Preliminary Engineer's Report
Judicial Ditch No. 5 Improvement

Brown and Redwood Counties, Minnesota

Date: June 27, 2023

ISG Project No.: 19-23338

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

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EXECUTIVE SUMMARY

A petition was submitted to the Brown and Redwood County Joint Drainage Authority requesting an improvement to the Judicial Ditch No. 5 (JD5) drainage system. The Joint Drainage Authority appointed ISG to complete a Preliminary Engineer's Report (PER) for the petitioned project. Judicial Ditch No. 5 drains an 1,119-acre watershed, which consists of gently rolling agricultural land. JD 5 outlets to Brown and Redwood County Judicial Ditch No. 36 (JD 36), which is a public open ditch system. JD 5 was originally constructed in 1922 and has had no improvements or major repairs since original construction. The As Constructed and Subsequently Improved (ACSIC) tile capacities within JD 5 are limited by the Main Tile outlet to JD 36, which has a drainage coefficient of 0.26 in/day. Most of the JD 5 system also drains through a portion of the Main Tile with a drainage coefficient of 0.19 in/day. Much of the Main West tile is limited to 0.25 in/day and the outlet of Branch 6 provides a 0.23 in/day drainage coefficient. Additionally, there are portions of the Main Tile that were constructed with less than 4 feet of pipe cover and portions of the Main West and Branch 6 tiles were constructed with approximately 3 feet of cover.

The proposed project (Option 1) includes improving the Main tile from the outlet up to and across T-313 (county line road) and the Main West across T-313 to connect BR 12 UP and the existing Main West. Also included in the project is a short improvement to Branch 6 to bring a new tile under T-313. The proposed drainage tile is designed to provide a 0.50 inch/day drainage coefficient to the improved areas. In general, the improvement provides an increase in peak discharge and less inundation to the watershed. To offset increases in peak flow rates to JD 36, two storage options are considered in the improvement. The storage option included in Option 2 consists of a 3-acre pond that primarily reduces peak flow rates from the improved tile and some surface flow. In Option 3, a temporary storage area consisting of up to 35 acres is designed to temporarily pond water via a small berm and alternative intakes along the proposed tile to reduce capacity into the tile. This option is designed to reduce peak surface flow runoff which also reduces erosion and downstream sedimentation.

The preliminary cost for this project (Option 1) is approximately $1,275,136. Option 2 is estimated to cost $1,458,145 with the inclusion of the permanent storage pond while Option 3 is estimate at $1,341,076 with the temporary water storage area. Based on the size of the improvement and outlet capacity, storage is recommended to be reviewed as it will provide water storage and water quality benefits to the system and downstream waters.

PETITION + ORDER

A petition was submitted to the Brown and Redwood County Joint Drainage Authority in the summer of 2022. This petition requested that portions of the Main, Main West, and Branch 6 tiles be enlarged, extended, straightened, rerouted, and/or deepened. All this is to improve and increase the public tile depth and overall drainage capacity of the system.

On September 6, 2022, the Joint Drainage Authority made an order in which it accepted the petition for JD 5 and appointed ISG as Engineer.

SYSTEM WATERSHED

Location

Judicial Ditch No. 5 is located in Sections 19, 30, and 31 of Prairieville Township in Brown County and Sections 24, 25, and 36 of Brookville Township in Redwood County. The Main tile flows generally southward from the NE ¼ NE ¼ of Section 25 of Brookville Township to its outlet to Brown Redwood County JD 36 in SE ¼ SE ¼ of Section 36 in Brookville Township. The Main West tile flows generally east southeasterly from the NW ¼ NW ¼ of Section 25 of Brookville Township to its junction with the Main tile in the NW ¼ SW ¼ of Section 30 of Prairieville Township. Branch 6 flows generally southeasterly from the NW ¼ SE ¼ of Section 25 of Brookville Township to its junction with the Main tile in the SW ¼ SW ¼ Section 30 of Prairieville Township. After consulting the historical DNR Public Waters Inventory Map, the DNR Buffer Map, and the GIS version of the Public Waters Inventory Map, the outlet of JD 5, JD 36, is a public drainage ditch classified as an altered public watercourse.

Watershed Description

The JD 5 system drains approximately 1,119 acres. Its watershed is characterized by rolling hills with an elevation difference of approximately 60 feet. The dominant hydrologic soil group classifications in the watershed are B, B/D, C, and C/D, with C/D accounting for nearly half of the acres in the watershed. Hydrologic soil groups B/D and C/D carry dual drainage classifications, meaning they function as a D soil (poorly drained) when undrained due to the presence of shallow groundwater. These soils can function as a more well-drained soil, B or C in this case, respectively, when artificially drained to remove shallow groundwater. Assuming all B/D and C/D cropland areas within the watershed are artificially drained leads to 59 percent of the watershed functioning as a C soil (moderately high runoff potential) and 38 percent function as a B soil (moderately low runoff potential), with A and D soils constituting the remaining 3 percent of the watershed.

See Appendix B for maps depicting the watershed's location, elevation, and hydrologic soil classifications.

HISTORY

Judicial Ditch No. 5 was originally constructed in 1922. Repairs to parts of the system were completed in 1963, 1964, 1967, 1984, 2009 and 2016. The 1963 and 1964 repairs consisted of repairing the system in Section 30 of Prairieville Township. In 1967, a washout in the tile line in the NW ¼ of Section 31 of Prairieville Township was repaired. The 1984 repair consisted of repairing intake washout in the S ½ of the NW ¼ of Section 30 of Prairieville Township. The 2009 repair removed trees from the Main West branch in the NW ¼ of the NW ¼ of Section 25 of Brookville Township. The 2016 repair cleaned a section of Branch 12 Upper tile in the SW ¼ of the NE ¼ of Section 30 in Prairieville Township.

While JD 5 is currently fully a tile system, original construction plans show 300 feet of open ditch at the outlet of the system in the SE ¼ of the SE ¼ of Section 36 of Brookville Township. Review of aerial imagery (1938, 1955, 1961) show a section of open ditch constructed to flow south through Sleepy Eye Creek's floodplain and into the creek. JD 36 was established in 1969 by straightening approximately 45 miles of Sleepy Eye Creek in Brown and Redwood Counties. The JD 36 outlet to Sleepy Eye Creek is approximately 1.5 miles downstream of the JD 5 outlet to JD 36. Aerial imagery confirms that Sleepy Eye Creek was straightened for the establishment of JD 36 at some point between 1961 and 1992. The straightening and establishment of JD 36 removed the need for the open channel portion of JD 5 and the system has been all tile since establishment of JD 36.

A Redetermination of Benefits (ROB) was ordered in 2019 and the completed ROB was adopted on January 22, 2020 by the Joint Drainage Authority.

Early Coordination and Feasibility Report

Prior to the Petition for this drainage improvement, ISG prepared a feasibility study for landowners for landowner consideration and discussion. Landowner meetings were held to discuss the feasibility study and potential improvement options with both Brown and Redwood Counties. The first meeting was held in December 2019 and the second meeting was held in June 2021. After these meetings, a petition for improvement was developed and later signed and submitted to the Joint Drainage Authority.

Investigation of External Sources of Funding and Technical Assistance

Section 103E.015, Subd. 1a of the Drainage Code requires that an investigation of external sources of funding and technical assistance be conducted prior to an order on the engineer's preliminary survey report for a drainage project. The funding can be used for wetland preservation or restoration or creation of water quality improvements, flood control, or alternative measures (per Section 103E.015, Subd. 1, clause (2)). The sources of funding authorized under this Section can be used outside the benefited area but must be used in the watershed of the system.

There are several funding sources that can be used to assist in funding for projects that provide water quality and flooding benefits, such as wetland restorations. Competitive funding through the Clean Water Fund can be used to pay for storage and water quality projects. Watershed-based implementation funding (WBIF) can also be accessed upon completion of the Cottonwood-Middle Minnesota One Watershed, One Plan project and subsequent WBIF grants made to the watershed partnership. Funding may also be available through the Board of Water and Soil Resources (BWSR) programs to support the construction of water storage projects throughout the Minnesota River Basin. Additional funding may be available through coordination with the Brown and Redwood Soil and Watershed Conservation Districts (SWCDs). The SWCDs should be contacted and involved before the pursuit of any external funding for practices within the JD 5 watershed.

PRESENT CONDITION OF SYSTEM BY OBSERVATION AND ANALYSIS

The present condition of JD 5 was determined via a topographic survey, historic aerial images, and a drone flight over the Main, Main West, and Branch 6 tiles. The images shown below were taken on September 16, 2022, during the topographic survey and via drone on October 26, 2022.

Present Condition of Drainage Infrastructure

Most of the JD 5 system dates to the 1922 establishment of the system, with the exceptions of limited spot repairs which are the only details available related to past repairs of the system. The JD 5 outlet to JD 36 is shown in a drone picture (Figure 1) looking north toward JD 5 and looking upstream along JD 36 (Figure 2).

Figure 1: JD 5 Outlet to JD 36 (Looking North)

Figure 2: JD 5 Outlet (Looking Northwest Upstgream along JD 36)

System Capacity

The capacity of agricultural drainage is expressed as a drainage coefficient in inches per day (in/day) and is defined as the depth of water over the entire area of the upstream watershed that can drain in a 24-hour period. For a system like JD 5, the industry standard is a 0.375 to a 0.50 inch/day drainage coefficient. Table 1 summarizes the hydraulic capacities for the portions of JD 5 proposed for improvement represented by the As Constructed or Subsequently Improved Condition.

TABLE 1. AS CONSTRUCTED MAIN, MAIN WEST, AND BRANCH 6 TILE CAPACITIES

Area	Start Location	End Location	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	0+00	3+00	24	0.30%	1140.2	0.26
	3+00	4+00	24	1.00%	1136.6	0.48
	4+00	18+00	18	1.00%	1131.4	0.22
	18+00	19+00	24	1.00%	1089.8	0.50
	19+00	21+00	24	0.15%	1089.8	0.19
	21+00	26+00	24	0.15%	1070.7	0.20
	26+00	32+50	24	0.15%	1013.5	0.21
	32+50	34+00	24	0.15%	974.0	0.21
	34+00	38+25	24	0.10%	974.0	0.18
	38+25	43+50	24	0.10%	812.5	0.21
	43+50	47+00	24	0.10%	783.8	0.22
	47+00	50+00	24	0.10%	593.3	0.29
	50+00	59+00	24	0.10%	550.2	0.31
	59+00	66+00	24	0.10%	542.6	0.31
	66+00	74+80	18	0.10%	344.3	0.23
	74+80	80+90	18	0.10%	313.4	0.25
	80+90	82+00	18	0.10%	287.5	0.28
	82+00	88+00	15	0.10%	215.2	0.23
	88+00	89+00	15	0.10%	206.2	0.24
	89+00	102+00	15	0.10%	187.9	0.26
	102+00	113+00	12	0.10%	129.5	0.21
	113+00	114+00	12	0.10%	108.3	0.25
	114+00	123+00	8	0.18%	32.8	0.37
	123+00	127+00	6	0.18%	5.7	1.00
Main West	0+00	1+00	15	2.60%	191.6	1.30
	1+00	9+50	15	0.10%	191.6	0.25
	9+50	11+00	15	0.10%	186.3	0.26
	11+00	13+50	15	0.10%	179.3	0.27
	13+50	31+00	15	0.10%	150.4	0.32
	31+00	42+00	12	0.10%	102.0	0.26
	42+00	54+00	10	0.10%	69.8	0.24
	54+00	65+00	8	0.14%	43.7	0.25
	65+00	69+00	6	0.14%	13.4	0.38
	69+00	71+00	6	1.20%	13.4	1.10
Br 6	0+00	4+00	12	0.12%	129.7	0.23
	4+00	14+00	12	0.12%	128.1	0.23
	14+00	18+00	10	0.20%	103.4	0.23
	18+00	25+50	8	0.20%	69.6	0.19
	25+50	29+00	8	0.20%	48.1	0.27
	29+00	31+50	6	0.20%	25.7	0.23

ACSIC tile capacities for the Main, Main West, and Branch 6 tiles are all below the industry standard of 0.375 to 0.5 in/day. While the Main West tile outlet has a calculated drainage coefficient 1.3 in/day, the Main West tile is limited by the capacity of the 15" tile from Station 1+00 to 9+50 (0.25 in/day). Likewise, nearly the entire JD 5 watershed (1,090 acres) drains through a portion of the Main tile with a drainage coefficient of 0.19 in/day.

Nature of the Outlet

The outlet of JD 5 is to Brown and Redwood JD 36 in the SE ¼ SE ¼ of Section 36 of Brookville Township in Redwood County. The section of JD 36 at the outlet (AUID 07020008-598) is listed as impaired for fish bioassessments and has a completed Total Maximum Daily Load (TMDL) for fecal coliform in the Cottonwood River Fecal Coliform Total Maximum Daily Load Report (October 2013). JD 36 is not a public water, but outlets to Sleepy Eye Creek, which is a public water, approximately 1.5 miles downstream of the JD 5 outlet.

Approximately 45 miles of Sleepy Eye Creek, including at the JD 5 outlet, was straightened with the establishment of JD 36 in the 1960s. Aerial shows Sleepy Eye Creek in 1962 (Figure 3) and JD 36 in 1991 (Figure 4).

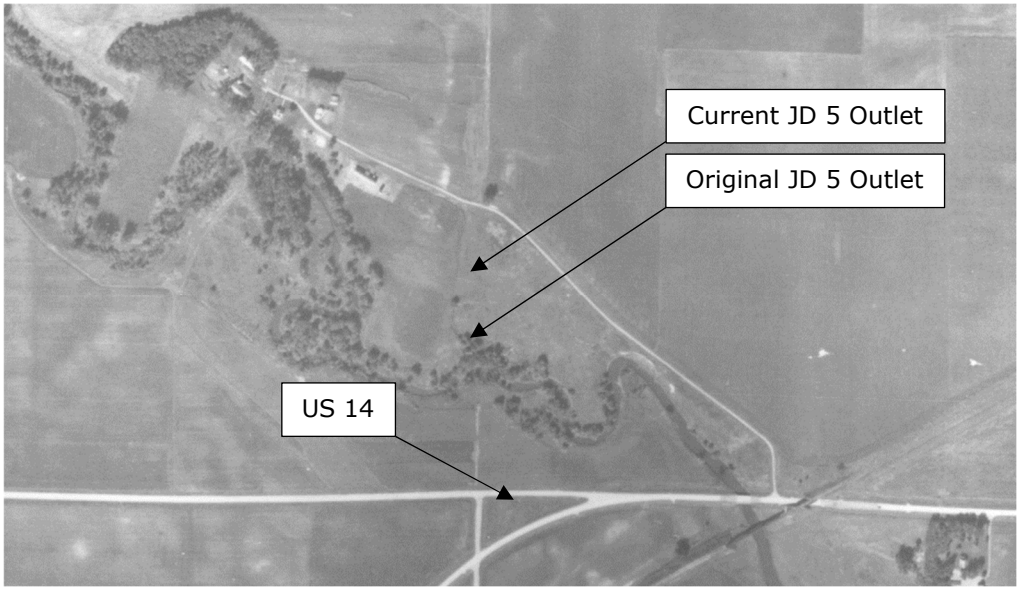


Figure 3: 1962 Aerial Image of Meandering Sleepy Ey Cree at the JD 5 Outlet

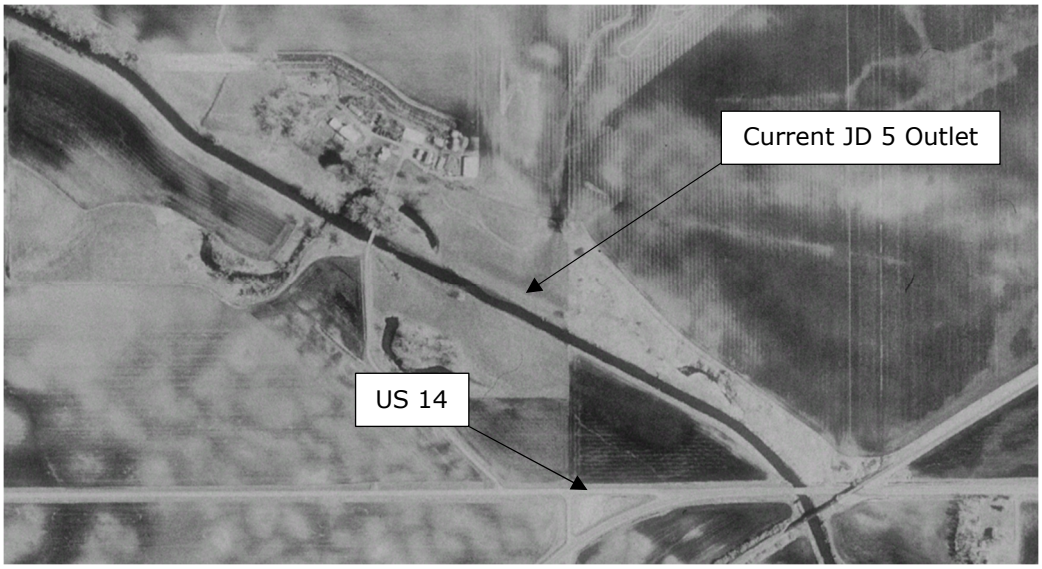


Figure 4: 1991 Aerial Image of JD 36 at the JD 5 Outlet

PROPOSED PROJECT

The following project has been proposed in response to the Petition with due regard to the results of the Preliminary Survey.

Project Design Parameters

While alternatives will be analyzed, there are certain things that will, by necessity, characterize any configuration of the proposed drainage project.

COEFFICIENT OF DRAINAGE

The capacity of agricultural drainage is expressed as a drainage coefficient which is defined as the depth of water over the entire area of the upstream watershed that a tile or open ditch can drain in a 24-hour period (inches per day (in/day)). For a system like JD 5, a drainage coefficient of 3/8 (0.375) to ½ (0.50) in/day for tile is recommended for buried tile with storage and timing further influencing design.

SYSTEM DEPTH

The depth of JD 5 is controlled by the following criteria: 1. Provide a minimum of five feet of cover in low spots along public tile alignments, 2. Increase tile diameters and/or grades to improve capacity, 3. Provide deeper outlets for private tile, and 4. Provide an adequate tile outlet into pond/ open ditch channels.

EROSION CONTROL

Required temporary erosion control will consist of silt fence or bio-roll around all surface intakes, and ditches until vegetation is established. The temporary erosion control will be maintained throughout the construction process according to the Minnesota Pollution Control Agency (MPCA) regulations.

Permanent erosion control will consist of riprap around all tile outlets into ditches and ponds (including surge basins) as necessary. Seeding and erosion control blanket will be placed on all disrupted areas around road crossings. All disturbed vegetation throughout the project will be reseeded with the appropriate seed mix and mulch.

An Erosion Control Plan or a Storm Water Pollution Prevention Plan will be developed before final construction plans are complete and a National Pollution Discharge and Elimination System (NPDES) permit application will be filed before construction.

SYSTEM EASEMENT

The proposed tile alignment will differ slightly from that of the existing tiles. Portions of existing tiles will be abandoned where they intersect new Main, Main West, and Branch 6. The new alignment was designed to be more cost effective with tile sizes, lengths, and connection points.

TILE AND CONNECTION MATERIALS

All public tile is solid non-perforated dual wall HDPE or RCP pipe with watertight gaskets at all straight-line pipe joints. All angle pipe joints and prefabricated fitting connections will be watertight.

TILE REPLACEMENT AND CONNECTIONS

When tiles are replaced, whether through repair or improvement proceedings, the replaced tiles are left in the ground and are segmented. The segments are then used as headers for private tiles. Segments are connected to the replacement tile at property lines and before the tile outlets. The replaced tile will be the responsibility of the landowner into the future. See connection details sheets in the Preliminary Plans.

Project Components

There are three different proposed improvement options for the Brown and Redwood JD 5 project as described in the following sections.

OPTION 1

The proposed Option 1 improvement includes improving the Main, Main West, and Branch 6 public tile lines to ½ in/day drainage coefficients with no additional water storage added to the watershed. The capacity for the proposed tiles is shown in Table 2. System capacity will increase by enlarging and/or steepening tiles lines. When a proposed tile replaces an existing branch, the existing system will be periodically connected into the proposed system and the existing tile will be abandoned.

TABLE 2. OPTION 1 PROPOSED TILE CAPACITIES

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	0+00	6+00	24	30	0.30%	0.35%	1140.2	0.26	0.51
	6+00	13+30	18	24	1.00%	1.10%	1131.4	0.22	0.50
	13+30	24+00	24	30	0.15%	0.35%	1131.4	0.18	0.51
	24+00	31+00	24	30	0.15%	0.30%	1070.7	0.20	0.50
	31+00	37+50	24	30	0.15%	0.25%	1013.5	0.21	0.48
	37+50	43+25	24	30	0.10%	0.20%	844.2	0.20	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	593.3	0.29	0.52
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59

The new system outlet will be near the same location and elevation as the existing, directly outletting into JD 36. Depth along the new tile system will be made up from Stations 12+00 to 24+00 through the hillside. From this point, the overall depth is deeper as the new tile will be installed deeper in the ground. This depth is carried through the remainder of the upstream system along the Main and Main West as a larger tile at a flatter grade is proposed. The new Main tile will terminate on the west side of 340th Avenue where it will connect into the existing main. The new Main West tile will cross 340th Avenue and then will cross the private driveway to the north where it will connect to the existing main west and terminate. Branch 6 will span from the new Main to the west across 340th Avenue where it will connect to the existing Branch 6 and terminate.

OPTION 2

Improvement Option 2 includes improving the Main, Main West, and Branch 6 public tile lines to ½ in/day drainage coefficients, as described in Option 1. Also included in Option 2 is a 3-acre storage pond located near the outlet to reduce peak flow rates entering JD 36. The storage pond would be constructed near the JD 5 outlet to capture tile flow from the entire JD 5 Watershed. The Main tile would be daylighted approximately 1,300 feet upstream of the existing outlet and a berm would be constructed approximately 300 feet upstream of the existing outlet to provide temporary detention storage during rainfall events. Portions of the tile upstream of the pond will be upsized to a 36-inch tile to flatten the tile and daylight into the pond. This pond is designed to be outside of the normal floodplain area of JD 36 to maximize the effectiveness prior to discharging into the JD 36 open ditch.

Since the proposed pond would capture both tile and overland flow; the resulting peak flow rates are greatly reduced between 14 and 27 percent over the 5 and 50-year rainfall frequencies. The outlet structure of the pond would be restricted to a 30-inch outlet with an overflow spillway for larger rainfall events. Proposed Option 2 tile capacities are shown in Table 3 with the storage area noted at the outlet while Figure 5 shows the location for the pond.

TABLE 3. OPTION 2 PROPOSED TILE CAPACITIES

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	Storage Area at Outlet								
	13+30	24+00	24	36	0.15%	0.11%	1131.4	0.20	0.51
	24+00	31+00	24	36	0.15%	0.11%	1070.7	0.20	0.49
	31+00	37+50	24	36	0.15%	0.10%	1013.5	0.21	0.50
	37+50	43+25	24	36	0.10%	0.10%	974.0	0.18	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	723.0	0.28	0.51
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59

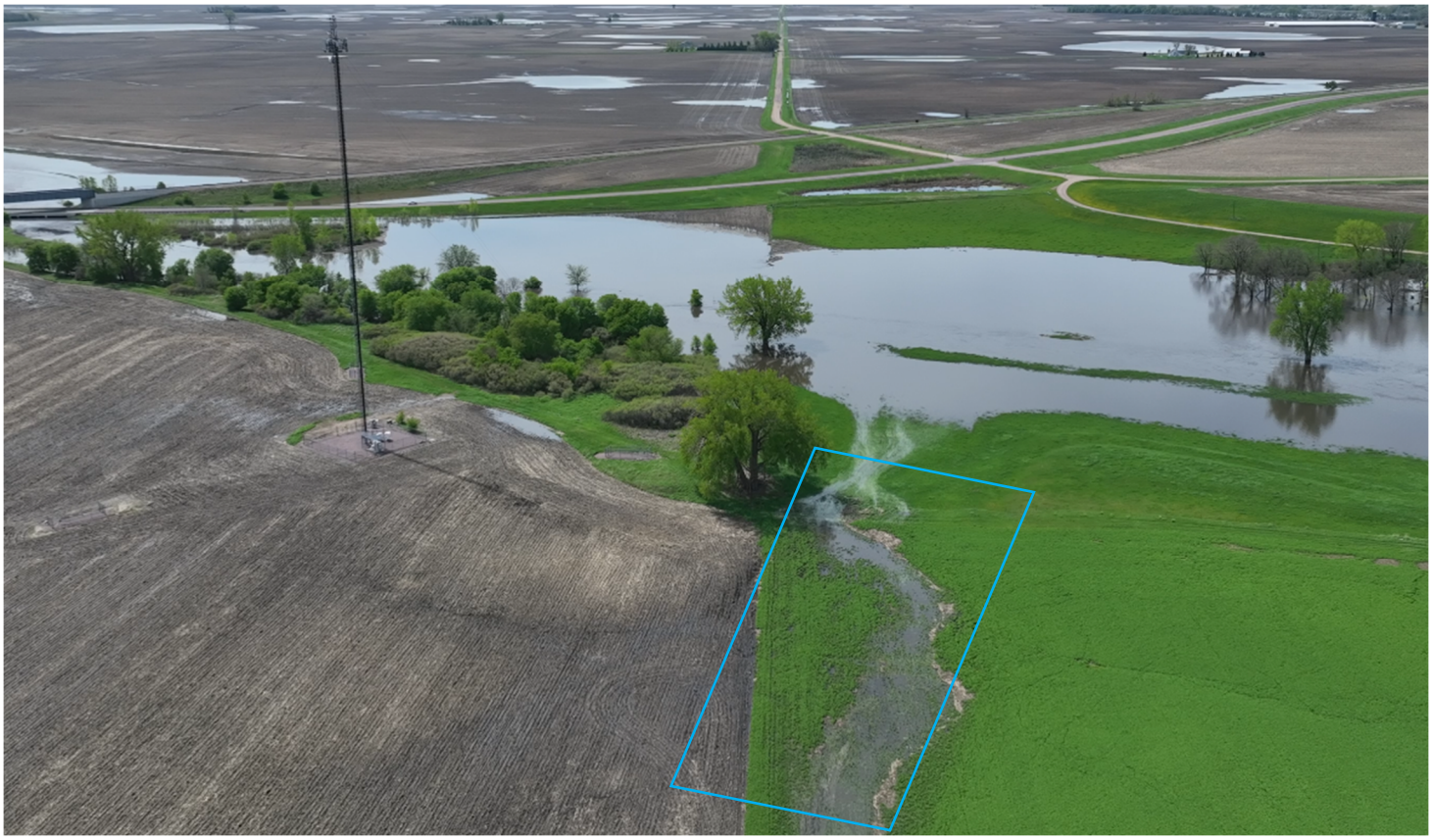


Figure 5: Location for Pond Option

OPTION 3

The proposed Option 3 improvement includes improving the Main, Main West, and Branch 6 public tile lines as indicated in Option 1 but also includes a temporary storage area to reduce peak flow rates exiting the system. This storage option is in the NW ¼ of Section 31 in Prairieville Township and would only be designed to temporarily pond water instead of a permanent storage pond like described in Option 2. The storage area would be constructed by creating a shallow berm along the surface flow path to restrict the overland flow. This will allow water to pond behind the berm and force the surface flow into water quality tile inlets.

The berm and area behind would be designed to still allow for agricultural production with no land permanently taken out of production. As a result, surface peak flow rates are reduced as the flow is restricted by the less capacity of the tile. Since there are proposed tile improvements downstream of this storage area, there are slight increases in peak flow rates under the lesser rain events; but greater peak flow rates are achieved by the temporary storage area on the larger events as the surface water accounts for more runoff than the buried tile. The temporary storage also promotes more infiltration into the soil.

This storage area is designed to drain water down within 48-hours on the 10-year (3.96-inch) rain event. The maximum flooding extents impacted by this is 35 acres and it is not designed to inundate for more than 48 hours till the 25-year (4.89-inch) rain event. At this event, approximately 10 acres of farmland would be flooded for more than 48 hours and would trigger crop stress. At this point, it is recommended that the drainage authority develop a crop loss payment schedule as the temporary ponding area is a benefit to the drainage system and reduces peak flow rates to the outlet of JD 36. Based on the design, temporary damage payments over time for crop loss may be less than permanent damages paid out at the front end of the project for a permanent pond that cannot be farmed. At this time and based on current average temporary damage payments, every 10 years it expected to pay $26,000 in temporary damages for the flooding occurring on the temporary storage area.

Proposed Option 3 tile capacities are shown in Table 4. The location for the temporary storage pond is shown below in Figure 6. This photo was taken on May 15th of 2023 after several inches of rain fell across the watershed. The design of the temporary storage would not increase flooding in the area outside of what currently occurs. This is due to the increase in tile capacity by the improvement which offsets the draw down time that would be seen in the surface overflow.

Figure 6: Proposed Temporary Storage Area (Option 3)

TABLE 4. OPTION 3 PROPOSED TILE CAPACITIES

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	0+00	6+00	24	30	0.30%	0.35%	1140.2	0.26	0.51
	6+00	13+30	18	24	1.00%	1.10%	1131.4	0.22	0.50
	13+30	24+00	24	30	0.15%	0.35%	1131.4	0.18	0.51
	24+00	31+00	24	30	0.15%	0.30%	1070.7	0.20	0.50
	31+00	37+50	24	30	0.15%	0.25%	1013.5	0.21	0.48
	37+50	43+25	24	30	0.10%	0.20%	844.2	0.20	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	593.3	0.29	0.52
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59

Drop Intakes

A drop intake is a structure used along a tile to aid in televising tile, accessing the tile to check for sediment accumulation, provide a location for private tile connections, and draining surface water. They are installed periodically along tile alignments, generally in low areas and/or on each side of road crossings. They are also placed at property lines and as replacements for existing drop intakes.

Standard drop intakes are designed to provide surface drainage through slotted intakes during low flow events. The slots are cut in each rib from 10-inches above grade to as much as 4-feet below grade (surrounded with rock to promote sedimentation and infiltration). During high flow events, a standard surface inlet trash rack provides an overflow to prevent extensive flooding.

With the existing Main, Main West, and Branch 6 tile lines remaining in place, the new tiles may not be constructed through the lowest point of road ditches or fields. To ensure proper drainage, water quality intakes will be offset into these low areas and connected to the drop intake. Water quality intakes are designed to provide surface drainage infiltration through a washed rock filter during low flow events. This allows for increased settling out of sediment. An integrated slotted (or perforated) intake provides an overflow during high flow events, preventing extensive flooding, similar to a standard drop intake.

The proposed Option 3 storage includes providing an area for temporary detention with the outlet being the Main buried tile. To convey water into the tile, several additional drop intakes would be added across the area to aid in draining the surface water that is ponded. These drop intakes are proposed to be water quality intakes as well to further reduce sediment and debris accumulation in the inlet and Main tile itself.

STATUTE REQUIRED + SUGGESTED EFFORTS

Project Necessity

After examining the Petition and analyzing the As-Constructed or Subsequently Improved Capacity (ACSIC) of JD 5, it is deemed necessary to improve the drainage capacity of JD 5 to meet the drainage standards for current farming practices. This improved drainage capacity will help increase crop yields and prevent crops from drowning out in depressional areas of the watershed. The proposed improvement will also replace aging and deteriorating drainage infrastructure for portions of the JD 5 drainage system.

Environmental, Land Use, and Multipurpose Water Management Considerations (Section 103E.015, Subd. 1)

The Drainage Code requires that the Drainage Authority assess the necessity and feasibility of a drainage project in relation to the environmental, land use, and multipurpose water management criteria of Section 103E.015, Subd. 1. To assist in providing thoroughness and clarity, the law will be used as the outline for this portion of the report.

103E.015 CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE

Subdivision 1. Environmental, land use, and multipurpose water management criteria. Before establishing a drainage project, the drainage authority must consider each of the following criteria:

(1) private and public benefits and costs of the proposed drainage project;

The proposed drainage system will replace aging and deteriorating infrastructure and meet today's farming needs for drainage and support a sustainable agricultural economy. The proposed system will decrease the duration of standing water in farm fields, which reduces the potential for crop loss and improves the farmability of land within the watershed. The proposed project will also decrease the rate of overland flow, which will in turn decrease the amount of sediment and particulate phosphorus that leaves the system.

Since the proposed improvements are for a public drainage system, their financial cost will be borne by the benefitted landowners. The proposed project will improve the drainage of benefitted landowners and will not negatively impact the environment.

(2) alternative measures, including measures identified in applicable state-approved and locally adopted water management plans, to:

(i) conserve, allocate, and use drainage waters for agriculture, stream flow augmentation, or other beneficial uses;

(ii) reduce downstream peak flows and flooding;

(iii) provide adequate drainage system capacity;

(iv) reduce erosion and sedimentation; and

(v) protect or improve water quality;

The following water management plans were consulted to see what alternative measures might be applicable to the proposed drainage project:

- Brown County Comprehensive Local Water Management Plan 2008-2013 (Amended August 2013)
- Redwood County Comprehensive Local Water Management Plan 2006-2016 (Amendment 2016-2020)
- Cottonwood River Restoration and Protection Strategy Report (WRAPS)
- Cottonwood River Watershed Total Maximum Daily Load Report (TMDL)

Neither of the county water management plans specifically highlight JD 36 or JD 5 as areas of specific concern.

Priority concerns in the Brown County plan include:

- Soil erosion, including reducing soil erosion and sedimentation on agricultural lands
- Drainage, including improving drainage management system based on water quality goals
- Wetlands/water retention

Priority concerns in the Redwood County plan include:

- Drainage management focusing on wetland restoration and floodwater retention opportunities (altered hydrology)
- Surface water quality addressing impaired waters for these priority pollutants: phosphorus, nitrogen, and fecal coliform bacteria

Specific actions listed in the county plans are to address water quantity issues in drainage systems, installing alternative tile intakes (50 per year in Brown County; 10 total from 2016 to 2020 in Brown County), and implementing water storage practices. The Cottonwood River WRAPS report lists eutrophication, altered hydrology, nitrate, and habitat as stressors causing the fish bioassessments impairment. Dissolved oxygen and total suspended solids were also listed as inconclusive stressors. BMPs in the proposed project include using water quality intakes at tile road crossings and storage to reduce peak discharge from JD 5 for most of the storm events considered in the analysis. The recommended storage options included in this report to comply with local water management plans by reducing sediment transport and reducing peak discharge through extra water storage to the landscape.

(3) the present and anticipated land use within the drainage project or system, including compatibility of the project with local land use plans;

The present land use for the system watershed is primarily agricultural. The only changes in land use would be minor changes as a result of the construction of a storage area included in Options 2. The storage area described in Option 3 would not convert farmland to storage area as it is designed to be temporary.

(4) current and potential flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50-year flood events, including adequacy of the outlet for the drainage project;

The ACSIC and proposed conditions were modeled with ICM, a dynamic modeling software that combines 1-dimensional flow calculations (open channel, pipe flow, etc.) with 2-dimensional flow calculations (overland flow) to better analyze hydrologic and hydraulic conditions. The 1D model incorporates land use and soil type to produce hydrologic inputs. Runoff is then routed to the public tile system, which is represented in the 1D model. Runoff exceeding the capacity of the 1D system is then transferred to the 2D model, where it is allowed to pond, infiltrate, flow overland, and re-enter the 1D model as system capacity allows. The 2D portion of the model incorporates land use and topography data to represent the topography and overland flow characteristics of the JD 5 watershed. A model was developed for the 5, 10, 25, and 50-year rainfall events for a 24-hour storm duration and tables summarizing model results are included below. Tables 5, 6, and 7 below show the peak flow rates at the outlet of the system for improvement Options 1, 2, and 3, respectively.

Peak Flowrate Comparison

Peak outlet flowrates are summarized in Tables 5, 6, and 7 below for Options 1, 2, and 3, respectively. Maximum peak flow rates are separated by tile and overland flow at the outlet of the system.

TABLE 5. OPTION 1 OUTLET PEAK FLOW COMPARISON

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change
JD5 Outlet	Tile	25.30	47.20	87%	28.60	51.80	81%	33.60	59.90	78%	37.50	64.70	73%
	Overland Flow	32.70	21.40	-35%	60.40	47.30	-22%	116.80	103.00	-12%	180.80	170.00	-6%
	Total	58.00	68.60	18%	89.00	99.10	11%	150.40	162.90	8%	218.30	234.70	8%
Denotes peak flows less than or equal to ACSIC													

TABLE 6. OPTION 2 OUTLET PEAK FLOW COMPARISON

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change
JD5 Outlet	Tile	25.30	40.90	62%	28.60	42.70	49%	33.60	46.20	38%	37.50	49.20	31%
	Overland Flow	32.70	1.50	-95%	60.40	23.30	-61%	116.80	82.40	-29%	180.80	138.60	-23%
	Total	58.00	42.40	-27%	89.00	66.00	-26%	150.40	128.60	-14%	218.30	187.80	-14%
Denotes peak flows less than or equal to ACSIC													

TABLE 7. OPTION 3 OUTLET PEAK FLOW COMPARISON

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change
JD5 Outlet	Tile	25.30	47.30	87%	28.60	52.20	83%	33.60	58.90	75%	37.50	64.30	71%
	Overland Flow	32.70	19.00	-42%	60.40	31.20	-48%	116.80	51.00	-56%	180.80	68.90	-62%
	Total	58.00	66.30	14%	89.00	83.40	-6%	150.40	109.90	-27%	218.30	133.20	-39%
Denotes peak flows less than or equal to ACSIC													

All improvement options reduce peak overland flow from the JD 5 watershed in the 5-, 10-, 25-, and 50-year events. Storage in Option 2 provides a reduction in peak total outflow from the JD 5 watershed in all four storm events. Storage Option 3 provides a reduction in total peak flowrate for the 10-, 25-, and 50-year events because the storage area does not provide storage for the entire tile improvement area and peak runoff from the downstream tile is larger than surface flow to the storage area at that time.

Due to the reduction in peak overland flow rates, the engineer believes the downstream JD 36 has adequate capacity to accommodate the proposed improvement without increased erosion. Storage options are recommended to be further reviewed as the project progresses. Detailed modeling results can be found in Appendix E.

(5) the effects of the proposed drainage project on wetlands;

Drainage projects must comply with a variety of state and federal wetland regulations: USACE 404, Minnesota Wetland Conservation Act (WCA), and USDA Swampbuster. ISG staff conducted a level 1 wetland delineation (desktop review) to determine the presence and extent of wetland signatures within the JD 5 watershed. This level 1 wetland delineation was conducted in accordance with the BWSR guidance document: Using Aerial Imagery to Assess Wetland Hydrology (July 1, 2010) in conjunction with the BWSR guidance document: Atypical Procedure: Offsite Hydrology Determination by Using Rainfall Data with Farm Services Agency Imagery (July 2006). Two areas of interest (AOIs) for potential wetlands were identified within the JD 5 watershed based on information from the National Wetlands Inventory. Following a review of historical aerial photographs and antecedent precipitation these AOIs were ultimately determined to be non-wetland. This was due to the AOIs only displaying apparent wetness signatures within historic aerials that had received above normal precipitation. Thus, there are no anticipated wetland impacts with this drainage project.

(6) the effects of the proposed drainage project on water quality;

Water quality issues pertinent to drainage projects can include erosion, sediment transport potential, and non-point source pollution (e.g. nutrients, pesticides, and bacteria). After checking available TMDL information and the MPCA Impaired Waters listing, it was concluded that JD 36 (AUID 07020008-598) is listed as impaired for fish bioassessments and has a completed TMDL for fecal coliform. The Cottonwood River WRAPS report lists eutrophication, altered hydrology, nitrate, and habitat as stressors causing the fish bioassessments impairment. Dissolved oxygen and total suspended solids were also listed as inconclusive stressors. BMPs in the proposed project include using water quality intakes at tile road crossings to slow surface flow into JD 5 and allow suspended sediment to settle out, which will reduce downstream sediment transport from JD 5 into JD 36. The impacts of existing hydrologic alteration will be mitigated by reductions in peak discharges from JD 5 in all modeled storm events for Option 2 and all but the 5-year event for Option 3. Storage options are included in this report to comply with local water management plans by reducing sediment transport and reducing peak discharge.

Please refer to the multi-purpose drainage management plan in Appendix C for additional water quality and best management practices. The multi-purpose drainage management plan was shared with landowners for opportunities to implement preventative, control, and treatment measures. The Brown and Redwood Counties SWCDs can assist landowners with the implementation. Other preventative practices can be incorporated throughout the watershed by private landowners to further improve water quality and soil health.

(7) the effects of the proposed drainage project on fish and wildlife resources;

The proposed drainage project is not expected to impact fish and wildlife resources as no landscape changes are anticipated. Natural Heritage Information System (NHIS) data for Brown and Redwood counties has been obtained by ISG via a license agreement with the Minnesota DNR (LA 2023-018). A review of the database identified no rare features within the JD 5 watershed that could have the potential to be adversely affected by the proposed project. The nearest Element Occurrence of a rare features was located approximately 4 miles southwest of the watershed.

(8) the effects of the proposed drainage project on shallow groundwater availability, distribution, and use; and

There are no anticipated effects to shallow groundwater from the proposed project. The project should only impact soil saturation levels. There are seven wells located in the project's watershed, five of which were classified as domestic wells and two of which were unclassified. The closest well is approximately 340 feet away from the proposed tile alignment. Therefore, the wells are not located within a proximity that would be affected by the drainage tiles of the proposed improvement.

(9) the overall environmental impact of all the above criteria.

The project will have a negligible environmental impact as there are no major land use changes, wetland impacts, fish and wildlife habitat changes, or any adverse effects to water quality. Storage options are included in the design to comply with environmental and land use criteria listed in local water plans. These storage options will provide extra water storage to the watershed, reduce outletting peak flow rates, reduce overall flow and erosion, and provide additional sedimentation to areas throughout the watershed.

Statement of Necessity and Feasibility, Section 103E.015, Subd. 1,

After assessing the necessity and feasibility of this drainage project on behalf of the Drainage Authority in relation to the environmental, land use, and multipurpose water management criteria of Section 103E.015, Subd. 1, the Engineer deems the proposed project to be both necessary and feasible.

Public Waters and Potential Permits

The Engineer believes that if the project moves forward, the drainage authority will not need to apply for a Public Waters Work Permit due to JD 5's outlet to JD 36, which is a public drainage system. The nearest downstream public water is Sleepy Eye Creek, approximately 1.5 miles downstream of the JD 5 outlet.

PRELIMINARY COST ESTIMATES

Separable Maintenance

When proposing to do an improvement and a separable portion of a larger system needs repair, the drainage statute, Section 103E.215, Subd. 6, allows the separation of the cost of repair from the cost of the improvement project. Separable maintenance can be applied to the portions of the existing system that will be replaced or improved by the proposed project. Detailed cost estimates of the potential repair and potential improvement costs have been included in Appendix G and are summarized below in Tables 11, 12, and 13.

Other Project Related Costs

All drainage projects have indirect costs that must be accounted for in project cost estimates and used in cost benefit analyses. These include costs related to drainage authority administration; topographic survey; reports, plans and specifications; and construction staking and administration.

Cost Estimates

The following tables summarize the estimated cost for the proposed improvement options.

TABLE 8. OPTION 1 COST ESTIMATE

Area	Separable Maintenance	Improvement Cost	Net Cost
Main Tile	$ 883,497	$ 1,106,504	$ 223,007
Main West Tile	$ 110,609	$ 121,596	$ 10,987
Branch 6 Tile	$ 44,068	$ 45,254	$ 1,186
Road Crossing Costs	$ -	$ 1,781	$ 1,781
Subtotal	**$ 1,038,174**	**$ 1,275,136**	**$ 236,962**
Road Authority Repair Costs	$ 43,233	$ 43,233	$ -
Total Project Costs	**$ 1,081,407**	**$ 1,318,368**	**$ 236,962**
		Subtotal Separable Maintenance Costs	$ 1,038,174
		Net Costs	$ 236,962
		Total Project Costs for Landowners	**$ 1,275,136**

TABLE 9. OPTION 2 COST ESTIMATE

Area	Separable Maintenance	Improvement Cost	Net Cost
Main Tile	$ 883,497	$ 1,018,548	$ 135,051
Main West Tile	$ 110,609	$ 121,596	$ 10,987
Branch 6 Tile	$ 44,068	$ 44,585	$ 517
Road Crossing Costs	$ -	$ 1,781	$ 1,781
Subtotal	**$ 1,038,174**	**$ 1,458,145**	**$ 419,971**
Road Authority Repair Costs	$ 43,233	$ 43,233	$ -
Total Project Costs	**$ 1,081,407**	**$ 1,501,378**	**$ 419,971**
		Subtotal Separable Maintenance Costs	$ 1,038,174
		Net Costs	$ 419,971
		Total Project Costs for Landowners	**$ 1,458,145**

TABLE 10. OPTION 3 COST ESTIMATE

Area	Separable Maintenance	Improvement Cost	Net Cost
Main Tile	$ 883,497	$ 1,104,337	$ 220,840
Main West Tile	$ 110,609	$ 121,596	$ 10,987
Branch 6 Tile	$ 44,068	$ 44,585	$ 517
Road Crossing Costs	$ -	$ 1,781	$ 1,781
Subtotal	**$ 1,038,174**	**$ 1,341,076**	**$ 302,902**
Road Authority Repair Costs	$ 43,233	$ 43,233	$ -
Total Project Costs	**$ 1,081,407**	**$ 1,384,309**	**$ 302,902**
		Subtotal Separable Maintenance Costs	$ 1,038,174
		Net Costs	$ 302,902
		Total Project Costs for Landowners	**$ 1,341,076**

SUMMARY OF FINDINGS, CONCLUSIONS + RECOMMENDATIONS

After a review of the Brown and Redwood County Judicial Ditch No. 5 system, many of the public tile branches have lower capacity than the recommended 0.50 in/day drainage coefficient and are too shallow to support current agricultural practices. Portions of the system are approximately 101 years old, which is above the life expectancy for public drainage systems with tile. This improvement would be a public benefit and contribute to the public welfare of the area.

Three tile branches in the JD5 system will be enlarged to increase the drainage capacity and deepened where necessary to provide a better outlet for private tile connections and to provide more cover over the tile for protection. These improvements will reduce the flooding extents and duration of standing water within the system.

A hydraulic/hydrologic model was created to compare the ACSIC drainage system with the proposed Improvement to compare flood extents, durations, and outlet flows. This model shows a decrease in peak flows at the outlet in the proposed condition with storage added. The proposed Improvement reduces peak flows with storage from the system and is considered a cost effective and feasible improvement and is recommended by the Engineer. The storage options also reduce overland flow, provide an area for sedimentation, and also align with the local water plans for water storage and sedimentation. Additional storage options may exist throughout the watershed and should be considered depending on willing landowners and overall cost effectiveness.

In accordance with Section 103E.245, Subd. 1: Whereas the engineer has examined the petition and order and conducted a preliminary survey and, whereas the engineer has found the proposed drainage project to be necessary due to problems found and clarified during the survey, and whereas the engineer has determined the proposed drainage project is necessary and feasible with reference to the environmental, land use, and multipurpose water management criteria in section 103E.015, subdivision 1 and, whereas the engineer determined that the proposed drainage project does not substantially affect Public Waters, and whereas the engineer has examined the nature and capacity of the outlet and any extension of the outlet, therefore the engineer recommends the proposed project or its alternative to the Drainage Authority for preliminary approval.

PRELIMINARY PLANS

Since the engineer finds the proposed drainage project in the petition is feasible and complies with the environmental, land use, and multipurpose water management criteria in section 103E.015, Subdivision 1, the engineer has in accordance with Section 103E.245, Subd. 4 included a set of preliminary plans of the drainage project in Appendix A. They are preliminary plans and are therefore unsigned.

Appendix A: Preliminary Plans

BROWN & REDWOOD COUNTIES
JUDICIAL DITCH No. 5

BROWN COUNTY, MINNESOTA **PRELIMINARY ENGINEERING REPORT** **ISG PROJECT # 22-23338**

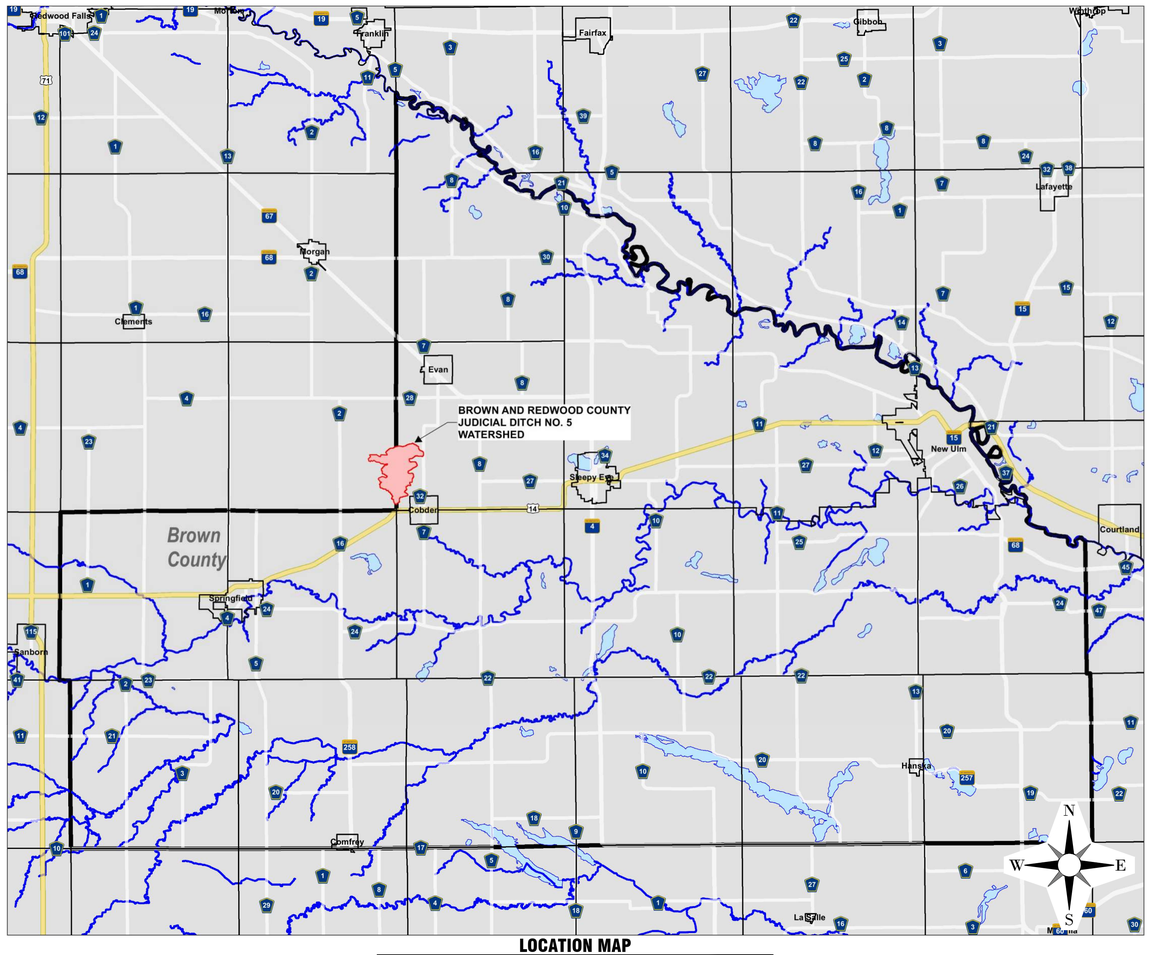
LEGEND

EXISTING

- WATERSHED BOUNDARY
- CITY LIMITS
- SECTION LINE
- QUARTER SECTION LINE
- RIGHT OF WAY LINE
- PROPERTY / LOTLINE
- EASEMENT LINE
- ACCESS CONTROL
- WATER EDGE
- WETLAND BOUNDARY
- FENCE LINE
- EXISTING OPEN DITCH
- CULVERT
- TILE
- PRIVATE TILE
- WATER
- GAS
- OVERHEAD ELECTRIC
- UNDERGROUND ELECTRIC
- UNDERGROUND TELEPHONE
- UNDERGROUND TV
- OVERHEAD UTILITY
- UNDERGROUND UTILITY
- UNDERGROUND FIBER OPTIC
- CONTOUR (MAJOR)
- CONTOUR (MINOR)
- DECIDUOUS TREE
- CONIFEROUS TREE
- TREE LINE
- DROP INTAKE
- HYDRANT
- POWER POLE

PROPOSED

- EASEMENT
- PROPOSED OPEN DITCH
- OPEN DITCH REPAIR
- CULVERT (RCP)
- CULVERT (CMP)
- CULVERT (HDPE)
- TILE
- TILE (PIPE WIDTH)
- PRIVATE TILE
- WATER
- GAS
- OVERHEAD ELECTRIC
- UNDERGROUND ELECTRIC
- UNDERGROUND TV
- CONTOUR (MAJOR)
- CONTOUR (MINOR)
- DROP INTAKE
- SLOUGH REPAIR
- SPOIL PLACEMENT
- TREE CLEARING
- REMOVE TREE
- BUFFER



LOCATION MAP

SHEET INDEX

1 TITLE
2 ESTIMATED QUANTITIES AND SCHEDULES
3 CONSTRUCTION NOTES
4 EXISTING WATERSHED
5 PROPOSED WATERSHED
6 DETAILS
7 DETAILS
8 DETAILS
9 DETAILS
10 DETAILS
11 PLAN - PROFILE MAINLINE
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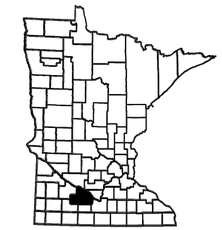
15 PLAN - PROFILE MAINLINE
16 PLAN - PROFILE MAINLINE WEST
17 PLAN - PROFILE BRANCH 6
18 POND GRADING
19 POND SECTIONS



GIS DISCLAIMER:

INFORMATION FOR THE BOUNDARY / LOT LINES, AND UNDERGROUND UTILITIES SHOWN WAS DERIVED FROM DIGITAL DATABASES AND IS FOR INFORMATIONAL PURPOSES ONLY. DATA MAY NOT HAVE BEEN PREPARED FOR, OR BE SUITABLE FOR: LEGAL, ENGINEERING, OR SURVEYING PURPOSES.

PROJECT GENERAL NOTES

1. ALL WORK SHALL CONFORM TO THE CONTRACT DOCUMENTS, WHICH INCLUDE, BUT ARE NOT LIMITED TO, THE OWNER - CONTRACTOR AGREEMENT, THE PROJECT MANUAL (WHICH INCLUDES GENERAL SUPPLEMENTARY CONDITIONS AND SPECIFICATIONS), DRAWINGS OF ALL DISCIPLINES AND ALL ADDENDA, MODIFICATIONS, AND CLARIFICATIONS ISSUED BY ARCHITECT/ENGINEER.
2. CONTRACT DOCUMENTS SHALL BE ISSUED TO ALL SUBCONTRACTORS BY THE GENERAL CONTRACTOR IN COMPLETE SETS IN ORDER TO ACHIEVE THE FULL EXTENT AND COMPLETE COORDINATION OF ALL WORK.
3. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
4. FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS. NOTIFY ARCHITECT/ENGINEER OF ANY DISCREPANCIES OR CONDITIONS REQUIRING INFORMATION OR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
5. DETAILS SHOWN ARE INTENDED TO BE INDICATIVE OF THE PROFILES AND TYPE OF DETAILING REQUIRED THROUGHOUT THE WORK. DETAILS NOT SHOWN ARE SIMILAR IN CHARACTER TO DETAILS SHOWN. WHERE SPECIFIC DIMENSIONS, DETAILS, OR DESIGN INTENT CANNOT BE DETERMINED, NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK.
6. ALL MANUFACTURED ARTICLES, MATERIALS, AND EQUIPMENT SHALL BE APPLIED, INSTALLED, CONNECTED, ERECTED, CLEANED, AND CONDITIONED ACCORDING TO MANUFACTURERS' INSTRUCTIONS. IN CASE OF DISCREPANCIES BETWEEN MANUFACTURERS' INSTRUCTIONS AND THE CONTRACT DOCUMENTS, NOTIFY ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK.
7. ALL DISSIMILAR METALS SHALL BE EFFECTIVELY ISOLATED FROM EACH OTHER TO AVOID GALVANIC CORROSION.
8. THE LOCATION AND TYPE OF ALL EXISTING UTILITIES SHOWN ON THE PLANS ARE FOR GENERAL INFORMATION ONLY AND ARE ACCURATE AND COMPLETE TO THE BEST OF THE KNOWLEDGE OF I & S GROUP, INC. (ISG). NO WARRANTY OR GUARANTEE IS IMPLIED. THE CONTRACTOR SHALL VERIFY THE SIZES, LOCATIONS, AND ELEVATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL IMMEDIATELY NOTIFY ENGINEER OF ANY DISCREPANCIES OR VARIATIONS FROM PLAN.
9. THE CONTRACTOR IS TO CONTACT "GOPHER STATE ONE CALL" FOR UTILITY LOCATIONS A MINIMUM OF 2 BUSINESS DAYS PRIOR TO ANY EXCAVATION / CONSTRUCTION (1-800-252-1166).

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF STATE OF MINNESOTA.

PRELIMINARY NOT FOR CONSTRUCTION

DATE_____ LIC. NO._____

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 TITLE
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

PROJECT INDEX:

OWNER:

BROWN COUNTY
AUDITOR-TREASURER OFFICE
14 S STATE STREET
NEW ULM, MN 56073
PH: 507.233.6613

PROJECT ADDRESS / LOCATION:

SECTIONS 19, 30-31,
PRAIRIEVILLE TWP.
BROWN COUNTY, MINNESOTA

SECTIONS 24-24, 36,
BROOKVILLE TWP.
REDWOOD COUNTY, MINNESOTA

MANAGING OFFICE:

MANKATO OFFICE
115 EAST HICKORY STREET
SUITE 300
MANKATO, MN 56001
PHONE: 507.387.6651

PROJECT MANAGER: MARK ORIGER
EMAIL: MARK.ORIGER@ISGINC.COM

SPECIFICATIONS REFERENCE

ALL CONSTRUCTION SHALL COMPLY WITH THE COUNTIES OF BROWN AND REDWOOD REQUIREMENTS AND MnDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2020 EDITION, AND THE STANDARD SPECIFICATIONS FOR SANITARY SEWER, STORM DRAIN AND WATERMAIN AS PROPOSED BY THE CITY ENGINEERS ASSOCIATION OF MINNESOTA 2018, UNLESS DIRECTED OTHERWISE.

PROJECT DATUM

HORIZONTAL COORDINATES HAVE BEEN REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83), 1996 ADJUSTMENT (NAD83(1996)) ON THE BROWN COUNTY COORDINATE SYSTEM, IN U.S. SURVEY FEET.
ELEVATIONS HAVE BEEN REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
RTK GPS METHODS WERE USED TO ESTABLISH HORIZONTAL AND VERTICAL COORDINATES FOR THIS PROJECT.

B.M. ELEVATION=1038.82

SAINTS - MNDoT POINT
NW CORNER OF THE INTERSECTION OF TRUNK HIGHWAY 14 AND COUNTY ROAD 7 IN THE TOWN OF COBDEN.

TOPOGRAPHIC SURVEY

THIS PROJECT'S TOPOGRAPHIC SURVEY CONSISTS OF DATA COLLECTED IN OCTOBER 2022 BY ISG.

TITLE

TITLE

SHEET

1 OF 19

PLOT DATE: 5/18/2023 2:11 PM

TOTAL ESTIMATED QUANTITIES

Item Code	Item	Unit	Estimated Quantity
01.7113.1000.01	MOBILIZATION	LS	1
33.4510.1000.02	CONNECT EXISTING 24-INCH TILE	EA	3
33.4510.1000.03	15-INCH AGRICULTURAL TILE	LF	1560
33.4510.1000.03	24-INCH AGRICULTURAL TILE	LF	8519
33.4510.1000.03	18-INCH AGRICULTURAL TILE	LF	11900
33.4510.1000.03	8-INCH AGRICULTURAL TILE	LF	42
33.4510.1000.03	30-INCH AGRICULTURAL TILE	LF	15790
33.4510.1000.02	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2
33.4510.1000.02	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	6
33.4510.1000.02	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	6
33.4510.1000.02	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	3
33.4510.1000.02	CONNECT EXISTING 4-INCH TILE	EA	98
33.4510.1000.02	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	12
33.4510.1000.02	CONNECT EXISTING 8-INCH TILE	EA	27
33.4510.1000.02	CONNECT EXISTING 6-INCH TILE	EA	58
33.4510.1000.02	CONNECT EXISTING 18-INCH TILE	EA	9
33.4510.1000.02	CONNECT EXISTING 15-INCH TILE	EA	9
33.4510.1000.02	CONNECT EXISTING 12-INCH TILE	EA	3
33.4510.1000.02	CONNECT EXISTING 10-INCH TILE	EA	6
33.4510.1000.07	GRANULAR PIPE FOUNDATION	CY	1359
33.0513.1000.02	FURNISH & INSTALL WATER QUALITY INLET	EA	30
33.4510.1000.03	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	1092
33.0513.1000.02	INSTALL DROP INTAKE (18-INCH)	EA	60
33.0513.1000.02	CAP DROP INTAKE (18-INCH)	EA	12
33.0513.1000.02	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	48
31.2316.1000.07	COMMON EXCAVATION - POND (P) (EV)	CY	20973.3333
31.2316.1000.05	TOP SOIL STRIP & PLACE SPOILS	AC	6.56075911
33.4510.1000.02	36-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	3
33.4510.1000.02	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1
34.0100.1000.02	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	18
31.1100.1000.02	TREE REMOVAL	EA	3
32.9219.1000.04	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	8720
31.2500.1000.03	INSTALL INLET PROTECTION	EA	63
31.3700.1000.07	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	223
33.4510.1000.03	REMOVE & REINSTALL FENCE	LF	500
33.4510.1000.02	REMOVE EXISTING DROP INTAKE	EA	3
33.4510.1000.00	MAJOR UTILITY CROSSING (ELECTRIC)	EA	9
33.4510.1000.00	MAJOR UTILITY CROSSING (FIBER OPTIC)	EA	3
31.2316.1000.07	CONSTRUCT BERM	CY	1118.51852

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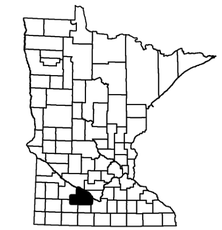

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 DETAILS
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

ESTIMATED QUANTITIES AND SCHEDULES

SHEET

2 OF 19

PLOT DATE: 5/18/2023 2:12 PM

GENERAL PROJECT NOTES:

1. DURING CONSTRUCTION, CONTRACTOR SHALL MAINTAIN A DRAINAGE OUTLET FOR THE ENTIRE JD 5 PROJECT AREA.
2. ALL PIPE DIMENSIONS REFERENCED IN THE PLANS REFER TO THE INSIDE DIAMETER.
3. RODENT GUARDS SHALL BE INSTALLED ON ALL OUTLETS 18" AND SMALLER. (INCIDENTAL TO RESPECTIVE BID ITEMS).
4. ALL ROAD SIGNAGE, COORDINATION, AND TRAFFIC CONTROL SIGNAGE SHALL BE INCIDENTAL TO ROAD RESTORATIONS AND SHALL CONFORM TO LOCAL ROAD AUTHORITY PERMITS AND REGULATIONS.
5. THE CONTRACTOR SHALL SUBMIT A WINTER CONSTRUCTION PLAN FOR SITE STABILIZATION, EROSION PREVENTION, AND SEDIMENT CONTROL IF THE PROJECT IS NOT COMPLETED BY OCTOBER 15 OF THE GIVEN CONSTRUCTION SEASON, UNLESS APPROVED BY THE ENGINEER. THE PLAN SHALL BE DEVELOPED TO SPECIFICALLY ADDRESS SHUTDOWN PROCEDURES OR ACTIVE CONSTRUCTION PLANS.
6. ALL DEWATERING FOR THE PROJECT IS INCIDENTAL.
7. PRODUCT MATERIAL SHALL BE AS SPECIFIED IN THE PLANS. IF NO SPECIFIC MATERIAL IS CALLED OUT, MATERIAL SHALL CONFORM TO THE APPROVED PRODUCT LIST IN THE APPROPRIATE SPECIFICATION.
8. ALL EFFORTS SHALL BE MADE DURING CONSTRUCTION TO SEPARATE SOIL TYPES. BACKFILL SHALL BE COMPACTED PRIOR TO PLACEMENT OF TOPSOIL, EXCEPT THE TOP TWO (2) FEET, FOR WHICH COMPACTION SHALL BE MINIMIZED TO THE EXTENT POSSIBLE. TOPSOIL SHALL BE PLACED TO A MINIMUM DEPTH OF 18", OR UNIFORM TO THE TOPSOIL DEPTH OF THE SURROUNDING AREA UNLESS SPECIFIED ELSEWHERE IN THE PLANS. EXCAVATED SPOILS SHALL BE SPREAD EVENLY IN CONSTRUCTION AREA AS TO NOT IMPEDE DRAINAGE. ALL EFFORTS SHALL BE MADE TO KEEP TOPSOIL ON TOP AND SEPARATED. NO TOPSOIL SHALL BE PLACED IN THE TRENCH BELOW 2' FROM EXISTING GROUND UNLESS APPROVED BY THE ENGINEER.
9. ALL SPOIL LEVELING, GRADING, AND RESTORATION OF DISTURBED AREAS SHALL BE IN ACCORDANCE TO THE CONTRACT DOCUMENTS AND SHALL BE INCIDENTAL TO THE WORK UNLESS OTHERWISE SPECIFIED.
10. HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL SHALL ONLY BE COMPLETED AS NECESSARY FOR SAFE CONSTRUCTION PRACTICES AND WITHIN THE ALLOWED CONSTRUCTION EASEMENT, UNLESS APPROVED BY THE ENGINEER. TREE REMOVAL AND GRUBBING SHALL BE INCIDENTAL TO HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL BID ITEM.
11. TREES CALLED OUT AS "REMOVE TREE" SHALL BE PAID FOR BY EACH OCCURRENCE. IF TREES ARE NOT CALLED OUT IN THE CONSTRUCTION DOCUMENTS AS REMOVE TREE, THEN THE REMOVAL SHALL BE PAID FOR BY THE ACRE AS HEAVY VEGETATIVE CLEARING WITH TREE REMOVAL.
12. AGGREGATE SURFACE SHALL BE INCIDENTAL TO CROSSING OR ROAD RESTORATION.
13. RIPRAP QUANTITIES ARE ESTIMATED. ADDITIONAL QUANTITY MAY BE REQUIRED BY THE ENGINEER. ALL RIPRAP QUANTITIES SHALL BE PAID BY THE CUBIC YARD INSTALLED, UNLESS RIPRAP IS INCIDENTAL TO A SEPARATE PAY ITEM. ALL EXCAVATION AND GEOTEXTILE FABRIC SHALL BE INCIDENTAL TO RESPECTIVE BID ITEM.
14. ALL WORK SHALL BE DONE IN 2,500 LF SECTIONS, UNLESS APPROVED OF BY THE ENGINEER. PRIOR TO COMMENCING ON A NEW SECTION, ALL WORK IN THE PREVIOUS SECTION MUST BE COMPLETED IN ADHERENCE WITH THE CONTRACT DOCUMENTS. THE ENGINEER RESERVES THE RIGHT TO CEASE OPERATIONS AND/OR WITHHOLD PAYMENT UNTIL COMPLIANCE HAS BEEN ACHIEVED.
15. EXISTING TILES THAT ARE DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED AT NO COST TO THE PROJECT, UNLESS OTHERWISE SPECIFIED.
16. ALL SIGNS AND MARKERS SHALL BE PROTECTED OR REMOVED AND REINSTALLED AT NO ADDITIONAL COST TO THE PROJECT, UNLESS OTHERWISE SPECIFIED. THE ENGINEER SHALL BE NOTIFIED OF ANY SIGNS OR MARKERS IN POOR CONDITION PRIOR TO REMOVAL.
17. THE DRAINAGE AUTHORITY TAKES NO AUTHORITY OVER OR RESPONSIBILITY FOR ANY AND ALL PRIVATE TILE SHOWN ON THESE PLANS. PRIVATE TILE LOCATIONS HAVE BEEN SUPPLIED BY LANDOWNERS FOR USE BY THE CONTRACTOR.
18. THE CONTRACTOR SHALL PAY ALL DAMAGES OUTSIDE OF THE AGREED UPON EASEMENT IN AN AMOUNT OF $1,200 PER ACRE OF DISTURBANCE, AS MEASURED BY THE ENGINEER.

UTILITY NOTES:

1. THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY LEVEL D. THE UTILITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED: STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA.

NOTE TO BE ADDED TO TILE NOTES IF MAJOR UTILITY CROSSING:

1. MAJOR UTILITY CROSSING IS ONLY APPLICABLE TO RURAL WATER LINES, WINDMILL TRANSMISSION LINES, GAS LINES, INSERT OR REMOVE UTILITIES AS NECESSARY UNLESS OTHERWISE APPROVED BY THE ENGINEER PRIOR TO CROSSING. ALL OTHER UTILITY CROSSINGS ARE INCIDENTAL TO TILE INSTALLATION.

GENERAL TILE INSTALLATION NOTES:

1. UNLESS OTHERWISE NOTED, CONTRACTOR SHALL LIMIT CONSTRUCTION ACTIVITY TO WITHIN A 100-FOOT WIDE SWATH ALONG PROPOSED TILE ALIGNMENTS FOR 24" TILE OR LESS, AND A 150-FOOT SWATH ALONG PROPOSED TILE ALIGNMENTS FOR TILES LARGER THAN 24". THE SWATH NEED NOT BE CENTERED ON THE PROPOSED TILE ALIGNMENT. ALL ACCESS ROADS SHOULD FOLLOW THE PROPOSED ALIGNMENTS. THE SWATH SHALL NOT DISTURB ANY NON-AGRICULTURAL PRIVATE PROPERTY. DISTURBANCE THROUGH ROAD CROSSINGS, ROAD DITCHES, AND GRASS BUFFERS SHALL BE LIMITED TO THE WIDTH OF A TRENCH NECESSARY FOR SAFE CONSTRUCTION PRACTICES AND MUST BE RE-SEEDED WHERE NEEDED.
2. MISCELLANEOUS TREE CLEARING SHALL BE INCIDENTAL TO TILE INSTALLATION UNLESS SPECIFIED IN THE PLANS.
3. ALL PIPE BEDDING AND ENCASEMENT IS INCIDENTAL TO STANDARD TILE INSTALLATION. REFER TO SPECIFICATIONS FOR DEFINITIONS. GRANULAR FOUNDATION MATERIAL SHALL BE USED IF UNSUITABLE OR UNSTABLE SOILS ARE PRESENT. THE USE OF FOUNDATION MATERIAL SHALL BE APPROVED BY THE ENGINEER BEFORE PLACEMENT AND WILL BE PAID FOR BY THE CUBIC YARD.
4. ALL BENDS, FITTINGS, AND TEES SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL, BANDED, AND WRAPPED IN GEOTEXTILE FABRIC. INCIDENTAL TO RESPECTIVE BID ITEM.
5. ALL TILE ENDS MUST BE CAPPED TO NOT TAKE SEDIMENT UNLESS ANOTHER TILE (PRIVATE OR PUBLIC) IS CONNECTED INTO THE PROPOSED TILE. CAPPING SHALL BE INCIDENTAL TO TILE INSTALLATION.
6. THE CONNECTION OF DISSIMILAR PROPOSED PIPE TYPES SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL AND BE MADE WITH A WATERTIGHT COUPLER APPROVED OF BY THE ENGINEER. THE CONNECTION SHALL BE INCIDENTAL TO TILE INSTALLATION.
7. ALL BENDS SHALL BE CONSTRUCTED AS PRE-FABRICATED BENDS, UNLESS APPROVED BY THE ENGINEER. ANY BENDS LARGER THAN 45° MUST BE CONSTRUCTED WITH MULTIPLE BENDS WITH AT LEAST 40 FEET IN BETWEEN EACH BEND. 45° BENDS SHALL NOT BE USED ON TILE 18 INCHES AND SMALLER.
8. UNLESS SPECIFICALLY NOTED, HDPE AND RCP WILL BE THE ONLY ACCEPTABLE MATERIALS FOR ALL AGRICULTURAL DRAIN TILE. REFER TO SPECIFICATIONS FOR PROPER INSTALLATION REQUIREMENTS AND MATERIALS.
9. VERIFY EXISTING TILE LOCATIONS AND ELEVATIONS PRIOR TO CONSTRUCTION, PAID FOR AS TILE INVESTIGATION BY THE HOUR.
10. ANY ALIGNMENT CHANGES MADE DUE TO TILE INVESTIGATION SHALL BE APPROVED BY THE ENGINEER DURING CONSTRUCTION. ALL EFFORTS WILL BE MADE TO UTILIZE THE SAME FITTINGS AS ORIGINALLY DESIGNED. THE CONTRACTOR WILL ONLY BE COMPENSATED FOR ADDITIONAL LINEAR FOOTAGE OF INSTALLED TILE DUE TO THE ALIGNMENT CHANGE PER THE UNIT BID PRICE.
11. DROP INTAKES WILL BE PAID FOR BY EACH AND NO ADDITIONAL COMPENSATION WILL BE MADE FOR IN-FIELD ELEVATIONS THAT VARY FROM THE PLANS. MINOR SHAPING AROUND DROP INTAKES AND CULVERT INLETS SHALL BE INCIDENTAL TO THEIR RESPECTIVE PAY ITEMS.
12. DROP INTAKES THAT ARE NOT INTENDED TO TAKE SURFACE FLOW MAY BE CAPPED, AS DETERMINED BY THE ENGINEER. INTAKES MAY BE CUT DOWN AND BURIED AFTER FINAL TELEVISING, PER LANDOWNER REQUEST PRIOR TO CLOSEOUT, AND WILL BE PAID FOR AS "CAP DROP INTAKE."
13. DROP INTAKES THAT ARE DESIGNED TO BE ON PROPERTY LINES SHALL BE ADJUSTED IN THE FIELD TO MATCH ACTUAL LOCATION OF PROPERTY LINE.
14. AT CROSSINGS OF EXISTING TILE, ONLY THE UPSTREAM SIDE NEED BE CONNECTED, UNLESS OTHERWISE DEEMED NECESSARY. ALL BENDS, TEES, CONNECTING TILE, AND OTHER FITTINGS NECESSARY FOR CONNECTION SHALL BE INCIDENTAL TO RESPECTIVE BID ITEM.
15. ALL TILE CONNECTIONS MUST BE CONNECTED TO THE PROPOSED TILE ON THE UPSTREAM SIDE OF THE EXISTING TILE.
16. TILE CONNECTIONS SHALL BE CONSTRUCTED WITH TILE THE SAME SIZE OR THE NEXT SIZE LARGER THAN THE EXISTING TILE, UNLESS OTHERWISE SPECIFIED OR APPROVED BY THE ENGINEER. HDPE SHALL BE USED FOR THE CONNECTION OF ALL EXISTING PUBLIC TILES AS WELL AS ALL PRIVATE TILES WHERE THE FILL HEIGHT OVER THE PROPOSED TILE IS GREATER THAN 10 FEET. PE SHALL ONLY BE ALLOWED FOR PRIVATE TILE WITH A PROPOSED FILL HEIGHT LESS THAN OR EQUAL TO 10 FEET. (SEE CONNECT TO EXISTING TILE DETAIL)

GENERAL POND EXCAVATION NOTES:

1. A 16.5-FOOT GRASS STRIP SHALL BE ESTABLISHED AROUND THE TOP OF THE POND EXCAVATION AREA. SEEDING SHALL OCCUR IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
2. CONSTRUCTION ACTIVITY OUTSIDE OF THE PROPOSED POND TOP AND FILL AREA SHALL BE LIMITED TO SAFE CONSTRUCTION PRACTICES OR A MAXIMUM OF 50 FEET WITHOUT APPROVAL FROM THE ENGINEER. APPROVAL FROM THE ENGINEER SHALL BE OBTAINED FOR ANY DISTURBANCE OUTSIDE OF THE APPROVED AREA BEFORE THE WORK BEGINS. ALL DISTURBED AREA SHALL BE RESTORED AS SPECIFIED IN THE CONTRACT DOCUMENTS.
3. A MINIMUM OF 6" OF TOPSOIL SHALL BE PLACED ON POND BOTTOM AND SIDE SLOPES, UNLESS APPROVED BY THE ENGINEER (INCIDENTAL TO POND EXCAVATION).
4. TOPSOIL STRIPPING IN THE AREA OF THE POND SHALL BE PAID FOR AS COMMON EXCAVATION TO THE POND. SEE GRADING CALCULATIONS AND SPECIFICATIONS FOR FURTHER CLARIFICATION.
5. PLACE ALL SPOILS FROM POND EXCAVATION IN DESIGNATED SPOIL AREAS IDENTIFIED ON PLANS, UNLESS OTHERWISE DETERMINED BY THE ENGINEER. SPOIL LEVELING/GRADING IS INCIDENTAL TO POND EXCAVATION UNLESS OTHERWISE SPECIFIED. CONTRACTOR MAY REMOVE CLAY MATERIAL FROM SITE FOR OTHER USE AT NO ADDITIONAL COST TO THE PROJECT IF APPROVED BY THE ENGINEER. ALL TOPSOIL SHALL REMAIN ON SITE.
6. TOPSOIL IN TOPSOIL STRIP AREAS DESIGNATED ON THE PLANS SHALL BE STRIPPED PRIOR TO PLACEMENT OF FILL MATERIAL FROM POND EXCAVATION. RECLAIMING, LEVELING, AND RIPPING OF THE TOPSOIL ON TOP OF THE SPOILS SHALL BE INCIDENTAL TO TOPSOIL STRIPPING.
7. EXISTING TOPSOIL DEPTH IN FILL AREA MAY DIFFER FROM THE DEPTH AT THE POND LOCATION. THE FILL AREA SHALL HAVE A MINIMUM OF XX" IN DEPTH AFTER WORK IS COMPLETED, UNLESS APPROVED OF BY THE ENGINEER.
8. TOPSOIL SHALL BE PLACED IN AN UNIFORM MANNER AS SPECIFIED BY THE CONTRACT DOCUMENTS UNLESS APPROVED BY THE ENGINEER.
9. ALL CONCRETE PIPE SECTIONS FOR THE POND OUTLET SHALL CONSIST OF CLASS III RCP CONFORMING TO MNDOT 3006G. ALL SECTIONS SHALL BE TIED TOGETHER.
10. CONTRACTOR SHALL SUBMIT A GRADING PLAN TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCING ON POND CONSTRUCTION.
11. FILL AREAS SHALL BE TILED WITH X" PERFORATED SINGLE WALL (PE) TILE. THE PROPOSED LAYOUT IS SHOWN IN THE PLANS. ANY VARIANCE FROM THE PROPOSED LAYOUT SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

ABBREVIATIONS

AC	ACRE	GA	GAUGE	PP	POLYPROPYLENE
ADD	ADDENDUM	GAL	GALLON	PSI	POUNDS PER SQUARE INCH
AGG	AGGREGATE	GPM	GALLONS PER MINUTE	PVC	POLYVINYL CHLORIDE
APPROX	APPROXIMATE	HDPE	HIGH DENSITY POLYETHYLENE	PVMT	PAVEMENT
BIT	BITUMINOUS	HORIZ	HORIZONTAL	QTY	QUANTITY
CAD	COMPUTER-AIDED DESIGN	HR	HOUR	RCP	REINFORCED CONCRETE PIPE
CFS	CUBIC FEET PER SECOND	HWL	HIGH WATER LEVEL	REBAR	REINFORCING BAR
CF	CUBIC FOOT	HWY	HIGHWAY	REM	REMOVE
CL	CENTERLINE	HYD	HYDRANT	ROW	RIGHT OF WAY
CMP	CORRUGATED METAL PIPE	I	INVERT	R/W	RIGHT OF WAY
CONC	CONCRETE	ID	INSIDE DIAMETER	SCH	SCHEDULE
CONST	CONSTRUCTION	IN	INCH	SF	SQUARE FOOT
CONT	CONTINUOUS	INV	INVERT	SPEC	SPECIFICATION
CR	COUNTY ROAD	LF	LINEAR FEET	SQ	SQUARE
CSAH	COUNTY STATE AID HIGHWAY	LIN	LINEAR	STA	STATION
CY	CUBIC YARD	LS	LUMP SUM	SY	SQUARE YARD
DI	DROP INTAKE	MAX	MAXIMUM	TEMP	TEMPORARY
DIA	DIAMETER	MH	MANHOLE	THRU	THROUGH
DIM	DIMENSION	MIN	MINIMUM	TRANS	TRANSFORMER
EA	EACH	MISC	MISCELLANEOUS	TV	TELEVISION
ELEC	ELECTRICAL	NO	NUMBER	TYP	TYPICAL
ELEV	ELEVATION	NTS	NOT TO SCALE	UT	UTILITY, UNDERGROUND TELEPHONE
EOF	EMERGENCY OVERFLOW	NWL	NORMAL WATER LEVEL	VCP	VITRIFIED CLAY PIPE
EQ	EQUAL	OC	ON CENTER	W/O	WITHOUT
EX	EXISTING	OCEW	ON CENTER EACH WAY	W/	WITH
FDN	FOUNDATION	OH	OVERHEAD	YD	YARD
FPM	FEET PER MINUTE	OHWL	ORDINARY HIGH WATER	YR	YEAR
FPS	FEET PER SECOND	OZ	OUNCE		
FT	FOOT, FEET	PERF	PERFORATED		
		PL	PROPERTY LINE		

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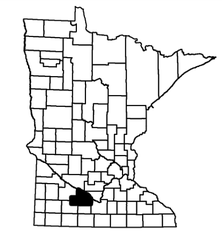

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 DETAILS
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

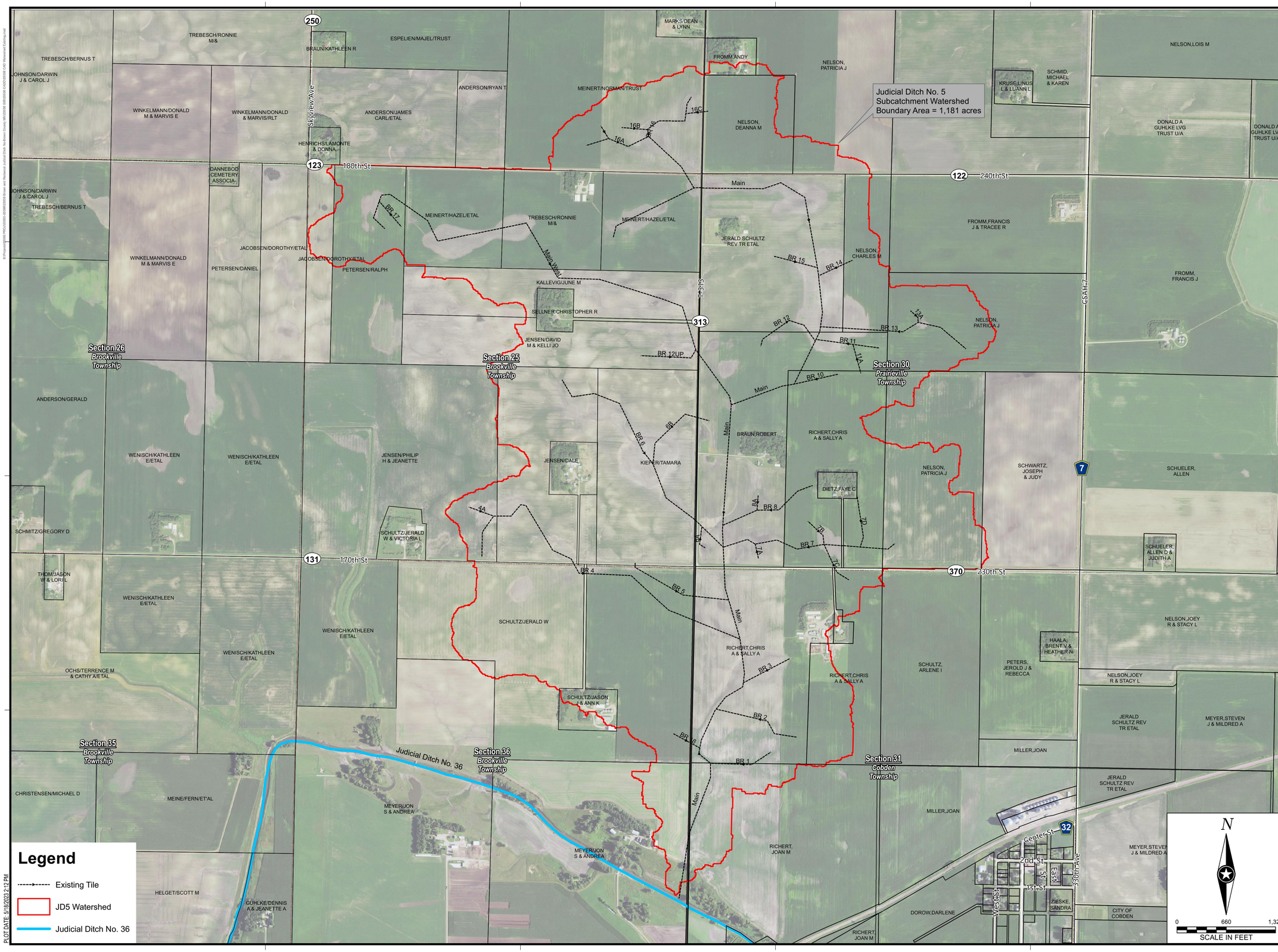
TITLE

CONSTRUCTION NOTES

SHEET

3 OF 19

PLOT DATE: 5/18/2023 2:12 PM



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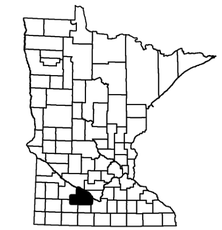

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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

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DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 WATERSHED MAPS
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

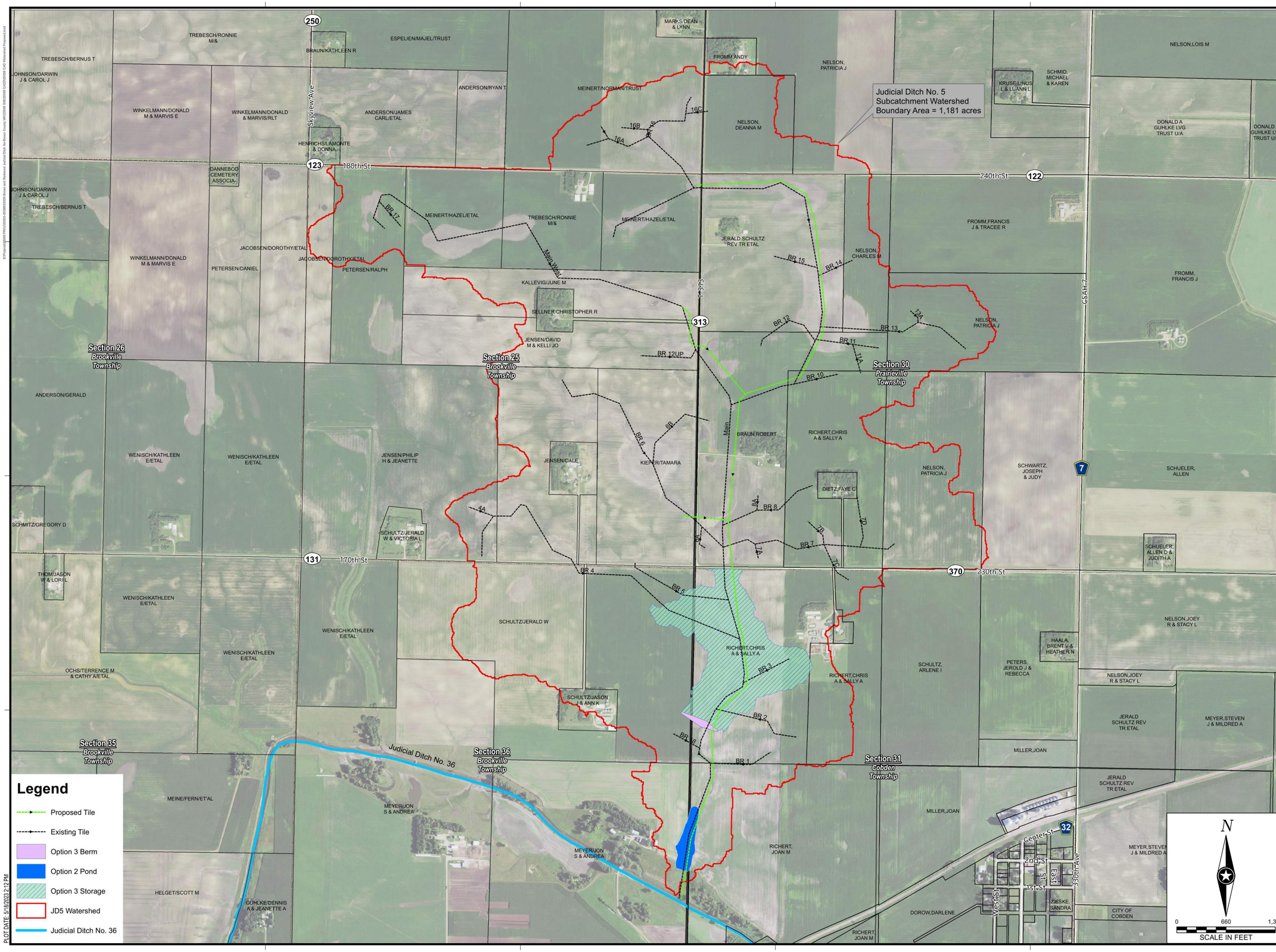
TITLE

EXISTING WATERSHED

SHEET

4 OF 19

PLOT DATE: 5/18/2023 2:12 PM



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CLIENT PROJECT NO.	-

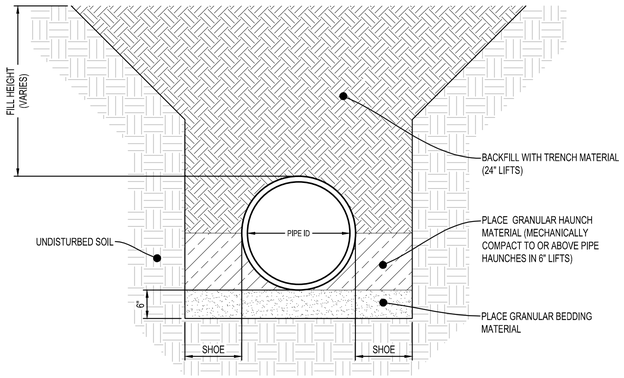
TITLE

PROPOSED WATERSHED

SHEET

5 OF 19

PLOT DATE: 5/18/2023 3:12 PM



NOTES:

GRANULAR BEDDING, GRANULAR ENCASEMENT, AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.

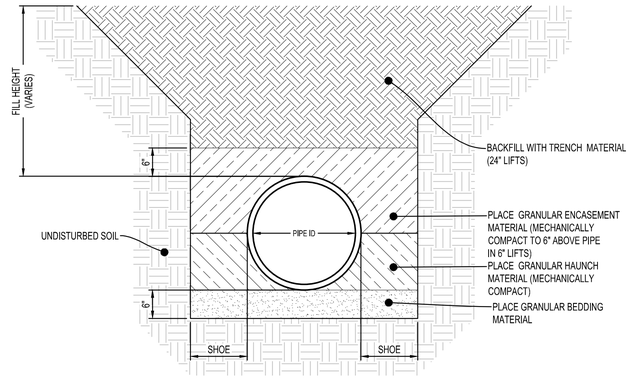
ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER SPECIFICATIONS, WHICHEVER IS GREATER.

THE CLASS OF RCP REQUIRED SHALL BE BASED ON THE PIPE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE SPECIFIED.

RCP FLAT BOTTOM TRENCH

NTS



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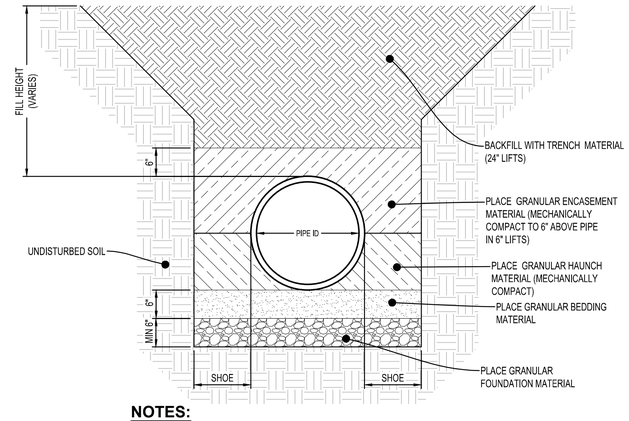
THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.

HDPE FLAT BOTTOM TRENCH

NTS



NOTES:

GRANULAR BEDDING, GRANULAR ENCASEMENT, AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.

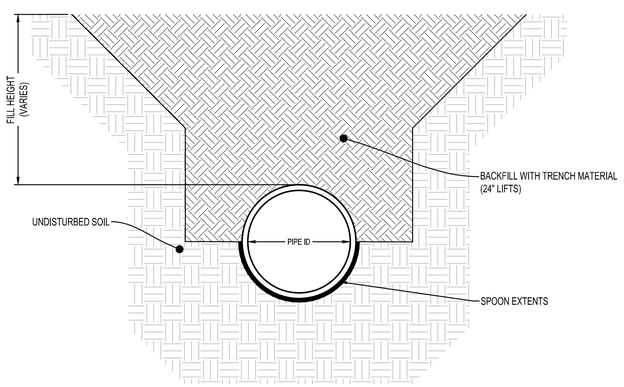
GRANULAR FOUNDATION BELOW THE PIPE SHALL BE PAID FOR BY THE CUBIC YARD, ONLY WHERE APPROVED BY THE FIELD ENGINEER.

ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.

HDPE FLAT BOTTOM TRENCH WITH GRANULAR FOUNDATION

NTS



NOTES:

BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.

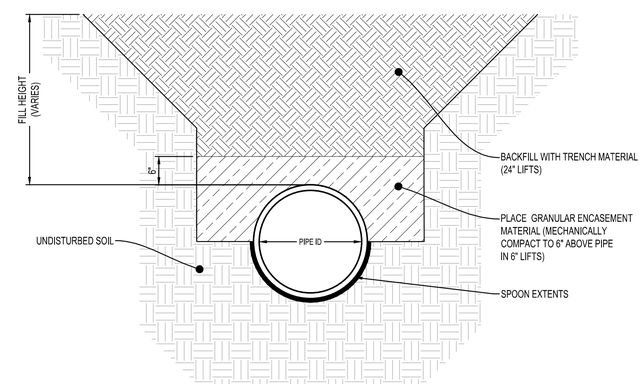
SPOON DIMENSIONS SHALL COMPLY WITH PIPE MANUFACTURER'S SPECIFICATIONS.

ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

THE CLASS OF RCP REQUIRED SHALL BE BASED ON THE PIPE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE SPECIFIED.

RCP SPOON TRENCH

NTS



NOTES:

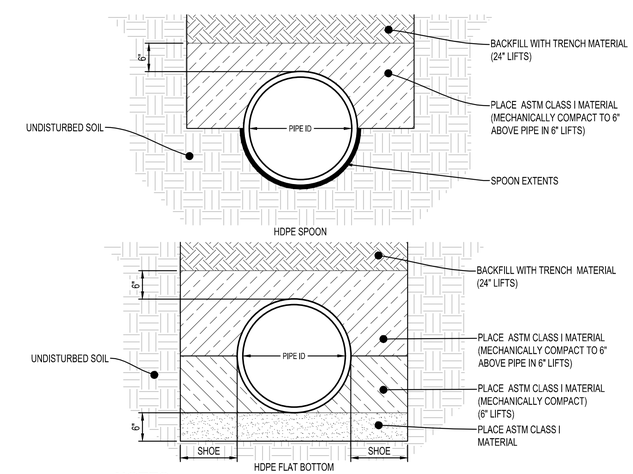
GRANULAR ENCASEMENT AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.

SPOON DIMENSIONS SHALL COMPLY WITH PIPE MANUFACTURER'S SPECIFICATIONS.

ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

HDPE SPOON TRENCH

NTS



NOTES:

GRANULAR BEDDING AND BACKFILL SHALL BE INCIDENTAL TO CONSTRUCTION.

SPOON DIMENSIONS SHALL COMPLY WITH PIPE MANUFACTURER'S SPECIFICATIONS.

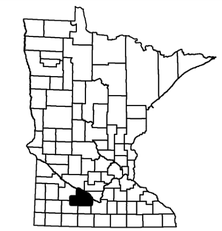
THE SHOE WIDTH SHALL BE THE SAME AS THE COMPACTING MECHANISMS WIDTH OR THE PIPE MANUFACTURER'S SPECIFICATIONS, WHICHEVER IS GREATER.

ALL PIPE WITH A FILL HEIGHT GREATER THAN 15-FEET SHALL BE FULLY ENCASED IN ASTM CLASS I MATERIAL.

HDPE WITH ASTM CLASS I COVER HEIGHT OVER 15'

NTS

ISG



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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

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PROJECT NO.	22-23338
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DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

DETAILS

SHEET

6 OF 19

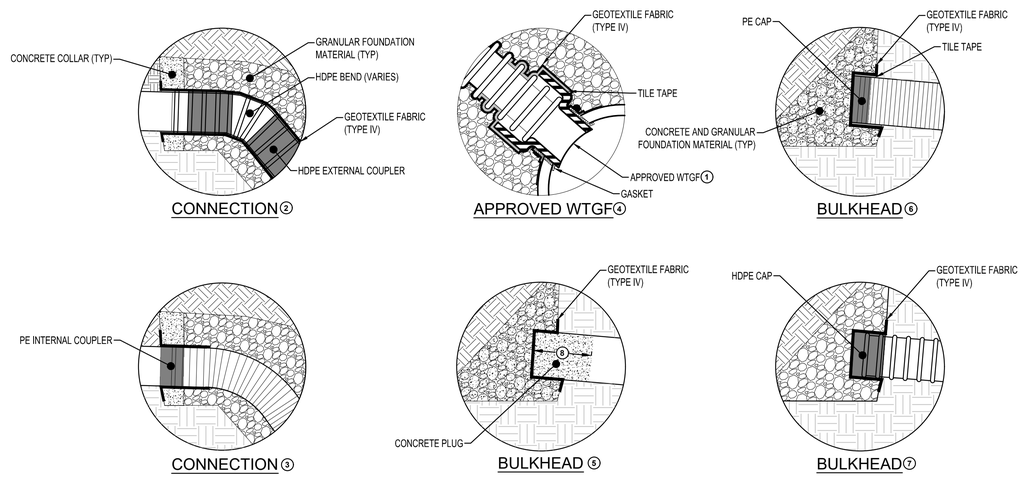
PLOT DATE: 5/18/2023 2:12 PM

NOTES:

1. APPROVED WATERTIGHT GASKETED FITTING (WTGF) SHALL ONLY BE USED WHEN THE PIPE TO BE CONNECTED IS 1/2 (OR SMALLER) THE DIAMETER OF THE PIPE TO BE TAPPED. A MOLDED TEE SHALL BE USED IN ALL OTHER SITUATIONS. APPROVED WTGF SHALL NOT BE INSTALLED COMPLETELY VERTICAL OR INTO THE BOTTOM HALF OF THE PIPE TO BE TAPPED.
2. CONNECTION OF HDPE TO CLAY, CONCRETE, OR PE TILE.
3. CONNECTION OF PE TO CLAY, CONCRETE, OR PE TILE.
4. CONNECTION OF PE OR HDPE TO PIPE TO BE TAPPED.
5. BULKHEAD OF EXISTING CLAY OR CONCRETE TILE.
6. BULKHEAD OF EXISTING PE TILE.
7. BULKHEAD OF EXISTING HDPE TILE.
8. CONCRETE BULKHEAD SHALL EXTEND INTO THE PIPE A MINIMUM LENGTH EQUIVALENT TO ONE DIAMETER OF THE PIPE.

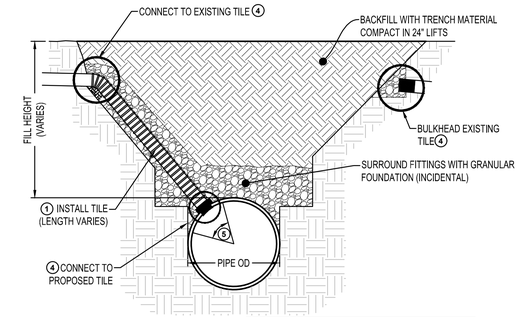
ALL TILE, FITTINGS, GEOTEXTILE FABRIC, FOUNDATION ROCK, TILE TAPE, CONCRETE, AND EXCAVATION SHALL BE INCIDENTAL TO RESPECTIVE BID ITEM UNLESS OTHERWISE NOTED.

NOT ALL SITUATIONS OR APPROVED EQUALS ARE DEMONSTRATED IN DETAIL. ENGINEER SHALL APPROVE OF EQUALS.



TYPICAL CONNECTION DETAILS

NTS



EXISTING TILE TYPE	FILL HEIGHT	CONNECTION MATERIAL 2
EXISTING PUBLIC TILES	ALL	HDPE
EXISTING PRIVATE TILES	>15 FEET	HDPE
EXISTING PRIVATE TILES	≤15 FEET	3

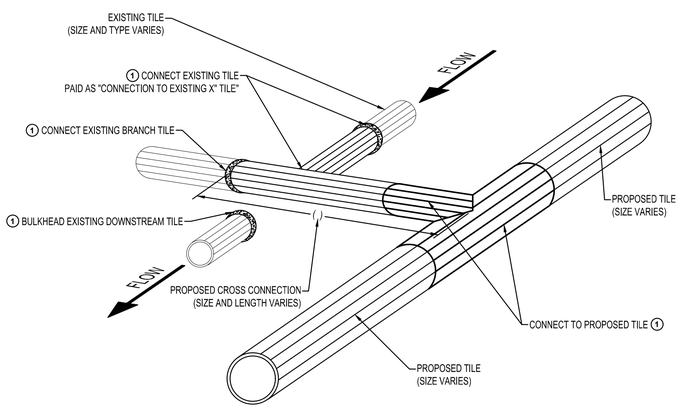
NOTES:

1. REFER TO THE TABLE FOR MATERIAL. SIZE VARIES. THE TILE SHALL BE THE SAME AS OR THE NEXT AVAILABLE SIZE, UNLESS OTHERWISE SPECIFIED OR APPROVED BY THE ENGINEER.
2. HDPE SHALL BE USED IF THE EXISTING TILE IS HDPE, REGARDLESS OF THE FILL HEIGHT.
3. HDPE SHALL BE USED FOR FIRST 5 FEET AWAY FROM THE PROPOSED PIPE AND THEN PE MAY BE USED.
4. REFER TO TYPICAL CONNECTION DETAILS.
5. CONNECTION TO PROPOSED TILE SHALL BE LIMITED TO 15 TO 75 DEGREES FROM SPRING LINE.

ALL TILE, FITTINGS, GEOTEXTILE FABRIC, FOUNDATION ROCK, TILE TAPE, CONCRETE, AND EXCAVATION SHALL BE INCIDENTAL.

CONNECT TO EXISTING TILE

NTS



NOTES:

1. REFER TO TYPICAL CONNECTION DETAILS.

CROSS CONNECT SHALL BE PAID AS THREE (3) SEPARATE PAY ITEMS:

1. X-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED PIPE
2. X-INCH AGRICULTURAL TILE FOR LENGTHS GREATER THAN 40'
3. CONNECTION TO EXISTING X" TILE

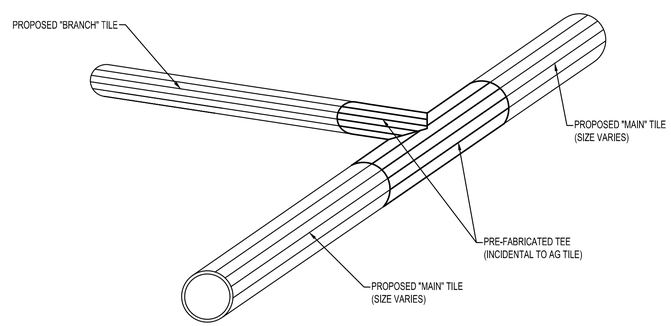
CROSS CONNECTION SHALL BE CONSTRUCTED WITH HDPE TILE.

CONNECTION TO PROPOSED TILE AND EXISTING BRANCH TILE ARE INCIDENTAL TO CROSS CONNECT. BULKHEAD IS INCIDENTAL TO CONNECTION TO EXISTING X" TILE.

TILE CONNECTIONS SHALL NOT BE INSTALLED COMPLETELY VERTICAL FROM TOP OF PIPE.

CROSS CONNECT TO EXISTING BRANCH TILE

NTS



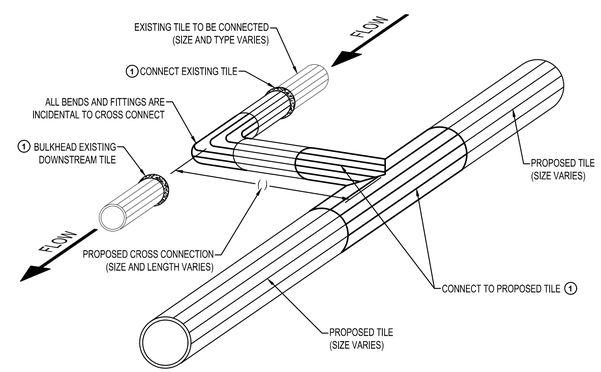
NOTES:

CONNECTION TO PROPOSED TILE SHALL BE INCIDENTAL TO TILE INSTALLATION.

PRE-FABRICATED TEE SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL.

CONNECT TO PROPOSED BRANCH TILE

NTS



NOTES:

1. REFER TO TYPICAL CONNECTION DETAILS.

CROSS CONNECT SHALL BE PAID AS TWO (2) SEPARATE PAY ITEMS:

1. X-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED PIPE
2. X-INCH AGRICULTURAL TILE FOR LENGTHS GREATER THAN 40'

CROSS CONNECTION SHALL BE CONSTRUCTED WITH HDPE TILE.

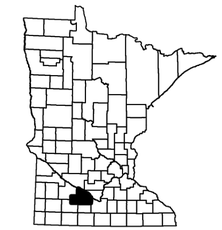
CONNECTION TO PROPOSED TILE, EXISTING TILE, AND BULKHEAD ARE INCIDENTAL TO CROSS CONNECT.

TILE CONNECTIONS SHALL NOT BE INSTALLED COMPLETELY VERTICAL FROM TOP OF PIPE.

CROSS CONNECT TO EXISTING TILE

NTS

ISG



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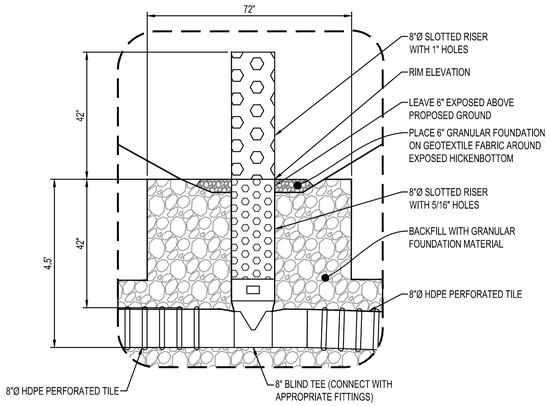
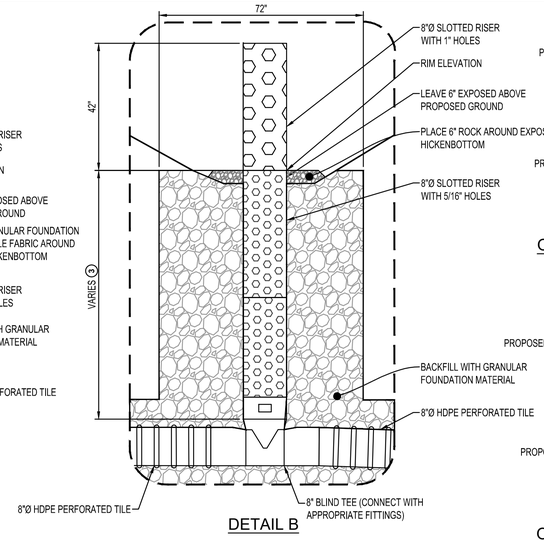


DETAIL A



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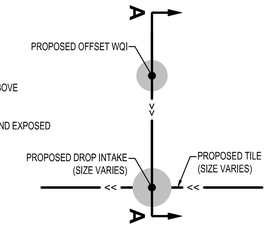
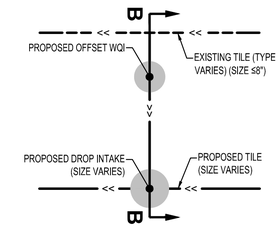
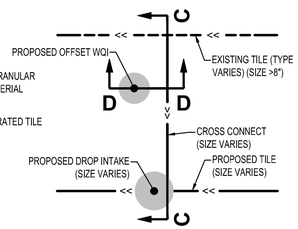


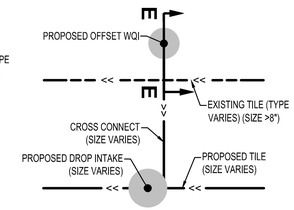
OFFSET WATER QUALITY INLET
WITH NO TILE CONNECTION



OFFSET WATER QUALITY INLET
WITH TILE CONNECTION (≤8")



OFFSET WATER QUALITY INLET
MID CROSS CONNECTION



OFFSET WATER QUALITY INLET
END OF CROSS CONNECTION

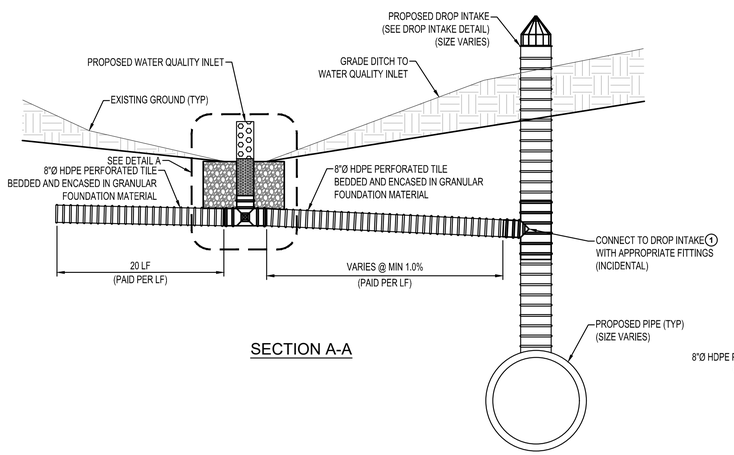
PLAN VIEWS

TYPICAL BID ITEM BREAKDOWN:

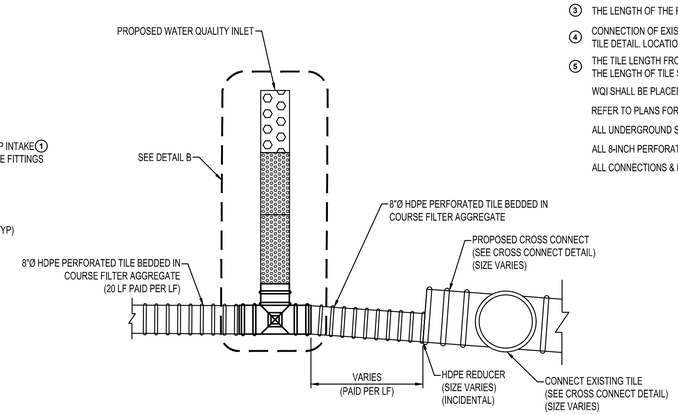
SITUATION	BID ITEMS
OFFSET WATER QUALITY INLET WITH NO TILE CONNECTION	1. FURNISH & INSTALL WATER QUALITY INLET (EA) 2. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF)
OFFSET WATER QUALITY INLET WITH TILE CONNECTION (≤8")	1. FURNISH & INSTALL WATER QUALITY INLET (EA) 2. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF) 3. CONNECT EXISTING X-INCH TILE
OFFSET WATER QUALITY INLET MID CROSS CONNECTION	1. XX-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED TILE (EA) 2. FURNISH & INSTALL WATER QUALITY INLET (EA) 3. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF)
OFFSET WATER QUALITY INLET END OF CROSS CONNECTION	1. XX-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED TILE (EA) 2. FURNISH & INSTALL WATER QUALITY INLET (EA) 3. INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET) (LF)

BID ITEM INCIDENTALS:

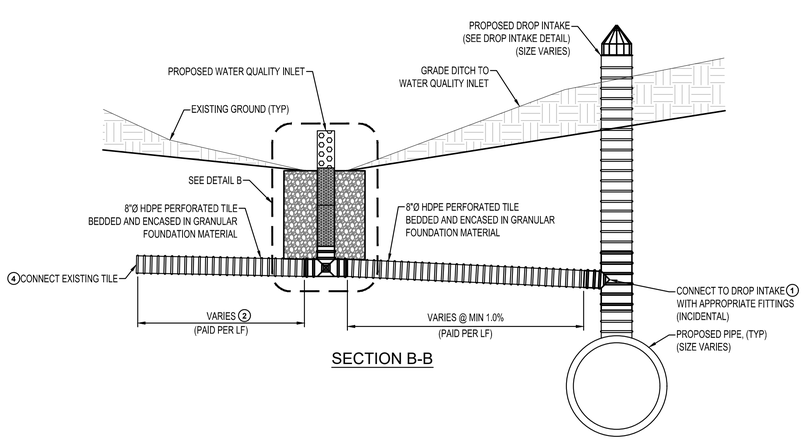
BID ITEM	UNIT	INCIDENTALS
FURNISH & INSTALL WATER QUALITY INLET	EA	ROCK, GEOTEXTILE FABRIC, RISER PIECES, BLIND TEE, FITTINGS, ALL CONNECTIONS
INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	PIPE, BEDDING AND ENCASEMENT MATERIAL
CONNECT EXISTING X-INCH TILE	EA	REFER TO CONNECT TO EXISTING TILE DETAIL
XX-INCH CROSS CONNECT W/ 40 LF OF SPECIFIED TILE	EA	REFER TO CROSS CONNECT TO EXISTING TILE DETAIL



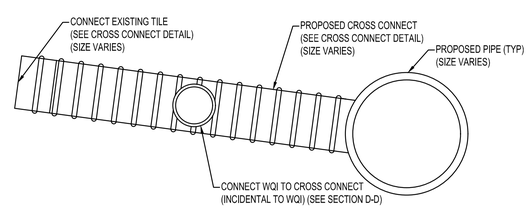
SECTION A-A



SECTION E-E



SECTION B-B



SECTION C-C

TYPICAL OFFSET WATER QUALITY INLET
NTS

NOTES:

1. THE ELEVATION AND DEPTH OF THE CONNECTION VARIES. IF NECESSARY, THE CONNECTION SHALL BE MADE INTO THE PROPOSED TILE IN ORDER TO OBTAIN APPROPRIATE GRADE. IF APPROPRIATE GRADE CANNOT BE OBTAINED, THE ENGINEER SHALL BE NOTIFIED FOR GRADE ADJUSTMENTS. ANY ADDITIONAL MATERIAL AND FITTINGS SHALL BE INCIDENTAL.
2. THE TILE SHALL EXTEND TO THE EXISTING TILE TO BE CONNECTED OR 20 LF PAST THE OFFSET WQI, WHICHEVER IS GREATER.
3. THE LENGTH OF THE RISER VARIES BASED ON THE DEPTH REQUIRED TO CONNECT THE EXISTING TILE. THE EXTRA RISER LENGTH SHALL BE INCIDENTAL TO THE WQI.
4. CONNECTION OF EXISTING TILES TO THE PERFORATED TILE OF THE OFFSET WATER QUALITY INLET SHALL BE PAID FOR AS A CONNECTION AND CONFORM TO THE CONNECT EXISTING TILE DETAIL. LOCATION OF CONNECTION VARIES.
5. THE TILE LENGTH FROM THE CROSS CONNECT TO THE OFFSET WQI VARIES BASED ON THE LOCATION OF THE CROSS CONNECT COMPARED WITH THE BOTTOM OF THE ROAD DITCH. THE LENGTH OF TILE SHALL BE PAID FOR BY THE LINEAR FOOT.

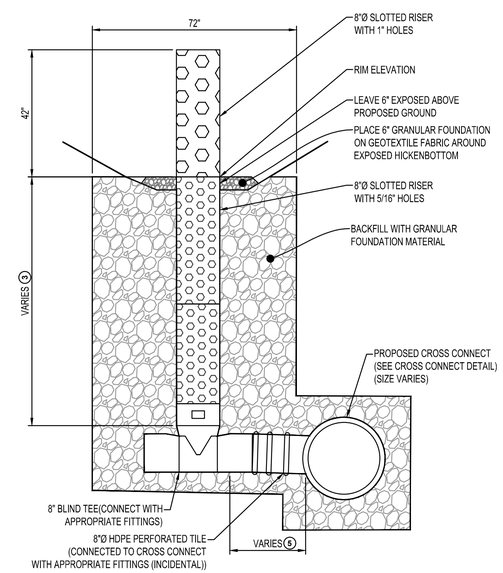
WQI SHALL BE PLACED IN THE LOW SPOT OF THE ROAD DITCH.

REFER TO PLANS FOR SIZES.

ALL UNDERGROUND SEGMENTS OF THE RISER SHALL BE WRAPPED IN MnDOT TYPE I GEOTEXTILE FABRIC.

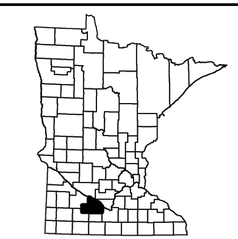
ALL 8-INCH PERFORATED TILE SHALL BE BEDDED AND ENCASED IN GRANULAR FOUNDATION MATERIAL.

ALL CONNECTIONS & FITTINGS SHALL BE WRAPPED IN FABRIC, ENCASED IN SPECIFIED ROCK, AND BE APPROVED BY THE ENGINEER.



SECTION D-D

ISG



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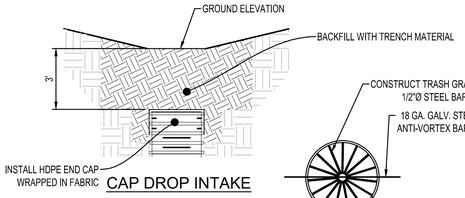
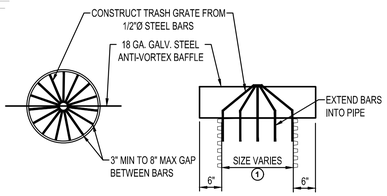
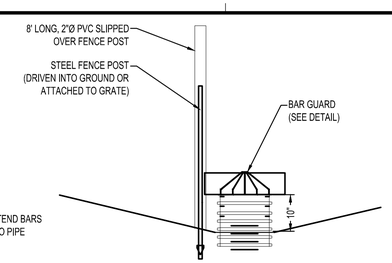


CAP DROP INTAKE



HEAVY DUTY BAR GUARD
(INCIDENTAL TO BAR GUARD ASSEMBLY)



BAR GUARD ASSEMBLY 5

NOTES:

1. INTAKES SHALL BE 18" FOR PROPOSED TILE LESS THAN 30" IN DIAMETER AND 24" FOR 30" DIAMETER AND LARGER.
2. INTAKE CAPS SHALL BE SUBSTITUTED FOR BAR GUARD ASSEMBLIES IN AREAS THAT WILL NOT TAKE SURFACE FLOW, AS APPROVED BY THE ENGINEER.
3. RIM ELEVATIONS CALLED OUT ON PLANS REPRESENTS EXISTING GROUND ELEVATION.
4. DETAIL A MAY BE INTERCHANGED WITH NARROW SLOTTED OR PERFORATED TILE.
5. BAR GUARD ASSEMBLY SHALL INCLUDE THE BAR GUARD, ANTI-VORTEX BAFFLE, AND THE FENCE POST WITH PVC.

ALL VERTICAL RISERS SHALL BE WRAPPED WITH MnDOT TYPE 1 GEOTEXTILE FABRIC. (INCIDENTAL TO EACH INTAKE)

IF THE PROPOSED TILE SIZE IS LESS THAN 18" IN DIAMETER, REDUCERS SHALL BE USED ON BOTH SIDES OF AN 18" TEE FOR THE RISER. (TELEVISING ACCESS)

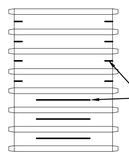
TILE FLAGS (7' MIN) MAY BE SUBSTITUTED FOR FENCE POST WITH PVC.

ALL APPROPRIATE FITTINGS, FABRIC, AND GRANULAR FOUNDATION MATERIAL SHALL BE INCIDENTAL.

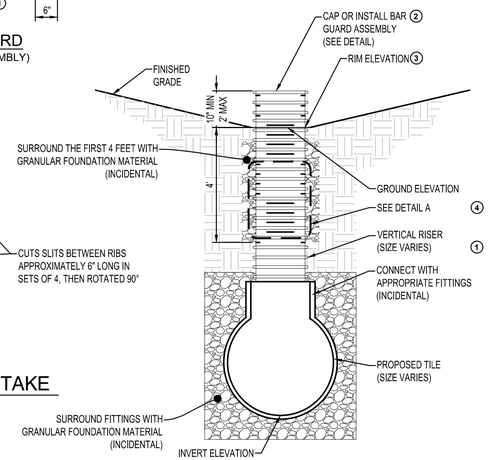
INTAKES THAT WILL NOT TAKE SURFACE FLOW SHALL BE CAPPED. INTAKES IN ROAD DITCHES AND AT PROPERTY LINES SHALL HAVE A BAR GUARD INSTALLED. VERIFY WITH ENGINEER. PAID FOR BY EACH.

VERTICAL RISERS MAY BE CUT DOWN AND BURIED AT 3' BELOW GRADE AFTER FINAL TELEVISING, PER LANDOWNER REQUEST. PAID FOR BY "CAP DROP INTAKE."

INTAKES SHALL NOT BE BURIED AND CAPPED UNTIL FINAL TELEVISING HAS BEEN APPROVED BY THE ENGINEER.

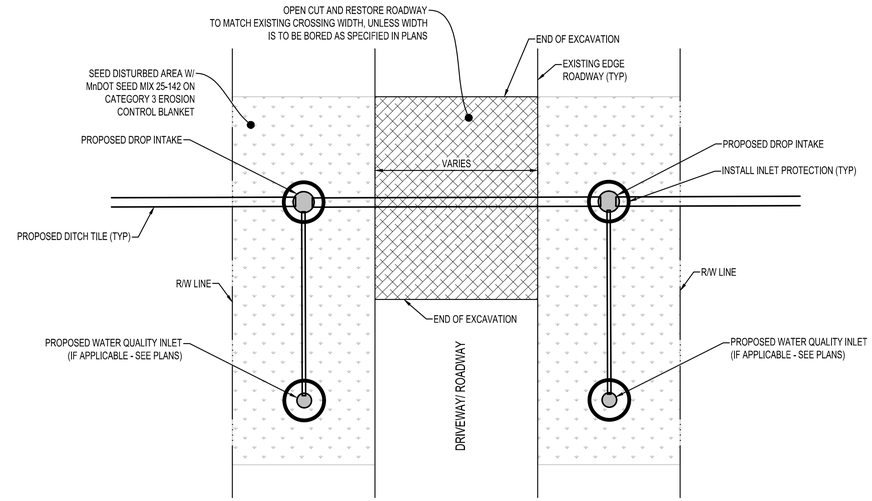


DETAIL A



SECTION

DROP INTAKE
NTS

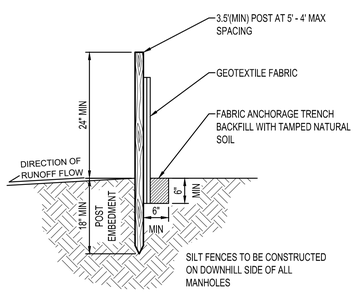


NOTES:

WATER QUALITY INLETS SHOULD BE INSTALLED AT LOW POINTS OF THE DITCH.

SEE ROADSIDE SEEDING SCHEDULE

TYPICAL ROAD CROSSING EROSION CONTROL
NTS

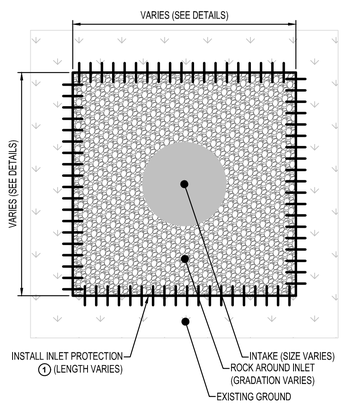


NOTES:

INSTALLATION, MAINTENANCE, AND REMOVAL OF SILT FENCE IN ACCORDANCE WITH CONTRACT DOCUMENTS SHALL BE INCIDENTAL TO THE BID ITEM.

SILT FENCE SHALL BE PAID FOR BY THE LF. REFER TO PAYMENT SCHEDULE IN CONTRACT DOCUMENTS.

SILT FENCE
NTS



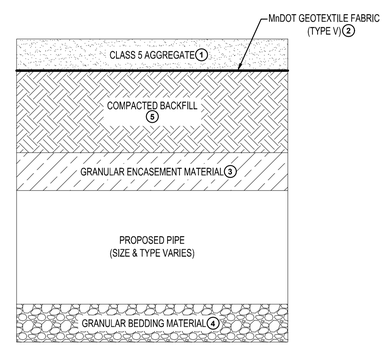
NOTES:

1. INLET PROTECTION SHALL BE SILT FENCE, SEDIMENT CONTROL LOG, OR AN APPROVED EQUAL. INLET PROTECTION SHALL BE INSTALLED IN ACCORDANCE WITH CONTRACT DOCUMENTS.

INLET PROTECTION SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION.

INSTALLATION, MAINTENANCE, AND REMOVAL OF INLET PROTECTION IN ACCORDANCE WITH CONTRACT DOCUMENTS SHALL BE INCIDENTAL TO THE INSTALL INLET PROTECTION BID ITEM. (REFER TO PAYMENT SCHEDULE)

TYPICAL INLET PROTECTION
NTS



NOTES:

1. SALVAGE AND REPLACE EXISTING CROSSING SURFACE MATERIAL. THE ROAD SLOPE AND WIDTH SHALL MATCH EXISTING CONDITIONS, UNLESS OTHERWISE SPECIFIED. ADDITIONAL CLASS 5 AGGREGATE MAY BE NEEDED TO MATCH EXISTING SECTION OR 10" MINIMUM FOR ROADWAYS, WHICHEVER IS GREATER. (INCIDENTAL TO OPEN CUT AND RESTORE GRAVEL ROADWAY)
2. GEOTEXTILE FABRIC SHALL BE INCIDENTAL TO OPEN CUT AND RESTORE GRAVEL ROADWAY.
3. REFER TO PIPE BEDDING DETAILS.
4. REFER TO PIPE BEDDING DETAILS, MAY BE EXISTING GROUND DEPENDING ON INSTALLATION METHOD.
5. COMPACTED BACKFILL SHALL BE PLACED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

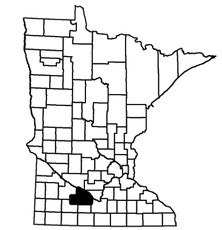
ROAD SLOPE AND WIDTH SHALL MATCH EXISTING CONDITIONS, UNLESS OTHERWISE SPECIFIED.

DISTURBED SHOULDER AND ROAD DITCH SHALL BE SEEDED WITH MnDOT 25-142 ON CATEGORY 3 EROSION CONTROL BLANKET, UNLESS OTHERWISE SPECIFIED.

THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN THE DISTURBED ROADS UNTIL THE PROJECT IS COMPLETED OR ROAD AUTHORITY HAS RESUMED CONTROL; WHICHEVER IS SOONER.

TILE GRAVEL ROAD CROSSING
NTS

ISG



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PRELIMINARY - NOT FOR CONSTRUCTION

DATE_____ LIC. NO._____

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 DETAILS
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

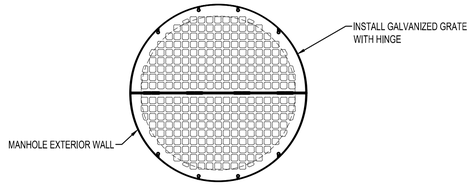
TITLE

DETAILS

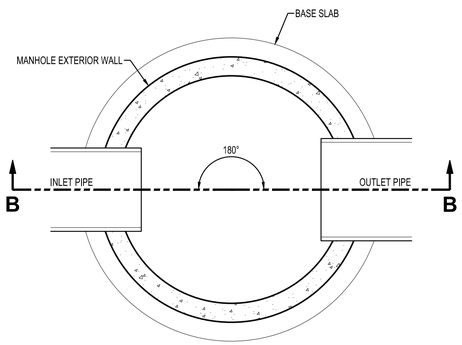
SHEET

9 OF 19

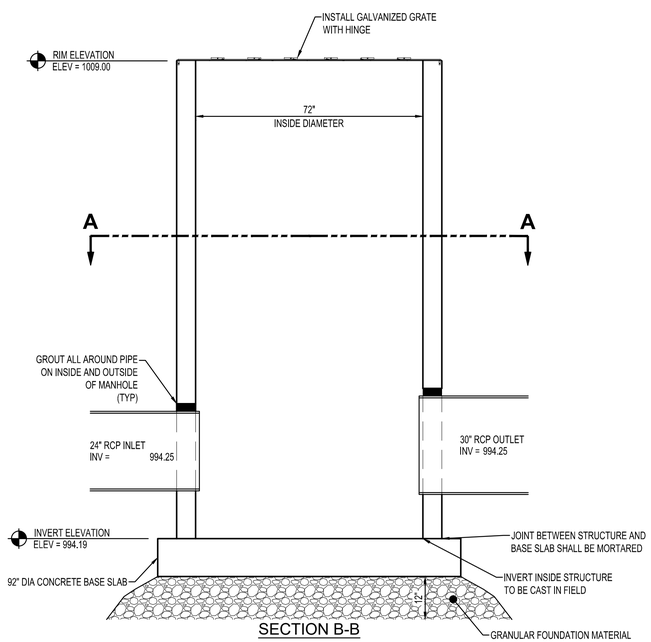
PLOT DATE: 5/18/2023 2:13 PM



PLAN
NTS



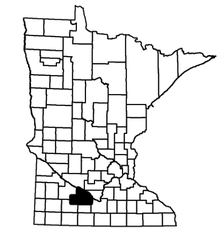
SECTION A-A



SECTION B-B

S-1 (OPTION 2)
RCP OUTLET STRUCTURE
NTS

ISG



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CLIENT PROJECT NO.	-

TITLE

DETAILS

SHEET

10 OF 19

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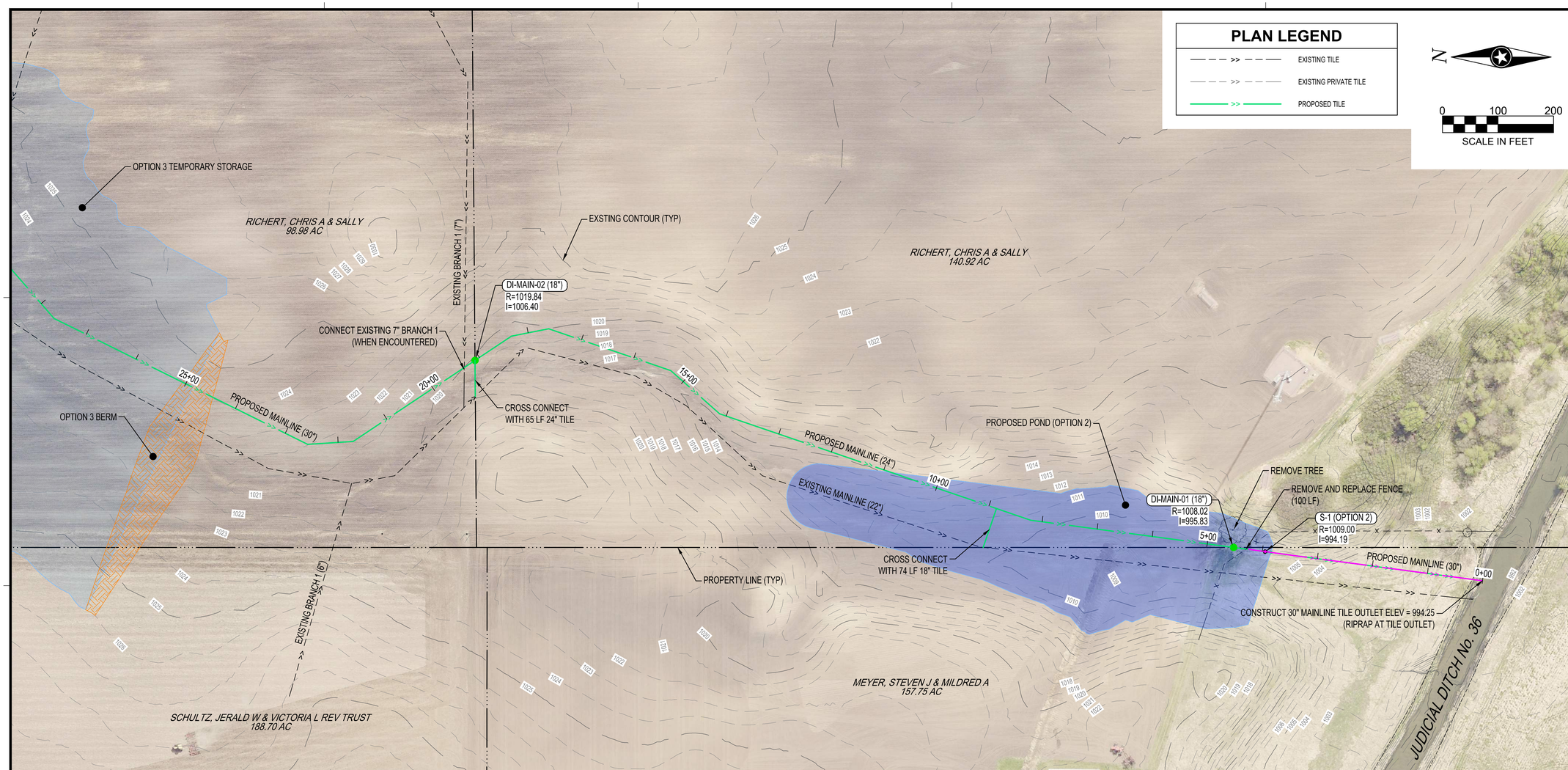

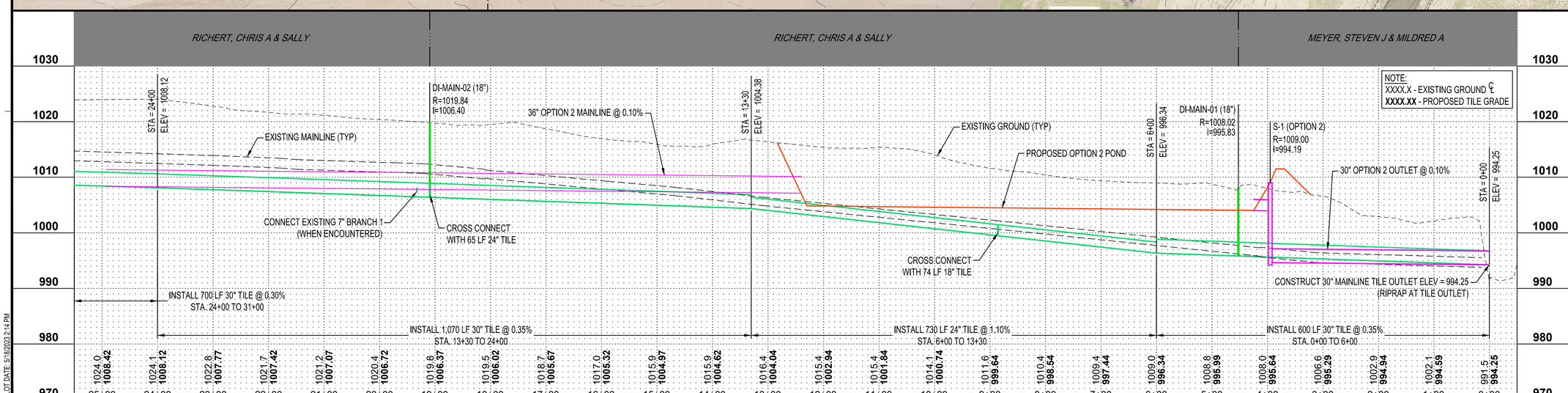

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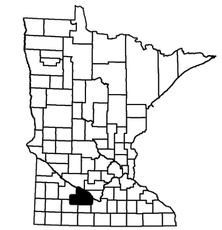

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

PLAN - PROFILE MAINLINE

SHEET

11 OF 19

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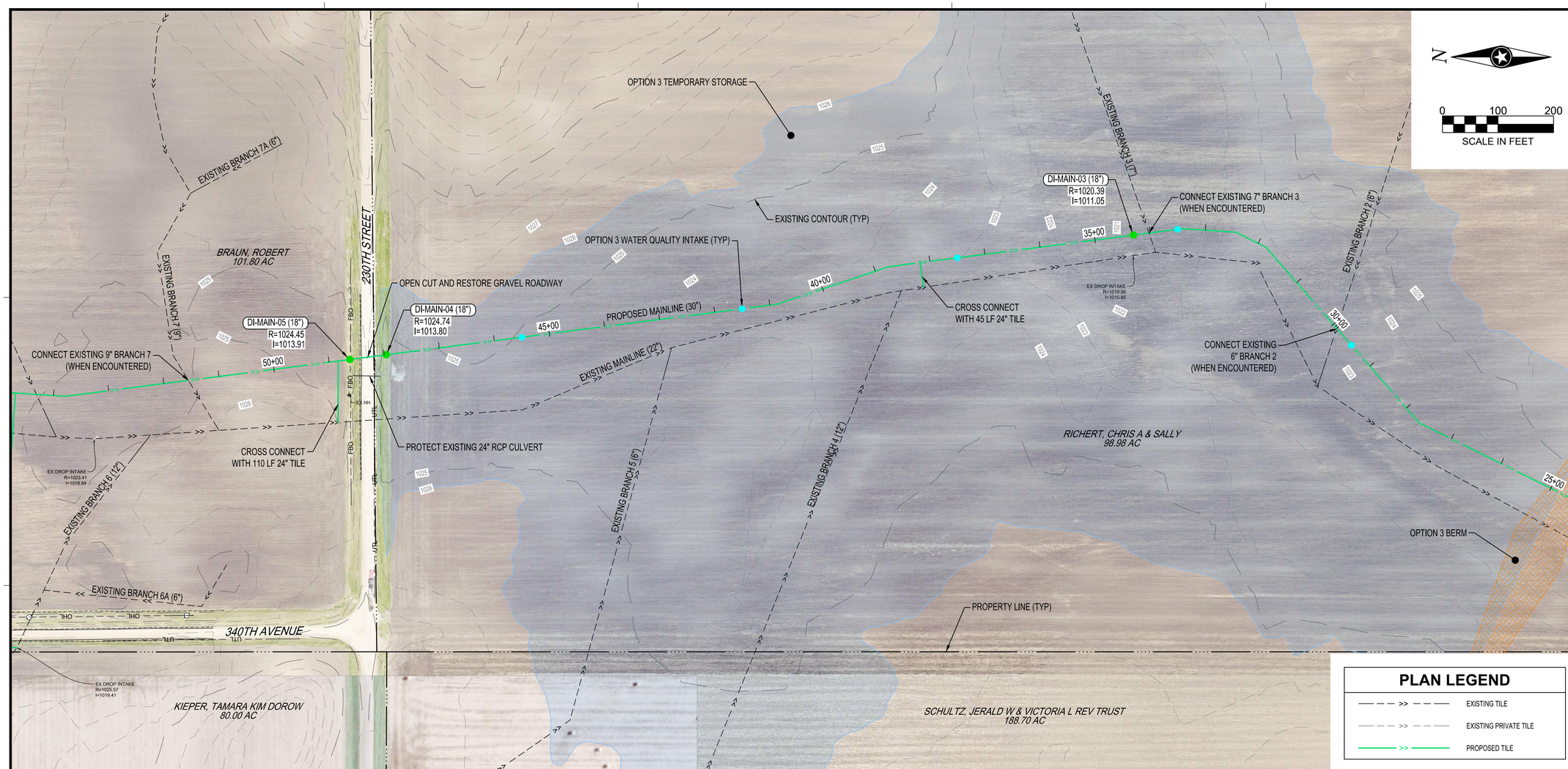

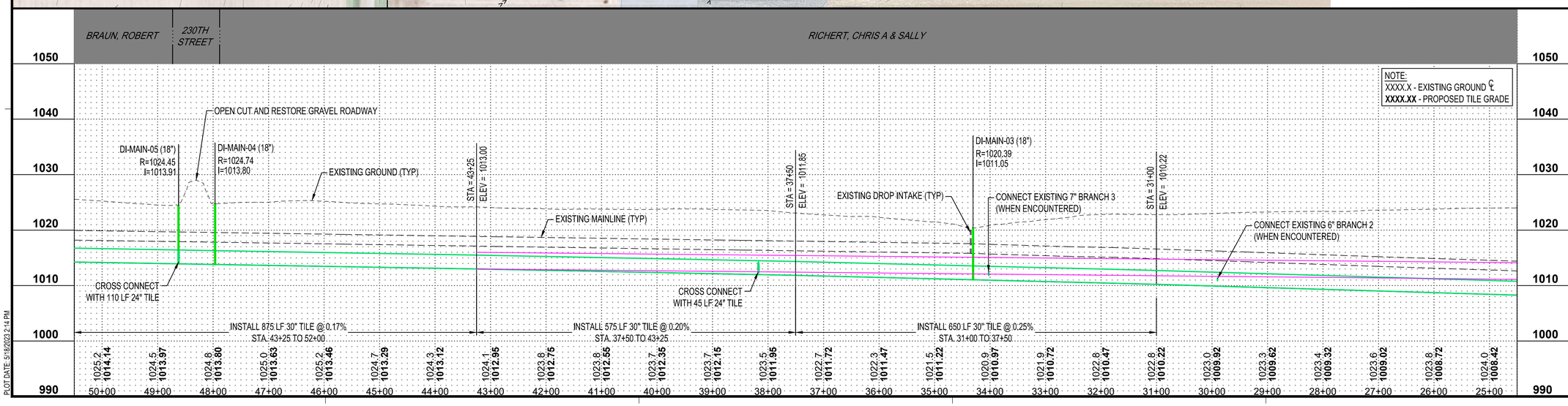

ISG

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

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DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

PLAN - PROFILE MAINLINE

SHEET

12 OF 19

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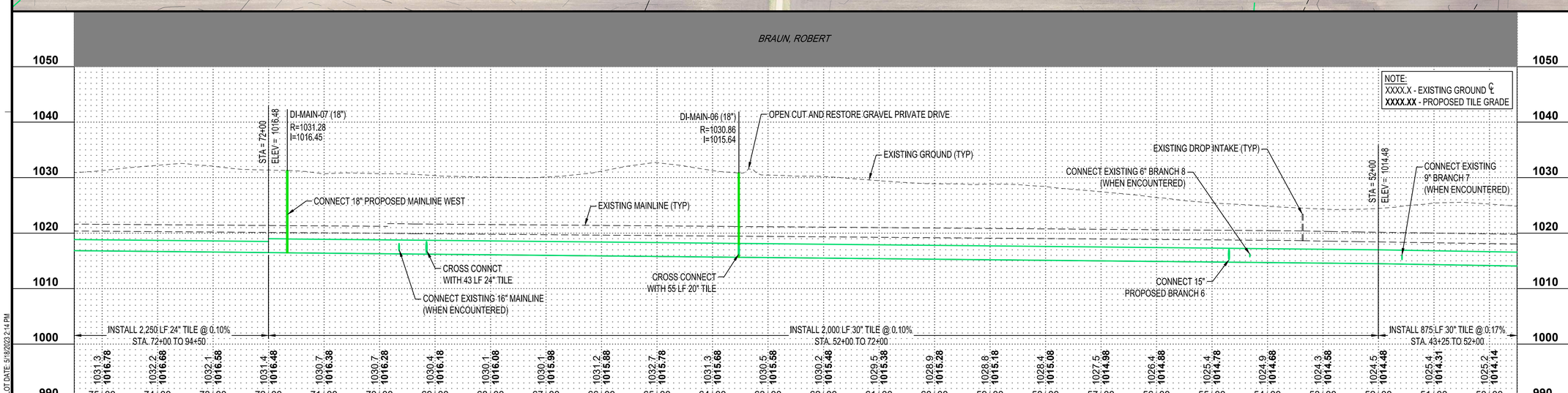

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PROJECT

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BROWN COUNTY MINNESOTA

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FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
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ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

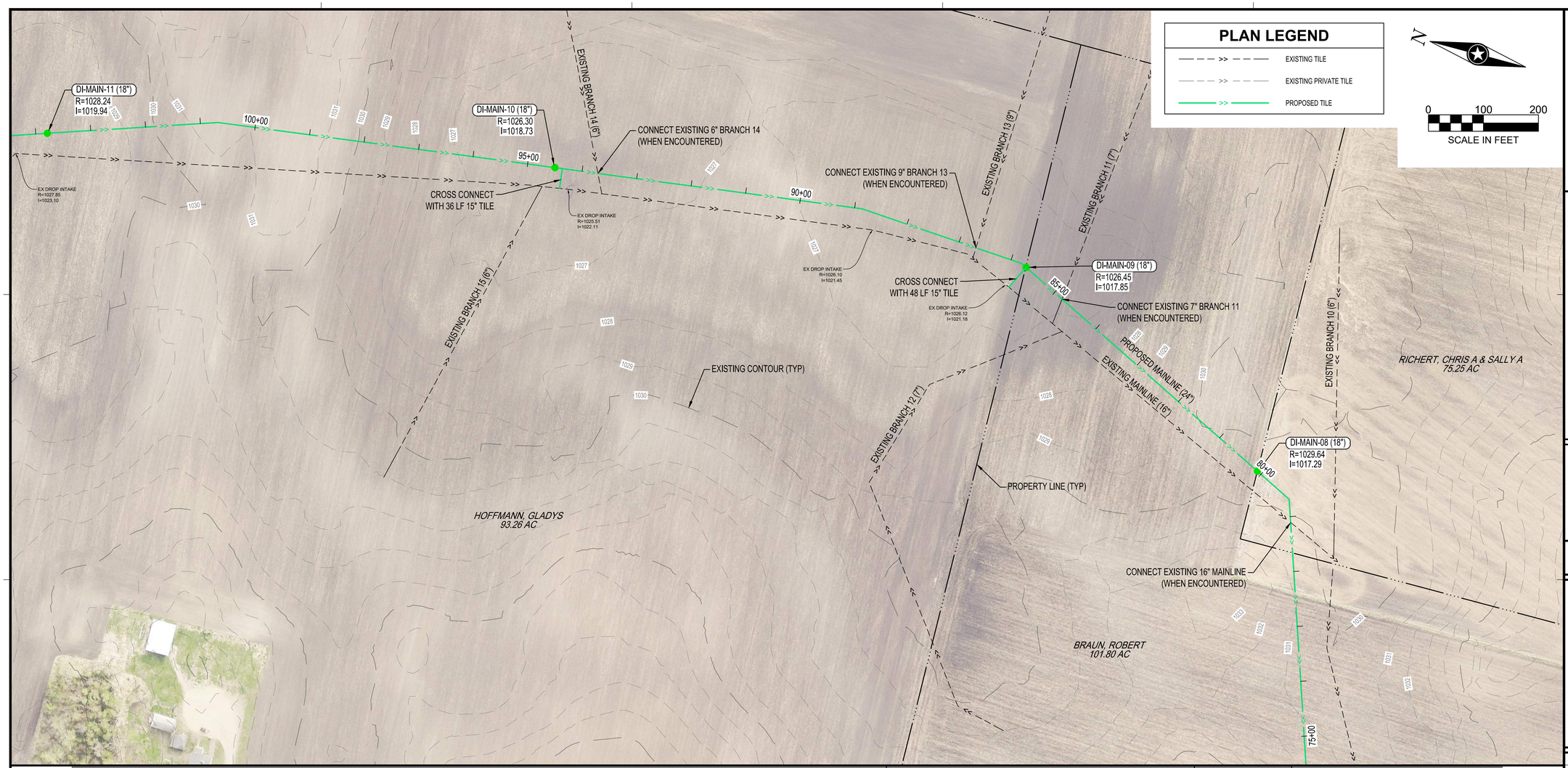
TITLE

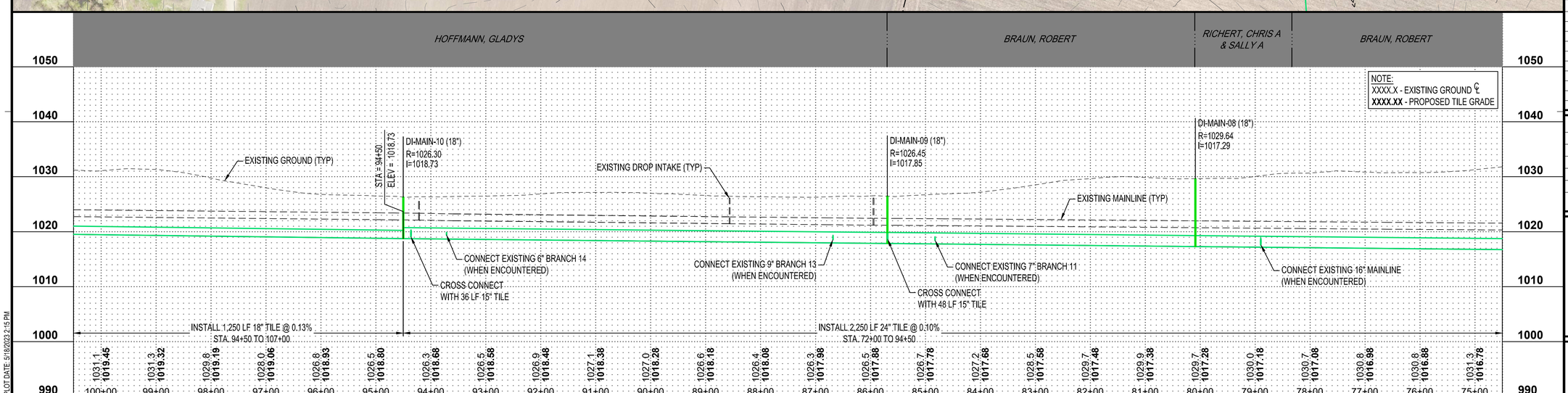
PLAN - PROFILE MAINLINE

SHEET

13 OF 19

PLOT DATE: 5/18/2023 2:14 PM





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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

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PROJECT NO.	22-23338
FILE NAME	23338 MAINLINE PROFILES
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

PLAN - PROFILE MAINLINE

SHEET

14 OF 19

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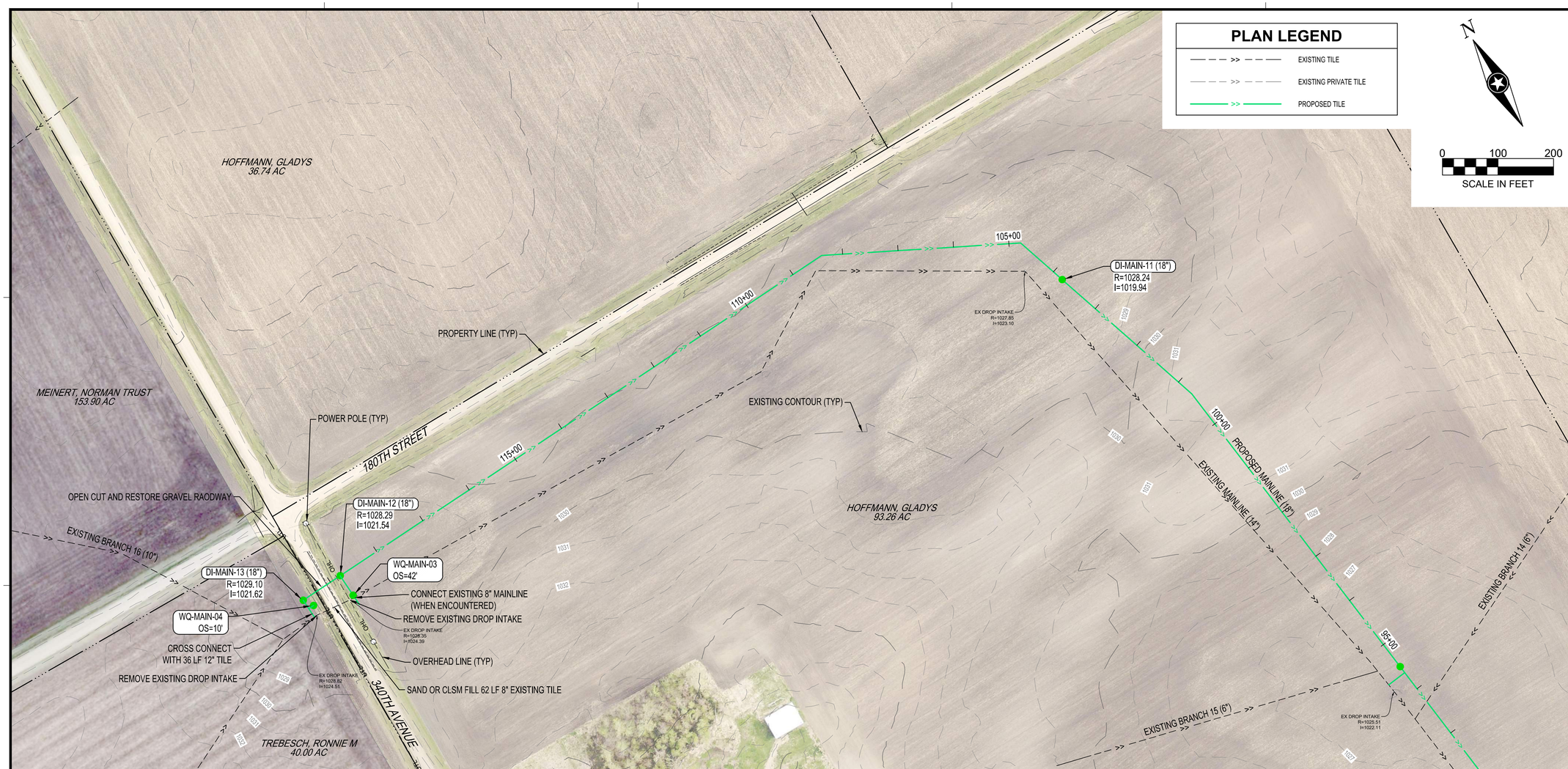

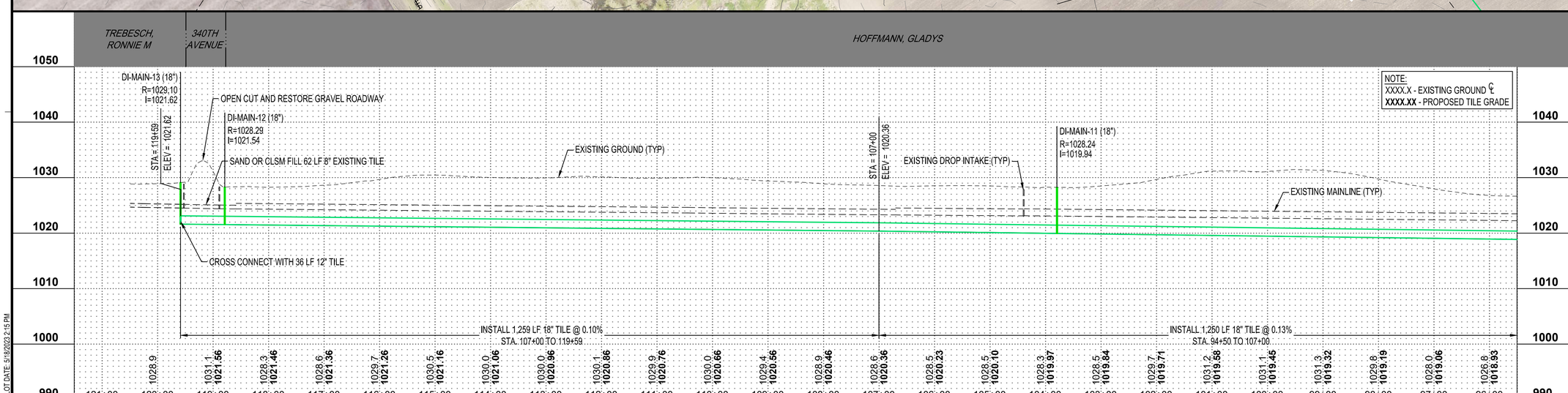

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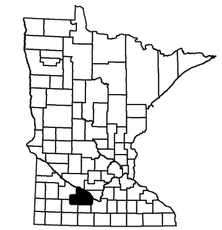

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DRAWN BY	KJH
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REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

PLAN - PROFILE MAINLINE

SHEET

15 OF 19

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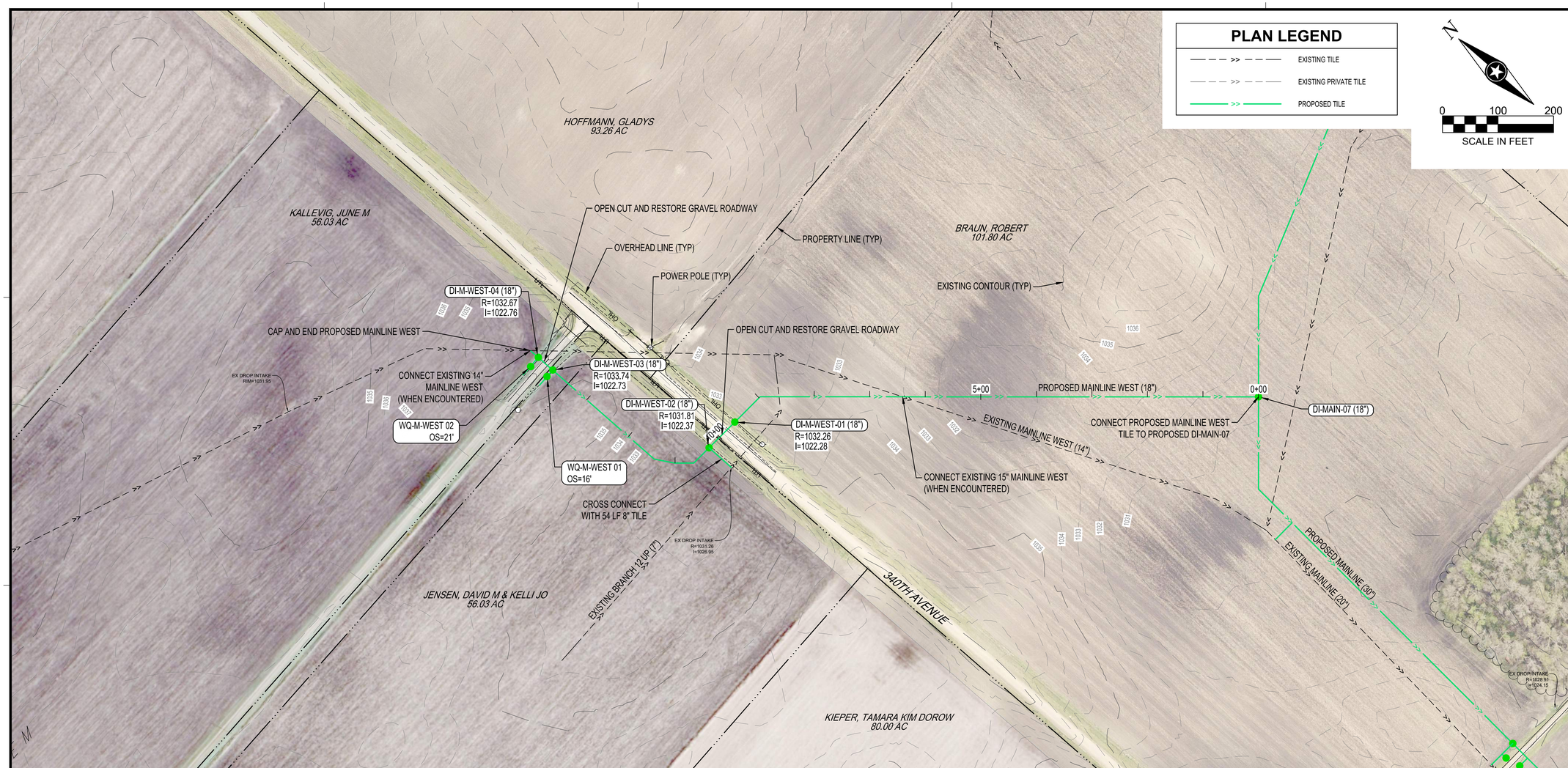

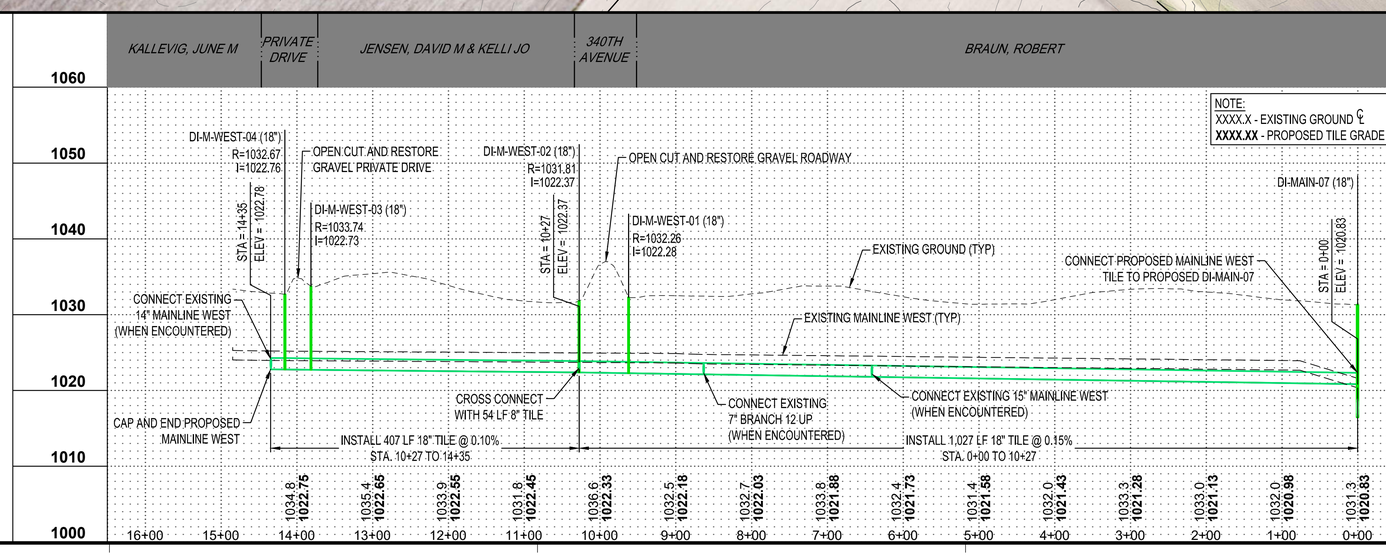

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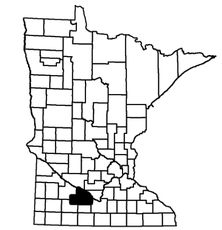

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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 MAINLINE WEST PROFILES
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

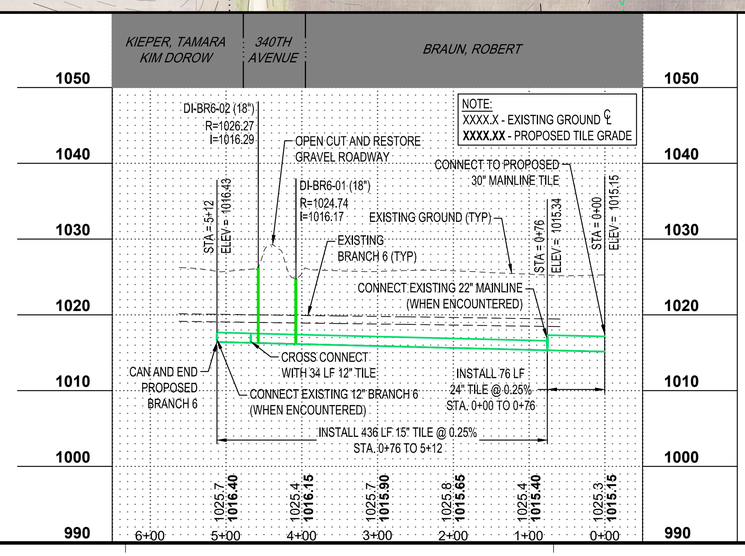
TITLE

PLAN - PROFILE MAINLINE WEST

SHEET

16 OF 19

PLOT DATE: 5/18/2023 2:17 PM



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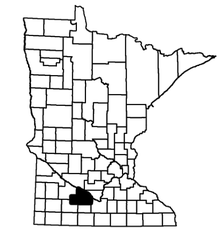

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PROJECT

BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 BRANCH 6 PROFILES
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

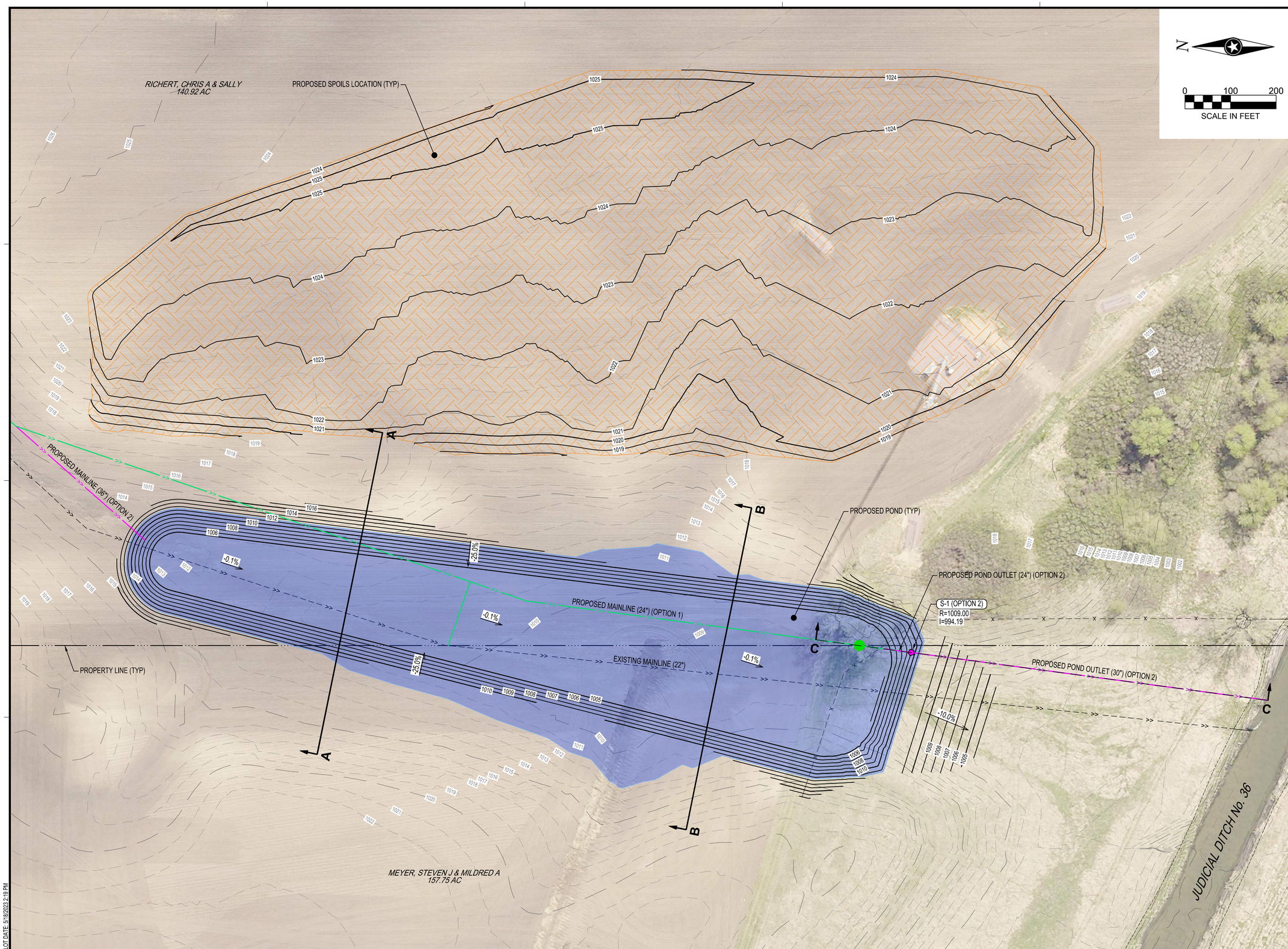
TITLE

PLAN - PROFILE BRANCH 6

SHEET

17 OF 19

PLOT DATE: 5/18/2023 2:18 PM



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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 POND
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

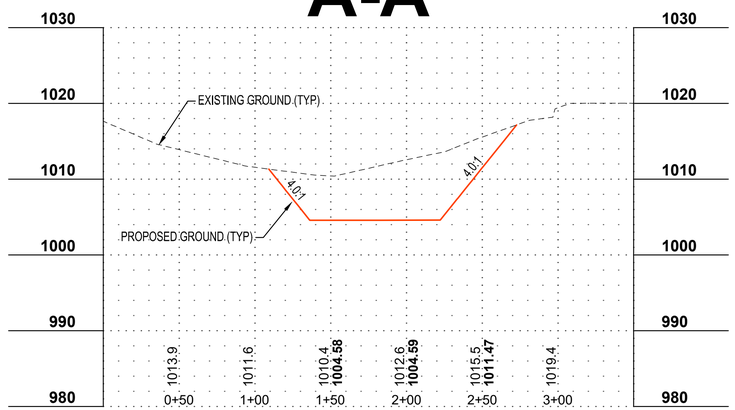
POND GRADING

SHEET

18 OF 19

PLOT DATE: 5/18/2023 3:19 PM

A-A



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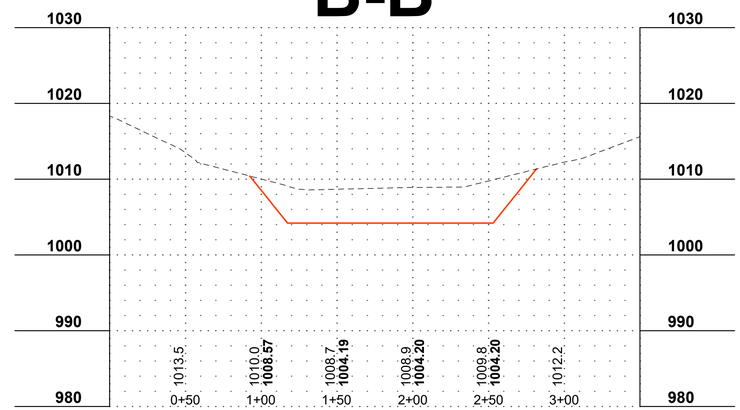

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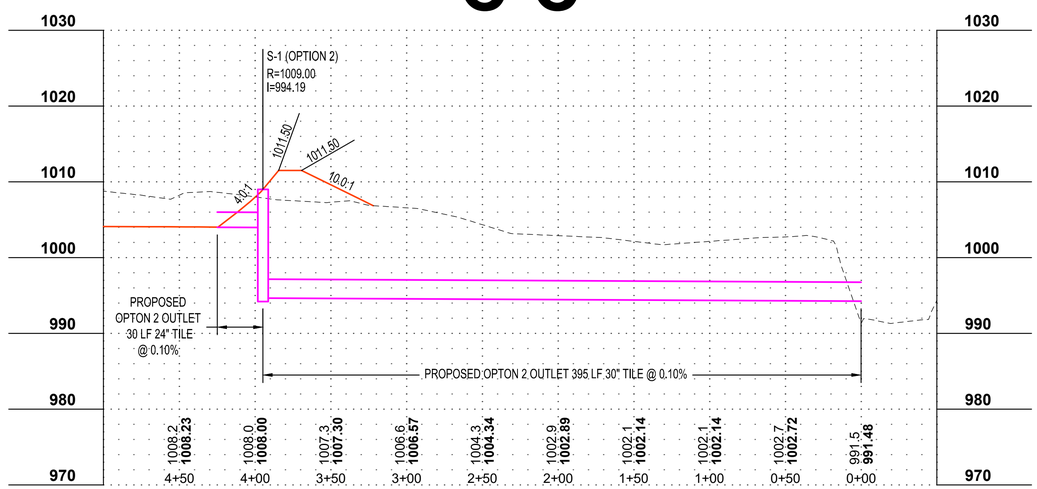

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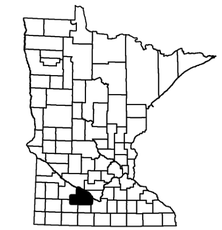

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BROWN & REDWOOD COUNTIES JUDICIAL DITCH No. 5

BROWN COUNTY MINNESOTA

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	22-23338
FILE NAME	23338 POND
DRAWN BY	KJH
DESIGNED BY	GJK
REVIEWED BY	MAO
ORIGINAL ISSUE DATE	--/--/--
CLIENT PROJECT NO.	-

TITLE

POND SECTIONS

SHEET

19 OF 19

PLOT DATE: 5/18/2023 2:19 PM

Appendix B: Petition and Order

PETITION FOR AN IMPROVEMENT OF
BROWN-REDWOOD COUNTY JUDICIAL DITCH NO. 5

TO THE BROWN-REDWOOD COUNTY JOINT BOARD OF COMMISSIONERS ACTING AS DRAINAGE AUTHORITY IN RELATION TO BROWN-REDWOOD COUNTY JUDICIAL DITCH NO. 5 ("DRAINAGE AUTHORITY")

The Petitioners herein respectfully represent:

WHEREAS, this Petition relates to the existing Mainline ("Mainline") and Mainline West ("Mainline West") subsurface drain tile of Brown-Redwood County Judicial Ditch No. 5 ("the existing system"); and

WHEREAS, said existing system is situated in Sections 19, 30, and 31 of Prairieville Township in Brown County and Sections 24, 25, 26, and 36 of Brookville Township in Redwood County; and

WHEREAS, the existing system has insufficient capacity or requires enlarging to furnish sufficient capacity or a better outlet; and

WHEREAS, it is the Petitioners' intention to improve the existing system by replacing and enlarging the existing Mainline and Mainline West subsurface tile in order to improve and increase the overall drainage capacity of the system, including public (i.e., Branches and Laterals) and private subsurface drainage tile ("proposed Improvement Project"); and

WHEREAS, the general course and terminus of the proposed Improvement Project for the existing system is depicted on Exhibit A which is attached hereto for reference; and

WHEREAS, Petitioner asserts that the proposed Improvement Project will benefit and be useful to the public and will promote the public health; and

WHEREAS, Petitioner requests that the engineer be specifically ordered to determine and offer alternative proposals for the consideration of the Drainage Authority which relate to the improvement of the drain capacity of existing Mainline and Mainline West, Branches, and Laterals that the engineer deems feasible, if any, including re-routing or any alternative outlets, if any; and

WHEREAS, pursuant to Minn. Stat. §103E.215, subd. 6, Petitioners requests that separable maintenance be used for those locations where the existing tiles are being replaced with new tile. Petitioners further request that the engineer be ordered to determine a proportionate share of life span based on the existing condition versus the designed capacity of the open ditch and tile; and

WHEREAS, Petitioners recommend that the separable maintenance to be paid by the entire system is that percentage of the in-place tile whose life span capacity has been used and that the improvement pay for that percentage of the tile, life span, or capacity that still is in repair. The Petitioners, as landowners, request that a percentage be paid as separable maintenance by the entire system, and a percentage be paid for by the improvement benefits as determined by the engineer and viewers; and

WHEREAS, the property area location, property identification, total affected (i.e., benefited) acres, and the names, and addresses of owners of the 40-acre tracts the proposed Improvement affects and passes over, as depicted on the attached Exhibit A, are as follows:

Tract 1 Owner/Address:	Norman Meinert Trust 2101 S. Meridian Rd. #232 Apache Junction, AZ 85120

Tract 2 Owner/Address:	Andy Fromm 24262 340th Ave. Sleepy Eye, MN 56085

Tract 2 Owner/Address:	Patricia J. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 3 Owner/Address:	OMITTED

Tract 4 Owner/Address:	OMITTED

Tract 5 Owner/Address:	Norman Meinert Trust 2101 S. Meridian Rd. #232 Apache Junction, AZ 85120

Tract 6 Owner/Address:	Norman Meinert Trust 2101 S. Meridian Rd. #232 Apache Junction, AZ 85120

Tract 7 Owner/Address:	Deanna M. Nelson 32491 250th St. SE Sleepy Eye, MN 56085

Tract 8 Owner/Address:	Patricia J. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 9 Owner/Address:	Ralph G. Petersen Trust 18338 Co. Hwy 2 Sleepy Eye, MN 56085

Tract 9 Owner/Address:	Dorothy Jacobson, et al. 1100 First Ave. Room #208 Sleepy Eye, MN 56085

Tract 10 Owner/Address:	Hazel Meinert, et al. c/o Corey Meinert 1437 Oak St. New Ulm, MN 56073-1575

Tract 11 Owner/Address:	Ronnie M. & Suzanne J. Trebesch 45714 180th St. Sleepy Eye, MN 56085

Tract 12* Owner/Address:	Hazel Meinert, et al. c/o Corey Meinert 1437 Oak St. New Ulm, MN 56073-1575

Tract 13* Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 14 Owner/Address:	Charles M. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 14* Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 15 Owner/Address:	OMITTED

Tract 16 Owner/Address:	OMITTED

Tract 17 Owner/Address:	June M. Kallevig 7212 E. Cottonwood St. #16 Springfield, MN 56087

Tract 18 Owner/Address:	June M. Kallevig 7212 E. Cottonwood St. #16 Springfield, MN 56087

Tract 18 Owner/Address:	Christopher R. Sellner 17632 Terrace Ave. Sleepy Eye, MN 56085

Tract in 18 Owner/Address:	David M. & Kelli Jo Jensen 30878 Co. Rd. 20 Comfrey, MN 56019

Tract 19* Owner/Address:	June M. Kallevig 7212 E. Cottonwood St. #16 Springfield, MN 56087

Tract 19*	
Owner/Address:	Christopher R. Sellner 17632 Terrace Ave. Sleepy Eye, MN 56085

Tract in 19*	
Owner/Address:	David M. & Kelli Jo Jensen 30878 Co. Rd. 20 Comfrey, MN 56019

Tract 20	
Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 20	
Owner/Address:	Robert Braun 23290 340th Ave. Sleepy Eye, MN 56085

Tract 21*	
Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 21	
Owner/Address:	Charles M. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 21*	
Owner/Address:	Robert Braun 23290 340th Ave. Sleepy Eye, MN 56085

Tract 22	
Owner/Address:	Patricia J. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 23 Owner/Address:	Patricia J. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 24 Owner/Address:	Philip H. & Jeanette Jensen 316 Riverside Dr. Springfield, MN 56087

Tract 25 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 25 Owner/Address:	Dale C. Jensen P.O. Box 2508 Livermore, CA 94551

Tract 26 Owner/Address:	Tamara Kieper 39049 Pleasant View Dr. Springfield, MN 56087

Tract 27* Owner/Address:	Robert Braun 23290 340th Ave. Sleepy Eye, MN 56085

Tract 28* Owner/Address:	Chris A. & Sally A. Richert 33623 230th St. Sleepy Eye, MN 56085

Tract 29 Owner/Address:	Patricia J. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 30 Owner/Address:	Philip H. & Jeanette Jensen 316 Riverside Dr. Springfield, MN 56087

Tract 31 Owner/Address:	Dale C. Jensen P.O. Box 2508 Livermore, CA 94551

Tract 31 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 32 Owner/Address:	Tamara Kieper 39049 Pleasant View Dr. Springfield, MN 56087

Tract 33* Owner/Address:	Robert Braun 23290 340th Ave. Sleepy Eye, MN 56085

Tract 34 Owner/Address:	Chris A. & Sally A. Richert 33623 230th St. Sleepy Eye, MN 56085

Tract 34 Owner/Address:	Faye C. Dietz 33604 230th St. Sleepy Eye, MN 56085

Tract 35 Owner/Address:	Patricia J. Nelson 29262 County Rd. 27 Sleepy Eye, MN 56085

Tract 36 Owner/Address:	Joseph & Judy Schwartz 22181 Co. Rd. 8 Sleepy Eye, MN 56085

Tract 37 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 38 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 38 Owner/Address:	Jason J. & Ann K. Schultz 45714 170th St. Sleepy Eye, MN 56085

Tract 39 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 40* Owner/Address:	Chris A. & Sally A. Richert 33623 230th St. Sleepy Eye, MN 56085

Tract 41 Owner/Address:	Chris A. & Sally A. Richert 33623 230th St. Sleepy Eye, MN 56085

Tract 42 Owner/Address:	OMITTED

Tract 43 Owner/Address:	Jon S. & Andrea Meyer 45379 160th St. Springfield, MN 56087

Tract 44 Owner/Address:	Jason J. & Ann K. Schultz 45714 170th St. Sleepy Eye, MN 56085

Tract 44 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 45 Owner/Address:	Jason J. & Ann K. Schultz 45714 170th St. Sleepy Eye, MN 56085

Tract 45 Owner/Address:	Jerald W. Schultz Revocable Trust, et al. c/o Jerald W. & Victoria L. Schultz 45293 170th St. Springfield, MN 56087

Tract 46* Owner/Address:	Chris A. & Sally A. Richert 33623 230th St. Sleepy Eye, MN 56085

Tract 47 Owner/Address:	Chris A. & Sally A. Richert 33623 230th St. Sleepy Eye, MN 56085

Tract 48* Owner/Address:	Jon S. & Andrea Meyer 45379 160th St. Springfield, MN 56087

Tract 49* Owner/Address:	Jon S. & Andrea Meyer 45379 160th St. Springfield, MN 56087

Tract 49* Owner/Address:	Joan M. Richert, et al. 211 Jackson Ave. N. Springfield, MN 56087

Tract 50 Owner/Address:	Joan M. Richert, et al. 211 Jackson Ave. N. Springfield, MN 56087

Tract 51* Owner/Address:	Jon S. & Andrea Meyer 45379 160th St. Springfield, MN 56087

Tract 52 Owner/Address:	Joan M. Richert, et al. 211 Jackson Ave. N. Springfield, MN 56087

WHEREAS, this Petition is signed by: (1) at least 26% of the owners of the property affected by the proposed improvements; (2) at least 26% of the owners of the property that the proposed improvement passes over; (3) the owners of at least 26% of the property area affected by the proposed improvement; or (4) the owners of at least 26% of the property area that the proposed improvement passes over; and

WHEREAS, Petitioners provide herewith a corporate surety bond in the face amount of $50,000 payable to the Drainage Authority of Brown-Redwood County Judicial Ditch No. 5, acting as the Drainage Authority for Brown-Redwood County Judicial Ditch No. 5, said bond conditioned to pay the costs incurred if the proceeding are dismissed or a contract is not awarded to allow the costs incurred to exceed the amount of the bond and that they will cause additional bond to be filed if it appears that the costs exceed the amount of the bond; and

WHEREAS, Petitioners have been informed and understands that they may not withdraw as a Petitioner at any time after this Petition is accepted by the Drainage Authority. Petitioners further acknowledge that if the proposed Improvement Project is dismissed or a contract is not awarded that it is liable to the Drainage Authority for all of the costs incurred including engineering, legal and miscellaneous fees and expenses in relation to this Petition as outlined under Minnesota Statutes 103E; and

WHEREAS, this Petition may be signed in counterparts.

NOW THEREFORE, we, as Petitioners, ask the Brown County Auditor for the formation and appointment of members of the Brown and Redwood Joint County Board of Commissioners, to act together as the drainage authority to oversee this improvement project proceeding, and, after formation, to present this Petition to the drainage authority for acceptance (after examination by its legal counsel), and, to further appoint Chuck Brandel, I+S Group, or, in the alternative, another engineer skilled in drainage matters to examine the proposed work.

Bruce E. Sellers
Attorney for Petitioners
Wendland Sellers Law Office
825 East Second St.
P.O. Box 247
Blue Earth, MN 56013
507-526-2196

This petition is prepared by:
Bruce E. Sellers, Attorney at Law
Wendland Sellers Law Office
825 East Second St.
P.O. Box 247
Blue Earth, MN 56013
507-526-2196

SIGNATURE PAGE FOR PROPOSED IMPROVEMENT PROJECT TO BROWN-REDWOOD COUNTY JUDICIAL DITCH NO. 5

Printed or Typed Name of Petitioner(s): Jason J. & Ann K. Schultz

Ownership (check one)

X Individual or Married.

_____ Partner. Name of Partnership _____

_____ Co-owner. How many ____

_____ Business Organization. Type of Business _____

_____ Trust. Name of Trust _____

How many trustees _____

_____ Other. _____

TRACT DESCRPTION	ACRES "PASSED" OVER	ACRES AFFECTED
TRACT 38	0.00	1.06
TRACT 44	0.00	2.67
TRACT 45	0.00	3.21

ACKNOWLEDGMENT: I understand and acknowledge that any person that knowingly signs a petition more than once, signs a name other than his or her own, signs when not qualified, or sets opposite his or her signature on a petition, a date other than the actual date of the signature was affixed, is violating the provisions of Minnesota law. Therefore, by signing this petition, I acknowledge that I have read the foregoing petition and understand the terms and requirements therein, and I further represent that I am a record property owner of real property of the referenced lot indicated above which lies within the proposed Brown-Redwood County Judicial Ditch No. 5 public drainage system, that I am qualified to sign said petition, that I have submitted only one signature page in support of this petition and on the date indicated above, and that I authorize this signature page to be incorporated in said petition.

Owner 9-24-2021

Signature Title Date

Ann Schultz owner 9-24-2021

Signature Title Date

SIGNATURE PAGE FOR PROPOSED IMPROVEMENT PROJECT TO BROWN-REDWOOD COUNTY JUDICIAL DITCH NO. 5

Printed or Typed Name of Petitioner(s): Jerald W. Schultz Revocable Trust and Victoria L. Schultz Revocable Trusts

Ownership (check one)

_____ Individual or Married.

_____ Partner. Name of Partnership _____

_____ Co-owner. How many ____

_____ Business Organization. Type of Business Schultz

✓ Trust. Name of Trust Jerald and Victoria Trust

How many trustees 2

_____ Other. _____

TRACT DESCRPTION	ACRES "PASSED" OVER	ACRES AFFECTED
TRACT 13	37.07	37.22
TRACT 14	27.13	26.98
TRACT 20	0.00	22.56
TRACT 21	16.23	16.23
TRACT 25	0.00	33.58
TRACT 31	0.00	32.32
TRACT 37	0.00	12.89
TRACT 38	0.00	40.05
TRACT 39	0.00	41.13

TRACT 44	0.00	7.60
TRACT 45	0.00	27.94

ACKNOWLEDGMENT: I understand and acknowledge that any person that knowingly signs a petition more than once, signs a name other than his or her own, signs when not qualified, or sets opposite his or her signature on a petition, a date other than the actual date of the signature was affixed, is violating the provisions of Minnesota law. Therefore, by signing this petition, I acknowledge that I have read the foregoing petition and understand the terms and requirements therein, and I further represent that I am a record property owner of real property of the referenced lot indicated above which lies within the proposed Brown-Redwood County Judicial Ditch No. 5 public drainage system, that I am qualified to sign said petition, that I have submitted only one signature page in support of this petition and on the date indicated above, and that I authorize this signature page to be incorporated in said petition.

Gerald W Schultz — 12-15-21

Signature — Title — Date

Valerie L. Schultz — 12-15-21

Signature — Title — Date

Signature — Title — Date

Signature — Title — Date

SIGNATURE PAGE FOR PROPOSED IMPROVEMENT PROJECT TO BROWN-REDWOOD COUNTY JUDICIAL DITCH NO. 5

Printed or Typed Name of Petitioner(s): Ralph G. Petersen Trust

Ownership (check one)

_X_ Individual or Married.

_____ Partner. Name of Partnership _____

_____ Co-owner. How many ____

_____ Business Organization. Type of Business _____

_____ Trust. Name of Trust _____

How many trustees _____

_____ Other. _____

TRACT DESCRPTION	ACRES "PASSED" OVER	ACRES AFFECTED
TRACT 9	0.00	26.78

ACKNOWLEDGMENT: I understand and acknowledge that any person that knowingly signs a petition more than once, signs a name other than his or her own, signs when not qualified, or sets opposite his or her signature on a petition, a date other than the actual date of the signature was affixed, is violating the provisions of Minnesota law. Therefore, by signing this petition, I acknowledge that I have read the foregoing petition and understand the terms and requirements therein, and I further represent that I am a record property owner of real property of the referenced lot indicated above which lies within the proposed Brown-Redwood County Judicial Ditch No. 5 public drainage system, that I am qualified to sign said petition, that I have submitted only one signature page in support of this petition and on the date indicated above, and that I authorize this signature page to be incorporated in said petition.

Edna Petersen owner 4-4-2022

Signature Title Date

_____ _____

Signature Title Date

SIGNATURE PAGE FOR PROPOSED IMPROVEMENT PROJECT TO BROWN-REDWOOD COUNTY JUDICIAL DITCH NO. 5

Printed or Typed Name of Petitioner(s): Ronnie M. & Suzanne J. Trebesch

Ownership (check one)

X Individual or Married

_____ Partner. Name of Partnership _____

_____ Co-owner. How many ____

_____ Business Organization. Type of Business _____

_____ Trust. Name of Trust _____

How many trustees _____

_____ Other. _____

TRACT DESCRPTION	ACRES "PASSED" OVER	ACRES AFFECTED
TRACT 11	0.00	40.64

ACKNOWLEDGMENT: I understand and acknowledge that any person that knowingly signs a petition more than once, signs a name other than his or her own, signs when not qualified, or sets opposite his or her signature on a petition, a date other than the actual date of the signature was affixed, is violating the provisions of Minnesota law. Therefore, by signing this petition, I acknowledge that I have read the foregoing petition and understand the terms and requirements therein, and I further represent that I am a record property owner of real property of the referenced lot indicated above which lies within the proposed Brown-Redwood County Judicial Ditch No. 5 public drainage system, that I am qualified to sign said petition, that I have submitted only one signature page in support of this petition and on the date indicated above, and that I authorize this signature page to be incorporated in said petition.

Signature	Title	Date
[signature]	OWNER	8-30-21
[signature]	OWNER	8-30-21

STATE OF MINNESOTA
REDWOOD AND BROWN JOINT COUNTIES JOINT DRAINAGE AUTHORITY
PUBLIC DRAINAGE AUTHORITY FOR THE IMPROVEMENT OF REDWOOD AND BROWN COUNTIES
JUDICIAL DITCH 5

The matter of the Petition for the improvement of Redwood and Brown Counties Judicial Ditch 5	**Preliminary Findings and Order**

The Joint Drainage Authority of Redwood and Brown Counties Judicial Ditch 5, at a special meeting on September 6, 2022, considered the petition for the improvement of Judicial Ditch 5. Upon review of the petition for improvement and the accompanying bond, Commissioner Groebner moved, seconded by Commissioner Forkrud, for adoption of the following:

Findings:

1. The petition for the improvement of Redwood and Brown Counties Judicial Ditch 5 (JD 5) has been filed with the Redwood and Brown County Auditor-Treasurers pursuant to statutes section 103E.215.

2. The Joint Drainage Authority, by its attorney, verified the signatures and ownership interests of the petitioners and finds that the petitioners are at least 26 percent of the owners of the property area affected by the proposed improvement.

3. The petition properly designated the drainage system proposed to be improved by number or another description that identifies the drainage system.

4. The petition alleges that the drainage system has insufficient capacity or needs enlarging to furnish sufficient capacity.

5. The petition describes the improvement, including the names and addresses of owners of the 40-acre tracts or government lots and property that the improvement passes over.

6. The petition alleges that the proposed improvement is necessary and will be of public utility and promote the public health.

7. The petition contains an agreement by the petitioners that they will pay all costs and expenses that may be incurred if the improvement proceedings are dismissed.

8. The petition alleges that the existing drainage system needs repair and further petitions the Board to consider separable maintenance when determining the allocation of costs of the improvement. Should the portion of the petition seeking improvement be withdrawn by the petitioners, the Board may still consider the petition as one for repair pursuant to statutes section 103E.715.

9. The petition was accompanied by a bond from the petitioners of $50,000 in the form of a commercial bond payable to the Joint Drainage Authority. The bond is adequate surety and has been reviewed and approved by Board's attorney. The bond is conditioned to pay the costs incurred if the proceedings are dismissed or a contract is not awarded to construct the drainage system proposed in the petition.

10. The costs incurred before the proposed drainage project is established may not exceed the amount of the petitioners' bond. A claim for expenses greater than the amount of the bond may not be paid unless an additional bond is filed. If the Drainage Authority determines that the cost of the proceeding will be greater than the petitioners' bond before the proposed drainage project is established, the Drainage Authority shall require an additional bond to cover all costs to be filed within a prescribed time. The proceeding will be stopped until the additional bond prescribed by the Drainage Authority is filed. If the additional bond is not filed within the time prescribed, the proceeding will be dismissed.

11. The Joint Drainage Authority's attorney has reviewed the petition and bond and has determined they meet the requirement of these proceedings.

Based on the foregoing findings, the Joint Drainage Authority Board adopts the following:

Order:

a. The Board appoints the engineering firm of ISG, Inc., and Chuck Brandel, P.E., to make a preliminary survey and file a report.

b. The engineer shall serve as the engineer for the drainage project throughout the proceedings and construction unless otherwise ordered.

c. The engineer shall file an oath to faithfully perform the assigned duties in the best manner possible and file a bond with the Board. The Board's attorney is directed to prepare a draft of the bond and oath upon execution of this order and deliver the same, along with a copy of this order, to the engineer for execution.

d. Upon execution and return of his bond and oath, the engineer shall proceed promptly with the preparation of a preliminary survey report.

e. The engineer shall include in his preliminary survey and report an investigation of the scope of improvement to include consideration of alternative improvement

configurations and the impact of regulatory permitting requirements related to wetlands or other environmental factors on the possible alternatives.

f. The engineer shall include in his preliminary survey and report an investigation of the current condition of the portion of the drainage system proposed to be improved and provide a recommendation on the propriety of a separable maintenance allocation of project costs.

g. The engineer is directed to initial early coordination with the Department of Natural Resources and other regulatory and funding agencies as contemplated by statutes section 103E.015.

After discussion, the Chairperson called the question. The question was on the adoption of the foregoing findings and order, and there were, 5 yeas, 0 nays, 0 absent, and 0 abstentions as follows:

	Yea	Nay	Absent	Abstain
Wakefield	☒	☐	☐	☐
Groebner	☒	☐	☐	☐
Forkrud	☒	☐	☐	☐
Veerkamp	☒	☐	☐	☐
Simonsen	☒	☐	☐	☐

Rick Wakefield
_____, Chairperson

Dated: September 6, 2022

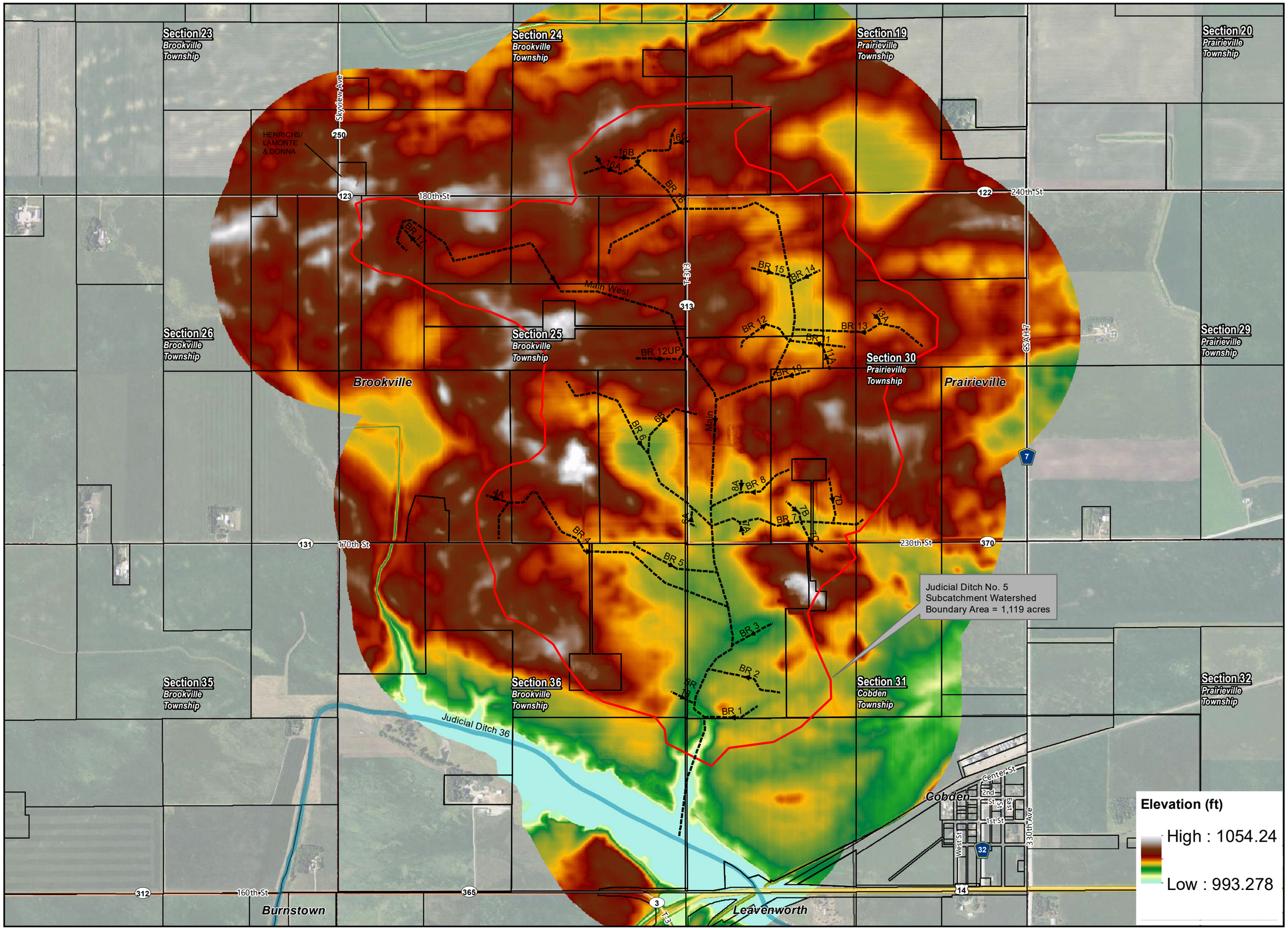
* * * * * * * * * * *

I, Scott Wold, Environmental Director of Redwood County, do hereby certify that I have compared the above resolution with the original thereof as the same appears of record and on file with the County and find the same to be a true and correct transcript thereof.

IN TESTIMONY WHEREOF, I hereunto set my hand this 6th day of September 2022.

_____
Scott Wold, Environmental Director

Appendix C: Maps



ISG

Elevation Map

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Existing Tile
- JD 5 Watershed
- JD 5 Parcels
- JD 36

PN: 19-23338

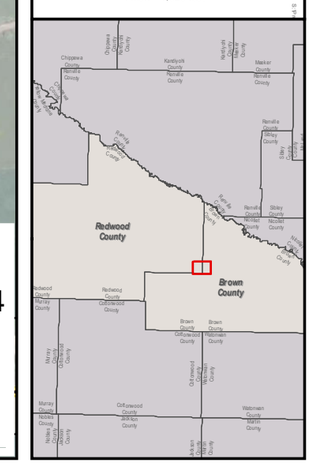
Source:

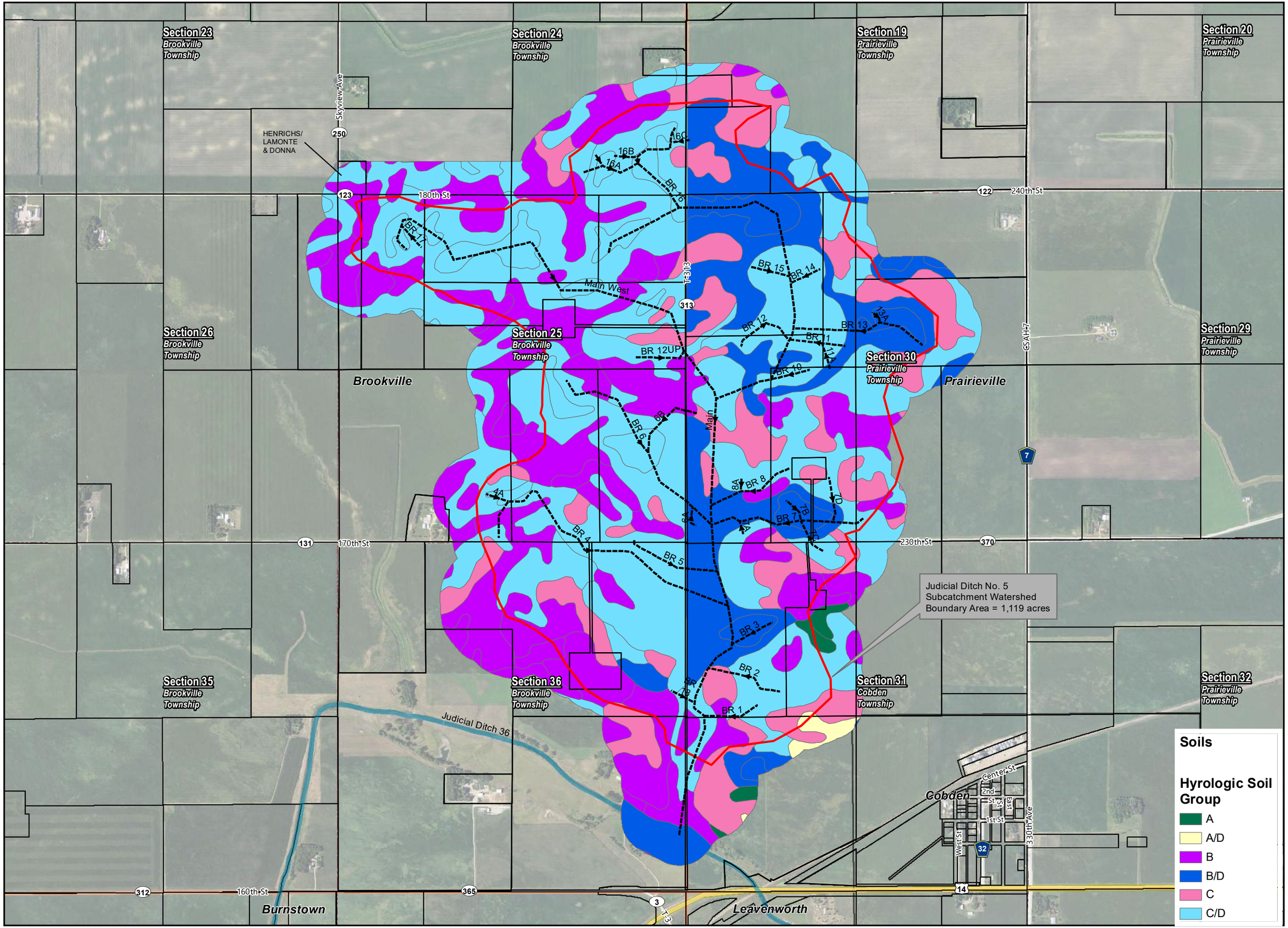
Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (Brown and Redwood Counties, 12/16/2016)
Parcels (Brown and Redwood Counties, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 330 660 1,320 Feet

1 inch = 1,320 feet





ISG

Hydrologic Soil Groups Map

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Existing Tile
- JD 5 Watershed
- JD 5 Parcels
- JD 36

PN: 19-23338

Source:

Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (Brown and Redwood Counties, 12/16/2016)
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N W E S

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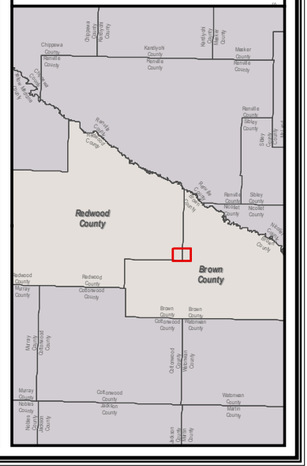
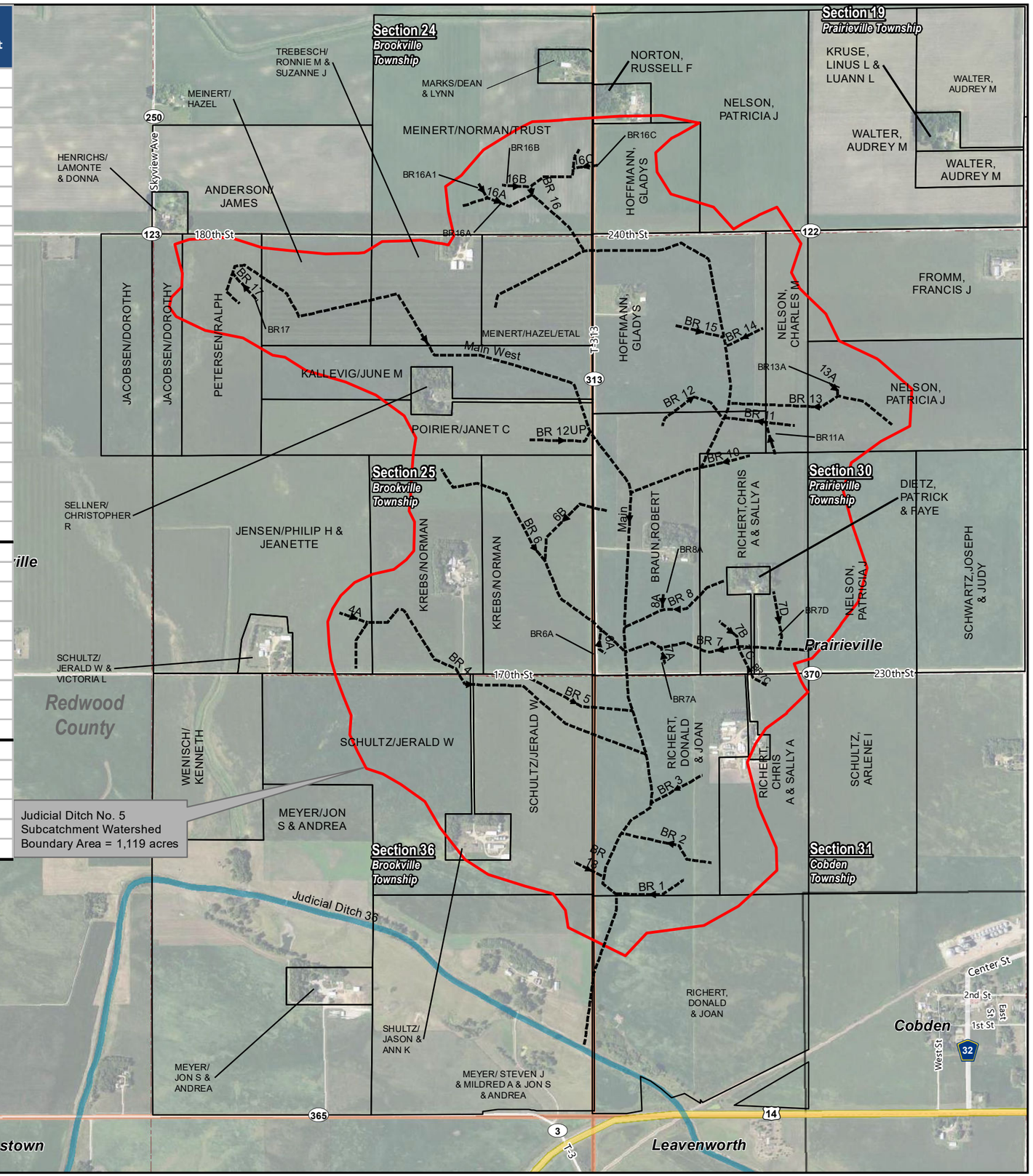
1 inch = 1,320 feet



Area	Start Location	End Location	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	0+00	3+00	24	0.30%	1140.2	0.26
	3+00	4+00	24	1.00%	1136.6	0.48
	4+00	18+00	18	1.00%	1131.4	0.22
	18+00	19+00	24	1.00%	1089.8	0.50
	19+00	21+00	24	0.15%	1089.8	0.19
	21+00	26+00	24	0.15%	1070.7	0.20
	26+00	32+50	24	0.15%	1013.5	0.21
	32+50	34+00	24	0.15%	974.0	0.21
	34+00	38+25	24	0.10%	974.0	0.18
	38+25	43+50	24	0.10%	812.5	0.21
	43+50	47+00	24	0.10%	783.8	0.22
	47+00	50+00	24	0.10%	593.3	0.29
	50+00	59+00	24	0.10%	550.2	0.31
	59+00	66+00	24	0.10%	542.6	0.31
	66+00	74+80	18	0.10%	344.3	0.23
	74+80	80+90	18	0.10%	313.4	0.25
	80+90	82+00	18	0.10%	287.5	0.28
	82+00	88+00	15	0.10%	215.2	0.23
	88+00	89+00	15	0.10%	206.2	0.24
	89+00	102+00	15	0.10%	187.9	0.26
	102+00	113+00	12	0.10%	129.5	0.21
	113+00	114+00	12	0.10%	108.3	0.25
	114+00	123+00	8	0.18%	32.8	0.37
	123+00	127+00	6	0.18%	5.7	1.00
Main West	0+00	1+00	15	2.60%	191.6	1.30
	1+00	9+50	15	0.10%	191.6	0.25
	9+50	11+00	15	0.10%	186.3	0.26
	11+00	13+50	15	0.10%	179.3	0.27
	13+50	31+00	15	0.10%	150.4	0.32
	31+00	42+00	12	0.10%	102.0	0.26
	42+00	54+00	10	0.10%	69.8	0.24
	54+00	65+00	8	0.14%	43.7	0.25
	65+00	69+00	6	0.14%	13.4	0.38
	69+00	71+00	6	1.20%	13.4	1.10
Br 6	0+00	4+00	12	0.12%	129.7	0.23
	4+00	14+00	12	0.12%	128.1	0.23
	14+00	18+00	10	0.20%	103.4	0.23
	18+00	25+50	8	0.20%	69.6	0.19
	25+50	29+00	8	0.20%	48.1	0.27
	29+00	31+50	6	0.20%	25.7	0.23



ISG

Existing System

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Existing Tile
- JD 5 Watershed
- JD 5 Parcels
- JD 36

PN: 19-23338

Source:

Orthophotograph (MnGeo WMS, 2015)
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Lakes (MN DNR, July, 2008)
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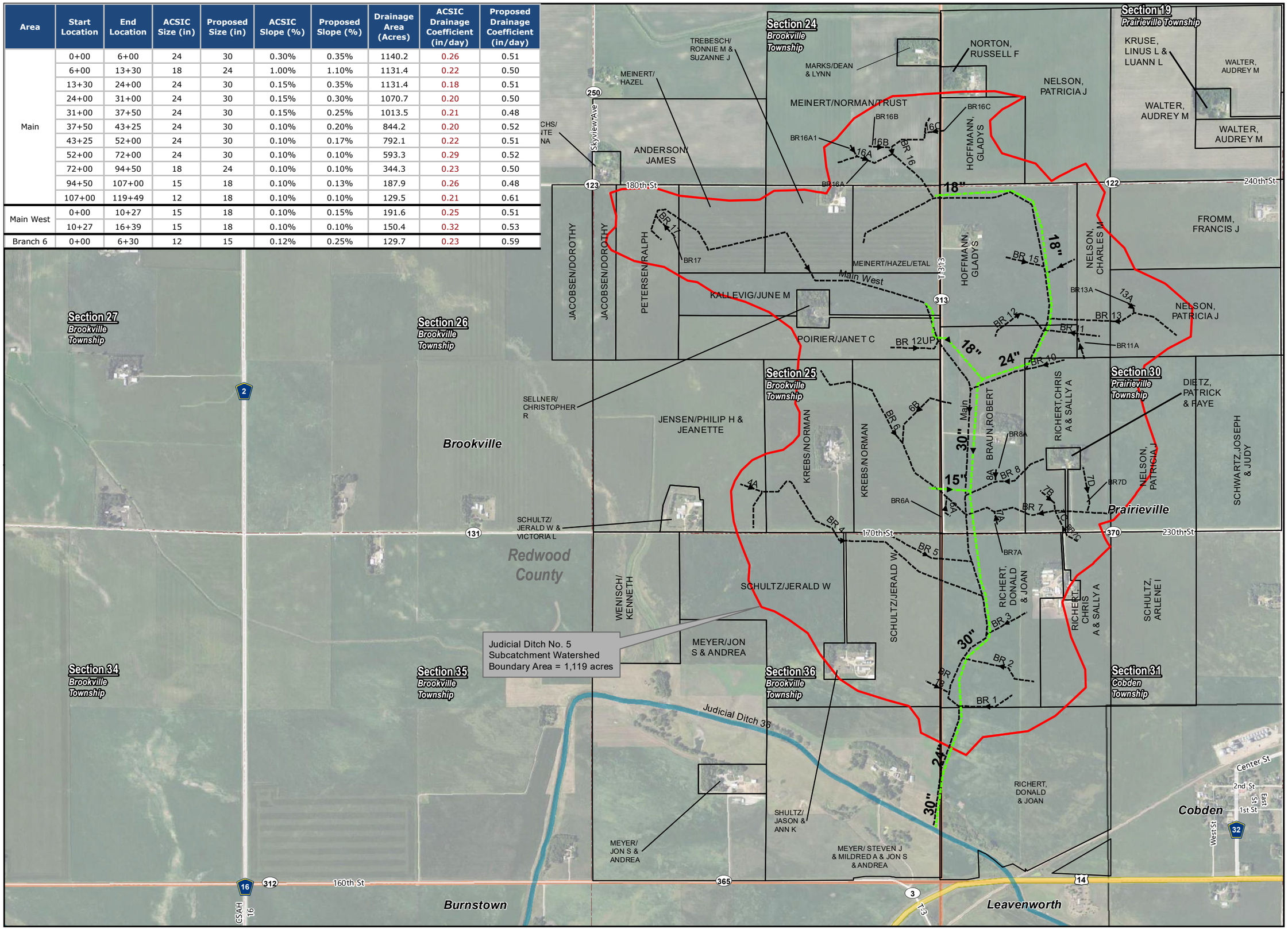
PLSS (MnGeo/USGS)

N W E S

0 330 660 1,320 Feet

1 inch = 1,320 feet

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	0+00	6+00	24	30	0.30%	0.35%	1140.2	0.26	0.51
	6+00	13+30	18	24	1.00%	1.10%	1131.4	0.22	0.50
	13+30	24+00	24	30	0.15%	0.35%	1131.4	0.18	0.51
	24+00	31+00	24	30	0.15%	0.30%	1070.7	0.20	0.50
	31+00	37+50	24	30	0.15%	0.25%	1013.5	0.21	0.48
	37+50	43+25	24	30	0.10%	0.20%	844.2	0.20	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	593.3	0.29	0.52
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59



Proposed Improvement Option 1

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Proposed Tile
- Existing Tile
- JD 5 Watershed
- JD 5 Parcels
- JD 36

PN: 19-23338

Source:

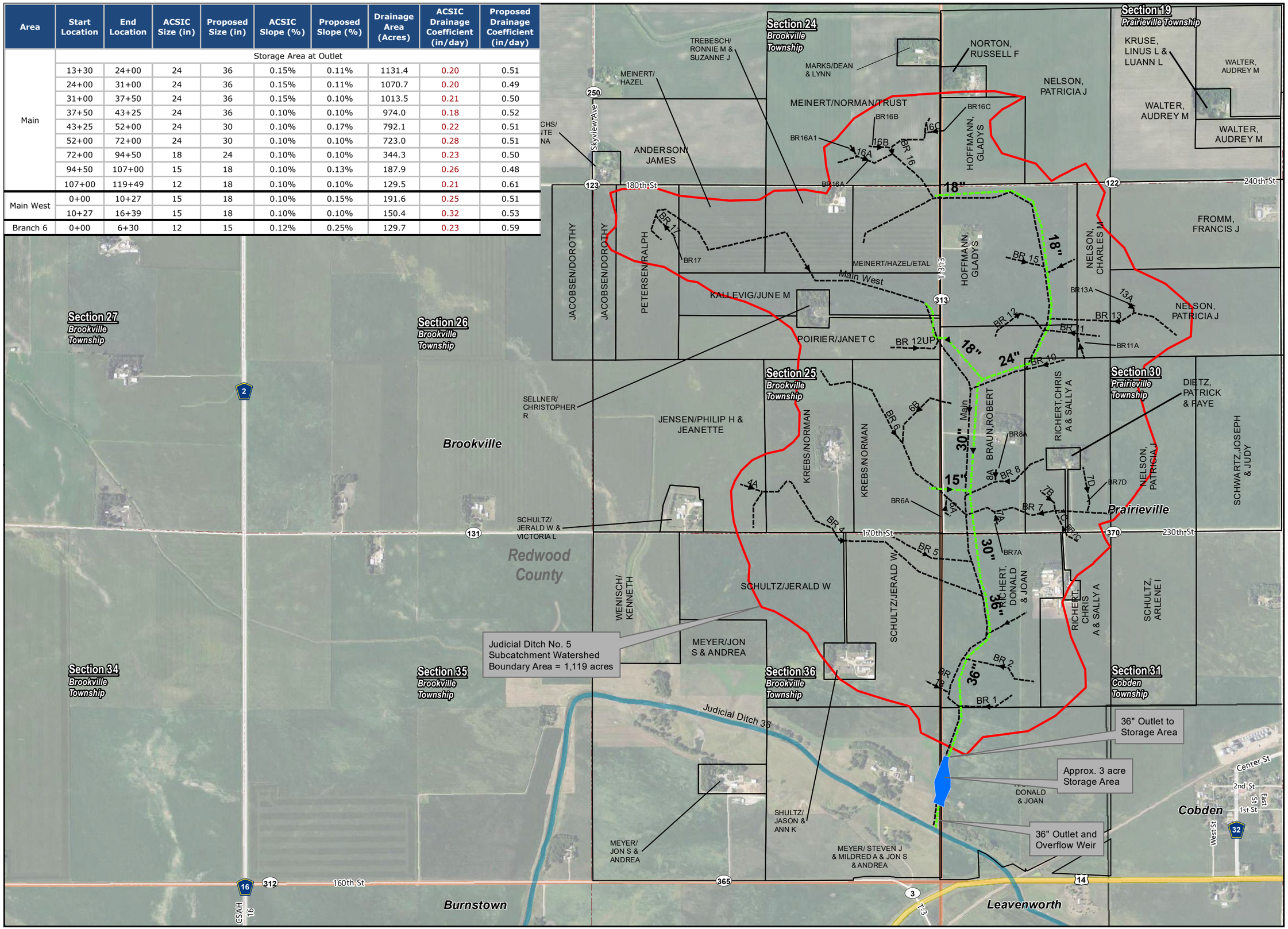
Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (Brown and Redwood Counties, 12/16/2016)
Parcels (Brown and Redwood Counties, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 330 660 1,320 Feet

1 inch = 1,320 feet

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	Storage Area at Outlet								
	13+30	24+00	24	36	0.15%	0.11%	1131.4	0.20	0.51
	24+00	31+00	24	36	0.15%	0.11%	1070.7	0.20	0.49
	31+00	37+50	24	36	0.15%	0.10%	1013.5	0.21	0.50
	37+50	43+25	24	36	0.10%	0.10%	974.0	0.18	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	723.0	0.28	0.51
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59



Proposed Improvement Option 2

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Proposed Tile
- Existing Tile
- JD 5 Watershed
- JD 5 Parcels
- JD 36

PN: 19-23338

Source:

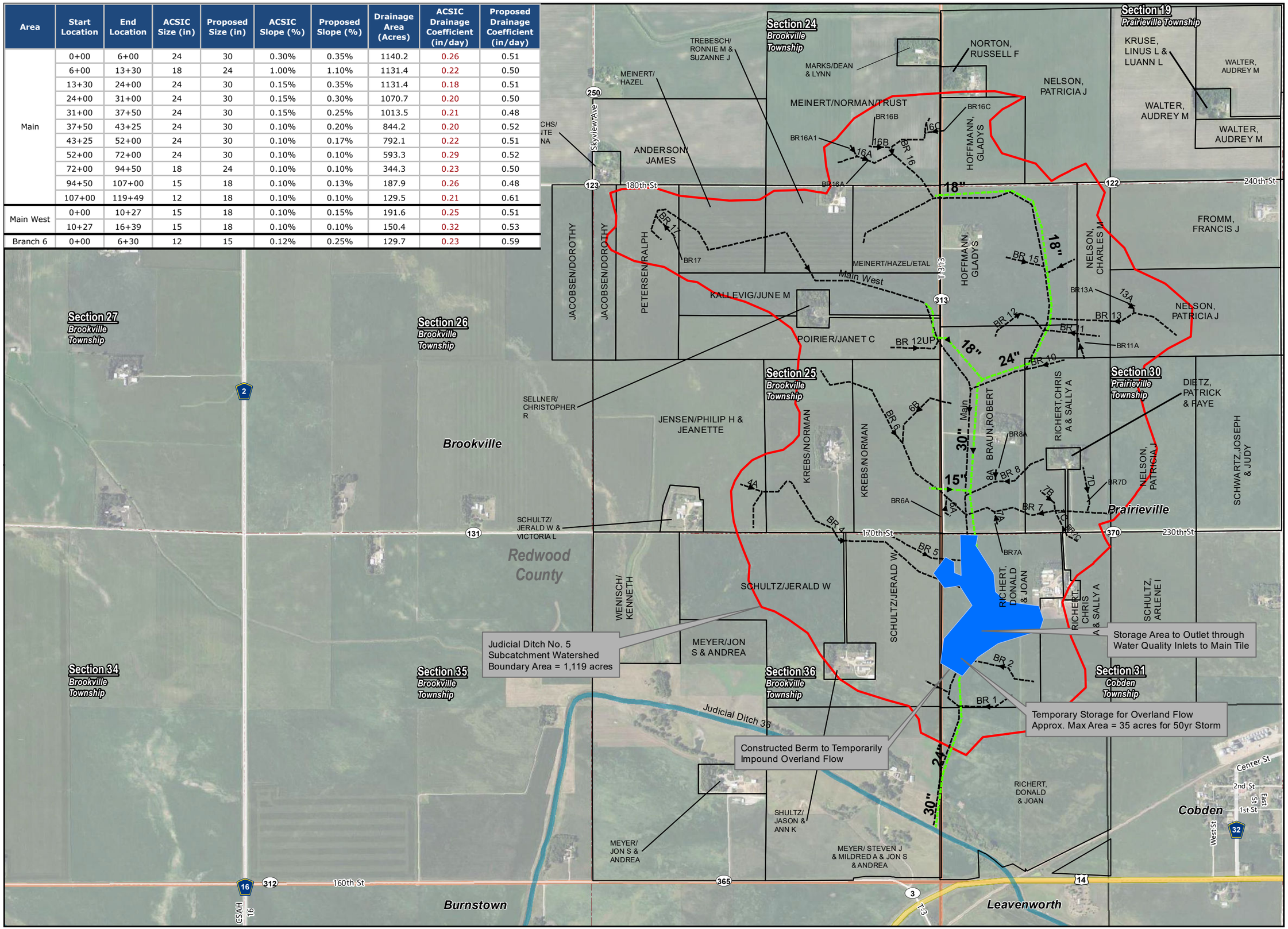
Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (Brown and Redwood Counties, 12/16/2016)
Parcels (Brown and Redwood Counties, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 330 660 1,320 Feet

1 inch = 1,320 feet

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	0+00	6+00	24	30	0.30%	0.35%	1140.2	0.26	0.51
	6+00	13+30	18	24	1.00%	1.10%	1131.4	0.22	0.50
	13+30	24+00	24	30	0.15%	0.35%	1131.4	0.18	0.51
	24+00	31+00	24	30	0.15%	0.30%	1070.7	0.20	0.50
	31+00	37+50	24	30	0.15%	0.25%	1013.5	0.21	0.48
	37+50	43+25	24	30	0.10%	0.20%	844.2	0.20	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	593.3	0.29	0.52
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59



ISG

Proposed Improvement Option 3

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Proposed Tile
- Existing Tile
- JD 5 Watershed
- JD 5 Parcels
- JD 36

PN: 19-23338

Source:

Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (Brown and Redwood Counties, 12/16/2016)
Parcels (Brown and Redwood Counties, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 330 660 1,320 Feet

1 inch = 1,320 feet

Appendix D: Multipurpose Drainage Management

MULTI-PURPOSE DRAINAGE MANAGEMENT PLAN

Multi-purpose drainage management incorporates Best Management Practices (BMPs) which utilize effective measures aimed at reducing sediment and nutrient loading and improving water quality. These BMPs are divided into the following three areas:

Preventative Measures

Preventative measures that can be applied throughout the watershed include crop rotation, cover crops, residue management, and nutrient management. These measures are aimed at controlling sediment, minimizing erosion and nutrient loss, and sustaining the soils health, all without dramatically changing the current land use of the landscape.

Control Measures

Control measures are practices aimed at improving water quality directly associated with the flow of water by reducing peak flow and providing in-stream storage, sedimentation, and nutrient uptake. Examples of control measures include alternative tile intakes, grassed waterways, two stage ditches, water control structures, and controlled subsurface drainage. These practices are directly linked to the conveyance of subsurface tile water or open channel ditch flow.

Treatment Measures

The function of treatment measures is to improve water quality by directly removing sediment and nutrients from the subsurface or surface water flow throughout a watershed. Examples of treatment measures include surge basins (storage ponds), filter/buffer strips, wetland restorations, woodchip bioreactors, and water and sediment control basins (WASCOBs). These practices may be incorporated to either the public or private drainage systems.

Conservative Drainage Practices

Conservative drainage practices, such as construction of controlled drainage systems, provide an option for improving the water quality within a drainage system. Through utilization of control structures, these systems are designed to allow agricultural producers to regulate water levels in their fields. The water level in the ground can be lowered during planting and harvest seasons and allowed to rise during the growing season. Water and nutrients stored in the soil during the growing season can then be used by the crops during drier periods, potentially increasing yields.

Funding

There are several outside sources of funding to potentially help pay for water quality improvements implemented in an improvement project such as this. A main source of funding for this type of project is through the Minnesota Board of Water and Soil Resources (BWSR) Clean Water Fund (CWF). The primary purpose of activities funded with grants associated with the CWF is to restore, protect and enhance water quality. One CWF grant program is the Multipurpose Drainage Management Grant. This grant is geared towards implementing practices that will reduce the transport of sediment and nutrient loads. Some practices that have been funded in the past include

grade stabilization, grassed waterways, water and sediment control basins, alternative side inlets, saturated buffers, storage wetlands, denitrifying bioreactors, etc.

Another potential source is the Legislative-Citizen Commission on Minnesota Resources (LCCMR) Environment and Natural Resources Trust Fund (ENRTF) which was established to provide funding for activities that protect, conserve, preserve, and enhance Minnesota's "air, water, land, fish, wildlife, and other natural resources." The LCCMR prioritizes innovative ideas that provide multiple benefits.

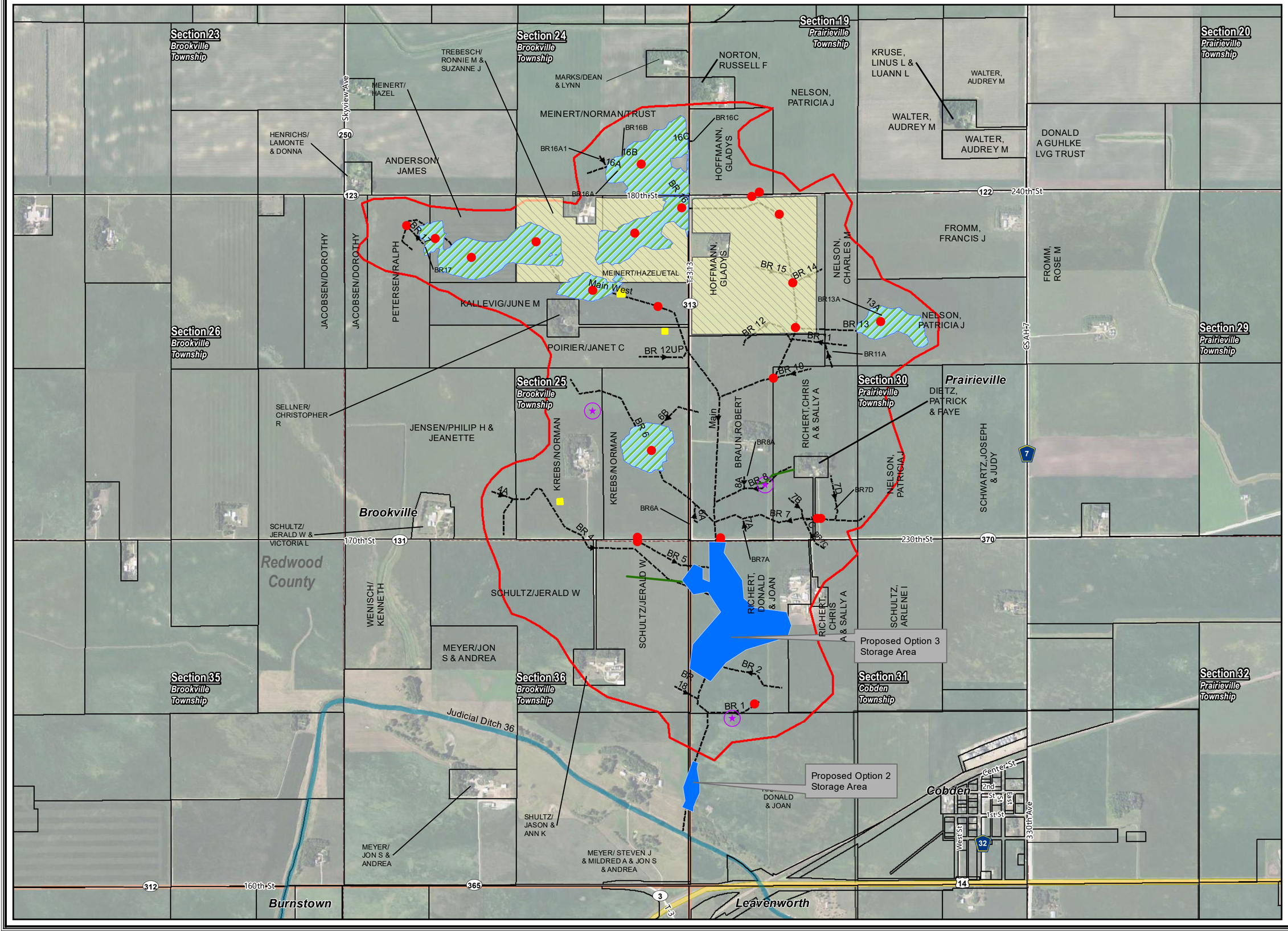
Potential locations for additional BMPs are shown on the Multi-Purpose Drainage Management map in this appendix. If landowners are interested in pursuing practices that go beyond this project scope, a few programs may be a source for funding. The Agriculture Best Management Practices (BMP) Loan Program provides loans to rural landowners to encourage BMPs that help counteract pollution problems.

Another option for individual landowners that are interested in pursuing additional practices is the Environmental Quality Incentives Program (EQIP) is a voluntary program through the NRCS that provides financial assistance to individual landowners for various conservative practices as identified above.

In addition, the BWSR Community Partners Grant may be an option. This grant leverages the interest of non-governmental partners such as lake and river associations, boy/girl scout troops and other civic groups to install on-the ground projects that reduce runoff and keep water on the land. It also allows for multiple local government units to work together on a project that involves the Community Partners Grant. Projects installed with the Community Partners Grant are intended to be structural or vegetative practices designed to reduce runoff and/or keep water on the land.

Future funding may also be available as part of watershed-based implementation funding (WBIF) through a comprehensive water management plan developed as part of the One Watershed, One Plan program.

Currently, this project proposes to use Water Quality Inlets in all public road ditches. In addition, multiple potential storage ponds are proposed as part of the improvement. Potential locations for these and additional BMPs are shown on the *Multi-Purpose Drainage Management Map* and will be proposed to landowners. Furthermore, additional water quality measures can be pursued and implemented with this project if requested.



ISG

Multi-Purpose Drainage Management Plan

Judicial Ditch No. 5

Brown and Redwood Counties, Minnesota

Wednesday, April 19, 2023

Legend

- Water & Sediment Control Basin
- Alternative Tile Intake
- GrassWaterway
- Bioreactor
- Wetland Restoration
- Controlled Drainage
- Storage
- Existing Tile

PN: 19-23338

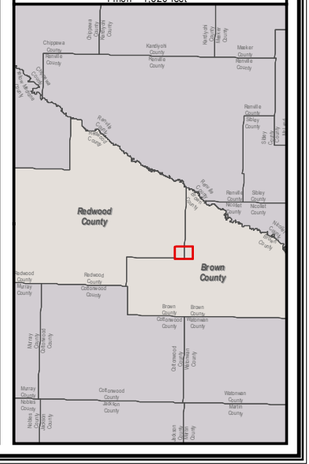
Source:

Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (Brown and Redwood Counties, 12/16/2016)
Parcels (Brown and Redwood Counties, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 330 660 1,320 Feet

1 inch = 1,320 feet



Appendix E: Drainage Calculations

Brown and Redwood Counties
Judicial Ditch No. 5

ISG

ACSIC TILE SUMMARY

Area	Start Location	End Location	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Main	0+00	3+00	24	0.30%	1140.2	0.26
	3+00	4+00	24	1.00%	1136.6	0.48
	4+00	18+00	18	1.00%	1131.4	0.22
	18+00	19+00	24	1.00%	1089.8	0.50
	19+00	21+00	24	0.15%	1089.8	0.19
	21+00	26+00	24	0.15%	1070.7	0.20
	26+00	32+50	24	0.15%	1013.5	0.21
	32+50	34+00	24	0.15%	974.0	0.21
	34+00	38+25	24	0.10%	974.0	0.18
	38+25	43+50	24	0.10%	812.5	0.21
	43+50	47+00	24	0.10%	783.8	0.22
	47+00	50+00	24	0.10%	593.3	0.29
	50+00	59+00	24	0.10%	550.2	0.31
	59+00	66+00	24	0.10%	542.6	0.31
	66+00	74+80	18	0.10%	344.3	0.23
	74+80	80+90	18	0.10%	313.4	0.25
	80+90	82+00	18	0.10%	287.5	0.28
	82+00	88+00	15	0.10%	215.2	0.23
	88+00	89+00	15	0.10%	206.2	0.24
	89+00	102+00	15	0.10%	187.9	0.26
	102+00	113+00	12	0.10%	129.5	0.21
	113+00	114+00	12	0.10%	108.3	0.25
	114+00	123+00	8	0.18%	32.8	0.37
	123+00	127+00	6	0.18%	5.7	1.00
Main West	0+00	1+00	15	2.60%	191.6	1.30
	1+00	9+50	15	0.10%	191.6	0.25
	9+50	11+00	15	0.10%	186.3	0.26
	11+00	13+50	15	0.10%	179.3	0.27
	13+50	31+00	15	0.10%	150.4	0.32
	31+00	42+00	12	0.10%	102.0	0.26
	42+00	54+00	10	0.10%	69.8	0.24
	54+00	65+00	8	0.14%	43.7	0.25
	65+00	69+00	6	0.14%	13.4	0.38
	69+00	71+00	6	1.20%	13.4	1.10
Br 1	0+00	1+00	8	2.70%	9.8	4.81
	1+00	8+00	8	0.20%	9.8	1.31
	8+00	9+00	8	0.50%	9.8	2.07
Br 2	0+00	11+50	6	0.20%	21.5	0.28
Br 3	0+00	4+00	8	0.10%	15.1	0.61
	4+00	6+00	6	0.10%	15.1	0.28
	6+00	7+00	6	2.10%	15.1	1.29

Brown and Redwood Counties
Judicial Ditch No. 5

ISG

ACSIC TILE SUMMARY

Area	Start Location	End Location	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Br 4	0+00	8+00	12	0.23%	141.3	0.29
	8+00	14+00	10	0.23%	116.4	0.22
	14+00	22+20	10	0.23%	110.2	0.23
	22+20	23+00	10	0.23%	108.4	0.23
	23+00	27+00	8	0.23%	40.6	0.34
	27+00	30+00	8	0.65%	21.8	1.07
	30+00	41+00	8	0.24%	21.8	0.65
	41+00	44+00	6	1.00%	3.1	4.36
	44+00	47+00	6	0.20%	3.1	1.95
	47+00	47+50	6	1.20%	3.1	4.77
Br 4A	0+00	3+00	6	0.60%	2.5	4.18
Br 5	0+00	7+00	6	0.23%	20.4	0.32
	7+00	9+50	6	0.50%	20.4	0.47
Br 6	0+00	4+00	12	0.12%	129.7	0.23
	4+00	14+00	12	0.12%	128.1	0.23
	14+00	18+00	10	0.20%	103.4	0.23
	18+00	25+50	8	0.20%	69.6	0.19
	25+50	29+00	8	0.20%	48.1	0.27
	29+00	31+50	6	0.20%	25.7	0.23
Br 6A	0+00	4+00	6	0.20%	1.6	3.69
Br 6B	0+00	3+00	6	0.20%	4.3	1.38
	3+00	5+00	6	0.50%	4.3	2.18
	5+00	8+00	6	1.10%	4.3	3.24
	8+00	11+00	6	0.20%	4.3	1.38
	11+00	11+75	6	1.06%	4.3	3.18
Br 7	0+00	4+00	10	0.16%	57.3	0.36
	4+00	16+00	10	0.16%	46.3	0.45
	16+00	18+00	8	0.40%	22.1	0.83
	18+00	24+00	6	0.40%	5.1	1.66
Br 7A	0+00	2+00	6	1.70%	1.3	13.73
Br 7B	0+00	4+00	6	1.10%	4.1	3.39
Br 7C	0+00	2+00	6	0.25%	12.6	0.53
	2+00	3+00	6	0.39%	12.6	0.66
	3+00	6+00	6	0.39%	6.9	1.21
Br 7D	0+00	6+00	6	0.50%	9.6	0.98
	6+00	7+00	6	1.40%	9.6	1.65
Br 8	0+00	3+30	6	0.42%	34.6	0.25
	3+30	12+00	6	0.42%	10.8	0.80
Br 8A	0+00	2+00	6	0.20%	8.2	0.73
Br 10	0+00	1+00	6	4.00%	19.0	1.41
	1+00	5+00	6	0.20%	19.0	0.32
	5+00	6+00	6	1.00%	19.0	0.71

Brown and Redwood Counties
Judicial Ditch No. 5

ISG

ACSIC TILE SUMMARY

Area	Start Location	End Location	ACSIC Size (in)	ACSIC Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)
Br 11	0+00	4+50	8	0.30%	11.7	1.35
	4+50	8+50	6	0.30%	2.7	2.74
Br 11A	0+00	4+00	6	1.20%	9.0	1.63
Br 12	0+00	10+00	8	0.28%	14.2	1.07
Br 12UP	0+00	4+00	8	0.26%	28.9	0.51
	4+00	8+00	6	0.40%	13.6	0.62
Br 13	0+00	6+00	10	0.16%	32.5	0.64
	6+00	12+50	8	0.16%	28.5	0.40
	12+50	16+00	8	0.16%	26.0	0.44
	16+00	21+00	6	0.28%	14.1	0.50
Br 13A	0+00	2+00	6	1.20%	1.6	9.32
Br 14	0+00	5+00	6	0.80%	9.0	1.34
Br 15	0+00	6+00	6	0.80%	18.2	0.66
Br 16	0+00	1+83	10	0.12%	62.9	0.29
	1+83	8+50	10	0.12%	56.5	0.32
	8+50	9+50	8	0.12%	26.7	0.37
	9+50	16+00	8	0.12%	21.5	0.47
	16+00	19+00	6	0.24%	0.4	16.48
Br 16A	0+00	1+00	8	1.00%	18.5	1.56
	1+00	5+50	8	0.26%	18.5	0.80
	5+50	9+00	6	0.45%	6.5	1.37
Br 16A1	0+00	2+00	6	1.00%	5.2	2.59
Br 16B	0+00	3+50	6	1.30%	5.3	2.88
Br 16C	0+00	3+00	6	0.90%	13.6	0.94
Br 17	0+00	4+50	6	0.20%	1.4	4.26
Br 18	0+00	4+00	6	1.40%	4.6	3.46

Brown and Redwood Counties
Judicial Ditch No. 5

ISG

PROPOSED OPTION #1 TILE SUMMARY

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	0+00	6+00	24	30	0.30%	0.35%	1140.2	0.26	0.51
	6+00	13+30	18	24	1.00%	1.10%	1131.4	0.22	0.50
	13+30	24+00	24	30	0.15%	0.35%	1131.4	0.18	0.51
	24+00	31+00	24	30	0.15%	0.30%	1070.7	0.20	0.50
	31+00	37+50	24	30	0.15%	0.25%	1013.5	0.21	0.48
	37+50	43+25	24	30	0.10%	0.20%	844.2	0.20	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	593.3	0.29	0.52
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59

Brown and Redwood Counties
Judicial Ditch No. 5

ISG

PROPOSED OPTION #2 TILE SUMMARY

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	Storage Area at Outlet								
	13+30	24+00	24	36	0.15%	0.11%	1131.4	0.20	0.51
	24+00	31+00	24	36	0.15%	0.11%	1070.7	0.20	0.49
	31+00	37+50	24	36	0.15%	0.10%	1013.5	0.21	0.50
	37+50	43+25	24	36	0.10%	0.10%	974.0	0.18	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	723.0	0.28	0.51
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59

Brown and Redwood Counties
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PROPOSED OPTION #3 TILE SUMMARY

Area	Start Location	End Location	ACSIC Size (in)	Proposed Size (in)	ACSIC Slope (%)	Proposed Slope (%)	Drainage Area (Acres)	ACSIC Drainage Coefficient (in/day)	Proposed Drainage Coefficient (in/day)
Main	0+00	6+00	24	30	0.30%	0.35%	1140.2	0.26	0.51
	6+00	13+30	18	24	1.00%	1.10%	1131.4	0.22	0.50
	13+30	24+00	24	30	0.15%	0.35%	1131.4	0.18	0.51
	24+00	31+00	24	30	0.15%	0.30%	1070.7	0.20	0.50
	31+00	37+50	24	30	0.15%	0.25%	1013.5	0.21	0.48
	37+50	43+25	24	30	0.10%	0.20%	844.2	0.20	0.52
	43+25	52+00	24	30	0.10%	0.17%	792.1	0.22	0.51
	52+00	72+00	24	30	0.10%	0.10%	593.3	0.29	0.52
	72+00	94+50	18	24	0.10%	0.10%	344.3	0.23	0.50
	94+50	107+00	15	18	0.10%	0.13%	187.9	0.26	0.48
	107+00	119+49	12	18	0.10%	0.10%	129.5	0.21	0.61
Main West	0+00	10+27	15	18	0.10%	0.15%	191.6	0.25	0.51
	10+27	16+39	15	18	0.10%	0.10%	150.4	0.32	0.53
Branch 6	0+00	6+30	12	15	0.12%	0.25%	129.7	0.23	0.59

Appendix F: Hydrologic & Hydraulic Modeling

PROJECT OVERVIEW

Brown and Redwood County Judicial Ditch No. 5 public drainage improvement proposes to increase the capacity of the Main, Main West, and Branch 6 public tiles. Proposed conditions include three options: Option 1 (no storage), Option 2 (outlet storage) and Option 3 (overland storage). The hydrologic and hydraulic performance of the existing and proposed options was completed in InfoWorks ICM.

MODEL PARAMETERS

Runoff Parameters

The routing method for the models used the SCS curve number runoff method. Sub-catchments were delineated at strategic points through the JD 5 watershed, such as at road crossings, changes in public tile capacity, public tile branch junctions, and depressional areas. Sub-catchment drainage areas, times of concentration, and runoff curve numbers were calculated in GIS. Times of concentration were calculated based on land covers and slopes to determine the most hydrologically remote point within each subwatershed and the corresponding overland travel time from that point to the sub-catchment outlet. A unique area-weighted curve number was developed for each sub-catchment based on both land cover (NLCD 2019) hydrologic soil group (HSG) data (gSSURGO). Artificial tile drainage (private tiles) was assumed to be present in cultivated and hay/pasture land covers overlapping areas with HSGs of A/D, B/D, and C/D, which are soils that are limited by the presence of shallow groundwater. As such, these areas will produce less runoff in the drainage (e.g. B) condition than the undrained (e.g. D) condition. Initial abstraction values were calculated as 0.2*S, where S = (1000/CN) – 10.

Hydraulic Parameters

Existing tile is assumed to function at the ACSIC and as such does not take into consideration restrictions and hydraulic losses resulting from deterioration over time. All public tiles are modeled with Manning's n values of 0.013.

Runoff from the 1D portion of the ICM model is routed directly into the public tiles, which is a conservative approach that delivers runoff to the public system more quickly than it would reach the public system in reality (either by infiltrating and passing through private tile or flowing overland and into the public system through a surface inlet).

Storm Events

The design storm events were chosen to comply with Minnesota drainage statute (103E.015(4)), "Current and potential flooding characteristics of property in the drainage project or system and downstream for 5-, 10-, 25-, and 50-year flood events, including adequacy of the outlet for the drainage project."

Storm event rainfall depths were taken from NOAA Atlas 14 Point Precipitation Frequency Estimates: MN near Sleepy Eye, MN (44.2968, -94.8661) and are listed in Table 1 below. The 24-hour duration was used with the NRCS MSE3 rainfall distribution.

TABLE 1. MODELED 24-HR PRECIPITATION VALUES

Return Period	Rainfall Depth (inches)
5yr	3.36
10yr	3.96
25yr	4.89
50yr	5.69

Infiltration

2D hydraulic infiltration was used in the model to allow surface water to infiltrate into the soil. Soil data was imported from GIS to apply infiltration parameters based on the USDA Hydrologic Soil Types as delineated by the USDA Web Soil Survey. Infiltration is applied using the Green-Ampt methodology with initial deficits of 0.01, which corresponds to an assumption that only 1 percent of total soil porosity is available at the beginning of the model run. This assumption is conservative in that it will limit infiltration, but is necessary due to the use of the SCS curve number runoff method (1D hydrology) and 2D hydraulics to model ponding, overland flow, and infiltration. With the use of 1D hydrology (as opposed to the much more computationally intensive 2D rain-on-grid hydrology), this initial deficit assumption creates an initial condition that is most realistic in that areas of ponded water in the

2D hydraulics portion of the model are those that are likely to become nearly saturated by the time ponding occurs from upland areas.

MODEL REVIEW

ICM model results are presented below. Tables 2, 3, and 4 list peak system discharge for Options 1, 2, and 3, respectively.

TABLE 2. OPTION 1 OUTLET PEAK FLOW COMPARISON

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change
JD5 Outlet	Tile	25.30	47.20	87%	28.60	51.80	81%	33.60	59.90	78%	37.50	64.70	73%
	Overland Flow	32.70	21.40	-35%	60.40	47.30	-22%	116.80	103.00	-12%	180.80	170.00	-6%
	Total	58.00	68.60	18%	89.00	99.10	11%	150.40	162.90	8%	218.30	234.70	8%
Denotes peak flows less than or equal to ACSIC													

TABLE 3. OPTION 2 OUTLET PEAK FLOW COMPARISON

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change
JD5 Outlet	Tile	25.30	40.90	62%	28.60	42.70	49%	33.60	46.20	38%	37.50	49.20	31%
	Overland Flow	32.70	1.50	-95%	60.40	23.30	-61%	116.80	82.40	-29%	180.80	138.60	-23%
	Total	58.00	42.40	-27%	89.00	66.00	-26%	150.40	128.60	-14%	218.30	187.80	-14%
Denotes peak flows less than or equal to ACSIC													

TABLE 4. OPTION 3 OUTLET PEAK FLOW COMPARISON

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change
JD5 Outlet	Tile	25.30	47.30	87%	28.60	52.20	83%	33.60	58.90	75%	37.50	64.30	71%
	Overland Flow	32.70	19.00	-42%	60.40	31.20	-48%	116.80	51.00	-56%	180.80	68.90	-62%
	Total	58.00	66.30	14%	89.00	83.40	-6%	150.40	109.90	-27%	218.30	133.20	-39%
Denotes peak flows less than or equal to ACSIC													

There is a modest increase in peak flow at the JD 5 outlet across all four storms in Improvement Option 1. Improvement Option 2 provides peak discharge reductions of 14 to 27 percent across the four storms, while Option 3 provides reductions of up to 39 percent (50-year event), with an increase of 14 percent in the 5-year event. These changes are minor and are anticipated to have an insignificant impact on the downstream waterway, JD 36.

Combined Outflow Hydrographs

Combined outflow hydrographs, indicating the total of tile outflow and overland flow at the outlet of JD 5, are presented below for the 5-, 10-, 25-, and 50-year events. Hydrographs are presented for the ACSIC and Improvement Options 1, 2, and 3. Hydrograph figures show only the first 5 days of each model run to allow for easier interpretation of results. However, each of the models was run sufficiently long to achieve a discharge of zero at the outlet of JD 5.

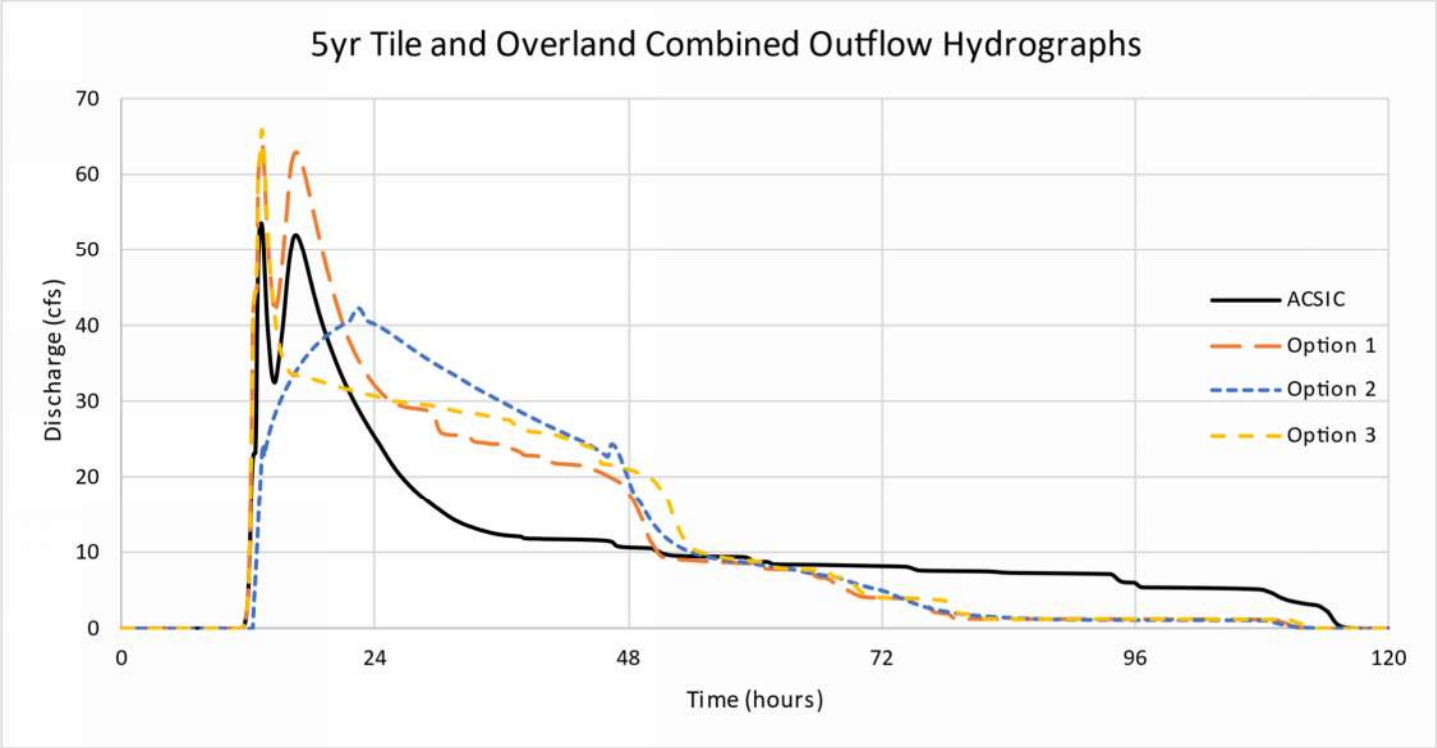

Figure 1. JD 5 Outlet 5-Year Combined Outflow Hydrograph Comparison

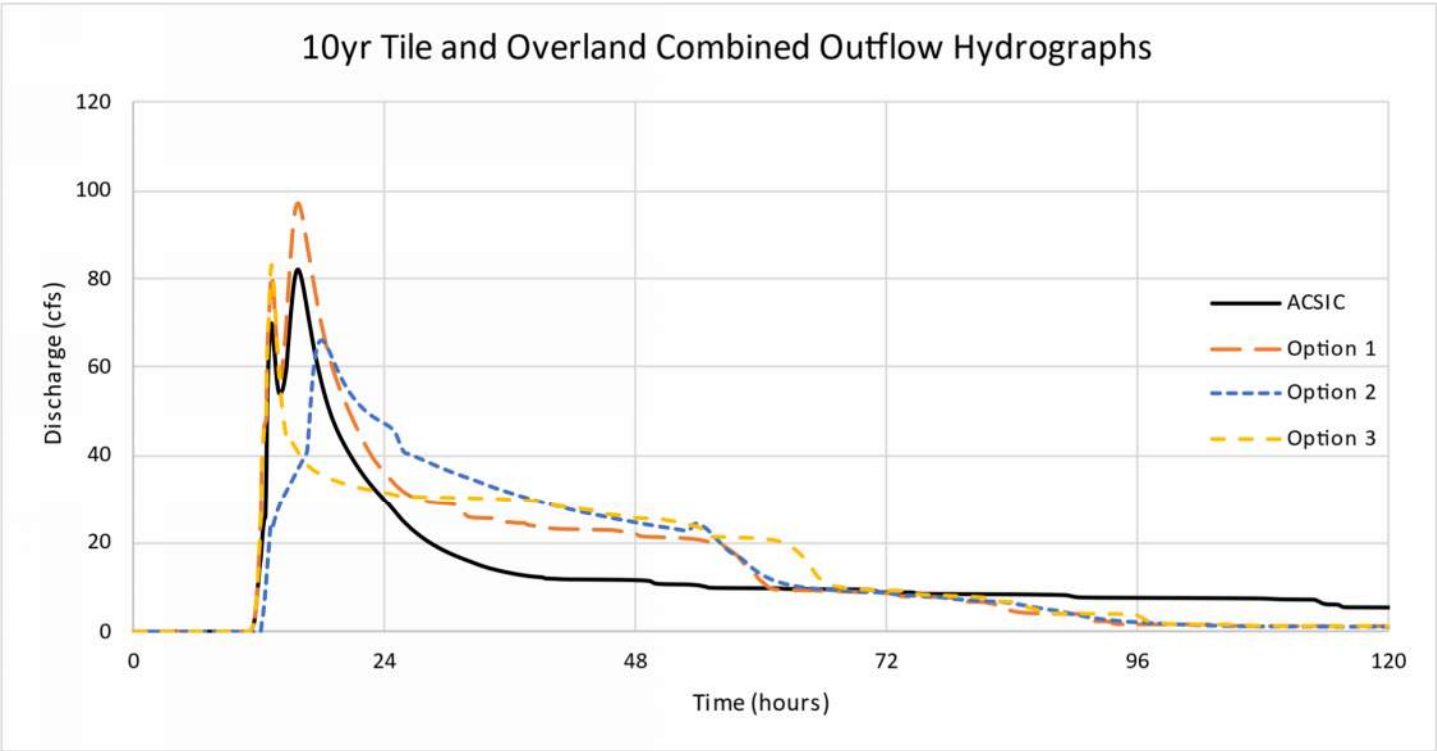

Figure 2. JD 5 Outlet 10-Year Combined Outflow Hydrograph Comparison

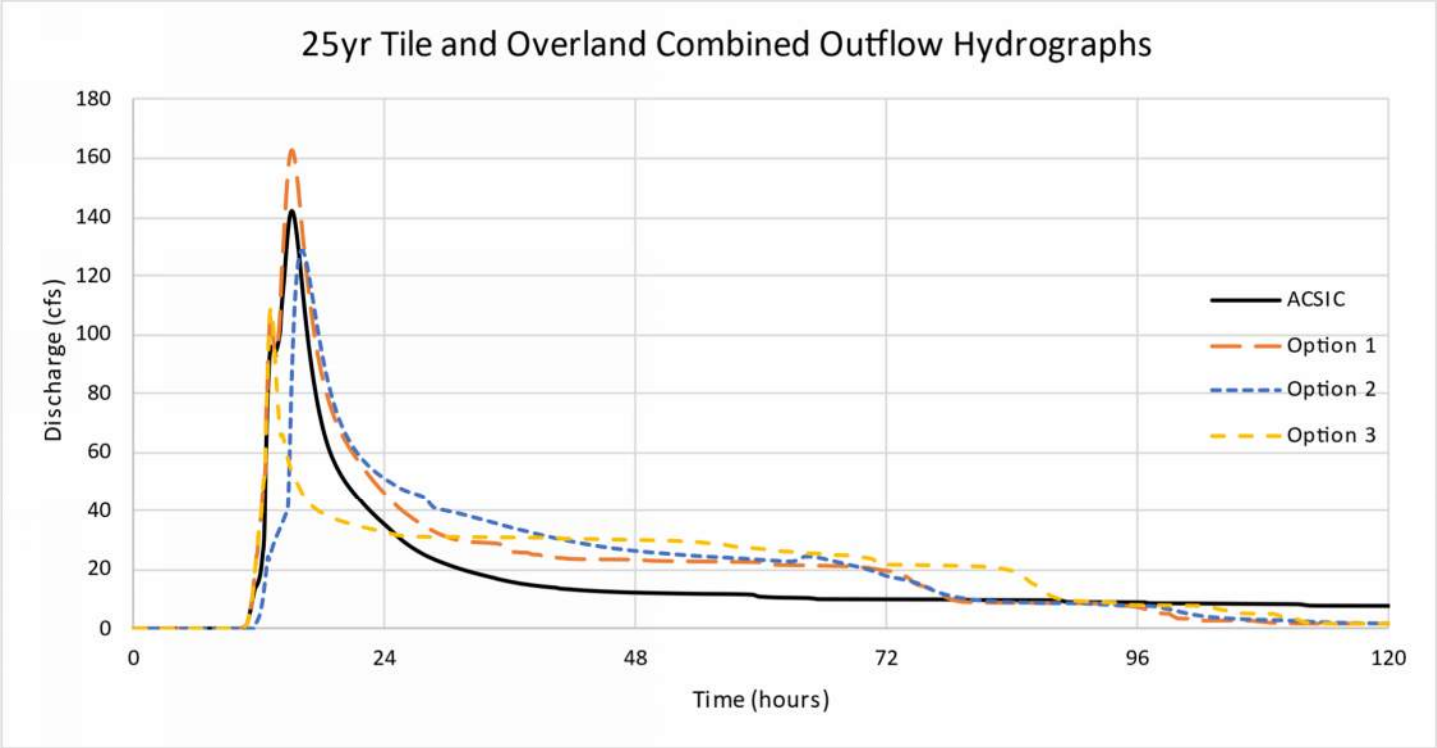

Figure 3. JD 25 Outlet 10-Year Combined Outflow Hydrograph Comparison

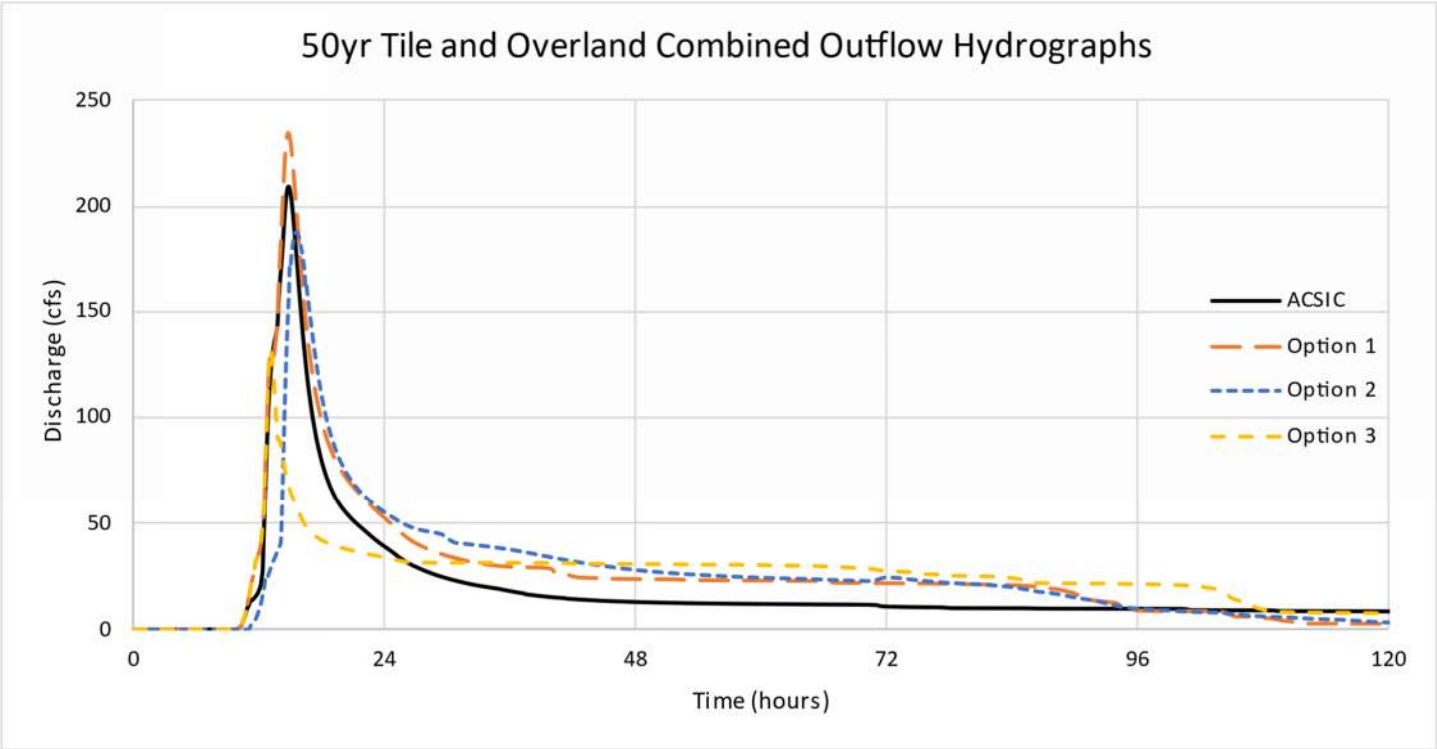

Figure 4. JD 50 Outlet 10-Year Combined Outflow Hydrograph Comparison

Model continuity error

Model continuity error is calculated by comparing the change in storage in the model (total final volume in the 2D model and conduits minus the total initial volume in the 2D model and conduits) to the net inflow to the system during the model (sum of inflows minus sum of outflow). Table 9 shows the volume balance error for each modeled storm event. Continuity errors for all models were less than 0.1 percent of the total inflow volume.

TABLE 9. MODELING CONTINUITY ERRORS

Event	ACSIC	Option 1	Option 2	Option 3
5yr	0.002%	-0.001%	-0.004%	0.025%
10yr	-0.051%	-0.034%	0.000%	-0.005%
25yr	-0.052%	-0.024%	0.000%	-0.003%
50yr	-0.039%	-0.023%	0.000%	-0.002%

FLOOD INUNDATION MAPS

The remainder of this modeling report includes inundation maps, both for maximum depth and duration. Maximum depth maps show the maximum depth for all 2D mesh elements with a maximum depth of at least 0.01 feet. Flooding duration indicates the duration of ponding in all areas with a maximum ponded depth of at least 0.01 feet. Generally, crop stress from excess water occurs at 24 hours and crops generally die if they remain flooded for longer than 48 hours.

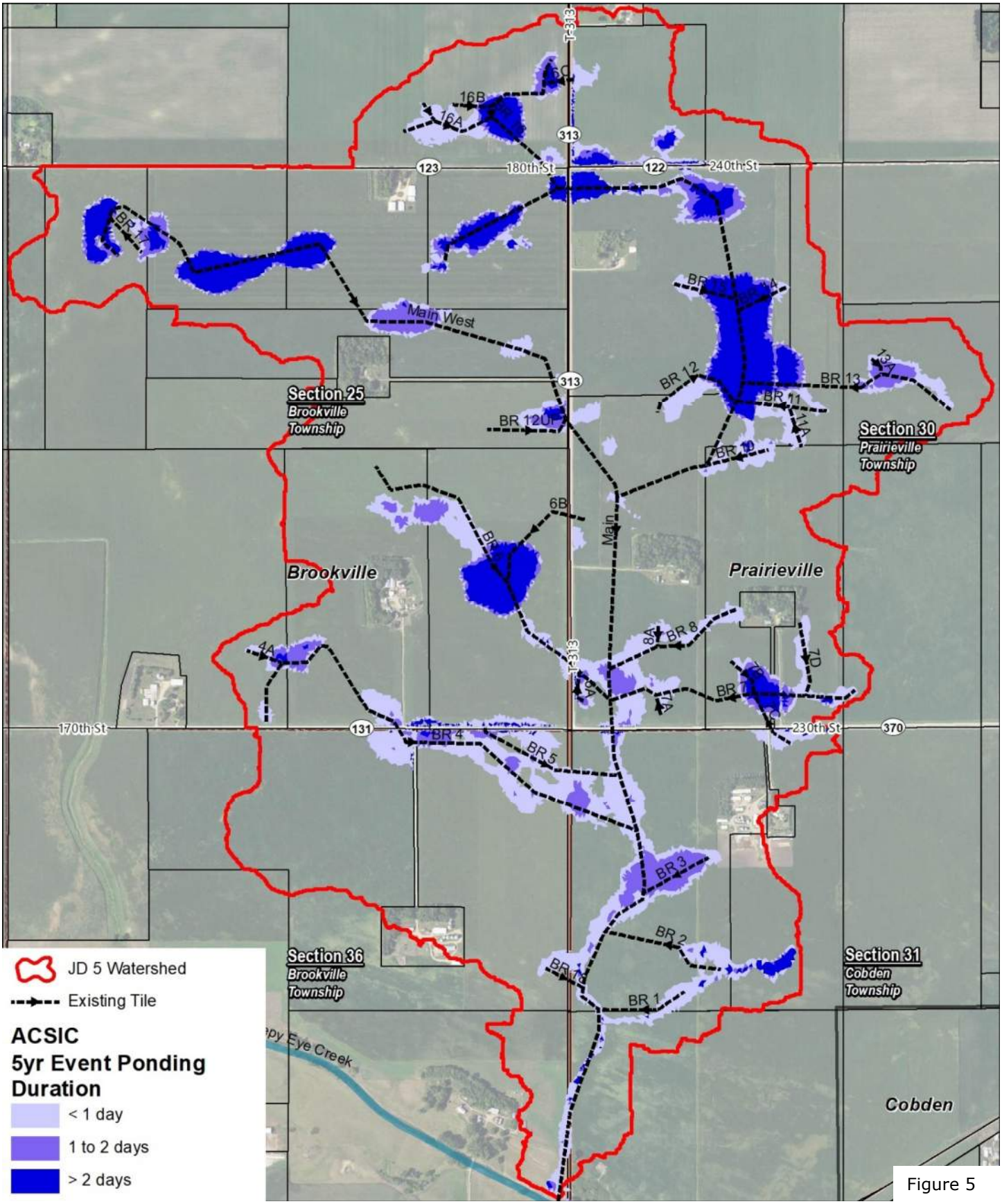

Figure 5. ACSIC Ponding Duration for the 5-year, 24-hour Rainfall Event

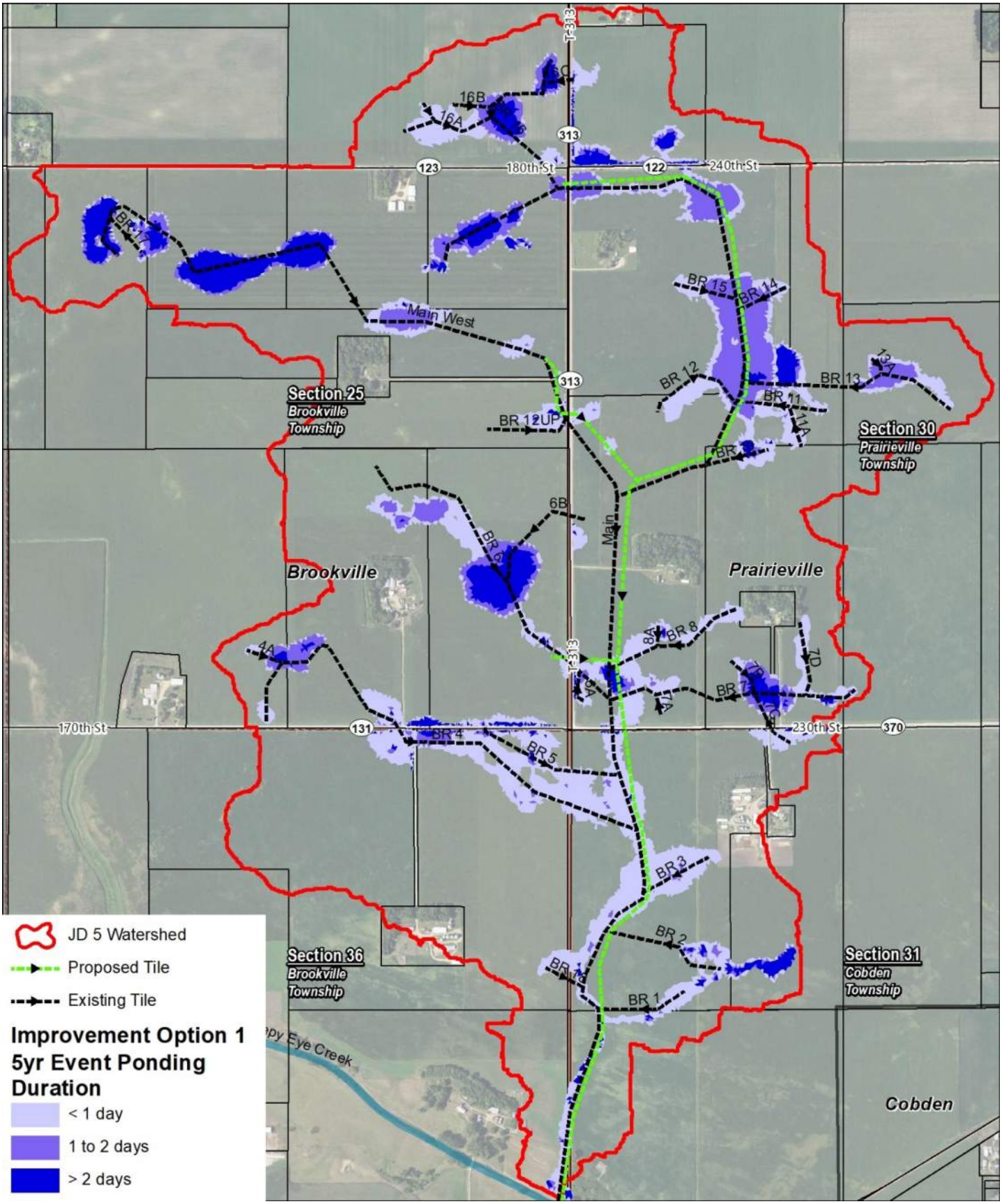

Figure 6. Improvement Option 1 Ponding Duration for the 5-year, 24-hour Rainfall Event

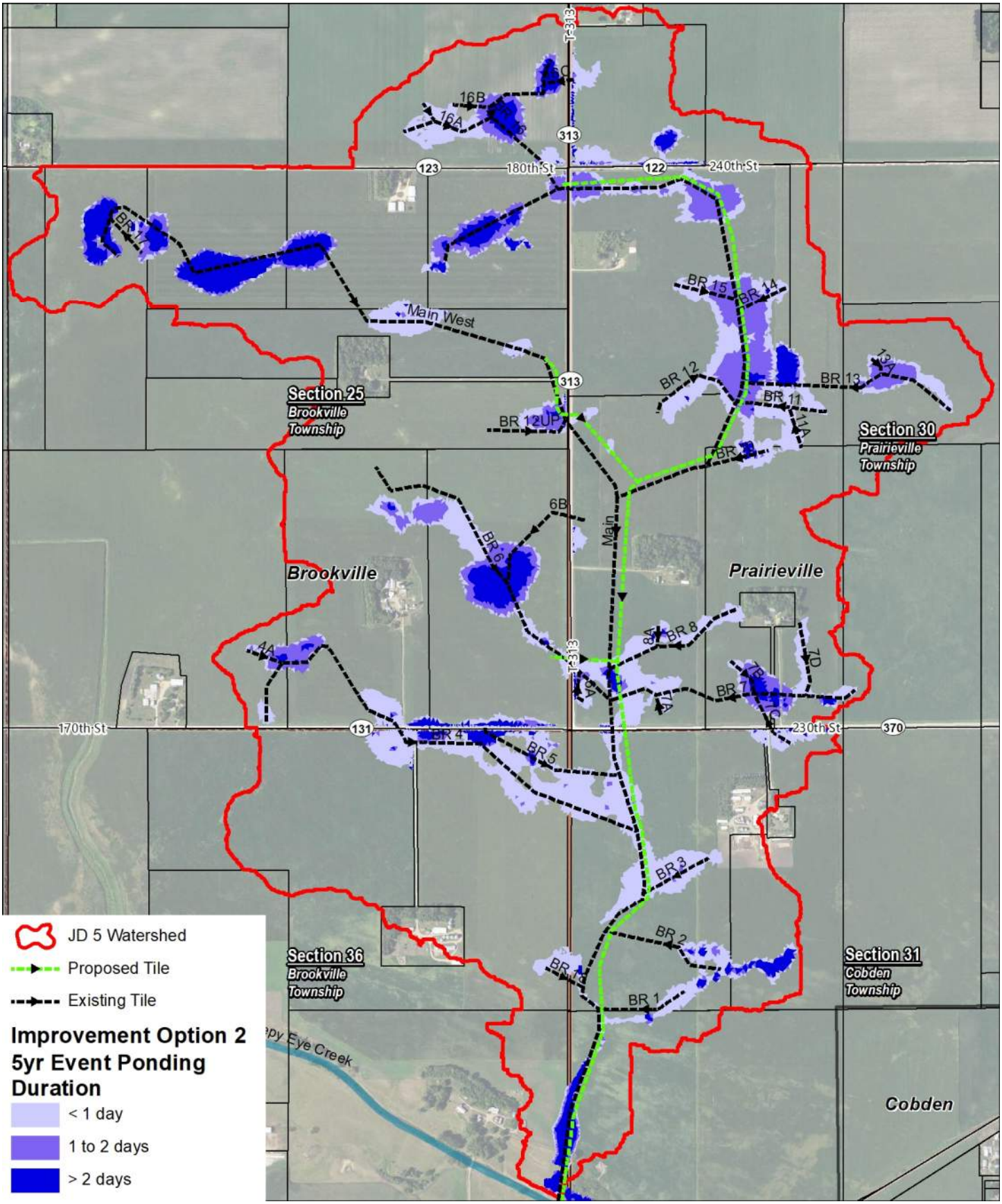

Figure 7. Improvement Option 2 Ponding Duration for the 5-year, 24-hour Rainfall Event

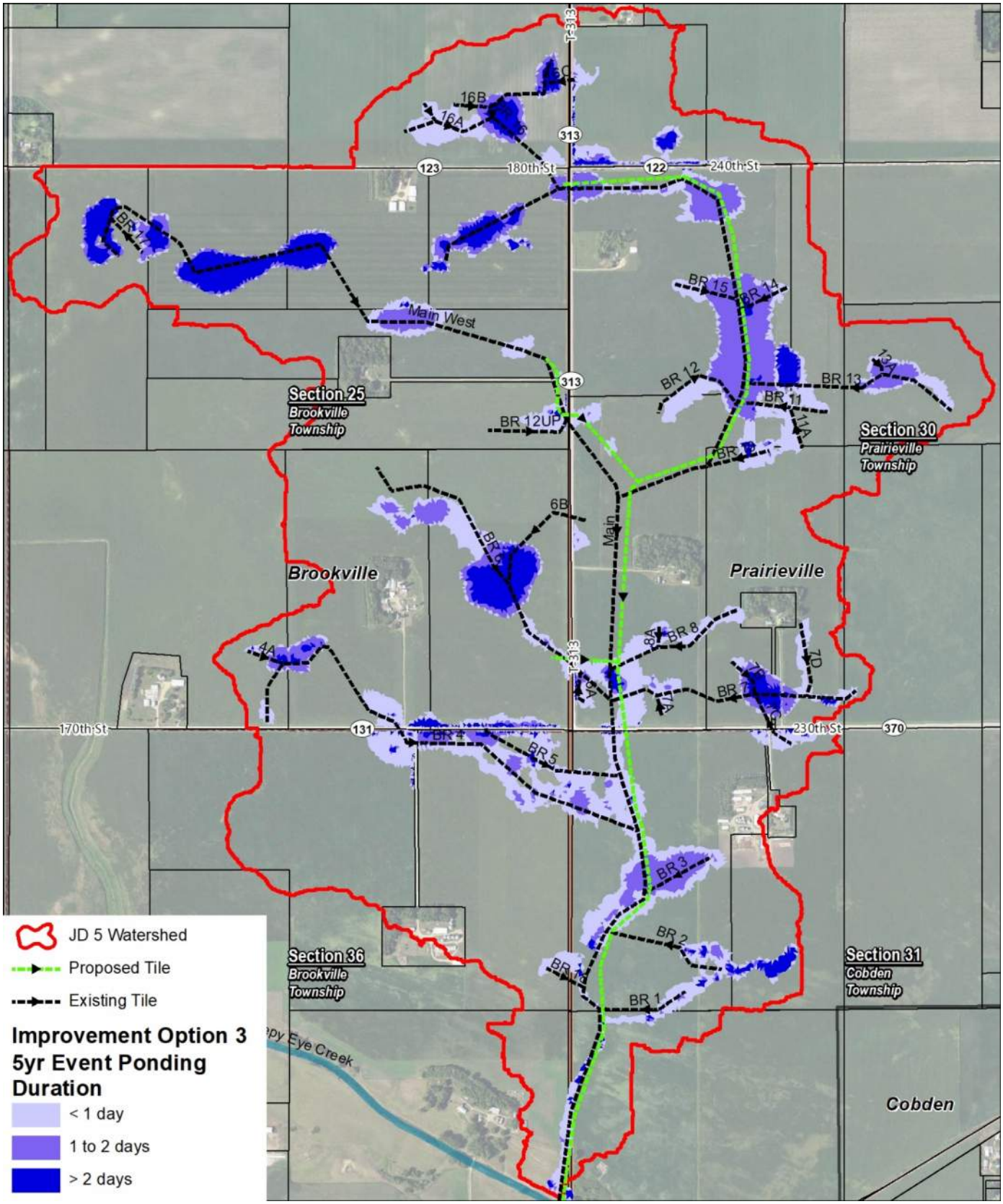

Figure 8. Improvement Option 3 Ponding Duration for the 5-year, 24-hour Rainfall Event

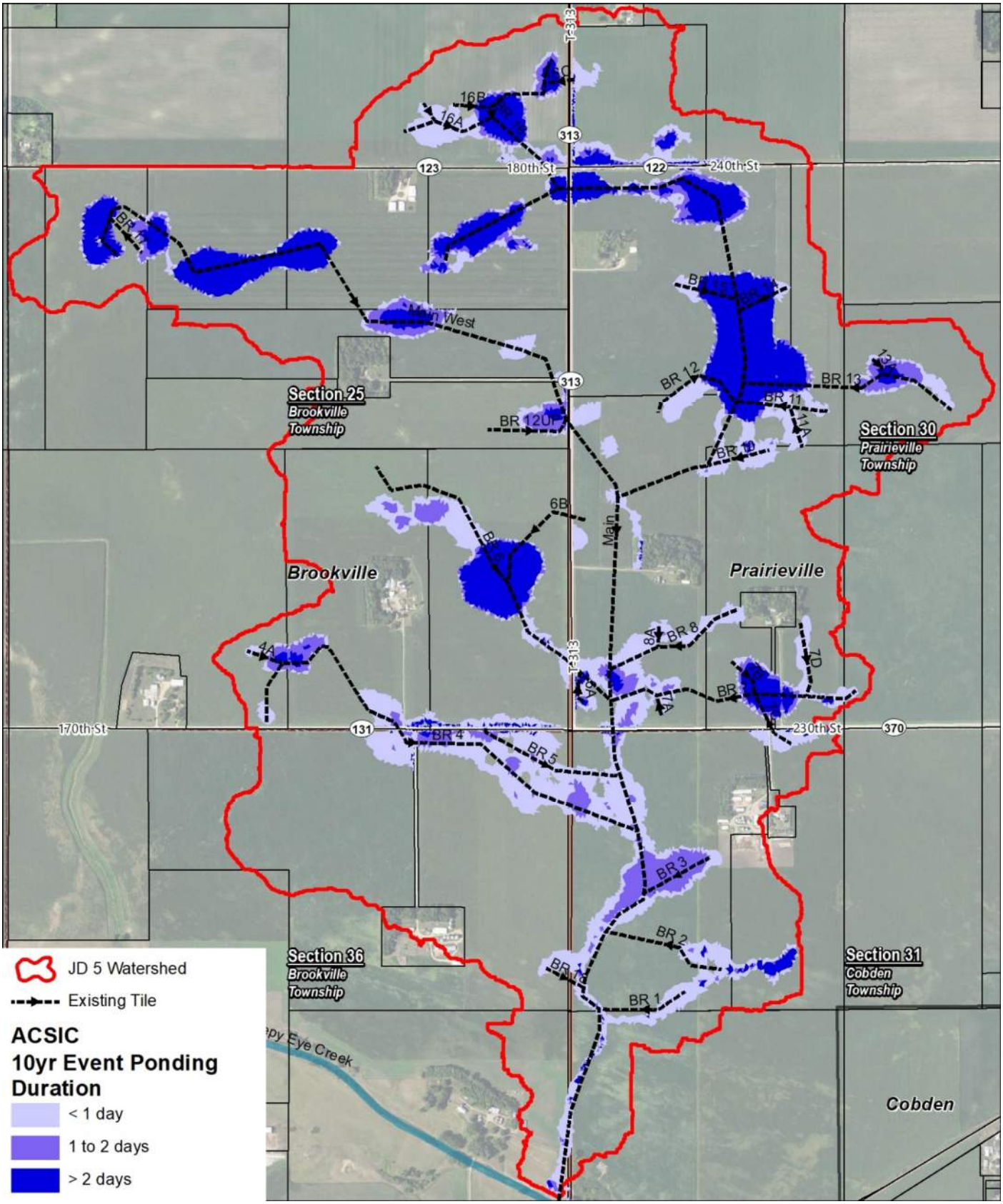

Figure 9. ACSIC Ponding Duration for the 10-year, 24-hour Rainfall Event

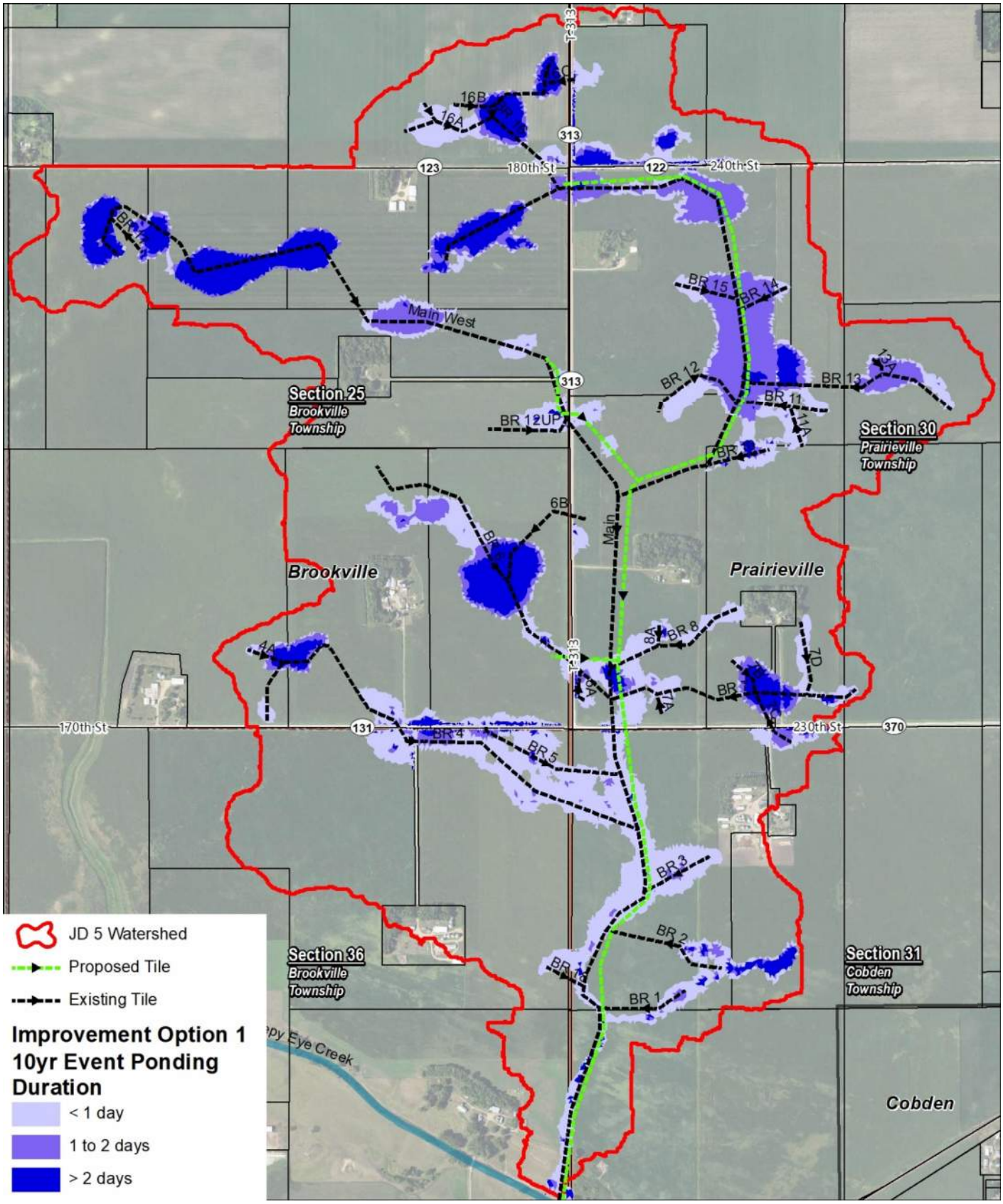

Figure 10. Improvement Option 1 Ponding Duration for the 10-year, 24-hour Rainfall Event

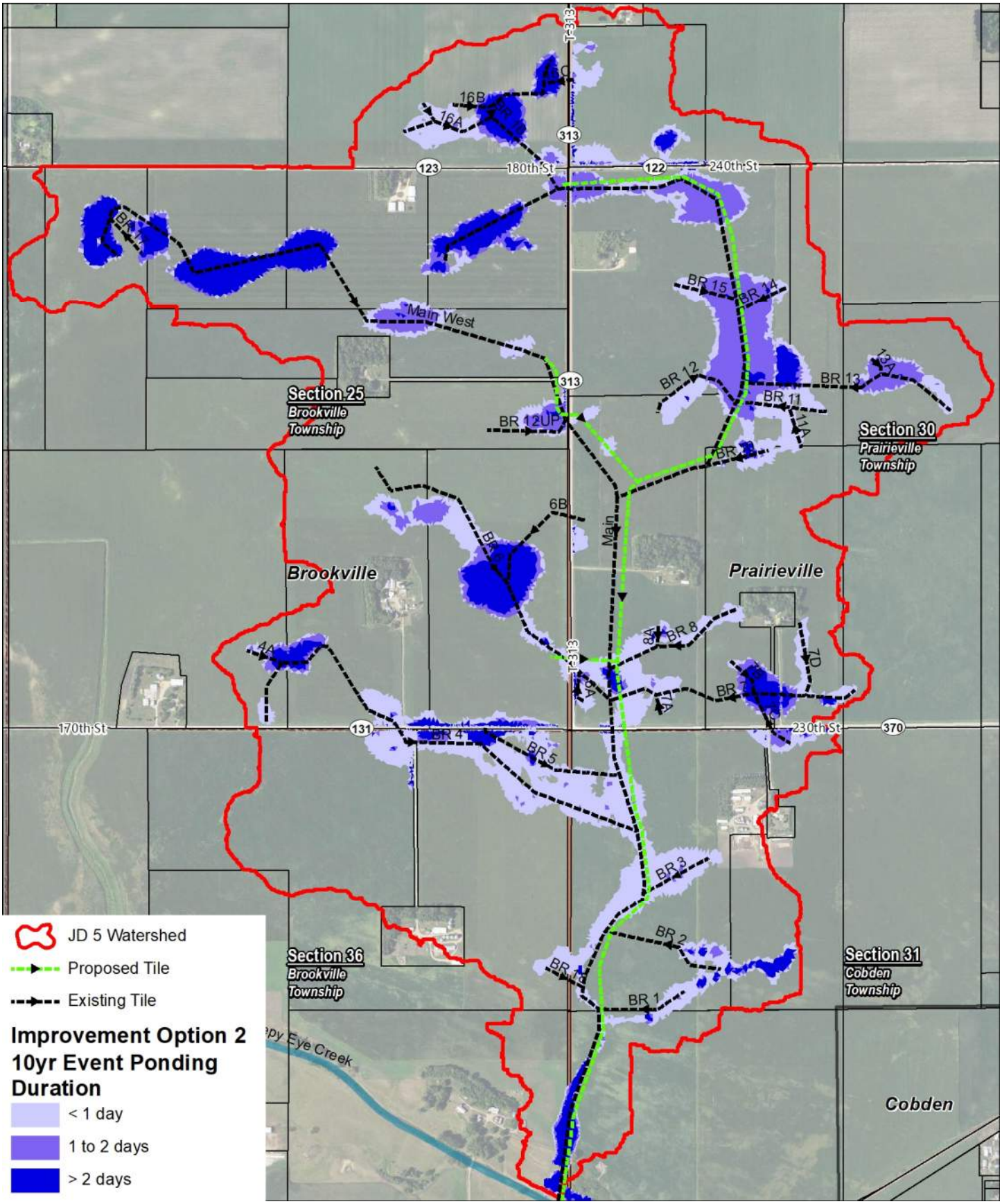

Figure 11. Improvement Option 2 Ponding Duration for the 10-year, 24-hour Rainfall Event

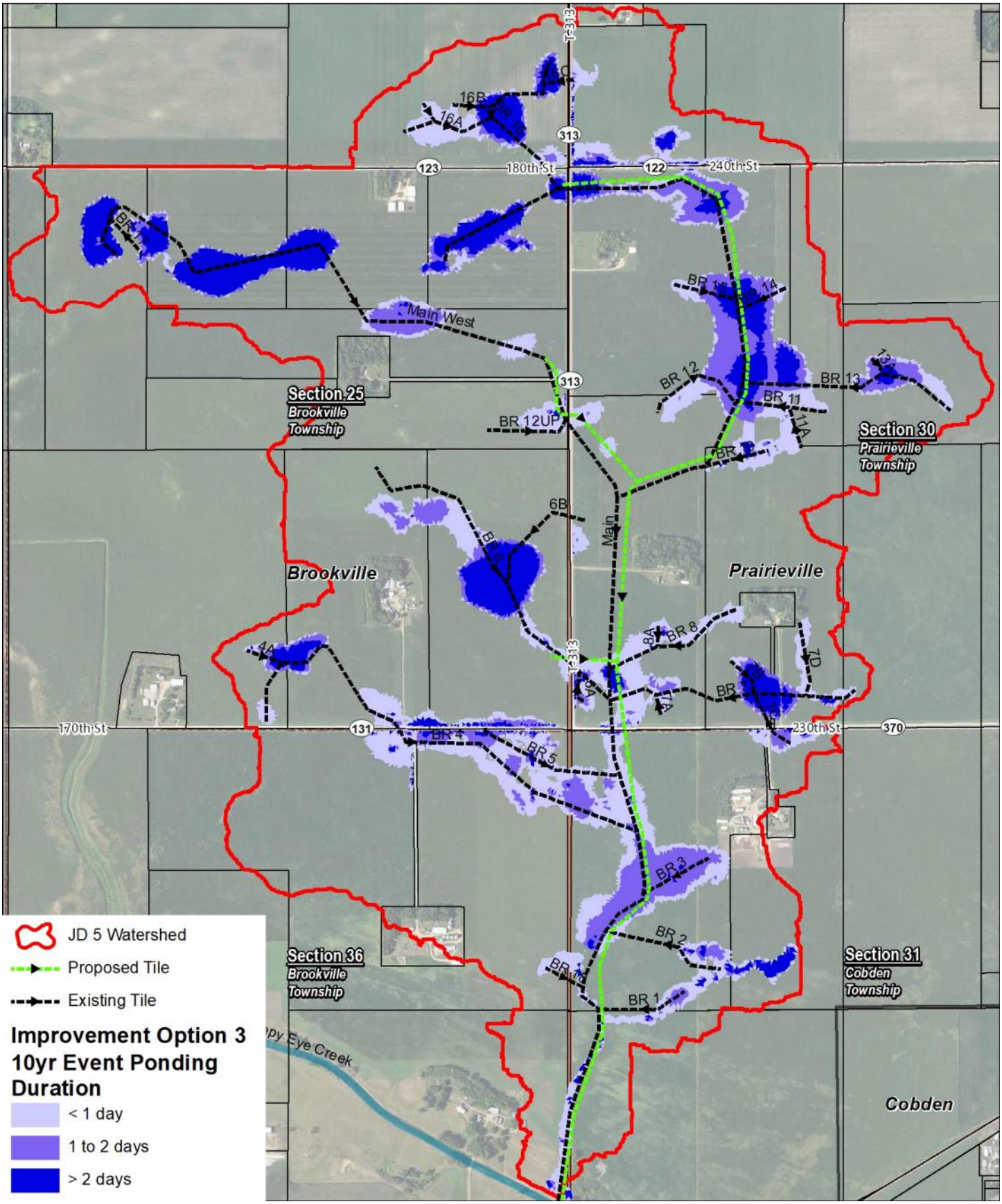

Figure 12. Improvement Option 3 Ponding Duration for the 10-year, 24-hour Rainfall Event

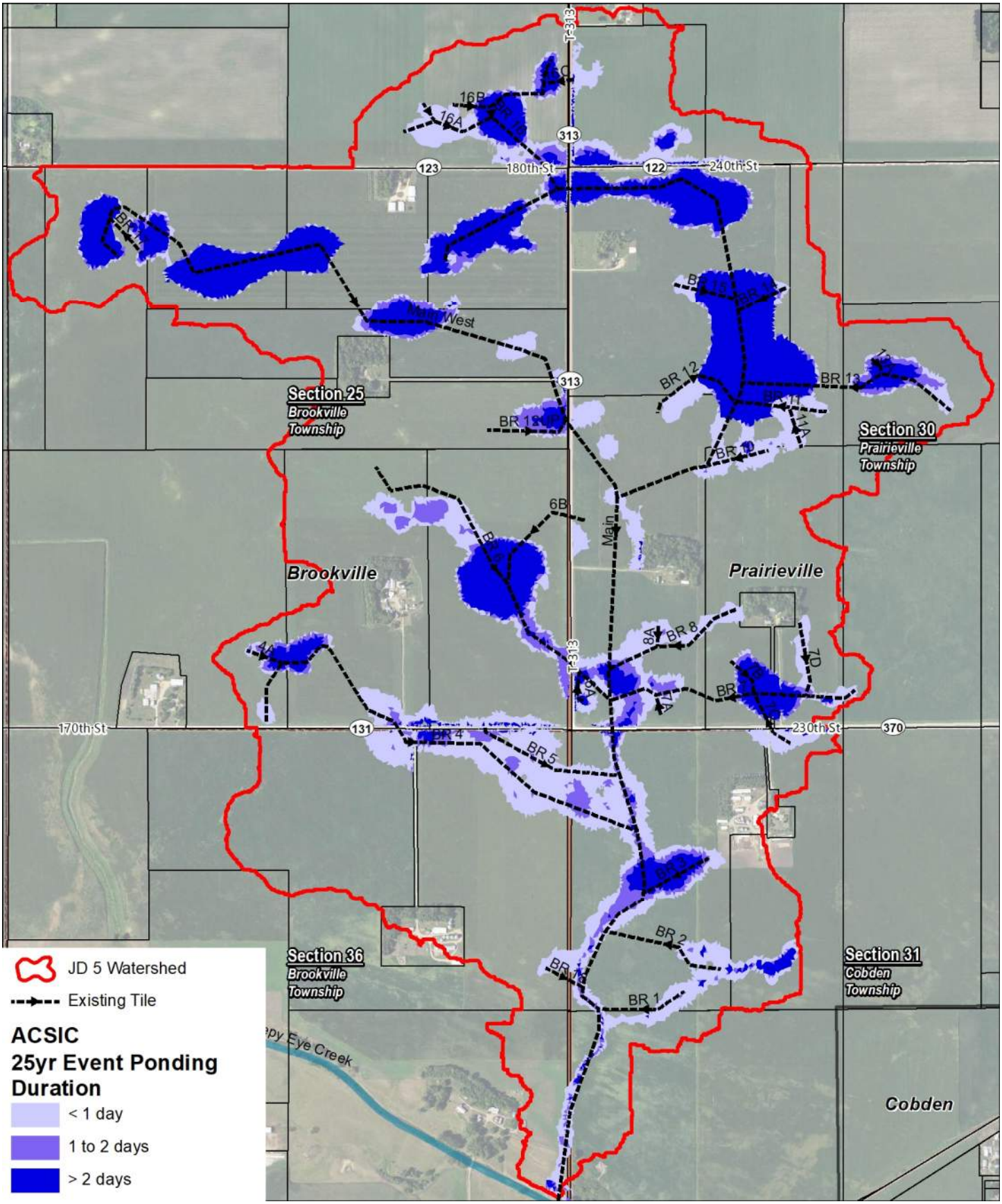

Figure 13. ACSIC Ponding Duration for the 25-year, 24-hour Rainfall Event

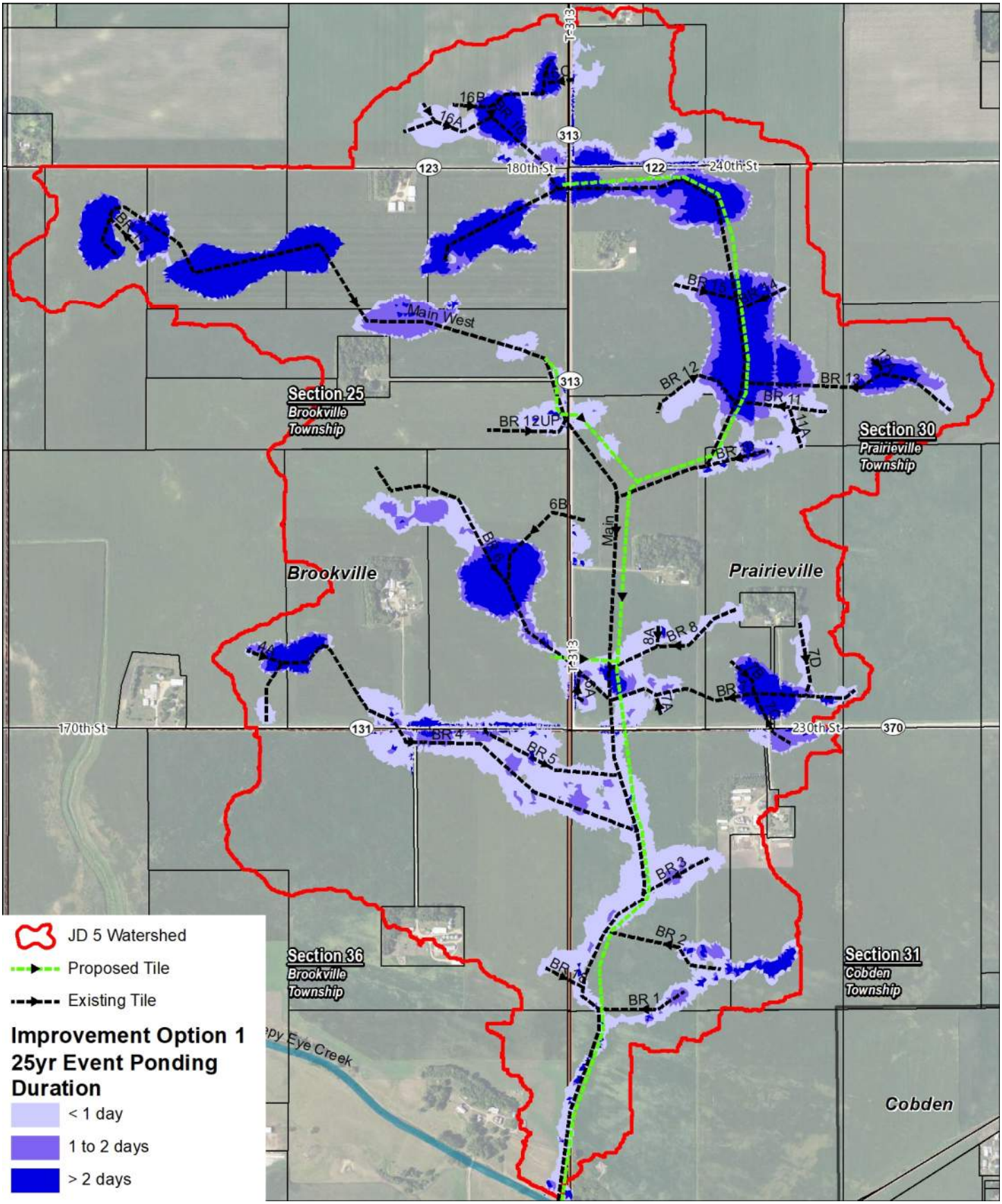

Figure 14. Improvement Option 1 Ponding Duration for the 25-year, 24-hour Rainfall Event

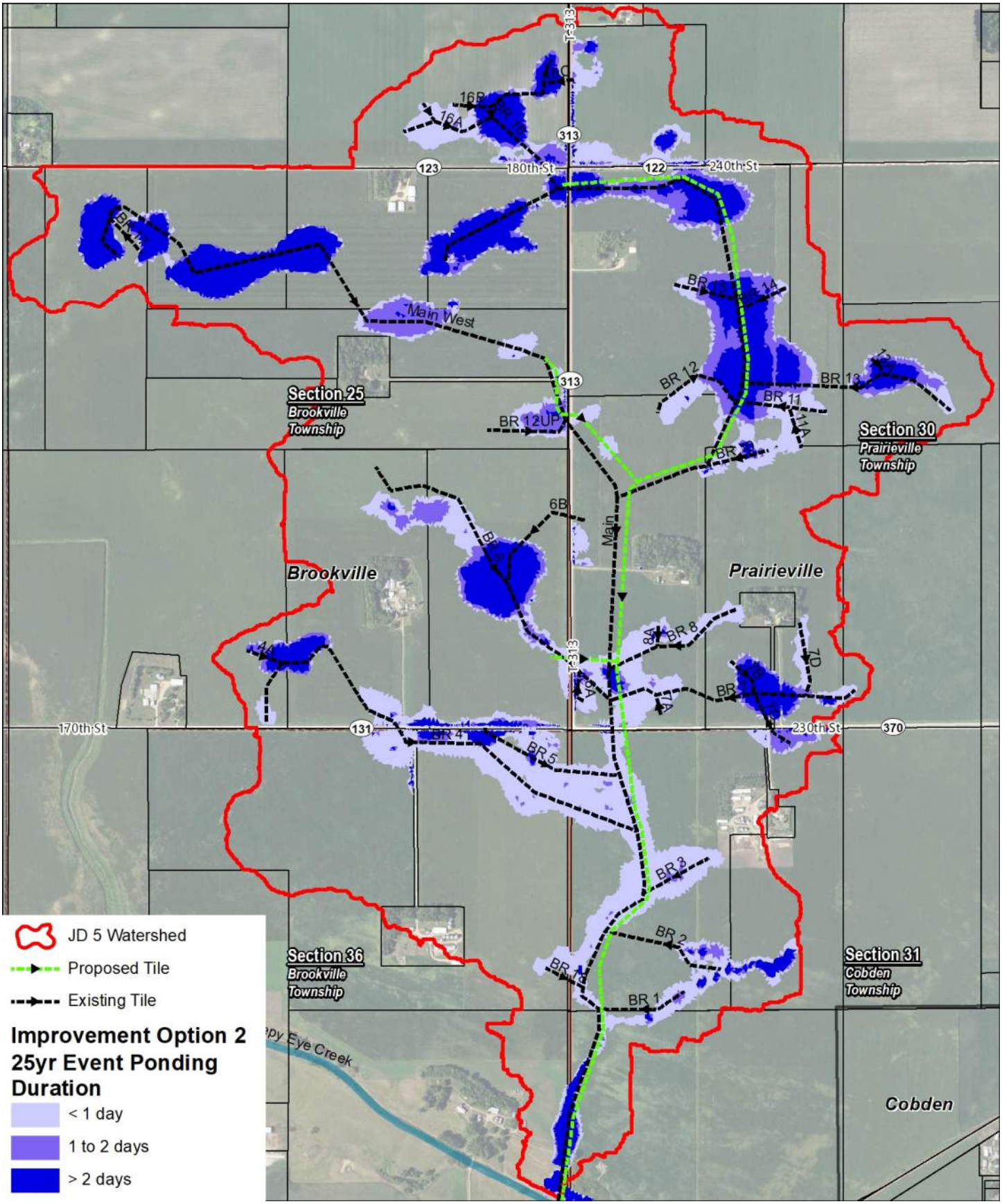

Figure 15. Improvement Option 2 Ponding Duration for the 25-year, 24-hour Rainfall Event

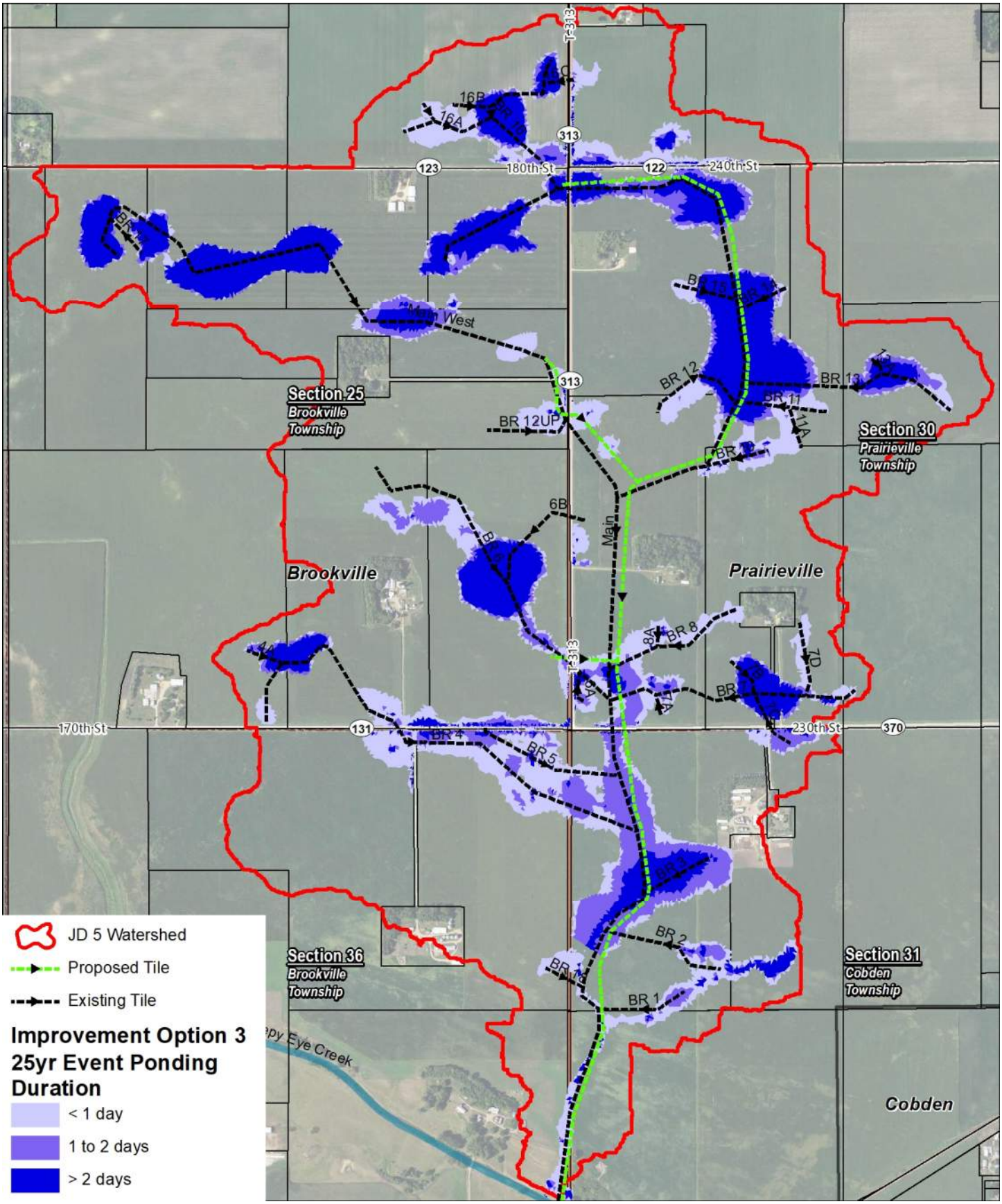

Figure 16. Improvement Option 3 Ponding Duration for the 25-year, 24-hour Rainfall Event

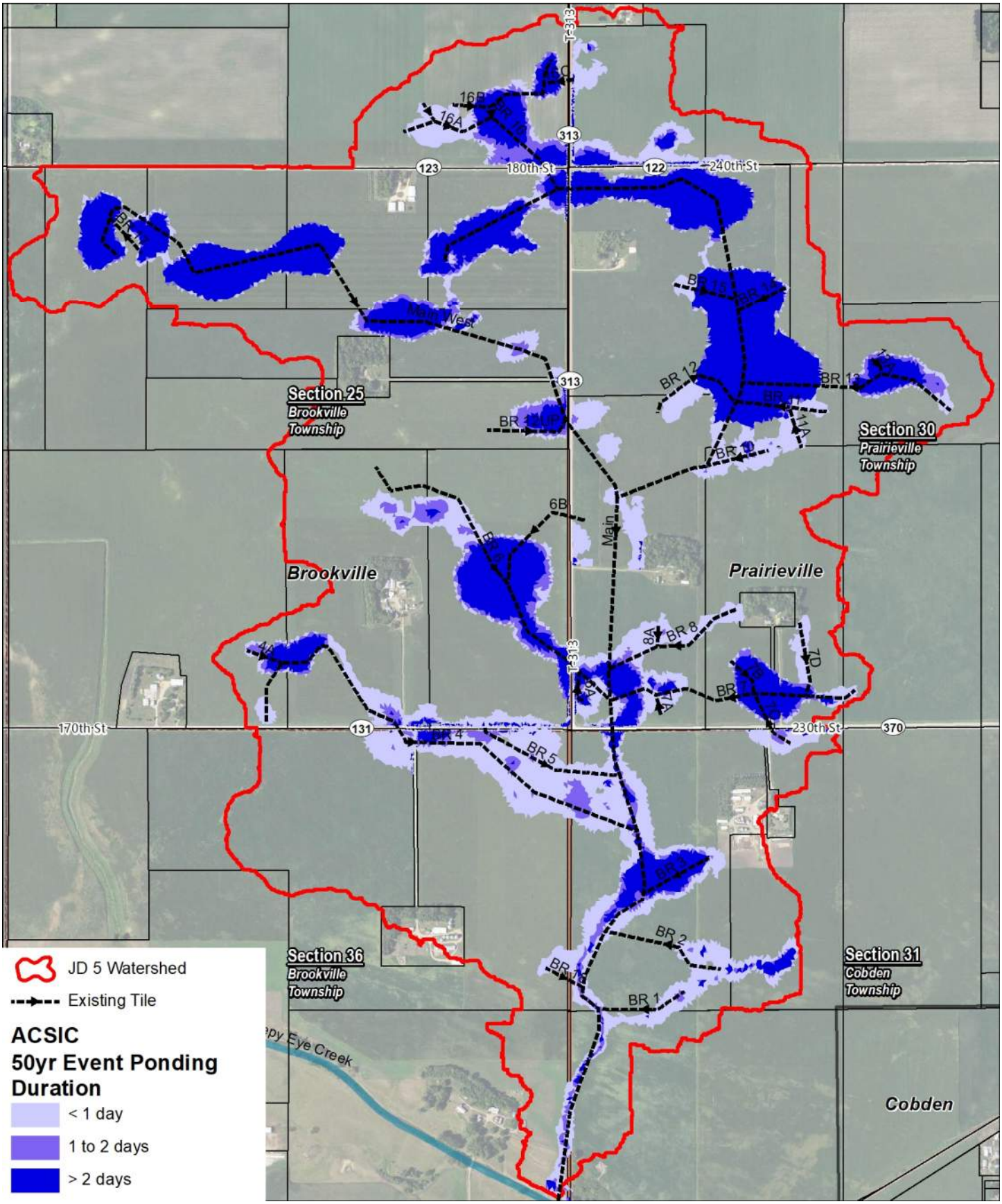

Figure 17. ACSIC Ponding Duration for the 50-year, 24-hour Rainfall Event

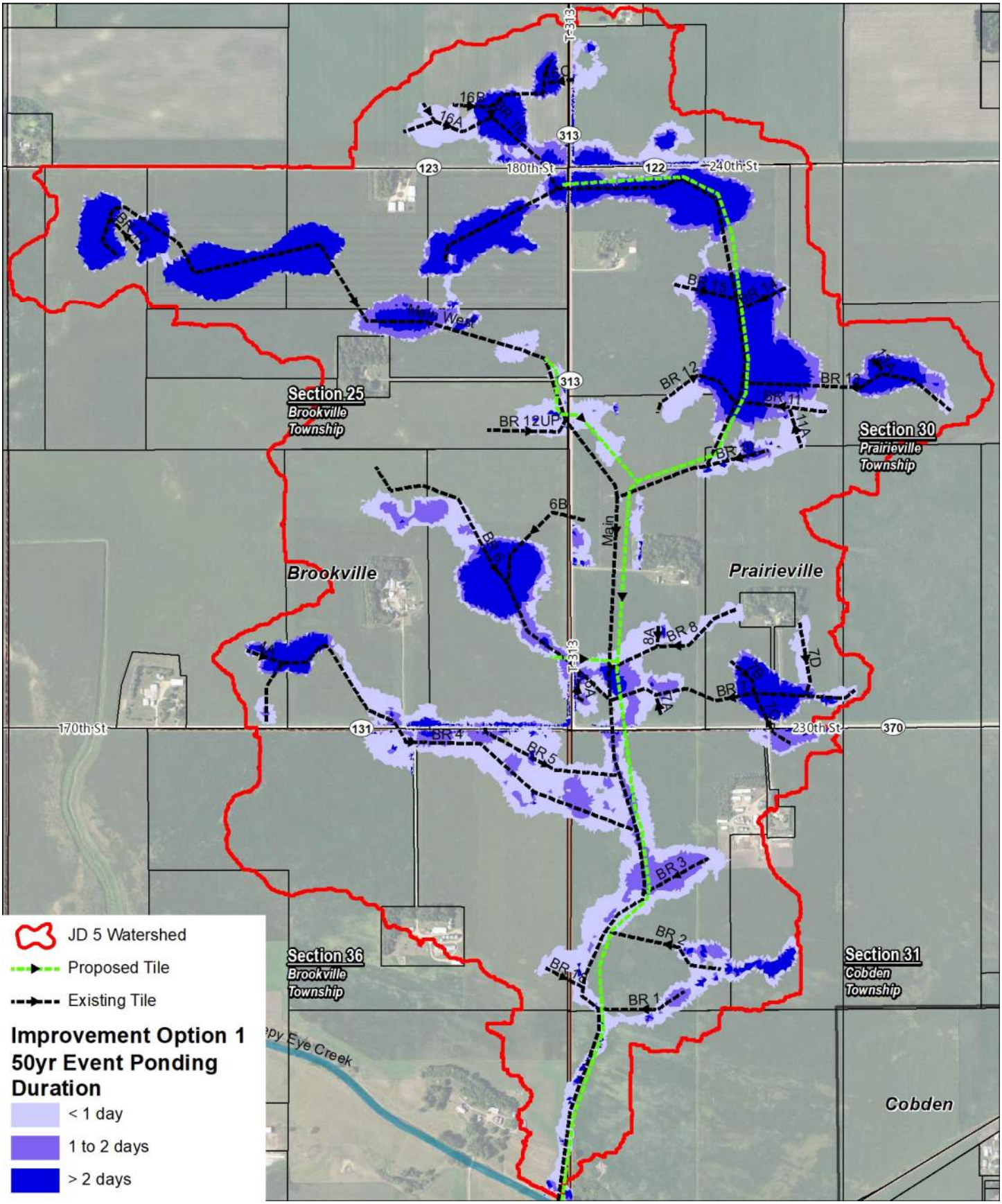

Figure 18. Improvement Option 1 Ponding Duration for the 50-year, 24-hour Rainfall Event

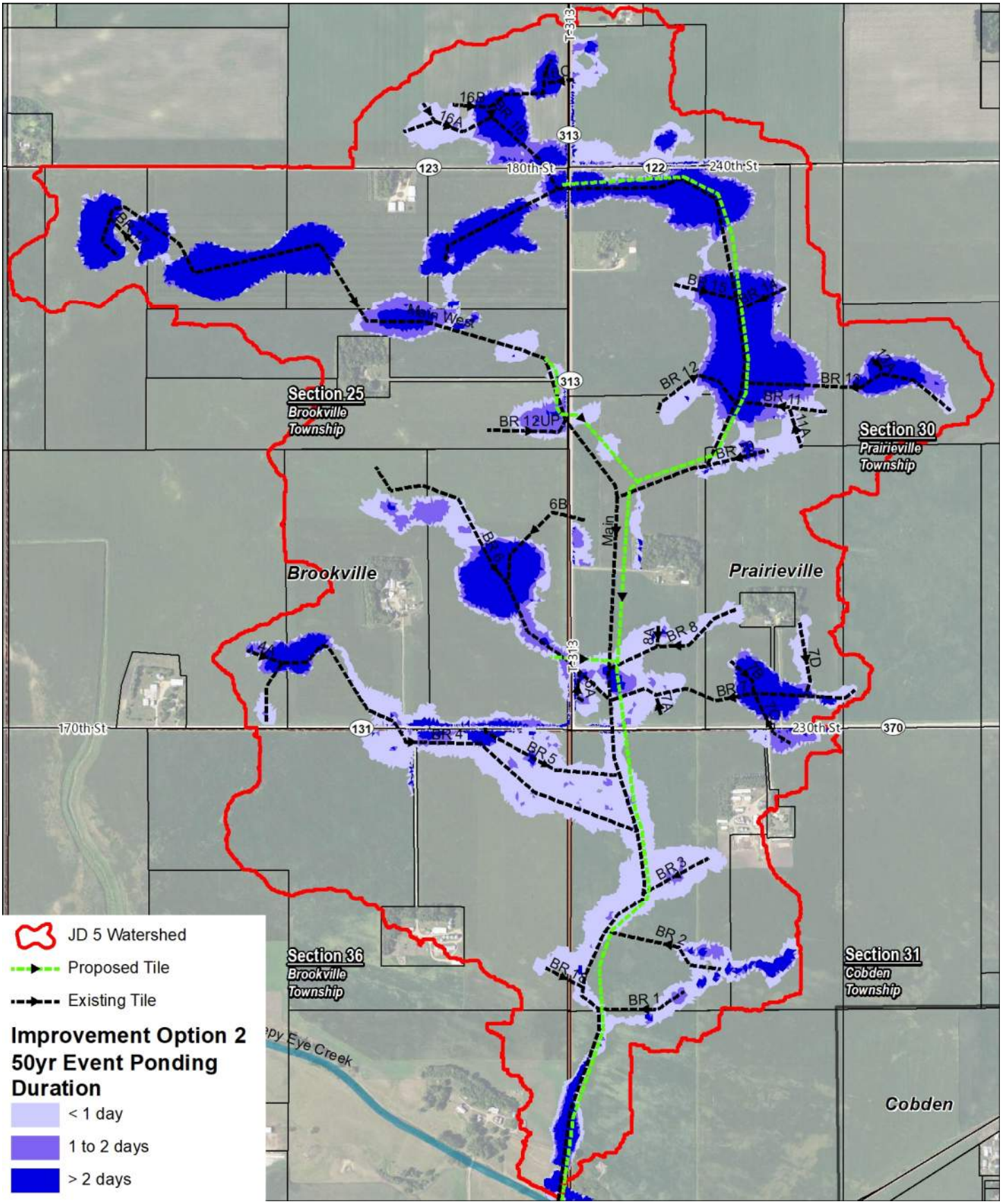

Figure 19. Improvement Option 2 Ponding Duration for the 50-year, 24-hour Rainfall Event

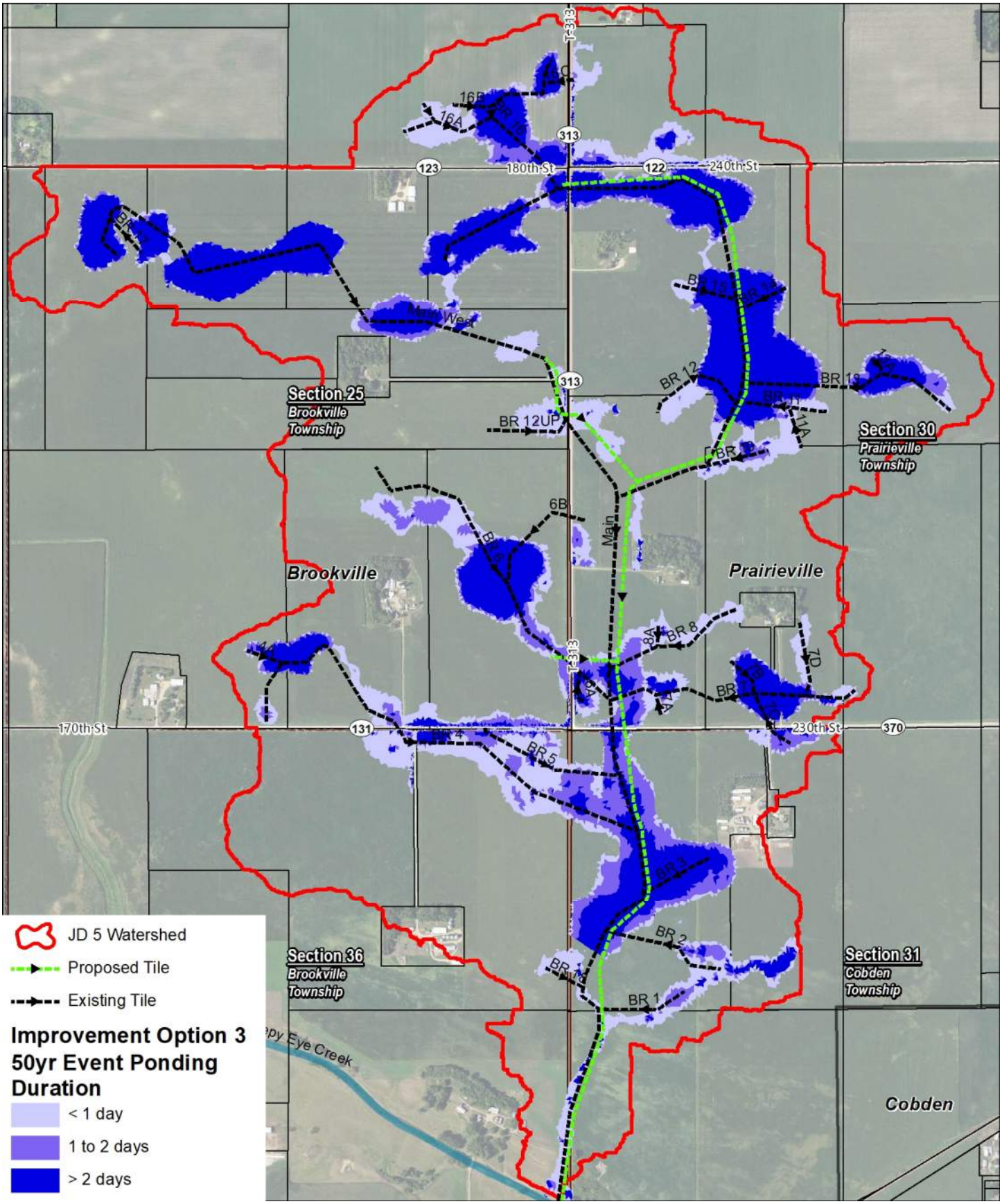

Figure 20. Improvement Option 3 Ponding Duration for the 50-year, 24-hour Rainfall Event

BROWN & REDWOOD COUNT
JUDICIAL DITCH No. 5

ISG

ICM Elevation Table - Option 1 No Storage

Location	5-yr			10-yr			25-yr			50-yr		
	ACSIC (MSL)	Proposed (MSL)	Difference	ACSIC (MSL)	Proposed (MSL)	Difference	ACSIC (MSL)	Proposed (MSL)	Difference	ACSIC (MSL)	Proposed (MSL)	Difference
JD5 Outlet - Surface	1005.50	1005.50	0.00	1005.70	1005.60	-0.10	1005.90	1005.90	0.00	1006.30	1006.30	0.00
Option 2 Pond Location	1019.50	1018.60	-0.90	1019.60	1018.80	-0.80	1019.80	1019.00	-0.80	1019.90	1019.20	-0.70
Option 3 Storage Location	1023.30	1023.30	0.00	1023.60	1023.60	0.00	1024.00	1023.80	-0.20	1024.30	1024.20	-0.10
Main - 170th St	1025.70	1025.30	-0.40	1025.90	1025.50	-0.40	1026.20	1025.70	-0.50	1026.40	1025.90	-0.50
Main - Main West Split	1030.10	1028.70	-1.40	1030.40	1029.60	-0.80	1030.80	1030.40	-0.40	1031.00	1030.70	-0.30
Main - BR 15	1028.00	1027.90	-0.10	1028.20	1028.20	0.00	1028.60	1028.60	0.00	1029.00	1028.90	-0.10
Main - Proposed End	1030.40	1030.00	-0.40	1030.60	1030.30	-0.30	1031.00	1030.70	-0.30	1031.70	1031.00	-0.70
Main West - Proposed End	1032.90	1033.20	0.30	1033.20	1033.50	0.30	1033.50	1033.90	0.40	1034.00	1034.20	0.20

Denotes peak elevation less than or equal to ACSIC

BROWN & REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ICM Flowrate Table - Option 1 No Storage

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change	ACSIC (cfs)	Option 1 (cfs)	% Change
JD5 Outlet	Tile	25.30	47.20	87%	28.60	51.80	81%	33.60	59.90	78%	37.50	64.70	73%
	Overland Flow	32.70	21.40	-35%	60.40	47.30	-22%	116.80	103.00	-12%	180.80	170.00	-6%
	Total	58.00	68.60	18%	89.00	99.10	11%	150.40	162.90	8%	218.30	234.70	8%
Option 2 Pond Location	Tile	12.90	35.90	178%	12.90	36.80	185%	12.90	37.50	191%	12.80	38.00	197%
Option 3 Storage Location	Tile	15.70	30.70	96%	14.70	29.00	97%	13.90	28.00	101%	13.20	28.00	112%
Main - 170th St	Tile	11.20	25.10	124%	11.20	27.40	145%	11.30	31.00	174%	11.90	33.80	184%
Main - Main West Split	Tile	10.70	21.70	103%	10.50	18.70	78%	10.60	17.90	69%	10.70	18.10	69%
Main - BR 15	Tile	3.90	9.80	151%	3.90	10.10	159%	3.90	10.40	167%	4.50	10.60	136%
Main - Proposed End	Tile	2.40	4.80	100%	2.70	5.40	100%	3.00	6.30	110%	3.20	7.00	119%
Main West - Proposed End	Tile	2.80	4.10	46%	3.10	4.20	35%	3.10	4.80	55%	3.10	4.80	55%

Denotes peak flows less than or equal to ACSIC

BROWN & REDWOOD COUNT
JUDICIAL DITCH No. 5

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ICM Elevation Table - Option 2 Pond

Location	5-yr			10-yr			25-yr			50-yr		
	ACSIC (MSL)	Option 2 (MSL)	Difference	ACSIC (MSL)	Option 2 (MSL)	Difference	ACSIC (MSL)	Option 2 (MSL)	Difference	ACSIC (MSL)	Option 2 (MSL)	Difference
JD5 Outlet - Surface	1005.50	1005.50	0.00	1005.70	1005.50	-0.20	1005.90	1005.50	-0.40	1006.30	1005.50	-0.80
Option 2 Pond Location	1019.50	1016.20	-3.30	1019.60	1016.80	-2.80	1019.80	1017.60	-2.20	1019.90	1018.10	-1.80
Option 3 Storage Location	1023.30	1022.90	-0.40	1023.60	1023.40	-0.20	1024.00	1023.80	-0.20	1024.30	1024.10	-0.20
Main - 170th St	1025.70	1024.90	-0.80	1025.90	1025.10	-0.80	1026.20	1025.40	-0.80	1026.40	1025.60	-0.80
Main - Main West Split	1030.10	1028.60	-1.50	1030.40	1029.60	-0.80	1030.80	1030.40	-0.40	1031.00	1030.70	-0.30
Main - BR 15	1028.00	1027.90	-0.10	1028.20	1028.20	0.00	1028.60	1028.60	0.00	1029.00	1028.90	-0.10
Main - Proposed End	1030.40	1030.40	0.00	1030.60	1030.60	0.00	1031.00	1030.90	-0.10	1031.70	1031.30	-0.40
Main West - Proposed End	1032.90	1032.50	-0.40	1033.20	1032.70	-0.50	1033.50	1033.60	0.10	1034.00	1034.30	0.30

Denotes peak elevation less than or equal to ACSIC

BROWN & REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ICM Flowrate Table - Option 2 Pond

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change	ACSIC (cfs)	Option 2 (cfs)	% Change
JD5 Outlet	Tile	25.30	40.90	62%	28.60	42.70	49%	33.60	46.20	38%	37.50	49.20	31%
	Overland Flow	32.70	1.50	-95%	60.40	23.30	-61%	116.80	82.40	-29%	180.80	138.60	-23%
	Total	58.00	42.40	-27%	89.00	66.00	-26%	150.40	128.60	-14%	218.30	187.80	-14%
Option 2 Pond Location	Tile	12.90	60.30	367%	12.90	64.40	399%	12.90	69.60	440%	12.80	72.20	464%
Option 3 Storage Location	Tile	15.70	43.80	179%	14.70	44.00	199%	13.90	44.60	221%	13.20	44.70	239%
Main - 170th St	Tile	11.20	25.90	131%	11.20	24.50	119%	11.30	28.30	150%	11.90	32.10	170%
Main - Main West Split	Tile	10.70	21.70	103%	10.50	18.70	78%	10.60	18.70	76%	10.70	19.00	78%
Main - BR 15	Tile	3.90	9.70	149%	3.90	10.00	156%	3.90	10.30	164%	4.50	10.50	133%
Main - Proposed End	Tile	2.40	5.70	138%	2.70	6.30	133%	3.00	7.20	140%	3.20	8.00	150%
Main West - Proposed End	Tile	2.80	4.50	61%	3.10	3.90	26%	3.10	4.20	35%	3.10	4.20	35%

Denotes peak flows less than or equal to ACSIC

BROWN & REDWOOD COUNT
JUDICIAL DITCH No. 5

ISG

ICM Elevation Table - Option 3 Storage

Location	5-yr			10-yr			25-yr			50-yr		
	ACSIC (MSL)	Option 3 (MSL)	Difference	ACSIC (MSL)	Option 3 (MSL)	Difference	ACSIC (MSL)	Option 3 (MSL)	Difference	ACSIC (MSL)	Option 3 (MSL)	Difference
JD5 Outlet - Surface	1005.50	1005.50	0.00	1005.70	1005.50	-0.20	1005.90	1005.60	-0.30	1006.30	1005.70	-0.60
Option 2 Pond Location	1019.50	1018.60	-0.90	1019.60	1018.80	-0.80	1019.80	1019.00	-0.80	1019.90	1019.20	-0.70
Option 3 Storage Location	1023.30	1023.90	0.60	1023.60	1024.30	0.70	1024.00	1025.00	1.00	1024.30	1025.60	1.30
Main - 170th St	1025.70	1025.40	-0.30	1025.90	1025.60	-0.30	1026.20	1025.90	-0.30	1026.40	1026.20	-0.20
Main - Main West Split	1030.10	1028.60	-1.50	1030.40	1029.60	-0.80	1030.80	1030.40	-0.40	1031.00	1030.70	-0.30
Main - BR 15	1028.00	1027.90	-0.10	1028.20	1028.10	-0.10	1028.60	1028.50	-0.10	1029.00	1028.80	-0.20
Main - Proposed End	1030.40	1030.20	-0.20	1030.60	1030.50	-0.10	1031.00	1030.80	-0.20	1031.70	1031.20	-0.50
Main West - Proposed End	1032.90	1033.20	0.30	1033.20	1033.50	0.30	1033.50	1033.90	0.40	1034.00	1034.10	0.10

Denotes peak elevation less than or equal to ACSIC

BROWN & REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ICM Flowrate Table - Option 3 Storage

Location	Conveyence	5-yr			10-yr			25-yr			50-yr		
		ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change	ACSIC (cfs)	Option 3 (cfs)	% Change
JD5 Outlet	Tile	25.30	47.30	87%	28.60	52.20	83%	33.60	58.90	75%	37.50	64.30	71%
	Overland Flow	32.70	19.00	-42%	60.40	31.20	-48%	116.80	51.00	-56%	180.80	68.90	-62%
	Total	58.00	66.30	14%	89.00	83.40	-6%	150.40	109.90	-27%	218.30	133.20	-39%
Option 2 Pond Location	Tile	12.90	36.20	181%	12.90	36.90	186%	12.90	37.60	191%	12.80	38.10	198%
Option 3 Storage Location	Tile	15.70	30.60	95%	14.70	28.90	97%	13.90	26.80	93%	13.20	26.10	98%
Main - 170th St	Tile	11.20	22.60	102%	11.20	23.50	110%	11.30	26.20	132%	11.90	28.40	139%
Main - Main West Split	Tile	10.70	21.70	103%	10.50	18.70	78%	10.60	17.20	62%	10.70	17.70	65%
Main - BR 15	Tile	3.90	7.70	97%	3.90	7.90	103%	3.90	8.10	108%	4.50	8.60	91%
Main - Proposed End	Tile	2.40	5.90	146%	2.70	6.50	141%	3.00	7.40	147%	3.20	8.10	153%
Main West - Proposed End	Tile	2.80	3.80	36%	3.10	4.20	35%	3.10	5.00	61%	3.10	5.00	61%

Denotes peak flows less than or equal to ACSIC

Appendix G: Preliminary Cost Estimates

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT OPTION 1 COST SUMMARY

Area	Separable Maintenance	Improvement Cost	Net Cost
Main Tile	$ 883,497	$ 1,106,504	$ 223,007
Main West Tile	$ 110,609	$ 121,596	$ 10,987
Branch 6 Tile	$ 44,068	$ 45,254	$ 1,186
Road Crossing Costs	$ -	$ 1,781	$ 1,781
Subtotal	**$ 1,038,174**	**$ 1,275,136**	**$ 236,962**
Road Authority Repair Costs	$ 43,233	$ 43,233	$ -
Total Project Costs	**$ 1,081,407**	**$ 1,318,368**	**$ 236,962**
		Subtotal Separable Maintenance Costs	$ 1,038,174
		Net Costs	$ 236,962
		Total Project Costs for Landowners	**$ 1,275,136**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT OPTION 2 COST SUMMARY

Area	Separable Maintenance	Improvement Cost	Net Cost
Main Tile	$ 883,497	$ 1,018,548	$ 135,051
Main West Tile	$ 110,609	$ 121,596	$ 10,987
Branch 6 Tile	$ 44,068	$ 44,585	$ 517
Storage	$ -	$ 271,635	$ 271,635
Road Crossing Costs	$ -	$ 1,781	$ 1,781
Subtotal	**$ 1,038,174**	**$ 1,458,145**	**$ 419,971**
Road Authority Repair Costs	$ 43,233	$ 43,233	$ -
Total Project Costs	**$ 1,081,407**	**$ 1,501,378**	**$ 419,971**
		Subtotal Separable Maintenance Costs	$ 1,038,174
		Net Costs	$ 419,971
		Total Project Costs for Landowners	**$ 1,458,145**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT OPTION 3 COST SUMMARY

Area	Separable Maintenance	Improvement Cost	Net Cost
Main Tile	$ 883,497	$ 1,104,337	$ 220,840
Main West Tile	$ 110,609	$ 121,596	$ 10,987
Branch 6 Tile	$ 44,068	$ 44,585	$ 517
Storage	$ -	$ 68,777	$ 68,777
Road Crossing Costs	$ -	$ 1,781	$ 1,781
Subtotal	**$ 1,038,174**	**$ 1,341,076**	**$ 302,902**
Road Authority Repair Costs	$ 43,233	$ 43,233	$ -
Total Project Costs	**$ 1,081,407**	**$ 1,384,309**	**$ 302,902**
		Subtotal Separable Maintenance Costs	$ 1,038,174
		Net Costs	$ 302,902
		Total Project Costs for Landowners	**$ 1,341,076**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

SEPARABLE MAINTENANCE (REPAIR)

Main Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 27,580.00	$ 27,580
102	TILE INVESTIGATION	HR	24	$ 260.00	$ 6,240
103	24-INCH AGRICULTURAL TILE	LF	5723	$ 42.50	$ 243,228
104	18-INCH AGRICULTURAL TILE	LF	3034	$ 32.00	$ 97,088
105	15-INCH AGRICULTURAL TILE	LF	2008	$ 27.00	$ 54,216
106	12-INCH AGRICULTURAL TILE	LF	1179	$ 25.66	$ 30,257
107	CONNECT EXISTING 18-INCH TILE	EA	2	$ 1,728.21	$ 3,456
108	CONNECT EXISTING 15-INCH TILE	EA	1	$ 1,235.47	$ 1,235
109	CONNECT EXISTING 12-INCH TILE	EA	1	$ 953.26	$ 953
110	CONNECT EXISTING 10-INCH TILE	EA	2	$ 854.81	$ 1,710
111	CONNECT EXISTING 8-INCH TILE	EA	7	$ 648.09	$ 4,537
112	CONNECT EXISTING 6-INCH TILE	EA	18	$ 536.90	$ 9,664
113	CONNECT EXISTING 4-INCH TILE	EA	30	$ 439.72	$ 13,192
114	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	4	$ 4,695.46	$ 18,782
115	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 3,138.08	$ 3,138
116	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	$ 2,266.26	$ 4,533
117	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
118	GRANULAR PIPE FOUNDATION	CY	350	$ 31.77	$ 11,120
119	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
120	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	187	$ 34.80	$ 6,508
121	INSTALL DROP INTAKE (18-INCH)	EA	13	$ 1,438.50	$ 18,701
122	CAP DROP INTAKE (18-INCH)	EA	4	$ 507.63	$ 2,031
123	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	9	$ 398.38	$ 3,585
124	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
125	TREE REMOVAL	EA	1	$ 417.70	$ 418
126	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
127	INSTALL INLET PROTECTION	EA	1	$ 192.50	$ 193
128	REMOVE & REINSTALL FENCE	LF	100	$ 17.50	$ 1,750
129	REMOVE EXISTING DROP INTAKE	EA	1	$ 410.34	$ 410
130	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
131	MAJOR UTILITY CROSSING (FIBER OPTIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 578,983**
				10% UNFORSEEN	$ 57,898
				TOTAL CONSTRUCTION COST	**$ 636,881**
	TEMPORARY DAMAGES	AC	33.99	$ 750.00	$ 25,492
	TELEVISING (POST CONSTRUCTION)	LF	11944	$ 1.00	$ 11,944
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 31,845
				TOPOGRAPHIC SURVEY	$ 14,930
				REPORTS, PLANS AND SPECIFICATIONS	$ 73,242
				CONSTRUCTION STAKING & ADMINISTRATION	$ 89,164
				TOTAL MAIN TILE REPAIR COST	**$ 883,497**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

SEPARABLE MAINTENANCE (REPAIR)

Main West Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 3,490.00	$ 3,490
102	TILE INVESTIGATION	HR	3	$ 260.00	$ 780
103	15-INCH AGRICULTURAL TILE	LF	1355	$ 27.00	$ 36,585
104	8-INCH AGRICULTURAL TILE	LF	14	$ 24.00	$ 336
105	CONNECT EXISTING 15-INCH TILE	EA	2	$ 1,235.47	$ 2,471
106	CONNECT EXISTING 8-INCH TILE	EA	2	$ 648.09	$ 1,296
107	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
108	CONNECT EXISTING 4-INCH TILE	EA	4	$ 439.72	$ 1,759
109	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,322.41	$ 1,322
110	GRANULAR PIPE FOUNDATION	CY	35	$ 31.77	$ 1,112
111	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
112	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	132	$ 34.80	$ 4,594
113	INSTALL DROP INTAKE (18-INCH)	EA	4	$ 1,438.50	$ 5,754
114	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	4	$ 398.38	$ 1,594
115	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
116	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
117	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
118	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 73,263**
				10% UNFORSEEN	$ 7,326
				TOTAL CONSTRUCTION COST	**$ 80,589**
	TEMPORARY DAMAGES	AC	3.14	$ 750.00	$ 2,357
	TELEVISING (POST CONSTRUCTION)	LF	1369	$ 1.00	$ 1,369
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 4,030
				TOPOGRAPHIC SURVEY	$ 1,712
				REPORTS, PLANS AND SPECIFICATIONS	$ 9,268
				CONSTRUCTION STAKING & ADMINISTRATION	$ 11,283
				TOTAL MAIN WEST TILE REPAIR COST	**$ 110,609**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

SEPARABLE MAINTENANCE (REPAIR)

Branch 6 Tile

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 1,410.00	$ 1,410
102	TILE INVESTIGATION	HR	1	$ 260.00	$ 260
103	12-INCH AGRICULTURAL TILE	LF	432	$ 25.66	$ 11,086
104	CONNECT EXISTING 24-INCH TILE	EA	1	$ 2,525.49	$ 2,525
105	CONNECT EXISTING 12-INCH TILE	EA	1	$ 953.26	$ 953
106	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
107	CONNECT EXISTING 4-INCH TILE	EA	2	$ 439.72	$ 879
108	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
109	GRANULAR PIPE FOUNDATION	CY	10	$ 31.77	$ 318
110	FURNISH & INSTALL WATER QUALITY INLET	EA	2	$ 1,347.90	$ 2,696
111	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	45	$ 34.80	$ 1,566
112	INSTALL DROP INTAKE (18-INCH)	EA	2	$ 1,438.50	$ 2,877
113	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	$ 398.38	$ 797
114	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 29,502**
				10% UNFORSEEN	$ 2,950
				TOTAL CONSTRUCTION COST	**$ 32,452**
	TEMPORARY DAMAGES	AC	0.99	$ 750.00	$ 744
	TELEVISING (POST CONSTRUCTION)	LF	432	$ 1.00	$ 432
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 1,623
				TOPOGRAPHIC SURVEY	$ 540
				REPORTS, PLANS AND SPECIFICATIONS	$ 3,733
				CONSTRUCTION STAKING & ADMINISTRATION	$ 4,544
				TOTAL BRANCH 6 TILE REPAIR COST	**$ 44,068**

TOTAL REPAIR COST

Main Tile	**$ 883,497**
Main West Tile	**$ 110,609**
Branch 6 Tile	**$ 44,068**

COMPLETE REPAIR COST	**$ 1,038,174**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #1

Main Tile (Option 1)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 34,340.00	$ 34,340
102	30-INCH AGRICULTURAL TILE	LF	6390	$ 55.00	$ 351,450
103	24-INCH AGRICULTURAL TILE	LF	3083	$ 42.50	$ 131,028
104	18-INCH AGRICULTURAL TILE	LF	2463	$ 32.00	$ 78,816
105	15-INCH AGRICULTURAL TILE	LF	8	$ 27.00	$ 216
106	CONNECT EXISTING 18-INCH TILE	EA	3	$ 1,728.21	$ 5,185
107	CONNECT EXISTING 15-INCH TILE	EA	1	$ 1,235.47	$ 1,235
108	CONNECT EXISTING 10-INCH TILE	EA	2	$ 854.81	$ 1,710
109	CONNECT EXISTING 8-INCH TILE	EA	7	$ 648.09	$ 4,537
110	CONNECT EXISTING 6-INCH TILE	EA	18	$ 536.90	$ 9,664
111	CONNECT EXISTING 4-INCH TILE	EA	30	$ 439.72	$ 13,192
112	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	4	$ 4,695.46	$ 18,782
113	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 3,138.08	$ 3,138
114	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	$ 2,266.26	$ 4,533
115	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
116	GRANULAR PIPE FOUNDATION	CY	406	$ 31.77	$ 12,899
117	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
118	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	187	$ 34.80	$ 6,508
119	INSTALL DROP INTAKE (18-INCH)	EA	13	$ 1,438.50	$ 18,701
120	CAP DROP INTAKE (18-INCH)	EA	4	$ 507.63	$ 2,031
121	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	9	$ 398.38	$ 3,585
122	30-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	$ 2,257.62	$ 2,258
123	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
124	TREE REMOVAL	EA	1	$ 417.70	$ 418
125	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET	SY	350	$ 3.69	$ 1,292
126	INSTALL INLET PROTECTION	EA	1	$ 192.50	$ 193
127	REMOVE & REINSTALL FENCE	LF	100	$ 17.50	$ 1,750
128	REMOVE EXISTING DROP INTAKE	EA	1	$ 410.34	$ 410
129	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
130	MAJOR UTILITY CROSSING (FIBER OPTIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 721,036**
				10% UNFORSEEN	$ 72,104
				TOTAL CONSTRUCTION COST	**$ 793,139**
	TEMPORARY DAMAGES	AC	38.29	$ 750.00	$ 28,720
	TELEVISING (POST CONSTRUCTION)	LF	11944	$ 1.00	$ 11,944
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 39,657
				TOPOGRAPHIC SURVEY	$ 14,930
				REPORTS, PLANS AND SPECIFICATIONS	$ 107,074
				CONSTRUCTION STAKING & ADMINISTRATION	$ 111,040
				TOTAL MAIN TILE (OPTION 1) IMPROVEMENT COST	**$ 1,106,504**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #1

Main West Tile (Option 1)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 3,800.00	$ 3,800
102	18-INCH AGRICULTURAL TILE	LF	1355	$ 32.00	$ 43,360
103	8-INCH AGRICULTURAL TILE	LF	14	$ 24.00	$ 336
104	CONNECT EXISTING 15-INCH TILE	EA	2	$ 1,235.47	$ 2,471
105	CONNECT EXISTING 8-INCH TILE	EA	2	$ 648.09	$ 1,296
106	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
107	CONNECT EXISTING 4-INCH TILE	EA	4	$ 439.72	$ 1,759
108	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,322.41	$ 1,322
109	GRANULAR PIPE FOUNDATION	CY	39	$ 31.77	$ 1,239
110	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
111	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	132	$ 34.80	$ 4,594
112	INSTALL DROP INTAKE (18-INCH)	EA	4	$ 1,438.50	$ 5,754
113	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	4	$ 398.38	$ 1,594
114	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
115	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
116	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
117	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 79,695**
				10% UNFORSEEN	$ 7,970
				TOTAL CONSTRUCTION COST	**$ 87,665**
	TEMPORARY DAMAGES	AC	3.14	$ 750.00	$ 2,357
	TELEVISING (POST CONSTRUCTION)	LF	1369	$ 1.00	$ 1,369
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 4,384
				TOPOGRAPHIC SURVEY	$ 1,712
				REPORTS, PLANS AND SPECIFICATIONS	$ 11,835
				CONSTRUCTION STAKING & ADMINISTRATION	$ 12,274
				TOTAL MAIN WEST TILE (OPTION 1) IMPROVEMENT COST	**$ 121,596**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #1

Branch 6 Tile (Option 1)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 1,430.00	$ 1,430
102	15-INCH AGRICULTURAL TILE	LF	432	$ 27.00	$ 11,664
103	CONNECT EXISTING 24-INCH TILE	EA	1	$ 2,525.49	$ 2,525
104	CONNECT EXISTING 12-INCH TILE	EA	1	$ 953.26	$ 953
105	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
106	CONNECT EXISTING 4-INCH TILE	EA	2	$ 439.72	$ 879
107	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
108	GRANULAR PIPE FOUNDATION	CY	11	$ 31.77	$ 349
109	FURNISH & INSTALL WATER QUALITY INLET	EA	2	$ 1,347.90	$ 2,696
110	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	45	$ 34.80	$ 1,566
111	INSTALL DROP INTAKE (18-INCH)	EA	2	$ 1,438.50	$ 2,877
112	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	$ 398.38	$ 797
113	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 29,871**
				10% UNFORSEEN	$ 2,987
				TOTAL CONSTRUCTION COST	**$ 32,859**
	TEMPORARY DAMAGES	AC	0.99	$ 750.00	$ 744
	TELEVISING (POST CONSTRUCTION)	LF	432	$ 1.00	$ 432
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 1,643
				TOPOGRAPHIC SURVEY	$ 540
				REPORTS, PLANS AND SPECIFICATIONS	$ 4,436
				CONSTRUCTION STAKING & ADMINISTRATION	$ 4,601
				TOTAL BRANCH 6 TILE (OPTION 1) IMPROVEMENT COST	**$ 45,254**

TOTAL IMPROVEMENT COST

Main Tile (Option 1)	**$ 1,106,504**
Main West Tile (Option 1)	**$ 121,596**
Branch 6 Tile (Option 1)	**$ 45,254**

COMPLETE IMPROVEMENT COST	**$ 1,273,354**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #2

Main Tile (Option 2)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 31,680.00	$ 31,680
102	36-INCH AGRICULTURAL TILE	LF	3000	$ 60.71	$ 182,130
103	30-INCH AGRICULTURAL TILE	LF	2770	$ 55.00	$ 152,350
104	24-INCH AGRICULTURAL TILE	LF	2353	$ 42.50	$ 100,003
105	18-INCH AGRICULTURAL TILE	LF	2429	$ 32.00	$ 77,728
106	15-INCH AGRICULTURAL TILE	LF	8	$ 27.00	$ 216
107	CONNECT EXISTING 18-INCH TILE	EA	3	$ 1,728.21	$ 5,185
108	CONNECT EXISTING 15-INCH TILE	EA	1	$ 1,235.47	$ 1,235
109	CONNECT EXISTING 10-INCH TILE	EA	2	$ 854.81	$ 1,710
110	CONNECT EXISTING 8-INCH TILE	EA	7	$ 648.09	$ 4,537
111	CONNECT EXISTING 6-INCH TILE	EA	17	$ 536.90	$ 9,127
112	CONNECT EXISTING 4-INCH TILE	EA	26	$ 439.72	$ 11,433
113	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	4	$ 4,695.46	$ 18,782
114	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	$ 2,266.26	$ 4,533
115	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
116	GRANULAR PIPE FOUNDATION	CY	370	$ 31.77	$ 11,755
117	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
118	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	187	$ 34.80	$ 6,508
119	INSTALL DROP INTAKE (18-INCH)	EA	12	$ 1,438.50	$ 17,262
120	CAP DROP INTAKE (18-INCH)	EA	4	$ 507.63	$ 2,031
121	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	8	$ 398.38	$ 3,187
122	36-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	$ 3,136.17	$ 3,136
123	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
124	TREE REMOVAL	EA	1	$ 417.70	$ 418
125	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET	SY	350	$ 3.69	$ 1,292
126	INSTALL INLET PROTECTION	EA	1	$ 192.50	$ 193
127	REMOVE & REINSTALL FENCE	LF	300	$ 17.50	$ 5,250
128	REMOVE EXISTING DROP INTAKE	EA	1	$ 410.34	$ 410
129	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
130	MAJOR UTILITY CROSSING (FIBER OPTIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 665,257**
				10% UNFORSEEN	$ 66,526
				TOTAL CONSTRUCTION COST	**$ 731,783**
	TEMPORARY DAMAGES	AC	33.57	$ 750.00	$ 25,175
	TELEVISING (POST CONSTRUCTION)	LF	10560	$ 1.00	$ 10,560
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 36,590
				TOPOGRAPHIC SURVEY	$ 13,200
				REPORTS, PLANS AND SPECIFICATIONS	$ 98,791
				CONSTRUCTION STAKING & ADMINISTRATION	$ 102,450
				TOTAL MAIN TILE (OPTION 2) IMPROVEMENT COST	**$ 1,018,548**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #2

Main West Tile (Option 2)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 3,800.00	$ 3,800
102	18-INCH AGRICULTURAL TILE	LF	1355	$ 32.00	$ 43,360
103	8-INCH AGRICULTURAL TILE	LF	14	$ 24.00	$ 336
104	CONNECT EXISTING 15-INCH TILE	EA	2	$ 1,235.47	$ 2,471
105	CONNECT EXISTING 8-INCH TILE	EA	2	$ 648.09	$ 1,296
106	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
107	CONNECT EXISTING 4-INCH TILE	EA	4	$ 439.72	$ 1,759
108	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,322.41	$ 1,322
109	GRANULAR PIPE FOUNDATION	CY	39	$ 31.77	$ 1,239
110	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
111	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	132	$ 34.80	$ 4,594
112	INSTALL DROP INTAKE (18-INCH)	EA	4	$ 1,438.50	$ 5,754
113	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	4	$ 398.38	$ 1,594
114	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
115	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
116	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
117	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 79,695**
				10% UNFORSEEN	$ 7,970
				TOTAL CONSTRUCTION COST	**$ 87,665**
	TEMPORARY DAMAGES	AC	3.14	$ 750.00	$ 2,357
	TELEVISING (POST CONSTRUCTION)	LF	1369	$ 1.00	$ 1,369
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 4,384
				TOPOGRAPHIC SURVEY	$ 1,712
				REPORTS, PLANS AND SPECIFICATIONS	$ 11,835
				CONSTRUCTION STAKING & ADMINISTRATION	$ 12,274
				TOTAL MAIN WEST TILE (OPTION 2) IMPROVEMENT COST	**$ 121,596**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #2

Branch 6 Tile (Option 2)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 1,410.00	$ 1,410
102	15-INCH AGRICULTURAL TILE	LF	432	$ 27.00	$ 11,664
103	CONNECT EXISTING 24-INCH TILE	EA	1	$ 2,525.49	$ 2,525
104	CONNECT EXISTING 12-INCH TILE	EA	1	$ 953.26	$ 953
105	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
106	CONNECT EXISTING 4-INCH TILE	EA	1	$ 439.72	$ 440
107	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
108	GRANULAR PIPE FOUNDATION	CY	11	$ 31.77	$ 349
109	FURNISH & INSTALL WATER QUALITY INLET	EA	2	$ 1,347.90	$ 2,696
110	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	45	$ 34.80	$ 1,566
111	INSTALL DROP INTAKE (18-INCH)	EA	2	$ 1,438.50	$ 2,877
112	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	$ 398.38	$ 797
113	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 29,412**
				10% UNFORSEEN	$ 2,941
				TOTAL CONSTRUCTION COST	**$ 32,353**
	TEMPORARY DAMAGES	AC	0.99	$ 750.00	$ 744
	TELEVISING (POST CONSTRUCTION)	LF	432	$ 1.00	$ 432
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 1,618
				TOPOGRAPHIC SURVEY	$ 540
				REPORTS, PLANS AND SPECIFICATIONS	$ 4,368
				CONSTRUCTION STAKING & ADMINISTRATION	$ 4,530
				TOTAL BRANCH 6 TILE (OPTION 2) IMPROVEMENT COST	**$ 44,585**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #2

Storage (Option 2)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 7,730.00	$ 7,730
102	COMMON EXCAVATION - POND (P) (EV)	CY	20973	$ 3.50	$ 73,407
103	TOP SOIL STRIP & PLACE SPOILS	AC	7	$ 4,284.09	$ 28,107
104	24-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1.0	$ 1,956.16	$ 1,956
105	INSTALL STRUCTURE S-1 WITH GALVINIZED GRATE	EA	1	$ 21,785.00	$ 21,785
106	16.5' BUFFER STRIP SEEDING	AC	0.7575758	$ 1,920.84	$ 1,455
107	POND BOTTOM SEEDING	AC	2.50	$ 3,662.50	$ 9,156
108	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET	SY	1780	$ 3.69	$ 6,568
109	CLASS III RIPRAP WITH GEOTEXTILE FABRIC	CY	150	$ 80.13	$ 12,020
				SUBTOTAL CONSTRUCTION COST	**$ 162,184**
				10% UNFORSEEN	$ 16,218
				TOTAL CONSTRUCTION COST	**$ 178,402**
	TEMPORARY DAMAGES	AC	7	$ 750.00	$ 5,250
	LAND ACQUISTION/ PERMANENT DAMAGES	AC	3	$ 8,500.00	$ 25,500
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 8,921
				TOPOGRAPHIC SURVEY	$ 4,500
				REPORTS, PLANS AND SPECIFICATIONS	$ 24,085
				CONSTRUCTION STAKING & ADMINISTRATION	$ 24,977
				TOTAL STORAGE (OPTION 2) IMPROVEMENT COST	**$ 271,635**

TOTAL IMPROVEMENT COST

Main Tile (Option 2)	**$ 1,018,548**
Main West Tile (Option 2)	**$ 121,596**
Branch 6 Tile (Option 2)	**$ 44,585**
Storage (Option 2)	**$ 271,635**

COMPLETE IMPROVEMENT COST	**$ 1,456,364**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #3

Main Tile (Option 3)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 34,270.00	$ 34,270
102	30-INCH AGRICULTURAL TILE	LF	6390	$ 55.00	$ 351,450
103	24-INCH AGRICULTURAL TILE	LF	3083	$ 42.50	$ 131,028
104	18-INCH AGRICULTURAL TILE	LF	2463	$ 32.00	$ 78,816
105	15-INCH AGRICULTURAL TILE	LF	8	$ 27.00	$ 216
106	CONNECT EXISTING 18-INCH TILE	EA	3	$ 1,728.21	$ 5,185
107	CONNECT EXISTING 15-INCH TILE	EA	1	$ 1,235.47	$ 1,235
108	CONNECT EXISTING 10-INCH TILE	EA	2	$ 854.81	$ 1,710
109	CONNECT EXISTING 8-INCH TILE	EA	7	$ 648.09	$ 4,537
110	CONNECT EXISTING 6-INCH TILE	EA	17	$ 536.90	$ 9,127
111	CONNECT EXISTING 4-INCH TILE	EA	26	$ 439.72	$ 11,433
112	24-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	4	$ 4,695.46	$ 18,782
113	18-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 3,138.08	$ 3,138
114	15-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	2	$ 2,266.26	$ 4,533
115	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
116	GRANULAR PIPE FOUNDATION	CY	406	$ 31.77	$ 12,899
117	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
118	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	187	$ 34.80	$ 6,508
119	INSTALL DROP INTAKE (18-INCH)	EA	13	$ 1,438.50	$ 18,701
120	CAP DROP INTAKE (18-INCH)	EA	4	$ 507.63	$ 2,031
121	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	9	$ 398.38	$ 3,585
122	36-INCH TILE OUTLET (20 LF OF PIPE & RIPRAP ON GEOTEXTILE FABRIC)	EA	1	$ 3,136.17	$ 3,136
123	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
124	TREE REMOVAL	EA	1	$ 417.70	$ 418
125	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET	SY	350	$ 3.69	$ 1,292
126	INSTALL INLET PROTECTION	EA	1	$ 192.50	$ 193
127	REMOVE & REINSTALL FENCE	LF	100	$ 17.50	$ 1,750
128	REMOVE EXISTING DROP INTAKE	EA	1	$ 410.34	$ 410
129	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
130	MAJOR UTILITY CROSSING (FIBER OPTIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 719,549**
				10% UNFORSEEN	$ 71,955
				TOTAL CONSTRUCTION COST	**$ 791,503**
	TEMPORARY DAMAGES	AC	38.29	$ 750.00	$ 28,720
	TELEVISING (POST CONSTRUCTION)	LF	11944	$ 1.00	$ 11,944
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 39,576
				TOPOGRAPHIC SURVEY	$ 14,930
				REPORTS, PLANS AND SPECIFICATIONS	$ 106,853
				CONSTRUCTION STAKING & ADMINISTRATION	$ 110,811
				TOTAL MAIN TILE (OPTION 3) IMPROVEMENT COST	**$ 1,104,337**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #3

Main West Tile (Option 3)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 3,800.00	$ 3,800
102	18-INCH AGRICULTURAL TILE	LF	1355	$ 32.00	$ 43,360
103	8-INCH AGRICULTURAL TILE	LF	14	$ 24.00	$ 336
104	CONNECT EXISTING 15-INCH TILE	EA	2	$ 1,235.47	$ 2,471
105	CONNECT EXISTING 8-INCH TILE	EA	2	$ 648.09	$ 1,296
106	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
107	CONNECT EXISTING 4-INCH TILE	EA	4	$ 439.72	$ 1,759
108	8-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,322.41	$ 1,322
109	GRANULAR PIPE FOUNDATION	CY	39	$ 31.77	$ 1,239
110	FURNISH & INSTALL WATER QUALITY INLET	EA	4	$ 1,347.90	$ 5,392
111	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	132	$ 34.80	$ 4,594
112	INSTALL DROP INTAKE (18-INCH)	EA	4	$ 1,438.50	$ 5,754
113	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	4	$ 398.38	$ 1,594
114	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
115	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
116	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
117	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 79,695**
				10% UNFORSEEN	$ 7,970
				TOTAL CONSTRUCTION COST	**$ 87,665**
	TEMPORARY DAMAGES	AC	3.14	$ 750.00	$ 2,357
	TELEVISING (POST CONSTRUCTION)	LF	1369	$ 1.00	$ 1,369
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 4,384
				TOPOGRAPHIC SURVEY	$ 1,712
				REPORTS, PLANS AND SPECIFICATIONS	$ 11,835
				CONSTRUCTION STAKING & ADMINISTRATION	$ 12,274
				TOTAL MAIN WEST TILE (OPTION 3) IMPROVEMENT COST	**$ 121,596**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #3

Branch 6 Tile (Option 3)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 1,410.00	$ 1,410
102	15-INCH AGRICULTURAL TILE	LF	432	$ 27.00	$ 11,664
103	CONNECT EXISTING 24-INCH TILE	EA	1	$ 2,525.49	$ 2,525
104	CONNECT EXISTING 12-INCH TILE	EA	1	$ 953.26	$ 953
105	CONNECT EXISTING 6-INCH TILE	EA	1	$ 536.90	$ 537
106	CONNECT EXISTING 4-INCH TILE	EA	1	$ 439.72	$ 440
107	12-INCH CROSS-CONNECT W/40 LF OF SPECIFIED PIPE	EA	1	$ 1,555.53	$ 1,556
108	GRANULAR PIPE FOUNDATION	CY	11	$ 31.77	$ 349
109	FURNISH & INSTALL WATER QUALITY INLET	EA	2	$ 1,347.90	$ 2,696
110	INSTALL 8-INCH PERFORATED TILE (WATER QUALITY INLET)	LF	45	$ 34.80	$ 1,566
111	INSTALL DROP INTAKE (18-INCH)	EA	2	$ 1,438.50	$ 2,877
112	INSTALL BAR GUARD ASSEMBLY (18-INCH DROP INTAKES)	EA	2	$ 398.38	$ 797
113	MAJOR UTILITY CROSSING (ELECTRIC)	EA	1	$ 2,041.67	$ 2,042
				SUBTOTAL CONSTRUCTION COST	**$ 29,412**
				10% UNFORSEEN	$ 2,941
				TOTAL CONSTRUCTION COST	**$ 32,353**
	TEMPORARY DAMAGES	AC	0.99	$ 750.00	$ 744
	TELEVISING (POST CONSTRUCTION)	LF	432	$ 1.00	$ 432
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 1,618
				TOPOGRAPHIC SURVEY	$ 540
				REPORTS, PLANS AND SPECIFICATIONS	$ 4,368
				CONSTRUCTION STAKING & ADMINISTRATION	$ 4,530
				TOTAL BRANCH 6 TILE (OPTION 3) IMPROVEMENT COST	**$ 44,585**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

PROPOSED IMPROVEMENT - OPTION #3

Storage (Option 3)

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 1,020.00	$ 1,020
102	INSTALL 18-INCH ASI RISER ASSEMBLY W/STANDARD	EA	4	$ 1,865.00	$ 7,460
103	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET	SY	2420	$ 3.69	$ 8,930
104	CONSTRUCT BERM	CY	1119	$ 3.50	$ 3,915
				SUBTOTAL CONSTRUCTION COST	**$ 21,325**
				10% UNFORSEEN	$ 2,132
				TOTAL CONSTRUCTION COST	**$ 23,457**
	TEMPORARY DAMAGES	AC	35	$ 750.00	$ 26,250
	LAND ACQUISTION/ PERMANENT DAMAGES	AC	0.5	$ 8,500.00	$ 4,250
				COUNTY ADMINISTRATION COSTS (Legal, Staff, Bonding, Advertisement)	$ 1,173
				TOPOGRAPHIC SURVEY	$ 2,195
				REPORTS, PLANS AND SPECIFICATIONS	$ 5,667
				CONSTRUCTION STAKING & ADMINISTRATION	$ 5,785
				TOTAL STORAGE (OPTION 3) IMPROVEMENT COST	**$ 68,777**

NOTE: TEMPORARY DAMAGES ASSUMED EVERY 10 YEARS BASED ON H/H MODEL

TOTAL IMPROVEMENT COST

Main Tile (Option 3)	**$ 1,104,337**
Main West Tile (Option 3)	**$ 121,596**
Branch 6 Tile (Option 3)	**$ 44,585**
Storage (Option 3)	**$ 68,777**

COMPLETE IMPROVEMENT COST	**$ 1,339,295**

BROWN AND REDWOOD COUNTIES

JUDICIAL DITCH No. 5

ISG

ROAD CROSSING SUMMARY

Crossing	Road Authority	Road Authority Cost (Repair Cost With Road)	Improvement Cost*	Project Cost for Road Crossings (Difference of Improvement Cost and Road Authority Cost)
Main Tile				
230th St	PRAIRIEVILLE TOWNSHIP	$ 12,291	$ 13,615	$ 1,324
340th Ave	BROOKVILLE/PRAIRIEVILLE TWPs	$ 10,275	$ 10,646	$ 372
Main West Tile				
340th Ave	BROOKVILLE/PRAIRIEVILLE TWPs	$ 10,392	$ 10,646	$ 254
Branch 6 Tile				
340th Ave	BROOKVILLE/PRAIRIEVILLE TWPs	$ 10,275	$ 10,106	$ (168)
TOTAL		**$ 43,233**	**$ 45,014**	**$ 1,781**
BROOKVILLE TOWNSHIP ROAD AUTHORITY TOTAL		**$ 15,471**	**$ 15,699**	**$ 229**
PRAIRIEVILLE TOWNSHIP ROAD AUTHORITY TOTAL		**$ 27,762**	**$ 29,315**	**$ 1,553**

*Note that road crossing costs are equal for all three proposed improvement options

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ROAD CROSSINGS

MAIN TILE REPAIR COST WITH ROAD - 230TH ST

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	TILE INVESTIGATION	HR	1	$ 260.00	$ 260
103	24-INCH AGRICULTURAL TILE	LF	80	$ 42.50	$ 3,400
104	GRANULAR PIPE FOUNDATION	CY	3	$ 31.77	$ 95
105	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
106	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
107	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 8,356**
				10% UNFORSEEN	$ 836
				TOTAL CONSTRUCTION COST	**$ 9,191**
				COUNTY ADMINISTRATION COSTS	$ 500
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,300
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,300
				ESTIMATED MAIN TILE REPAIR COST WITH ROAD - 230TH ST	**$ 12,291**

MAIN TILE IMPROVEMENT COST - 230TH ST

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 500.00	$ 500
102	30-INCH AGRICULTURAL TILE	LF	80	$ 55.00	$ 4,400
103	GRANULAR PIPE FOUNDATION	CY	3	$ 31.77	$ 95
104	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
105	MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEG	SY	350	$ 3.69	$ 1,292
106	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 9,196**
				10% UNFORSEEN	$ 920
				TOTAL CONSTRUCTION COST	**$ 10,115**
				COUNTY ADMINISTRATION COSTS	$ 600
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,400
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,500
				ESTIMATED MAIN TILE IMPROVEMENT COST - 230TH ST	**$ 13,615**

***Note that road crossing costs are equal for all three proposed improvement options**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ROAD CROSSINGS

MAIN TILE REPAIR COST WITH ROAD - 340TH AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	TILE INVESTIGATION	HR	1	$ 260.00	$ 260
103	12-INCH AGRICULTURAL TILE	LF	80	$ 25.66	$ 2,053
104	GRANULAR PIPE FOUNDATION	CY	2	$ 31.77	$ 64
105	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
106	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
107	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 6,977**
				10% UNFORSEEN	$ 698
				TOTAL CONSTRUCTION COST	**$ 7,675**
				COUNTY ADMINISTRATION COSTS	$ 400
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,100
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,100
				ESTIMATED MAIN TILE REPAIR COST WITH ROAD - 340TH AVE	**$ 10,275**

MAIN TILE IMPROVEMENT COST - 340TH AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	18-INCH AGRICULTURAL TILE	LF	80	$ 32.00	$ 2,560
103	GRANULAR PIPE FOUNDATION	CY	2	$ 31.77	$ 64
104	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
105	MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEG	SY	350	$ 3.69	$ 1,292
106	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 7,224**
				10% UNFORSEEN	$ 722
				TOTAL CONSTRUCTION COST	**$ 7,946**
				COUNTY ADMINISTRATION COSTS	$ 400
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,100
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,200
				ESTIMATED MAIN TILE IMPROVEMENT COST - 340TH AVE	**$ 10,646**

***Note that road crossing costs are equal for all three proposed improvement options**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ROAD CROSSINGS

MAIN WEST TILE REPAIR COST WITH ROAD - 340TH AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	TILE INVESTIGATION	HR	1	$ 260.00	$ 260
103	15-INCH AGRICULTURAL TILE	LF	80	$ 27.00	$ 2,160
104	GRANULAR PIPE FOUNDATION	CY	2	$ 31.77	$ 64
105	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
106	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
107	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 7,084**
				10% UNFORSEEN	$ 708
				TOTAL CONSTRUCTION COST	**$ 7,792**
				COUNTY ADMINISTRATION COSTS	$ 400
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,100
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,100
				ESTIMATED MAIN WEST TILE REPAIR COST WITH ROAD - 340TH AVE	**$ 10,392**

MAIN WEST TILE IMPROVEMENT COST - 340TH AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	18-INCH AGRICULTURAL TILE	LF	80	$ 32.00	$ 2,560
103	GRANULAR PIPE FOUNDATION	CY	2	$ 31.77	$ 64
104	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
105	MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEG	SY	350	$ 3.69	$ 1,292
106	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 7,224**
				10% UNFORSEEN	$ 722
				TOTAL CONSTRUCTION COST	**$ 7,946**
				COUNTY ADMINISTRATION COSTS	$ 400
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,100
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,200
				ESTIMATED MAIN WEST TILE IMPROVEMENT COST - 340TH AVE	**$ 10,646**

***Note that road crossing costs are equal for all three proposed improvement options**

BROWN AND REDWOOD COUNTIES
JUDICIAL DITCH No. 5

ISG

ROAD CROSSINGS

BRANCH 6 TILE REPAIR COST WITH ROAD - 340TH AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	TILE INVESTIGATION	HR	1	$ 260.00	$ 260
103	12-INCH AGRICULTURAL TILE	LF	80	$ 25.66	$ 2,053
104	GRANULAR PIPE FOUNDATION	CY	2	$ 31.77	$ 64
105	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
106	SEED MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEGORY 3	SY	350	$ 3.69	$ 1,292
107	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 6,977**
				10% UNFORSEEN	$ 698
				TOTAL CONSTRUCTION COST	**$ 7,675**
				COUNTY ADMINISTRATION COSTS	$ 400
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,100
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,100
				ESTIMATED BRANCH 6 TILE REPAIR COST WITH ROAD - 340TH AVE	**$ 10,275**

BRANCH 6 TILE IMPROVEMENT COST - 340TH AVE

Item No.	Item	Unit	Quantity	Unit Price	Amount
101	MOBILIZATION	LS	1	$ 400.00	$ 400
102	15-INCH AGRICULTURAL TILE	LF	80	$ 27.00	$ 2,160
103	GRANULAR PIPE FOUNDATION	CY	2	$ 31.77	$ 64
104	OPEN CUT & RESTORE GRAVEL ROAD OR DRIVEWAY	EA	1	$ 2,138.87	$ 2,139
105	MIX 25-142 W/MNDOT EROSION CONTROL BLANKET CATEG	SY	350	$ 3.69	$ 1,292
106	INSTALL INLET PROTECTION	EA	4	$ 192.50	$ 770
				SUBTOTAL CONSTRUCTION COST	**$ 6,824**
				10% UNFORSEEN	$ 682
				TOTAL CONSTRUCTION COST	**$ 7,506**
				COUNTY ADMINISTRATION COSTS	$ 400
				REPORTS, PLANS AND SPECIFICATIONS	$ 1,100
				CONSTRUCTION STAKING & ADMINISTRATION	$ 1,100
				ESTIMATED BRANCH 6 TILE IMPROVEMENT COST - 340TH AVE	**$ 10,106**

***Note that road crossing costs are equal for all three proposed improvement options**