Multi-Purpose Drainage Management Report

Chetomba Creek

Renville County, Minnesota

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Architecture
Engineering
Environmental
Planning

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INTRODUCTION

Upon request, ISG completed a review of a portion of Chetomba Creek in Renville County, Minnesota. The scope included an examination of the Chetomba Creek watershed utilizing drone aerial imagery and GIS mapping. The information was utilized to identify practices or activities that will reduce downstream peak flows and flooding, reduce erosion and sedimentation, improve water quality, and improve aquatic and terrestrial habitat. In addition, the report includes sediment and nutrient reduction calculations as well as cost estimations on an individual Best Management Practice (BMP) scale.

It should be noted that some general assumptions were made during this analysis. ISG received watershed boundaries from the United States Geological Survey Hydrologic Unit 12 (USGS HUC12) dataset, and aerial drone video from Renville County. Additional information may or may not modify our findings, but large change in scope is not anticipated from this report. If landowners have tile maps or any other information that can aid in future work, please feel free to share this information. Survey and onsite practice feasibility will need to be verified prior to project design on each individual BMP.

WATERSHED

Location

The Chetomba Creek watershed of interest is located in Sections 1-3, 9-12, 15 and 16 of Wang Township, Sections 1, 4-10, 12-18, 22-25, and 36 of Ericson Township, Sections 4-9, 16-21, and 28-32 of Crooks Township, and Section 6 of Emmet Township. Within the watershed, there is approximately 101,776-feet (19.3-miles) of open ditch. The entirety of this open ditch is not considered a public watercourse and includes a 16.5-foot buffer on each side of the ditch. Out of the 101,776-feet of open ditch, the Mainline of Kandiyohi-Chippewa-Renville Judicial Ditch No. 7 makes up approximately 80,413-feet, with various Renville County ditches making up the remainder. These ditches include CD 88, CD 39, CD 86, CD 102, CD 83, CD 84, and JD 21. The Main open ditch flows generally west to its outlet into Hawk Creek in the NW ¼ of the SW ¼ of Section 16 of Wang Township.

The greater Chetomba Creek watershed is included as a priority subwatershed in the Hawk Creek-Middle Minnesota Comprehensive Watershed Management Plan. High priority goals for the Chetomba Creek watershed include impaired lake and streams, altered hydrology, soil erosion and sediment loss, recreation, agricultural practices and runoff management, and education and outreach. To align with the watershed management plans, the MDM analysis will focus on BMPs that maximize sediment reductions and provide storage.

The MDM analysis focused on two HUC12 watersheds within the Chetomba Creek watershed. There are many other drainage systems within the greater Chetomba Creek watershed that eventually drain into it, totaling over 100,000 acres. These systems were not analyzed within this report.

Watershed Description

The Chetomba Creek watershed of interest drains approximately 16,130 acres. The watershed is characterized by mostly flat agricultural land with an elevation difference of approximately 100-feet. The watershed is mostly agricultural land, and there are multiple Minnesota Board of Water and Soil Resources Reinvest in Minnesota (BWSR RIM) Easements.

The watershed begins at the Renville-Kandiyohi county border and drains west, eventually into Hawk Creek, which is listed on the Minnesota Public Waters Inventory as a Public Watercourse. Hawk Creek is the only public water in or downstream of the watershed of interest.

Natural Resources, Wetlands, and Water Quality

The watershed has three areas identified as “below” for areas of biological significance by the Minnesota Biologic Survey (MBS) for biodiversity significance. These areas include the SW ¼ of Section 16 of Ericson Township, the SW ¼ of Section 7 of Ericson Township, and the SE ¼ of Section 12 of Wang Township. MBS considers sites ranked as below as below the minimum biodiversity threshold for statewide significance however have conservation value at the local level as habitat for native plants and animals, corridors for animal movement, buffer surrounding high quality natural areas, or as areas with high potential for restoration of native habitat.

The watershed has one area owned and managed by the Minnesota Department of Natural Resources (DNR) as a Wildlife Management Area (WMA). This area totals 320 acres and is located in Sections 8 and 17 of Ericson Township.

In review of National Wetland Inventory (NWI), there are several wetlands throughout the watershed. In addition, there are multiple areas in BWSR CREP easements as well as areas in RIM easements for riparian areas and wetlands. A map of the NWI, BWSR easements, and public waters are displayed on the Wetland and Natural Resources Map in Appendix A.

The outlet of Chetomba Creek into Hawk Creek is controlled by dams or similar outlet structures. These structures are barriers to fish passage within the watershed.

EXISTING CONDITIONS ANALYSIS

A drone flight inventory was provided to ISG on December 4th, 2023, by Renville County. The drone flight captured video of the conditions of the open ditch identifying areas in need of repair and other locations where Multi-purpose Drainage Management (MDM) Best Management Practices (BMPs) are recommended to enhance water quality and reduce erosion.

Trees

Trees and shrubs growing in or falling into a ditch restrict flow and create a cavity for erosion. The trees also provide a canopy across ditch banks and buffers creating poor conditions for grasses and other native vegetation in the buffer to grow. This makes the ditch more susceptible to erosion. Perennial grass along the ditch bank and on side slopes provides dense root growth, creating stable banks and reducing erosion. There were multiple locations throughout the watershed in which trees were located within the open ditch or within the 16.5-foot buffer. The following figure shows an example of one of these locations.

Figure 1: Trees growing within the open ditch (NW ¼ of Section 11 of Wang Township)

Bank Erosion and Sloughing

Sloughing was identified at various locations along the ditch. Sloughing occurs when the bank of the open ditch shears and collapses into the open ditch. The main causes of sloughing include overland flow overtopping the ditch bank, lack of buffer vegetation, steep side slopes, and meandering alignment of the open ditch. The sloughing deposits sediment into Chetomba Creek which restricts flow and requires maintenance. In some areas severe sloughing is present and natural benching is forming. In areas, creating benches at 3-5 times the inner channel width will help to minimize additional future erosion. The following photos show examples of bank erosion and sloughing. The photos below indicate examples of sloughing that is noted throughout the watershed. There is approximately 8,340 LF of sloughing identified on the public drainage systems within Chetomba Creek.

Figure 2: Bank sloughing along the right side of the open ditch (SW ¼ of Section 15 of Ericson Township)

Figure 3: Isolated sloughing shown in the red circles (SW ¼ of Section 14 of Ericson Township)

Open Ditch Cleaning

There are areas within Chetomba Creek where open ditch cleaning may be necessary. Cleaning of an open ditch on a watershed of this size is recommended to take place every 15 to 20 years. Deposited sediment provides an opportunity for vegetation growth in the bottom of the channel. The effects of vegetation in the ditch vary depending on the type of vegetation present. Sediment, grasses, and cattails in the ditch bottom can impede water flow leading to localized flooding during storm events. Sediment deposits along with vegetation growth can cause the ditch to meander potentially eroding side slopes. The photos below show potential cleaning areas.

Figure 4: Vegetation growing within the bottom of the open ditch (NE ¼ of Section 12 of Wang Township))

Figure 5: Sediment deposit in the bottom of the open ditch (NW ¼ of Section 12 of Wang Township))

Buffers

The Minnesota Buffer Law States that there must be 50-foot buffers along lakes, rivers, and streams and a 16.5-foot (1-rod) buffer on public ditches. The open ditch systems within the Chetomba Creek watershed are required to follow the buffer law and incorporate a 16.5-foot buffer along the entirety of the open ditch. Buffer strips help prevent sediment from entering into the ditch as well as sloughing of the ditch side slopes. From review of drone footage, a majority of the public ditches within the Chetomba Creek watershed are in compliance with the Minnesota Buffer Law.

MULTI-PUPOSE DRAINAGE MANAGEMENT METHODS

Existing Data, Desktop Analysis and Site Investigation

Prior to this report, the Agricultural Conservation Planning Framework (ACPF) GIS tools were used to site and prioritize BMPs within the watershed. The data sets previously developed were the starting point for identifying practical and feasible practices to prioritize for implementation. Additional desktop analysis was completed to refine the number of practices based on the site conditions. Additional practices were added that may be outside the scope of siting through the GIS tools but would be feasible based upon on-site conditions such as topography, field boundaries, and aerial review. It is important to note that this study was completed through desktop analysis and on-site investigation is needed to verify project feasibility.

Water Quality Modeling

Nutrient and sediment reductions were estimated utilizing Hydrological Simulation Program – FORTRAN (HSPF) Scenario Application Manager (SAM). For each practice the treated acres were determined and correlated with the loading based on the land use. Practice reductions were used for each practice based on research and literature review. Each pollution reduction was determined independently of each other therefore, if multiple practices are implemented, the expected reductions for the practice may be different based on the change in loading.

BMP Cost Estimates

Estimated cost for each BMP includes materials, construction, and installation of the practice. Costs were determine using an average cost on a per linear foot or per acre basis. These costs take into consideration easements (where applicable), mobilization, technical assistance/engineering design, and contingency. The BMP cost estimates included in this analysis are not detailed cost estimates and on-site investigation with specific design criteria will need to be completed before final implementation.

TABLE 1. BMP COST ANALYSIS

Wetlands

Berms	$5.00	LF
Seeding	$3,500.00	AC
Outlet Structure	$25,000.00	EA
Riprap	$85.00	CY
Land Acquisition	$14,000.00	AC
Temporary Damages	$650.00	AC
Other (20%)		
Technical Assistance (20%)		
Adminstration (10%)		
Mobiliation (5%)		

WASCOBs

Land Acquisition	$14,000.00	AC
WASCOB Berm	$12.00	LF
Technical Assistance (10%)	$1.20	LF
Administration (5%)	$0.60	LF
10% Contingency	$1.38	LF
Total per LF	$15.18	
Mobilization	$2,000.00	EA
Outlet structure	$2,500	EA

Grass Waterways

Land Acquisition	$14,000.00	AC
Grass Waterway	$6.00	LF
Technical Assistance (10%)	$0.60	LF
Administration (5%)	$0.30	LF
Contingency (10%)	$0.60	LF
Total per LF	$7.50	
Mobilization	$2,000.00	EA

ASIs

ASI	$3,500.00	EA
Technical Assistance (10%)	$350.00	EA
Administration (5%)	$175.00	EA
Subtotal	$4,025.00	
10% Contingency	$402.50	EA
Mobilization	$2,000.00	EA
Total per	$6,427.50	

Stream Barbs

Concrete Stream Barb w/ties	$1,000.00	EA
Upstream Checkdam (1)	$566.95	EA
Technical Assistance (10%)	$100.00	EA
Administration (5%)	$50.00	EA
Contingency (10%)	$100.00	EA
Mobilization	$500.00	EA
Total per	$2,316.95	

BEST MANAGEMENT PRACTICES

Impoundment + Storage Practices

Wetland Restoration
Wetland restorations are re-establishing basins that were prehistoric wetlands and were drained for agricultural production. Benefits of a wetland restoration include reduced peak flow rates, sedimentation, nutrient reductions, wildlife enhancement, and overall improved water quality. There are many programs available for wetland restorations and include wetland banking, RIM-WRP, CREP, and through various NRCS programs.

Constructed Treatment Wetland
Constructed treatment wetlands are generally located in low-lying areas that would otherwise be saturated during rain events. Constructed wetlands use embankments such as berms or overflow weirs to hold agricultural drainage water to be treated. Constructed wetland benefits are similar to wetland restorations in that they include reduced peak flow rates, sedimentation, nutrient reductions, wildlife enhancement, and overall improved water quality. There are many programs available for constructed treatment wetlands and include wetland banking, RIM-WRP, CREP, and through various NRCS programs.

Wetland Enhancements
Wetland Enhancements are implemented to enhance existing wetland areas. Wetland enhancements include but are not limited to increasing wetland storage by adding additional hydrology to the site, expanding the wetland footprint, or allowing agricultural drainage water treatment. By enhancing the wetland, it can add additional water quality benefits including increased sedimentation, nutrient reduction, and reduced peak flows.

Figure 6: Potential Wetland Enhancement Location (BMP #15)

Water and Sediment Control Basins (WASCOBs)
Water and sediment control basins (WASCOBs) are an earth embankment placed perpendicular to the water flow direction on a moderate to steep hillside of an agricultural area. The primary goal of a WASCOB is to improve the ability to farm steep sloped areas of farmland by reducing gully erosion. They are placed in areas that experience gully erosion and steep side slopes or can be placed adjacent to ditch banks experience gully erosion. They are designed to temporarily pool water on the hillside behind the embankment, thus reducing peak surface flow, reduce erosion, and provide an area for sedimentation.

Alternative Side Inlets
Alternative side inlet structures replace open surface intakes that are level with the existing ground and convey water through the ditch bank. They are also placed along open ditches where gully erosion is occurring through the ditch bank. The goal of an alternative side inlet is to prevent erosion through the ditch bank and keep sediment and debris from entering the open channel. An alternative side inlet contains a drop structure behind the ditch bank with a later pipe entering the open channel. Various intakes can be place on the drop structure including Hickenbottoms, trash grates, perforated risers, or rock inlets. Alternative side inlets are recommended for areas with existing surface inlets, where gully erosion occurs through the ditch bank, or where large surface flow enters the ditch. Similar to WASCOBs, ASIs are designed to temporarily store water behind the spoil banks providing temporary storage, reducing erosion, and allowing for sedimentation.

Figure 7: Potential ASI Location (BMP #82)

Soil Health Practices

Soil health practices include cover crops, reduced tillage, no-till, perennial cover, and other practices that promote healthy soils. Areas with high runoff risk are priority areas to target implementation of soil health practices. Runoff risk is determined as the potential for overland flow to carry sediment and nutrients to downstream waters. A runoff risk was completed for the Chetomba Creek watershed which identified areas currently in agricultural production and identified field boundaries as high and moderate runoff risk. A Runoff Risk map is included in Appendix A which displays the runoff risk for each field boundary.

Control Measure Conservation Practices

Grassed Waterways

Grassed waterways are installed to reduce the risk of concentrated flow (gully) erosion. This practice is effective in preventing gully erosion as the growing grasses can reduce mean velocity of runoff, which discourages soil detachment. Grass vegetation also provides a physical barrier to prevent gully formation and the fibrous root systems of grasses lead to increased soil strength, which can limit detachment of soil particles. Grassed waterways are typically placed in steep sloped areas with concentrated flows subject to erosion.

Stream Barbs

Stream barbs are typically installed around bends in an open ditch. The purpose of the barbs is to control the velocity profile within the ditch and keep the flow more centralized. This prevents the higher, erosive velocities from undercutting the outer bank as typically found around bends in open ditches. Several areas were marked for potential stream barb implementation. The photos below show an example of existing stream barbs within Chetomba Creek, and potential areas for future stream barbs. For the purposes of the study it was assumed stream barbs would be placed at 50-feet spacing without riprap protection. For each stream barb location, a singular rock check dam is included upstream of the first stream barb. This will increase protection of the stream banks by reducing flow velocities heading into the channel bend.

Figure 8: Existing Stream Barbs (SE ¼ of Section 8 of Ericson Township)

Figure 9: Potential Stream Barb Location (SW ¼ of Section 8 of Ericson Township))

PRIORIZIATION

After review of the Hawk Creek – Middle Minnesota One Watershed One Plan, it was determined that the focus of this study is to prioritize practices for sediment reductions with the greatest ability to reduce sediment for the lowest cost. Additional benefits from the practices include reductions in Total Phosphorus and Total Nitrogen which are both included in the table below. A maps of all BMP locations are included in Appendix A.

TABLE 2. PRIORITIZED BMPS

Unique ID	BMP Number	TSS Reductions (T/yr)	TN Reductions (lb/yr)	TP Reductions (lb/yr)	Estimated Total Cost	TSS Cost Effectiveness ($/lb/yr)	TN Cost Effectiveness ($/lb/yr)	TP Effectiveness ($/lb/yr)	Rank
Stream Barb	106	6.17		7.10	$26,350.00	$2.13		$3,711.22	1
Stream Barb	107	5.22		6.00	$22,441.95	$2.15		$3,738.46	2
Stream Barb	111	8.37		9.63	$37,187.50	$2.22		$3,863.44	3
Stream Barb	114	7.79		8.96	$35,100.00	$2.25		$3,916.06	4
Stream Barb	109	8.66		9.96	$39,375.00	$2.27		$3,954.62	5
Stream Barb	113	10.93		12.56	$50,362.50	$2.30		$4,008.19	6
Stream Barb	108	15.08		17.35	$70,000.00	$2.32		$4,035.37	7
Stream Barb	110	9.94		11.43	$46,437.50	$2.34		$4,064.05	8
Stream Barb	112	6.41		7.37	$30,754.45	$2.40		$4,173.38	9
WASCOB	43	3.78	509.30	25.12	$18,743.70	$2.48	$36.80	$746.27	10
WASCOB	29	3.02	407.50	20.10	$15,800.56	$2.61	$38.77	$786.26	11
ASI	66	1.24	169.75	7.54	$7,409.38	$2.98	$43.65	$982.48	12
ASI	69	1.24	169.75	7.54	$7,409.38	$2.98	$43.65	$982.48	12
ASI	73	1.24	169.75	7.54	$7,409.38	$2.98	$43.65	$982.48	12
ASI	61	1.24	169.75	7.54	$7,409.38	$2.98	$43.65	$982.48	15
ASI	62	1.24	169.75	7.54	$7,409.38	$2.98	$43.65	$982.48	15
ASI	68	1.24	169.75	7.54	$7,409.38	$2.98	$43.65	$982.48	15
ASI	63	1.24	169.08	7.51	$7,409.38	$2.99	$43.82	$986.36	18
WASCOB	42	1.89	254.65	12.56	$12,114.22	$3.21	$47.57	$964.64	19
ASI	70	1.11	150.77	6.70	$7,409.38	$3.35	$49.14	$1,106.10	20
WASCOB	27	1.70	237.26	10.93	$12,417.18	$3.66	$52.34	$1,136.41	21
WASCOB	39	1.26	169.77	8.37	$9,961.80	$3.96	$58.68	$1,189.87	22
ASI	78	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	79	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	80	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	86	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	87	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	91	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	94	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	95	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	96	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	97	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	99	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	101	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	104	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23
ASI	105	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	23

TABLE 2. PRIORITIZED BMPS (CONT.)

ASI	93	0.92	121.46	5.78	$7,409.38	$4.01	$61.00	$1,282.25	37
ASI	76	0.89	120.95	5.37	$7,409.38	$4.18	$61.26	$1,378.82	38
ASI	98	0.80	105.45	5.02	$7,409.38	$4.62	$70.26	$1,476.88	39
WASCOB	41	1.26	169.77	8.37	$11,664.94	$4.63	$68.71	$1,393.30	40
WASCOB	32	1.32	177.51	8.75	$12,268.25	$4.66	$69.11	$1,401.44	41
ASI	102	0.79	104.13	4.95	$7,409.38	$4.68	$71.16	$1,495.68	42
WASCOB	45	1.18	164.59	7.58	$11,855.90	$5.04	$72.03	$1,564.08	43
WASCOB	36	0.63	84.88	4.19	$7,097.03	$5.64	$83.61	$1,695.39	44
WASCOB	28	0.85	118.63	5.46	$9,713.22	$5.72	$81.88	$1,777.90	45
Wetland	10	31.22	3321.39	122.02	$367,459.01	$5.89	$110.63	$3,011.35	46
WASCOB	34	0.63	84.88	4.19	$7,495.66	$5.95	$88.30	$1,790.62	47
WASCOB	33	0.63	84.88	4.19	$7,571.28	$6.01	$89.20	$1,808.68	48
WASCOB	35	0.63	84.88	4.19	$7,756.03	$6.16	$91.37	$1,852.81	49
ASI	88	0.59	77.34	3.68	$7,409.38	$6.30	$95.80	$2,013.70	50
Wetland	11	24.62	2619.69	96.24	$333,152.60	$6.77	$127.17	$3,461.52	51
WASCOB	53	0.63	84.88	4.19	$8,780.39	$6.97	$103.44	$2,097.52	52
WASCOB	46	0.62	86.67	3.99	$8,839.92	$7.13	$102.00	$2,214.81	53
WASCOB	19	0.85	118.63	5.46	$13,180.45	$7.77	$111.11	$2,412.53	54
ASI	74	0.48	64.98	2.89	$7,409.38	$7.78	$114.03	$2,566.54	55
ASI	92	0.47	62.33	2.97	$7,409.38	$7.82	$118.87	$2,498.65	56
ASI	75	0.47	64.15	2.85	$7,409.38	$7.88	$115.51	$2,599.83	57
WASCOB	37	0.63	84.88	4.19	$10,267.74	$8.16	$120.96	$2,452.83	58
Wetland	13	10.34	1061.27	41.75	$170,266.97	$8.23	$160.44	$4,078.13	59
WASCOB	50	0.63	84.88	4.19	$10,417.68	$8.27	$122.73	$2,488.65	60
WASCOB	38	0.63	84.88	4.19	$10,498.82	$8.34	$123.68	$2,508.03	61
WASCOB	51	0.63	84.88	4.19	$10,656.71	$8.46	$125.54	$2,545.75	62
WASCOB	30	0.78	104.52	5.15	$13,153.29	$8.49	$125.85	$2,551.92	63
WASCOB	59	0.63	84.88	4.19	$10,930.46	$8.68	$128.77	$2,611.14	64
WASCOB	56	0.63	84.88	4.19	$11,254.07	$8.94	$132.58	$2,688.45	65
ASI	83	0.39	51.19	2.44	$7,409.38	$9.52	$144.75	$3,042.65	66
ASI	84	0.39	50.71	2.41	$7,409.38	$9.61	$146.10	$3,071.00	67
ASI	89	0.38	50.09	2.38	$7,409.38	$9.73	$147.93	$3,109.39	68
WASCOB	60	0.49	65.51	3.23	$9,709.88	$9.99	$148.22	$3,005.63	69
WASCOB	57	0.51	68.47	3.38	$10,444.65	$10.29	$152.55	$3,093.43	70
Wetland	9	8.09	860.67	31.62	$172,066.19	$10.64	$199.92	$5,441.68	71
ASI	81	0.33	43.96	2.09	$7,409.38	$11.09	$168.54	$3,542.68	72
Wetland	8	15.31	1628.57	59.83	$347,992.94	$11.37	$213.68	$5,816.18	73
ASI	103	0.32	42.15	2.01	$7,409.38	$11.56	$175.78	$3,694.87	74
WASCOB	44	0.51	68.21	3.36	$11,886.50	$11.75	$174.25	$3,533.46	75
ASI	64	0.31	42.46	1.89	$7,409.38	$11.90	$174.52	$3,928.11	76
WASCOB	24	0.63	84.88	4.19	$15,195.51	$12.07	$179.02	$3,630.01	77
WASCOB	23	0.41	55.13	2.72	$10,217.42	$12.50	$185.34	$3,758.32	78
WASCOB	49	0.42	56.56	2.79	$10,878.34	$12.97	$192.33	$3,899.94	79
ASI	82	0.28	37.08	1.76	$7,409.38	$13.14	$199.82	$4,200.07	80
ASI	67	0.26	34.93	1.55	$7,409.38	$14.47	$212.15	$4,775.08	81
ASI	85	0.25	33.22	1.58	$7,409.38	$14.67	$223.04	$4,688.22	82
WASCOB	47	0.27	38.37	1.77	$8,216.94	$14.97	$214.18	$4,650.54	83
Wetland	14	6.00	615.75	24.22	$185,568.44	$15.46	$301.37	$7,660.57	84
WASCOB	48	0.26	34.54	1.70	$8,138.93	$15.89	$235.63	$4,778.04	85
WASCOB	21	0.30	41.06	2.02	$10,095.21	$16.58	$245.87	$4,985.67	86
ASI	71	0.22	30.46	1.35	$7,409.38	$16.59	$243.28	$5,475.68	87
Wetland6	6	36.61	3895.42	143.11	$1,272,271.60	$17.38	$326.61	$8,889.94	88
WASCOB	22	0.28	37.61	1.85	$9,825.10	$17.61	$261.23	$5,297.07	89
WASCOB	26	0.24	34.20	1.57	$9,157.66	$18.72	$267.78	$5,814.51	90
WASCOB	31	0.26	35.30	1.74	$10,105.05	$19.30	$286.29	$5,805.38	91
Wetland	12	25.92	2758.01	101.33	$1,050,678.57	$20.27	$380.96	$10,369.24	92
ASI	100	0.18	23.23	1.11	$7,409.38	$20.98	$319.00	$6,705.24	93
WASCOB	40	0.20	27.33	1.35	$8,930.29	$22.03	$326.77	$6,626.18	94
ASI	65	0.15	20.70	0.92	$7,409.38	$24.41	$357.86	$8,054.74	95
WASCOB	58	0.19	25.08	1.24	$9,174.54	$24.67	$365.83	$7,418.27	96
ASI	77	0.12	16.33	0.78	$7,409.38	$29.84	$453.63	$9,535.00	97
WASCOB	54	0.15	20.72	1.02	$9,347.83	$30.41	$451.05	$9,146.24	98
WASCOB	52	0.15	20.84	1.03	$10,068.38	$32.58	$483.18	$9,797.70	99
WASCOB	20	0.14	21.23	1.01	$9,376.72	$32.68	$441.67	$9,283.72	100
Wetland	1	5.50	585.53	21.51	$372,883.04	$33.88	$636.83	$17,333.78	101
WASCOB	25	0.14	18.80	0.93	$9,497.25	$34.06	$505.19	$10,244.07	102
Wetland	3	7.10	755.91	27.77	$641,617.83	$45.16	$848.81	$23,103.74	103
ASI	72	0.08	11.09	0.49	$7,409.38	$45.57	$668.12	$15,038.00	104
Wetland	17	2.67	273.62	10.76	$270,720.18	$50.76	$989.41	$25,149.85	105
WASCOB	55	0.10	13.93	0.69	$11,534.53	$55.83	$828.06	$16,791.04	106
Wetland	4	2.66	283.14	10.40	$311,863.21	$58.59	$1,101.44	$29,980.09	107
ASI	90	0.06	7.76	0.37	$7,409.38	$62.82	$954.98	$20,073.29	108
Wetland	16	1.43	146.92	5.78	$229,154.28	$80.02	$1,559.67	$39,645.31	109
Wetland	7	1.98	210.71	7.74	$795,740.58	$200.91	$3,776.52	$102,793.35	110
Wetland	15	0.38	38.70	1.52	$169,993.43	$225.36	$4,392.34	$111,648.83	111
Wetland	5	0.89	94.56	3.47	$468,355.74	$263.48	$4,952.78	$134,809.96	112
Wetland	2	0.44	47.27	1.74	$645,056.56	$725.89	$13,644.93	$371,402.18	113
Wetland	18	0.14	14.52	0.57	$311,080.57	$1,099.44	$21,428.66	$544,694.68	114

FUNDING

There are several outside funding sources available to assist in financing practices that help to improve water quality and natural resources in the watershed. All of the water quality measures proposed with this project are applicable for some source of outside funding. Below outlines options for pursuing funding to improve water quality, reduce erosion and sedimentation, reduce downstream flooding, and protect and enhance aquatic and terrestrial habitat. These grants can be applied for, if there is support from the Drainage Authority, Soil and Water Conservation District (SWCD), and/or interest from individual landowners. While this list outlines many options available for this region, it is not all inclusive and other funding sources may be options for pursuing cost-share for implementation.

TABLE 8. GRANT PROGRAMS

Grant / Program	Grant / Program Goals*
BWSR CWF Watershed Based Implementation Fund (WBIF)	Approved workplan developed to support goals outline in the Watonwan River Comprehensive Watershed Management Plan
BWSR Clean Water Fund (CWF) Multi-purpose drainage management (MDM)	Target critical pollution source areas to reduce erosion and sedimentation, reduce peak flows and flooding, and improve water quality while protecting drainage system efficiency and reducing drainage system maintenance on 103E drainage systems
BWSR CWF Project and Practices	On-the-ground projects and practices that will protect or restore water quality in lakes, rivers or streams, or will protect groundwater or drinking water
BWSR Water Quantity and Storage Program	Establish storage practices in the Minnesota River basin and Lower Mississippi River basin to control water rates and/or volumes to protect infrastructure, improve water quality and related public benefits, and mitigate climate change impacts.
BWSR Outdoor Heritage Fund	Provides permanent protection on private lands through conservation easements
BWSR CWF Soil Health Grants	Provides funding for farmers to adopt cover crops or other soil health practices that benefit public water supplies
MDA Ag BMP Loan Program	Low interest loans to farmers, rural landowners, and agricultural supply business to encourage BMPs that prevent or reduce runoff from feedlots, farm fields, and other pollution problems identified by the county in local water plan.
NRCS Environmental Quality Incentives Program (EQUIP)	Address natural resources concerns and deliver environmental benefits such as improved water, air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, improved or create wildlife habitat and mitigation against drought and increasing weather volatility.

*Grant / program goals outlined above are a summary. Please reference the grant request for submission for the grant/program goals as well as eligible practices along with other program requirements or guidelines.

SUMMARY OF FINDINGS, CONCLUSIONS + RECOMMENDATIONS

The Chetomba Creek watershed has been assessed, conservation practice locations have been identified, and locations were determined for repair. Conservation practices that have been identified will help to meet the Hawk Creek water quality goals by reducing sediment to its outlet. Additional benefits include reductions in phosphorus, nitrogen, and water quantity and rate to downstream waters. Pollution reductions were calculated, and costs were estimated for construction and implementation of practices. The practices were then prioritized with practices that had the lowest cost with the greatest ability for sediment capture. The practice prioritization will help to engage local staff and landowners on targeting practices that will have the most impact in the watershed and to downstream waters at the lowest cost. Funding opportunities can be sought after for all the practices outlined through this study.

Next steps in the process would be to meet with landowners to review the report and its findings to receive feedback on the direction moving forward. If there is a desire to move forward with repairs or conservation practices, design plans can be completed which will involve surveying, construction plans, cost estimates, and potential permitting. Conservation practices could be explored independently or in junction with a drainage system project.

Appendix A: Maps

Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Chippewa County
Kandiyohi County
Renville County
Hawk Creek

Watershed Map

Chetomba Creek

Renville County,
Minnesota
Thursday, March 7, 2024

Legend

- Watershed of interest
- Existing Open Ditch
- Existing Tile
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Public Waters Basins

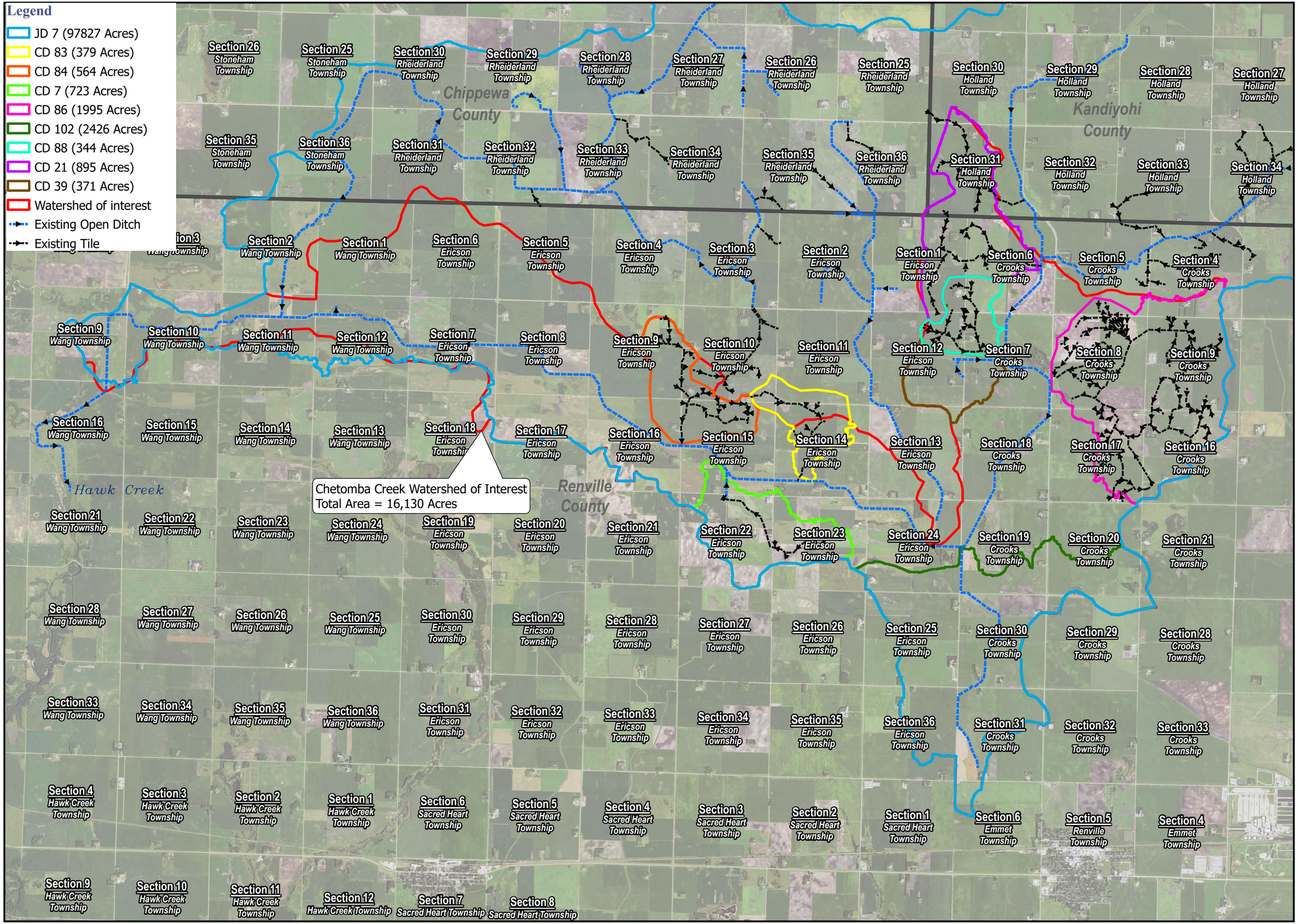
PN: 23-29672

Source:

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

N

0 1,000 2,000 4,000 Feet



County Ditch Watershed Map

Chetomba Creek

Renville County, Minnesota

Friday, March 8, 2024

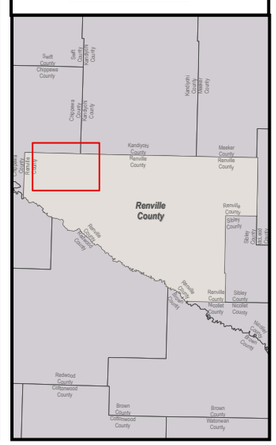
PN: 23-29672

Source:

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

N

0 1,000 2,000 4,000 Feet



Legend

Elevation (ft)

Value

1101.36

1002.89

Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Chippewa County

Kandiyohi County

Renville County

Hawk Creek

ISG

Elevation Map

Chetomba Creek

Renville County, Minnesota

Thursday, March 7, 2024

Legend

- Existing Open Ditch
- Existing Tile
- Watershed of interest
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Public Waters Basins

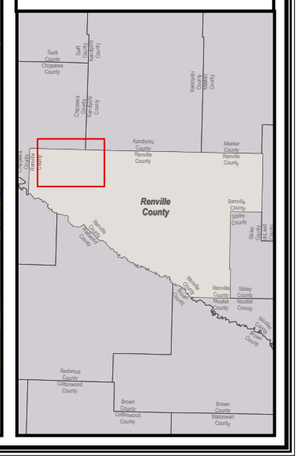
PN: 23-29672

Source:

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

N

0 1,000 2,000 4,000 Feet



Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Chippewa County

Kandiyohi County

Renville County

Hawk Creek

Legend

Runoff Risk

- C-High
- D-Moderate
- Watershed of interest
- Existing Open Ditch
- Existing Tile
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Public Waters Basins

ISG

Runoff Risk

Chetomba Creek

Renville County, Minnesota

Thursday, March 7, 2024

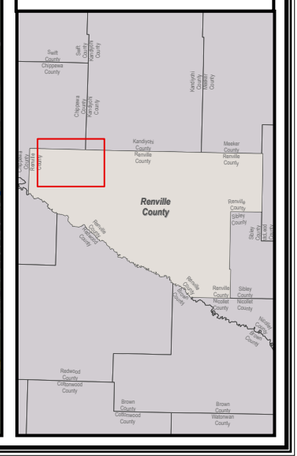
PN: 23-29672

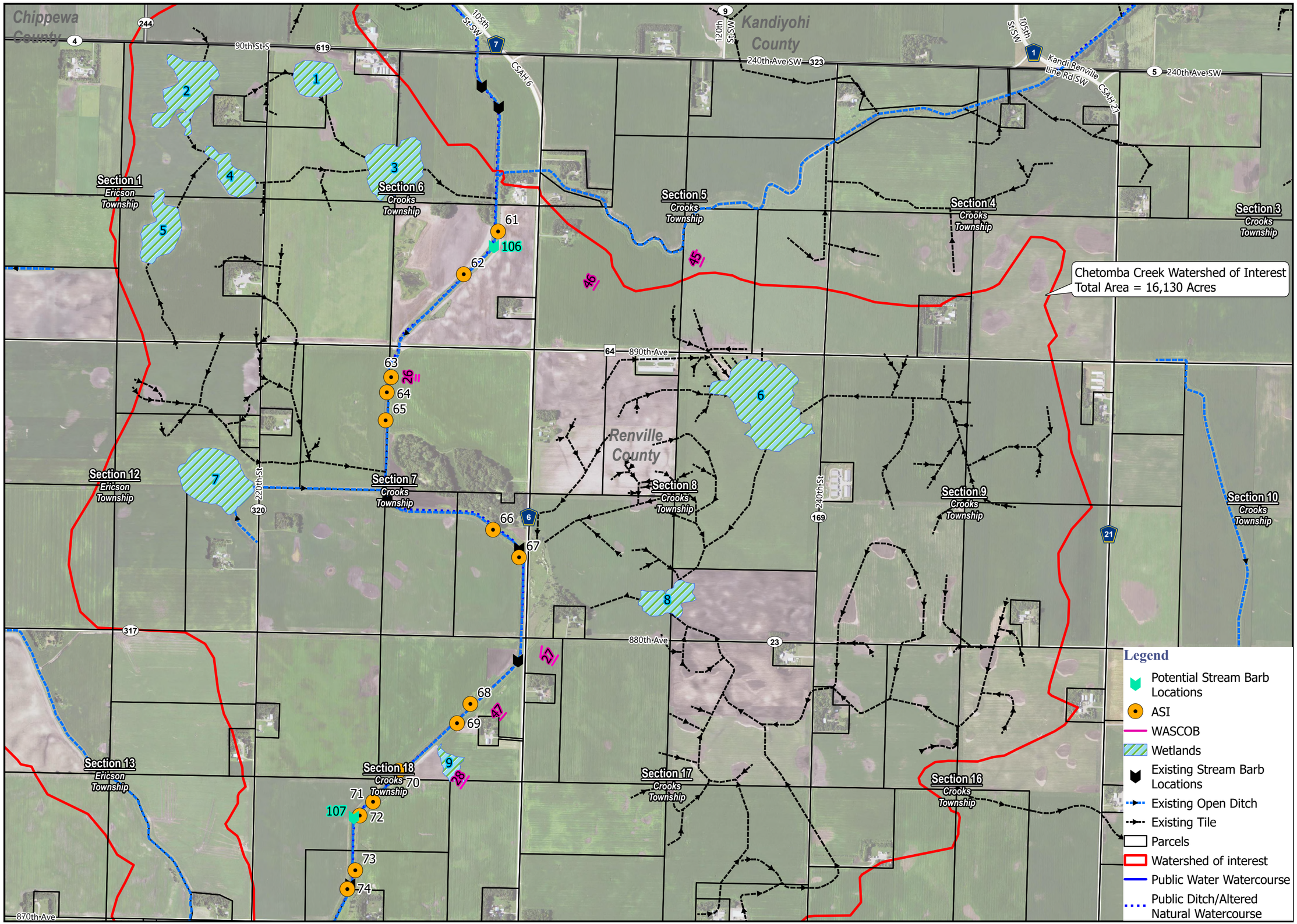
Source:

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

N

0 1,000 2,000 4,000 Feet





ISG

MDM Map North-East

Chetomba Creek

Renville County, Minnesota

Wednesday, March 27, 2024

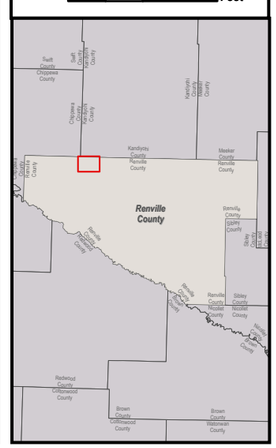
PN: 23-29672

Source:

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

N

0 400 800 1,600 Feet



Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Section 14
Ericson Township

Section 13
Ericson Township

Section 18
Crooks Township

Section 22
Ericson Township

Section 23
Ericson Township

Section 24
Ericson Township

Section 19
Crooks Township

Section 27
Ericson Township

Section 26
Ericson Township

Section 25
Ericson Township

Section 30
Crooks Township

Renville County

870th Ave

860th Ave

850th Ave

CSAH-12

220th St

210th St

220th St

CSAH-6

Legend

- Potential Stream Barb Locations
- ASI
- WASCOB
- Wetlands
- Existing Stream Barb Locations
- Existing Open Ditch
- Existing Tile
- Parcels
- Watershed of interest
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse

ISG

MDM Map South-East

Chetomba Creek

Renville County, Minnesota

Wednesday, March 27, 2024

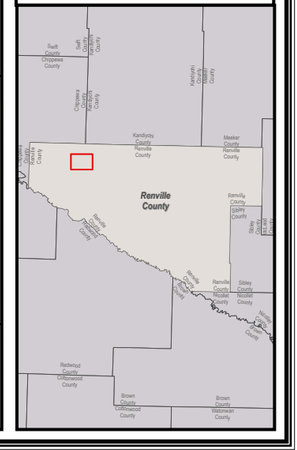
PN: 23-29672

Source:

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

N

0 400 800 1,600 Feet



Legend

- Potential Stream Barb Locations
- ASI
- WASCOB
- Wetlands
- Existing Stream Barb Locations
- Existing Open Ditch
- Existing Tile
- Parcels
- Watershed of interest
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse

Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Chippewa County

Renville County

Rosaasen Slough

MDM Map West

Chetomba Creek

Renville County, Minnesota

Wednesday, March 27, 2024

PN: 23-29672

Source:

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

N

0 500 1,000 2,000 Feet

Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Legend

- Existing Stream Barb Locations
- Existing Open Ditch
- Existing Tile
- MBS Sites of Below Biodiversity
- Watershed of interest
- Public Water Watercourse
- Public Ditch/Altered Natural Watercourse
- Public Waters Basins

State Administered Land

- Wildlife Management Area - WMA

Public Waters and Lands

Chetomba Creek

Renville County, Minnesota

Friday, March 1, 2024

PN: 23-29672

Source:

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

N

0 1,000 2,000 4,000 Feet

Chetomba Creek Watershed of Interest
Total Area = 16,130 Acres

Chippewa County

Kandiyohi County

Renville County

Hawk Creek

Legend

- MBS Sites of Below Biodiversity
- Watershed of interest
- Freshwater Emergent Wetland
- Freshwater Forested/ Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- Wildlife Management Area - WMA

BWSR Easement

- ACUB
- CREP I
- CREP II
- CREP III
- PWP
- RIM
- RIM-WRP

ISG

NWI and BWSR Easements

Chetomba Creek

Renville County, Minnesota

Thursday, March 7, 2024

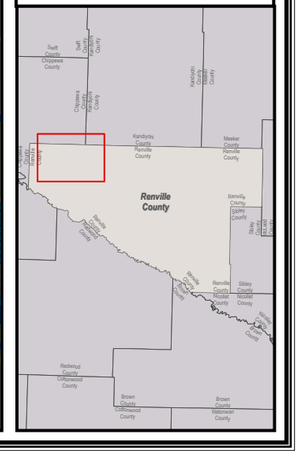
PN: 23-29672

Source:

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

N

0 1,000 2,000 4,000 Feet



Appendix B: Drone Report

Chetomba Creek Watershed – Renville County

CONDENSED DRONE REPORT

Project Name:	Chetomba Creek Watershed Plan – Renville MN
ISG Project Number:	23-29672
Date of Drone Flight:	December 4th, 2023

Picture #1: Major sloughing along left bank of open ditch

Picture #2: Vegetation growth in bottom of open ditch

Picture #3: Slough around bend in open ditch with vegetation growth in bottom of ditch

Picture #4: Sediment accumulation under bridge along 880th Ave

Project Name: Chetomba Creek Watershed Plan – Renville MN
ISG Project Number: 23-29672
Date of Drone Flight: December 4th, 2023

Picture #5: Sediment accumulation in bottom of open ditch

Picture #6: Sediment accumulation in bottom of open ditch

Picture #7: Gully erosion resulting in a washout on right side of open ditch

Picture #8: Sloughing along a bend in open ditch

Project Name: Chetomba Creek Watershed Plan – Renville MN
ISG Project Number: 23-29672
Date of Drone Flight: December 4th, 2023

Picture #9: Visible erosion at potential ASI location (right)

Picture #10: Trees in buffer around bend in open ditch

Picture #11: Example of an existing stream barb location in open ditch

Picture #12: Weir structure near the junction of Chetomba Creek and Hawk Creek