along the western edge of the amendment area in accordance with the Environmental Corridor Policies and Criteria ([link to document](#)) adopted in the *Dane County Water Quality Plan*.

Protection areas are areas required for inclusion in environmental corridors when those areas are added to an urban service area. Protection areas include natural resources features such as the 1% annual chance floodplain; waterbodies, streams, and wetlands plus their required vegetative buffers; riparian steep slopes; public lands, parks, and conservancy areas; and stormwater management facilities. Protection areas are mapped based on currently available information. Map 11 shows a potential protection area along the northern border of the amendment area associated with the offsite wetland as mapped in the Wisconsin Wetland Inventory. A wetland delineation will be required at the time of development to determine the actual wetland boundary. The delineated wetland area plus a 75-foot vegetative buffer will be required to be designated as environmental corridor per the adopted Environmental Corridor Policies and Criteria.

The 2050 Regional Development Framework (RDF) is designed to serve as a guide for local communities as they plan for future growth and development. One of the three goals of the RDF is to foster regional development that conserves water resources and natural areas. The RDF objective to achieve this goal is to enhance stewardship and natural resource areas. Stewardship areas are advisory areas to consider for inclusion in environmental corridors above the minimum requirements. The stewardship area recommendations in the RDF include natural resources features such as the 0.2% annual chance floodplain, potentially restorable wetlands, internally drained areas, hydric soils, current/potential Ice Age Trail Corridor, and Natural Resource Area boundaries identified in the Dane County Parks and Open Space Plan. The proposed amendment area includes 4.3 acres mapped as stewardship area for potentially

restorable wetlands, 1.5 acres of which are proposed to be designated as environmental corridor by this amendment (Map 11).

Meeting Projected Demand

Interim CARPC projections (draft) for 2050 suggest that an additional 114,000 residents, 59,000 housing units, and 72,000 jobs can be expected in the Central Urban Service Area over the next 30 years. Modeling in Urban Footprint for the Regional Development Framework located a community center to the southeast of the proposed amendment area at the intersection of Reiner/Sprecher Road and Commercial Avenue and a smaller, neighborhood center further north along Reiner Road just south of an extension of Lien Road within the amendment area. Residential development in the amendment area would add 2,000 units to the regional supply.

Phasing

The requested amendment is expected to develop from north to south. Parcels adjacent to Lien Road to the west and east are expected to develop within 10 years. The central parcel along Lien Road is expected to develop within 5-15 years as are the parcels adjacent the interstate. The southeastern corner of the amendment area (the location of most existing rural development) is expected to develop last, within 10-20 years.

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. 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 USA 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. In response to climate change, the City of Madison adopted peak rate control for the 200-year storm event in their ordinance in June 2020. Dane County adopted this same peak rate control requirement as well as requirements for closed basins in November 2021, which made these requirements universal to all of the communities in Dane County.

The City of Madison 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 current Dane County 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.

Regional partners are actively working to address chlorides through the Wisconsin Salt Wise Partnership. Participation in the chloride reduction trainings provided by WI Salt Wise is open to any municipality and private winter maintenance professional in the region. The City of Madison has been a key partner in WI Salt Wise and city staff regularly attended winter salt certification class for winter road maintenance. The City of Madison has also been an active partner in the development and implementation of the Starkweather Creek Chloride Management Plan.

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 can result in subsequent reductions in stream quality and transitions to more tolerant biological communities.

Groundwater modeling indicates that the cumulative effects of well withdrawals have resulted in a 0.7 cfs decrease in baseflow in Starkweather Creek at Lien Road from predevelopment (no pumping) to 2010 (Table 4). An additional 0.2 cfs decline compared to 2010 conditions is anticipated for the year 2040, according to modeling, reducing the baseflow to 0.3 cfs.

Table 4 Modeled Baseflow Results Due to Current and Anticipated Future Municipal Well Water Withdrawals (All Municipal Wells)			
Stream	No Pumping	2010	2040
<i>Starkweather Creek</i>	<i>1.2 cfs</i>	<i>0.5 cfs</i>	<i>0.3 cfs</i>

The loss of baseflow from the cumulative effects of well water pumping is a regional issue, beyond the boundaries of a single USA Amendment or even a single municipality. This issue is discussed along with potential management options in the updated *Dane County Groundwater Protection Planning Framework* ([link to report](#)). Maintaining pre-development groundwater recharge by infiltrating stormwater runoff helps to replenish groundwater, maintain baseflow, and mitigate this impact.

Comments at the Public Hearing

A public hearing was held on the proposed amendment at the March 10, 2022, meeting of the Capital Area Regional Planning Commission. City of Madison staff registered in favor of the amendment. There were no registrants opposed to the amendment. Commissioner McKeever

inquired about the specific location of the stormwater management facilities in the amendment area. There were no other questions from Commissioners.

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 or planned 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. In response to climate change, the City of Madison adopted peak rate control for the 200-year storm event in their ordinance in June 2020. Dane County adopted this same peak rate control requirement as well as requirements for closed basins in November 2021, which made these requirements universal to all of the communities in Dane County.

The City of Madison 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 current Dane County 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.

It is the Regional Planning Commission staff's opinion that the proposed amendment is consistent with water quality standards under Wis. Stat. § 281.15, and the adopted Policies and Criteria for the Review of Sewer Service Area Amendments to the *Dane County Water Quality Plan*, with the existing state and local requirements identified below. Additional actions have also been recommended below to further improve water quality and environmental resource management.

State and Local Requirements

Regional Planning Commission staff recommends approval of this amendment, based on the land uses and services proposed, and in recognition of the state and local requirements for the following:

1. State and local review and approval of stormwater management plan(s) is required, including Regional Planning Commission staff review and approval as part of the sewer extension review process.
 - a. Stormwater and erosion control practices are required to be installed prior to other land disturbing activities. Infiltration practices are required to be protected from compaction and sedimentation during land disturbing activities.
 - b. Peak rates of runoff are required to be controlled for the 1-, 2-, 10-, 100-, and 200-year 24-hour design storms to “pre-development” levels, in accordance with the City of Madison and Dane County Stormwater Ordinances.
 - c. Sediment control is required that achieves 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 and Dane County Stormwater Ordinances.

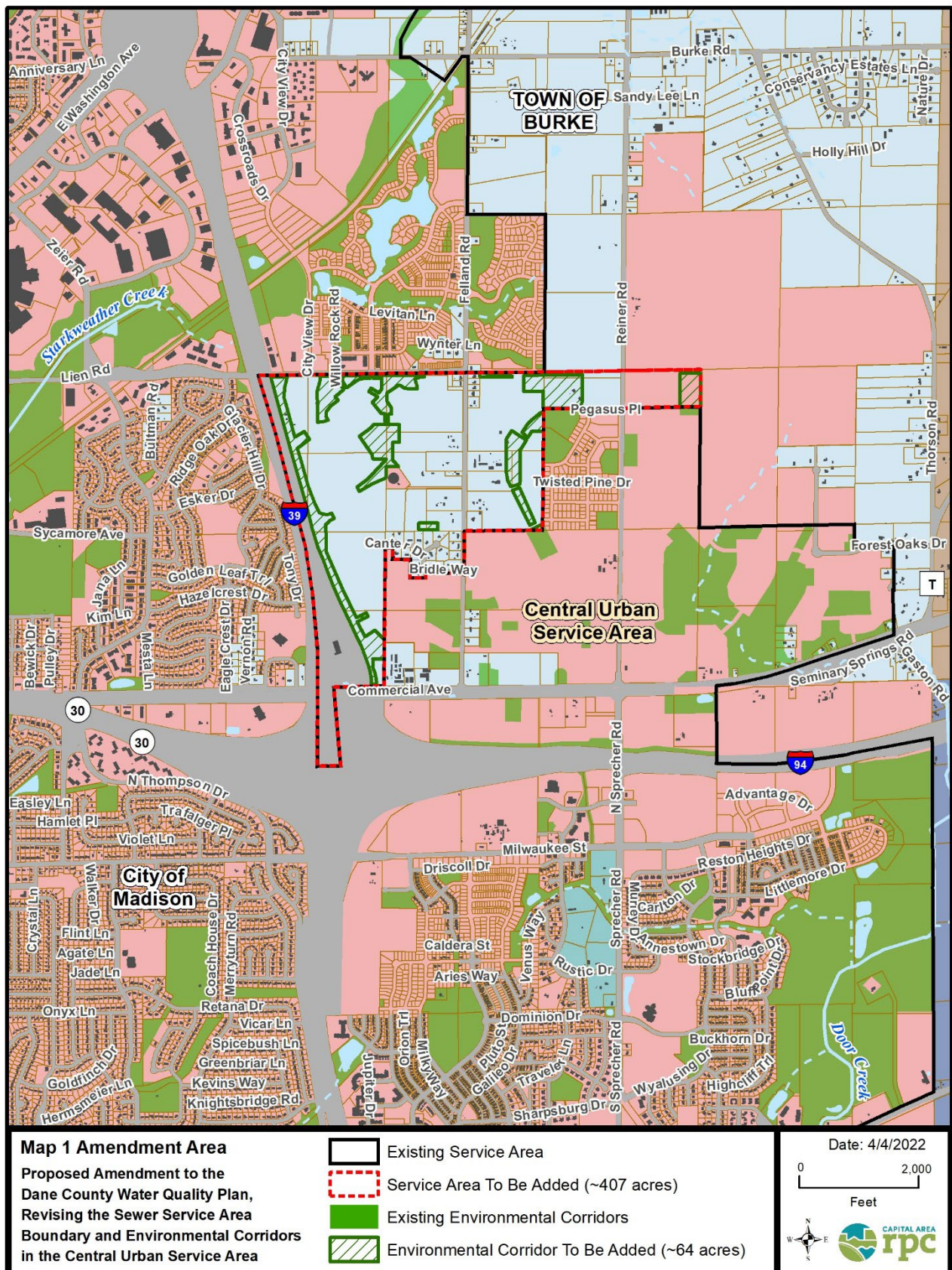
- d. Runoff volume control is required that maintains the post development stay-on volume to at least 90% of the pre-development stay-on volume for the average annual rainfall period, in accordance with the City of Madison and Dane County Stormwater Ordinances.
 - e. Oil and grease control are required that treats the first 0.5 inches of run-off using best management practices at commercial and industrial sites, in accordance with the City of Madison and Dane County Stormwater Ordinances.
 - f. Maintaining 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, when required by the City of Madison and Dane County Stormwater Ordinances.
2. Easements and perpetual legal maintenance agreements with the City, to allow the City to maintain stormwater management facilities if owners fail to do so, are required for any facilities located on private property.
 3. Field verification for areas of the development site considered suitable for infiltration including a site assessment for karst features is required by the Wisconsin Department of Natural Resources Conservation Practice Standard 1002 - Site Evaluation for Stormwater Infiltration.
 4. Environmental corridors are required to be delineated to meet the Environmental Corridor Policies and Criteria adopted in the *Dane County Water Quality Plan*.

Recommendations

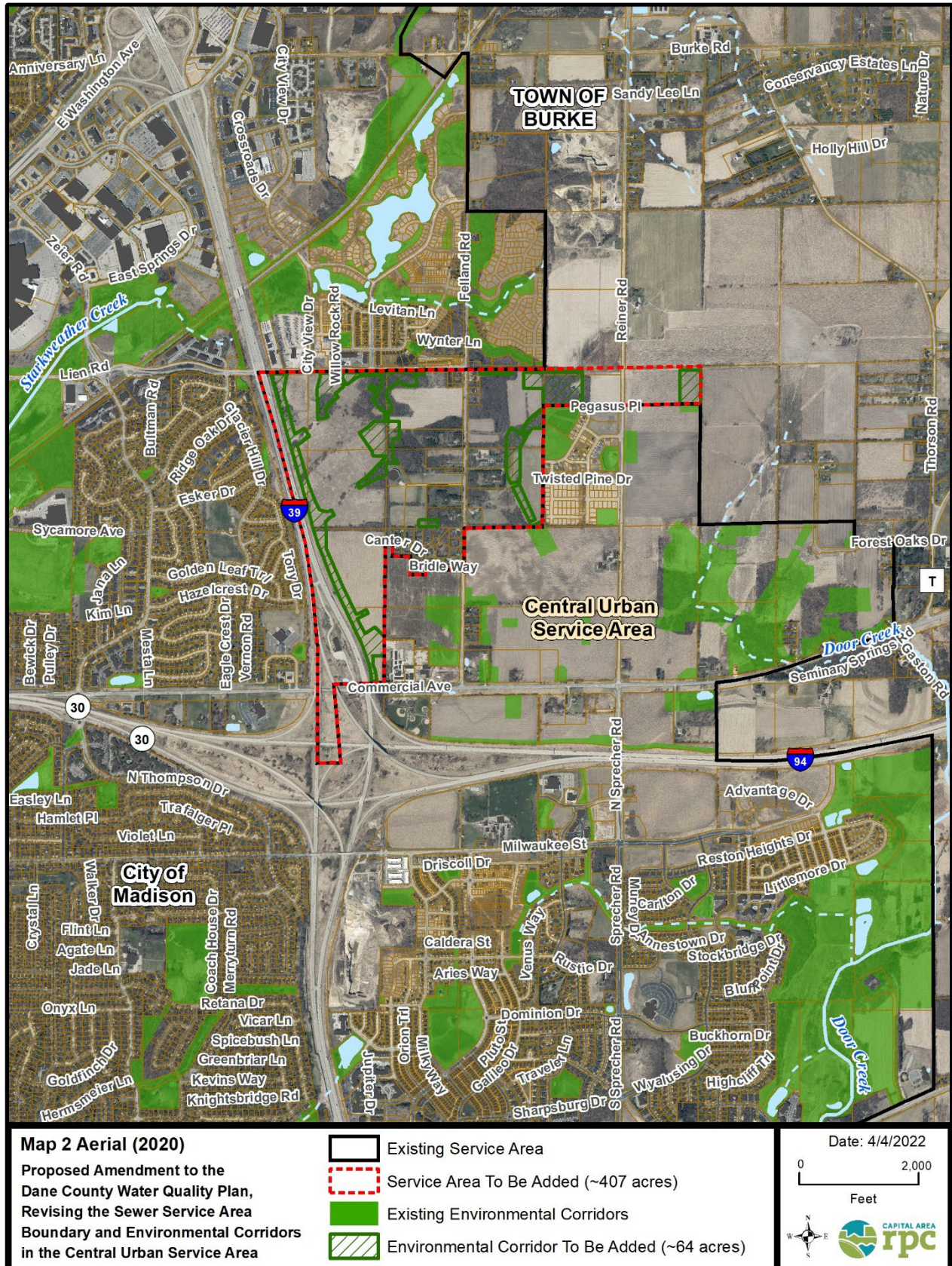
It is recommended that the City of Madison pursue the following to further improve water quality and environmental resource management:

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. Encourage the use of native flora favored by the Rusty Patched Bumble Bee in landscaping to provide suitable habitat for this pollinator, where appropriate.
3. Continue to foster the responsible use of chlorides by collaborating with Wisconsin Salt Wise and working to implement the Starkweather Creek Chloride Management Plan.

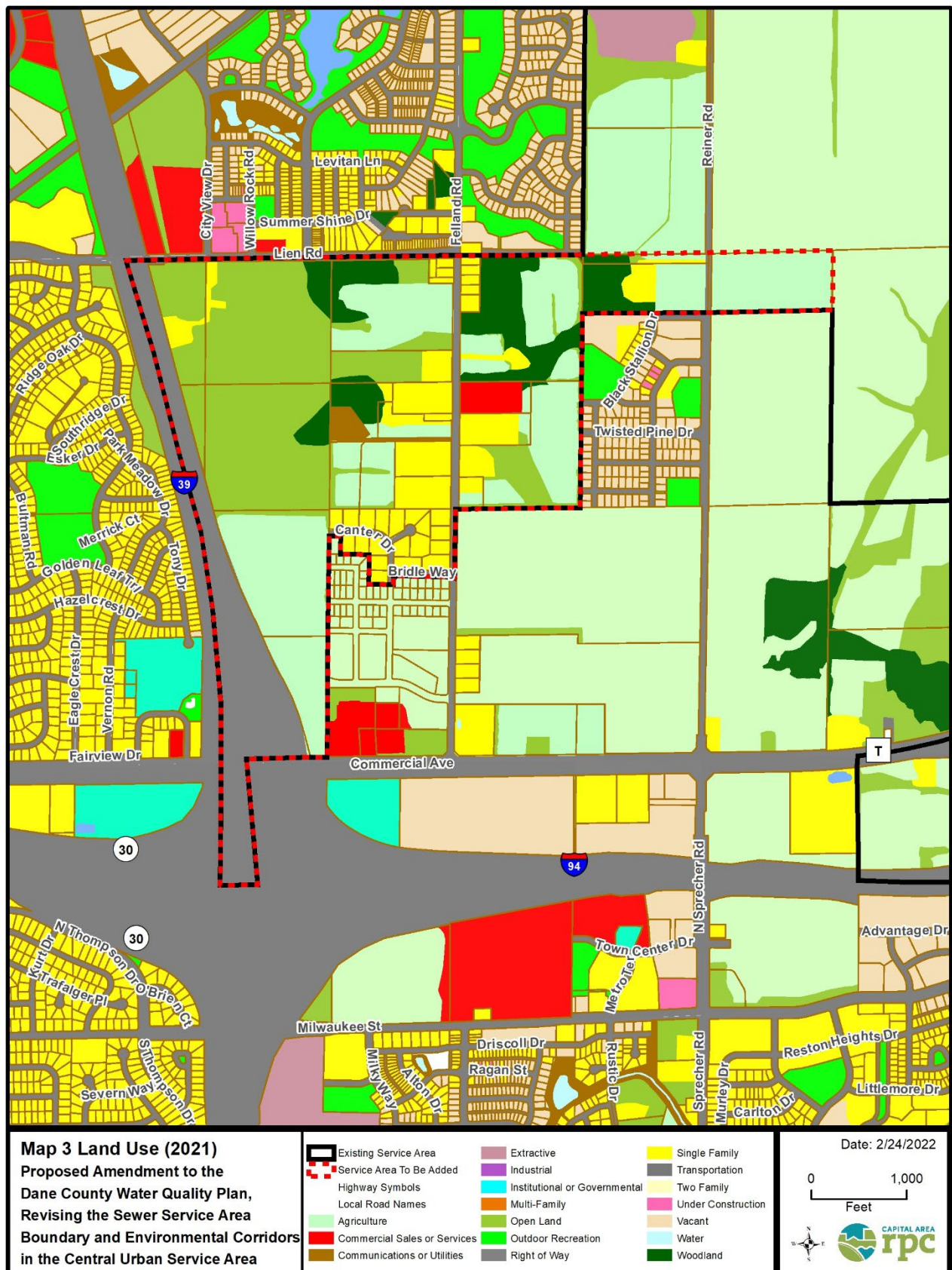
Map 1 - Amendment Area



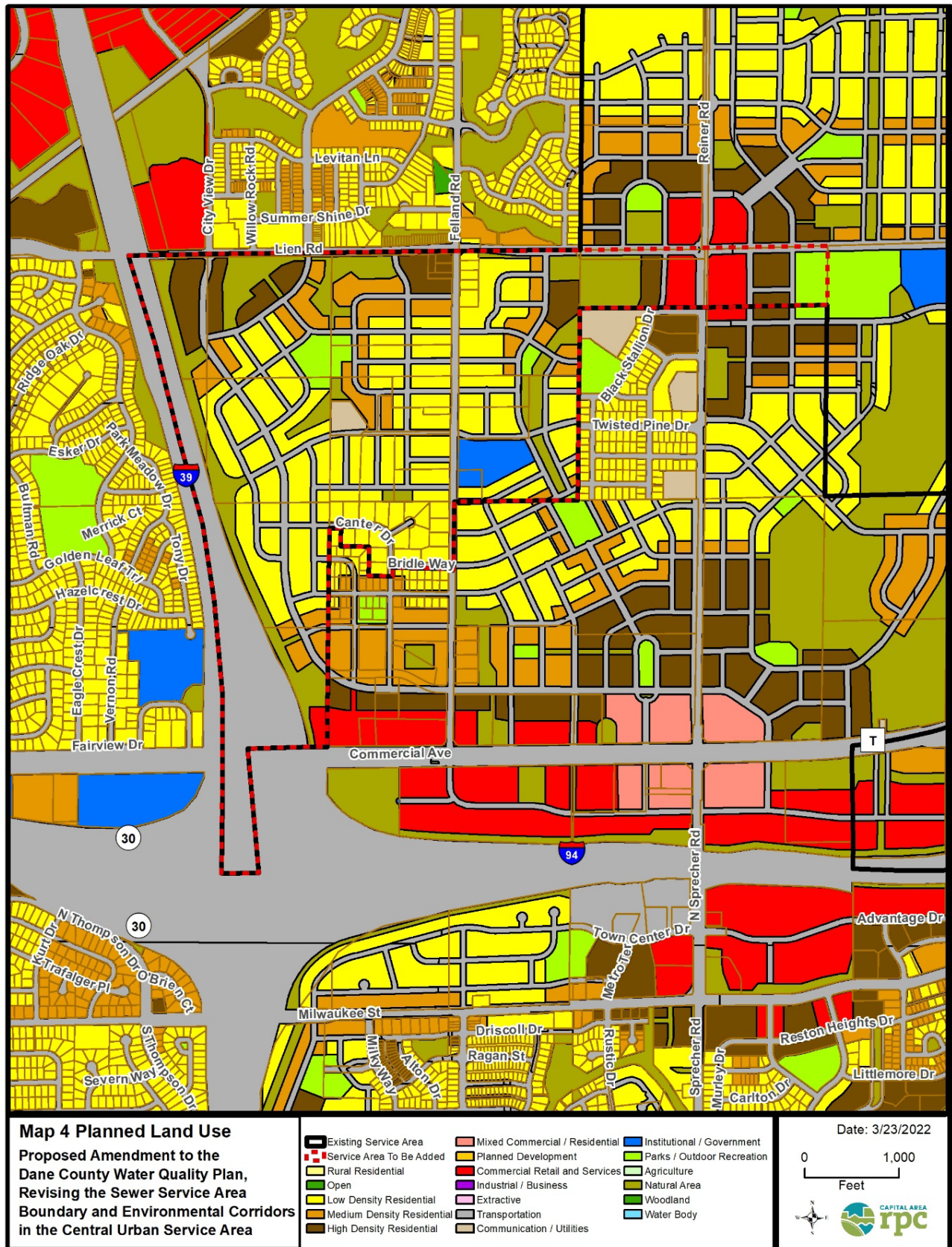
Map 2 – Aerial



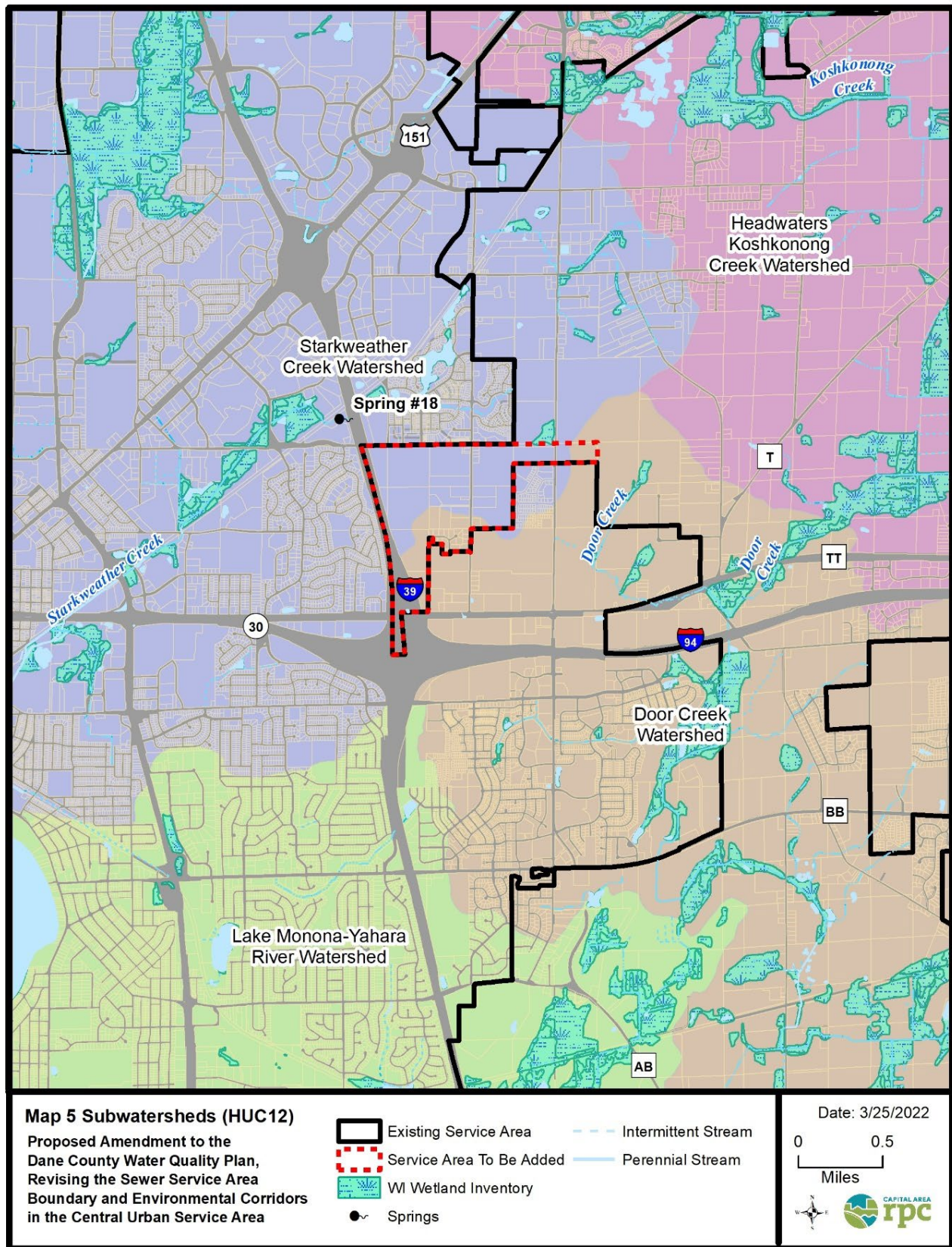
Map 3 – 2021 Land Use



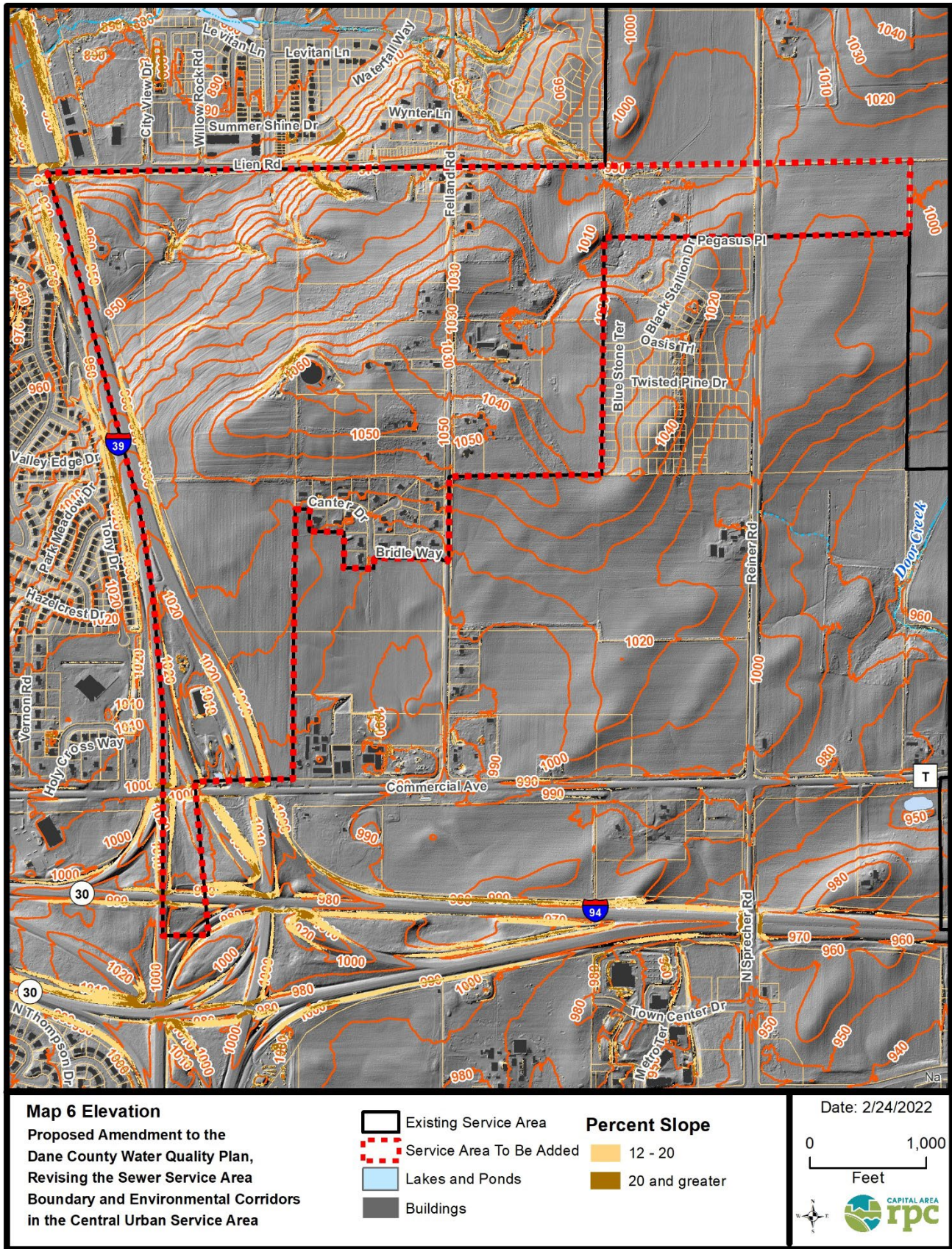
Map 4 – Planned Land Use



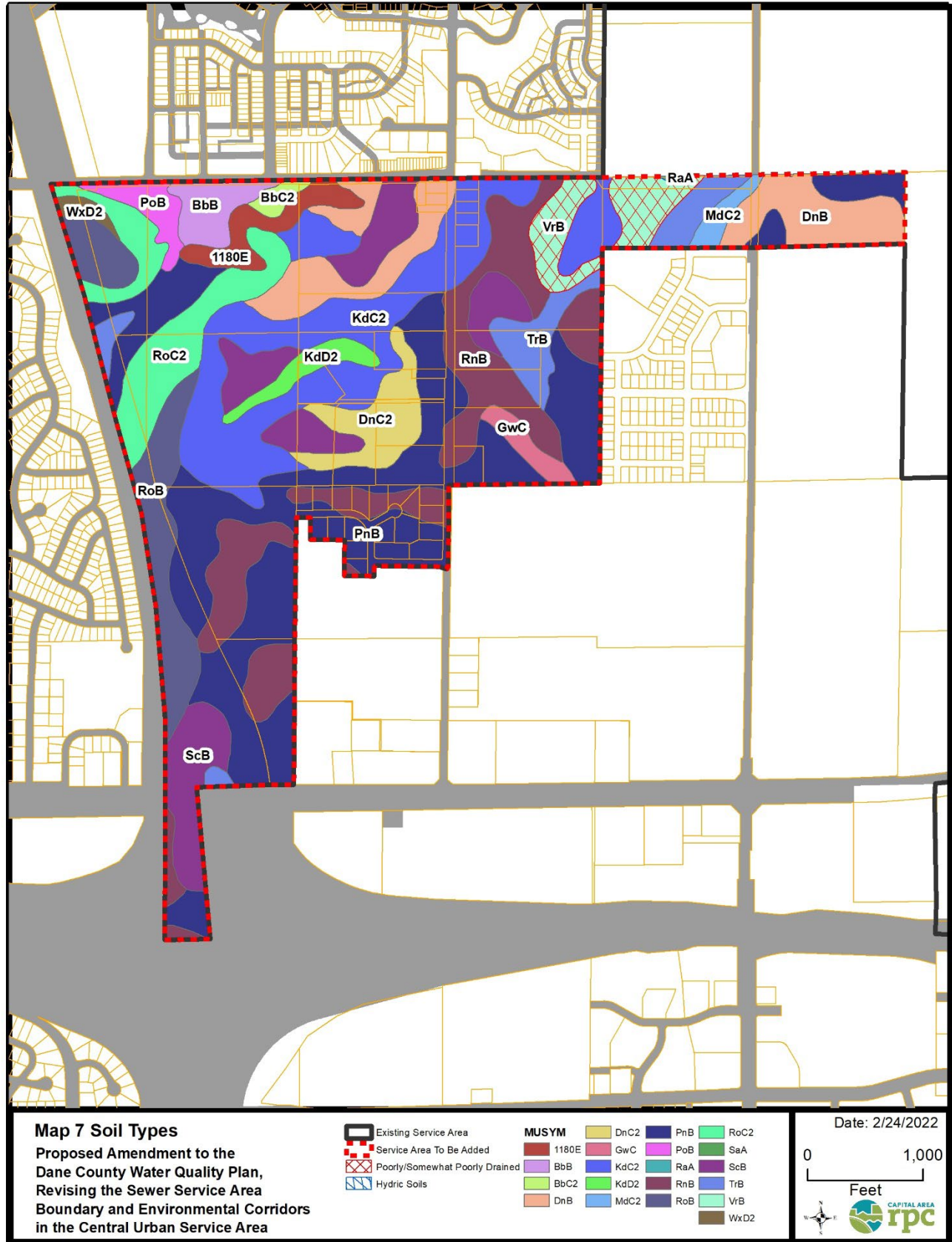
Map 5 – Subwatersheds



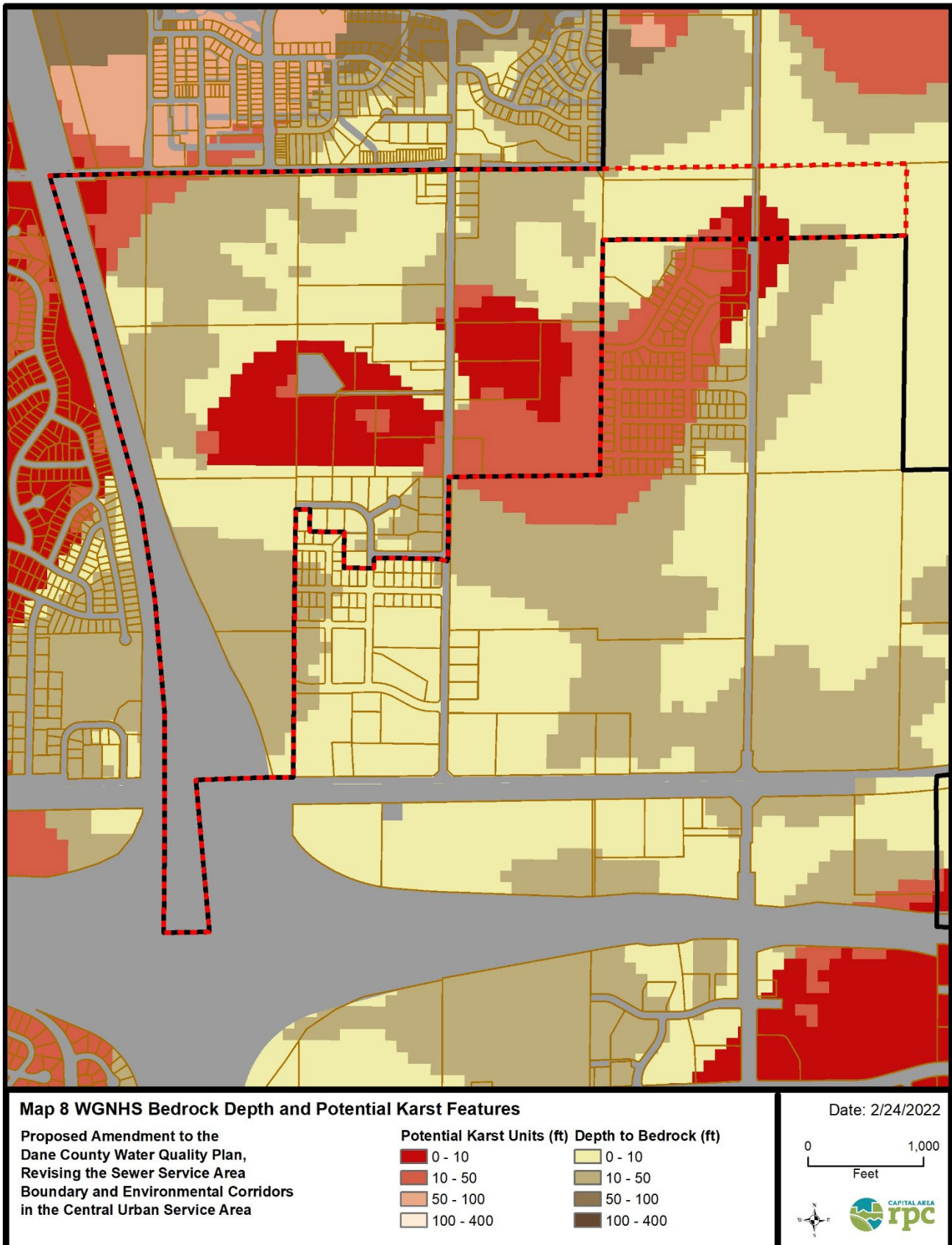
Map 6 – Elevations



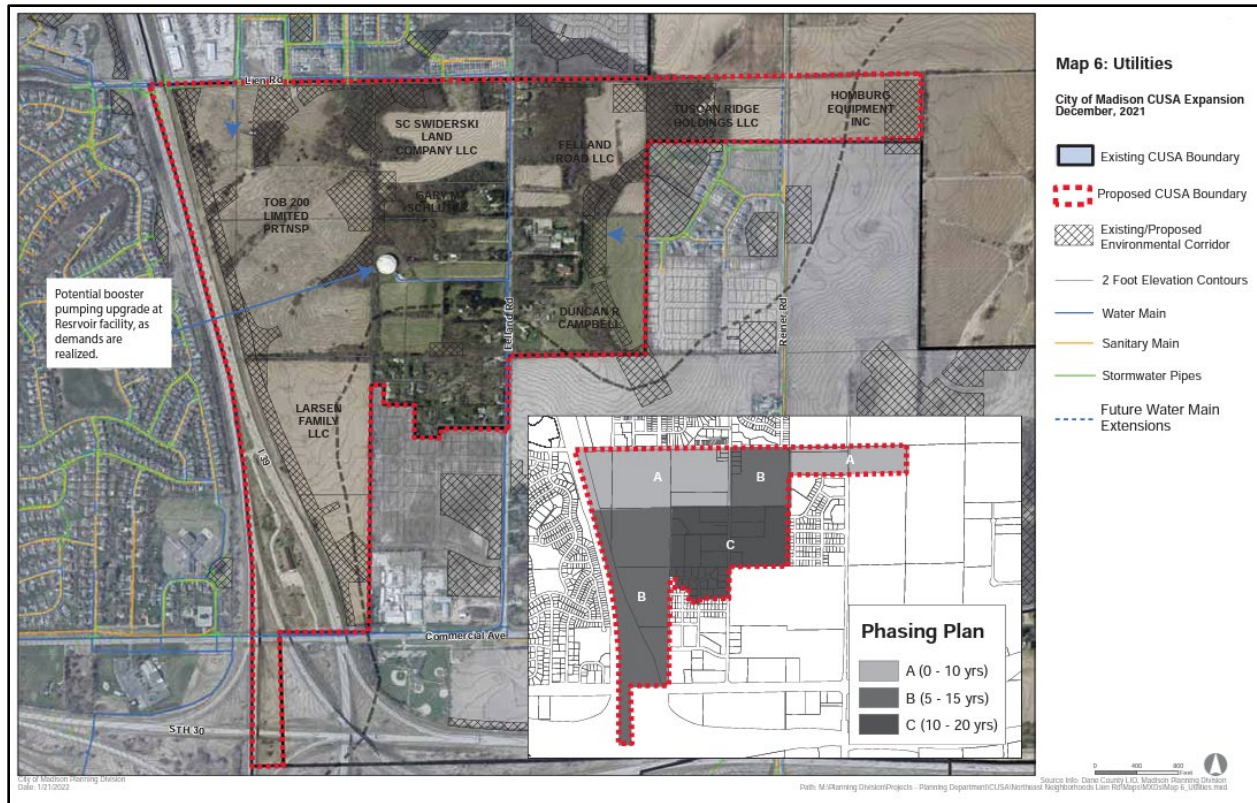
Map 7 - Soil Type



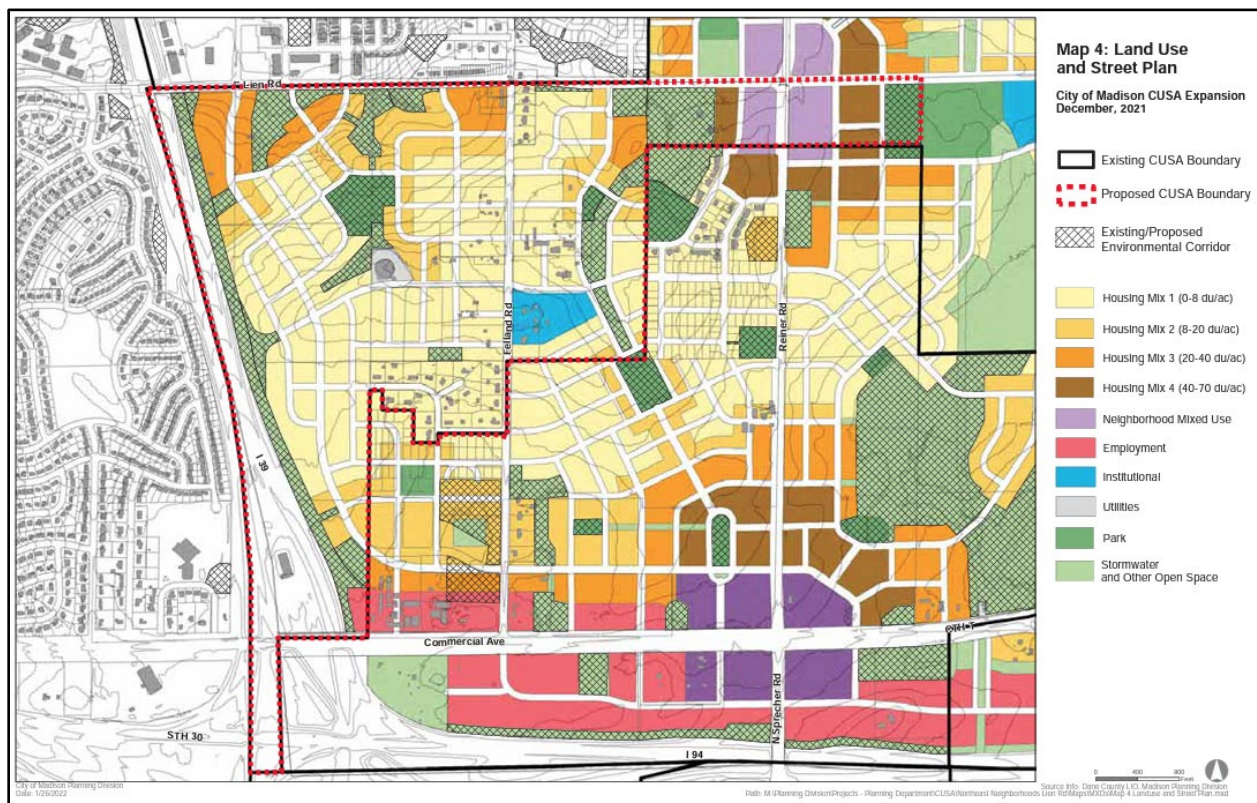
Map 8 – WGNHS Bedrock Depth and Potential Karst Features



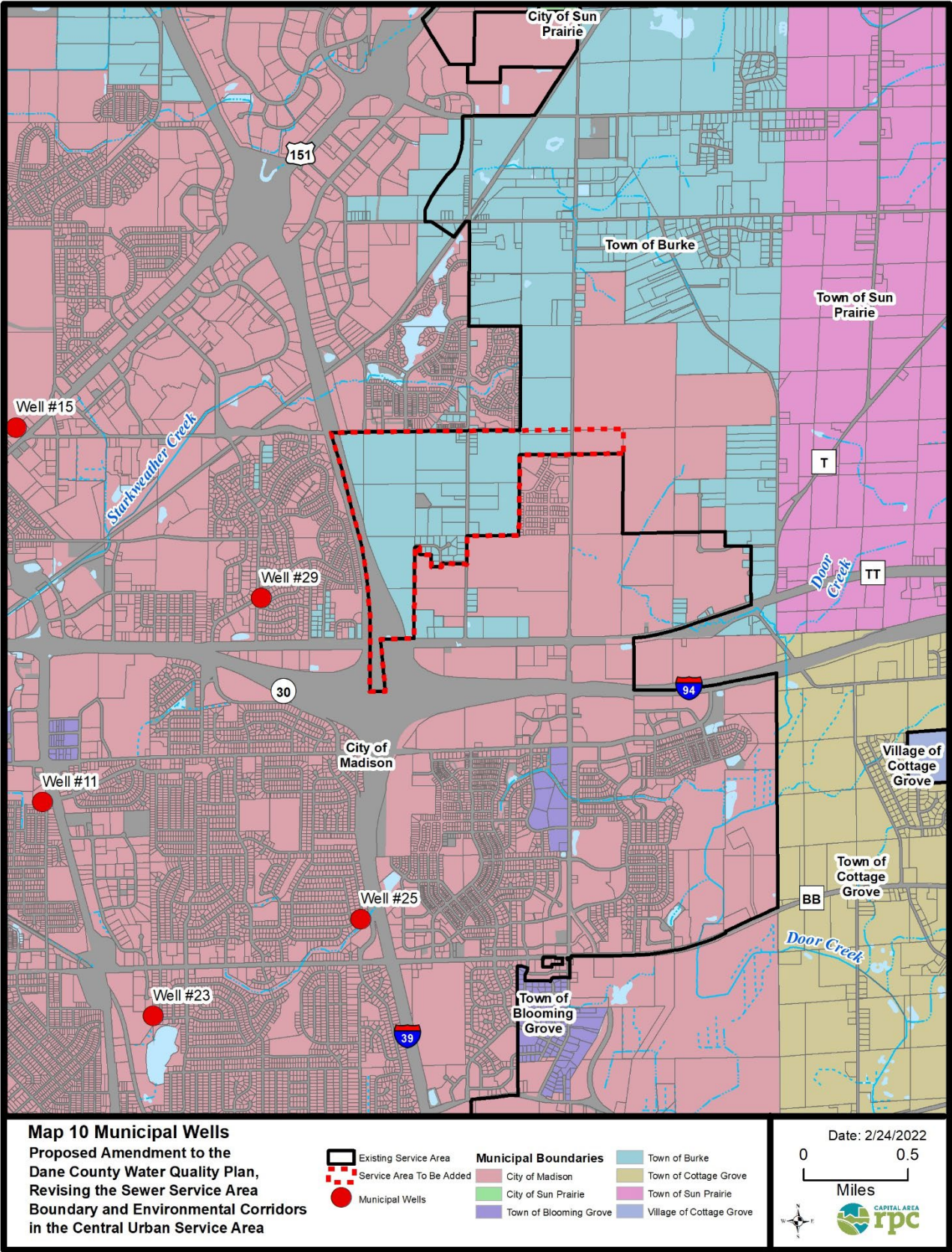
Map 9A – Proposed Sanitary Sewer and Water Main



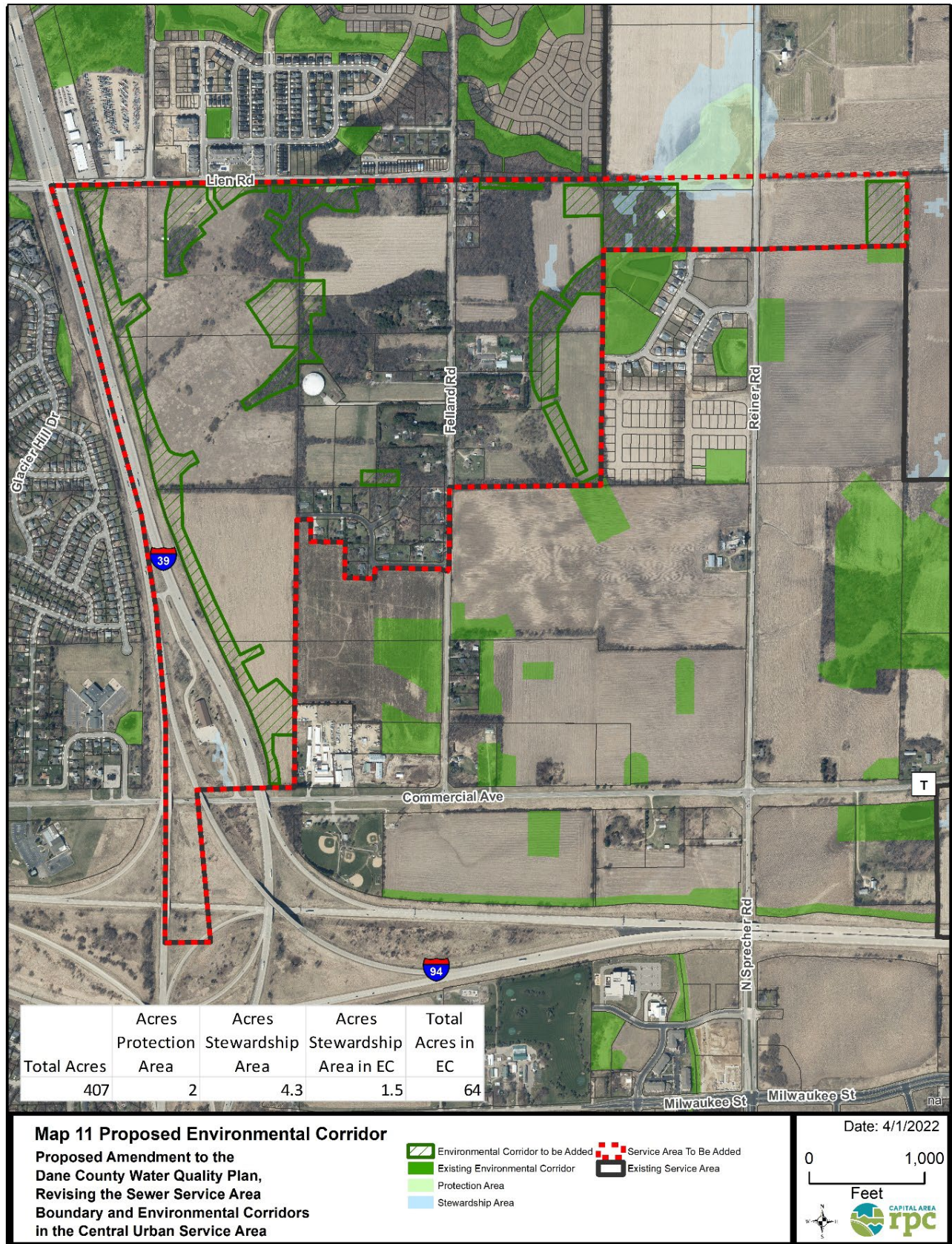
Map 9B – Proposed Stormwater Management



Map 10 – Municipal Wells



Map 11 – Proposed Environmental Corridor



Attachment 1 – Wisconsin Historical Society Letter

Sean Higgins

From: Office of the State Archaeologist <statearchaeologist@wisconsinhistory.org>
Sent: Wednesday, February 9, 2022 1:08 PM
To: Sean Higgins; Office of the State Archaeologist
Subject: RE: Upcoming Amendments

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Sean,

The amendment area referred to below has Madison YHNDP near Femrite Road contains the Schimming Mound (DA-0034; BDA-0314), which was first identified in 1914. More recent investigations over the years have found that the linear mound on top of the drumlin has eroded to the point that it was no longer visible. However, in 2020 an archaeologist was monitoring the removing of the drumlin sediment for fill and a large pit feature was discovered. Such a feature at the base of or near a mound often contains human remains. Worked stopped in the immediate area as burials are protected under state law. Further monitoring away from the mound did not uncover any additional features. Any work/disturbance in the area must avoid the burial feature. If you are not aware of the location of the feature for purposes of your planning, I can provide it. Besides this feature there are no recorded archaeological material in the amendment area.

The amendment area referred to as Middleton CUSAA, has four archaeological sites in the amendment area: DA-0739, DA-0738, DA-0971, and DA-0987. The sites were recorded as surface finds during survey for road construction. Much of the amendment area, however, has not been surveyed and there is a high probability that there are additional sites because of the proximity to a water source. I would recommend survey of the area prior to development.

The third amendment area referred to NEN CUSAA has no recorded cultural material.

If you have questions or want additional information, please let me know.

Jim

James M. Skibo, Ph.D.
State Archaeologist

Wisconsin Historical Society
816 State St
Madison WI 53706
608-264-6496(o)
Email: james.skibo@wisconsinhistory.org

From: Sean Higgins <seanh@capitalarearpc.org>
Sent: Wednesday, February 9, 2022 9:04 AM
To: Office of the State Archaeologist <statearchaeologist@wisconsinhistory.org>
Subject: Upcoming Amendments

Good Morning Jim,

Below are links to documents describing three upcoming Sewer Service Area amendment requests. We'll be drafting our staff analysis in the coming weeks and would appreciate WHS input.