

# Drainage Records Modernization Guidelines

Prepared by:

Board of Water and Soil Resources

In partnership with:

Water Resources Center

Minnesota State University, Mankato

# Drainage Records Modernization Guidelines

Presented by:

Al Kean, Chief Engineer  
Board of Water and Soil Resources (BWSR)

Rick Moore, GIS Specialist  
Water Resources Center  
Minnesota State University, Mankato

# Purpose and Funding of Guidelines

- ▶ Consolidate, document and share the experience of drainage authorities that have modernized their Chapter 103E drainage system records, to increase the efficiency and reduce the costs for drainage records modernization by other drainage authorities.
- ▶ Promote drainage records preservation through modernization.
- ▶ Promote more consistent drainage records modernization statewide.
- ▶ Enable more efficient and effective administration of Chapter 103E drainage systems for enhanced management of water quantity and quality.

In response to a consensus recommendation of the Drainage Work Group to develop drainage records modernization guidelines, the 2007 Minnesota Legislature appropriated funding to the Board of Water and Soil Resources for development of these guidelines.

# Pertinent Definitions

- ▶ Attributes
- ▶ Data Layers and Data Overlays
- ▶ Drainage System Segments
- ▶ Drainage Records Modernization
- ▶ Geographic Information Systems
- ▶ Georeferencing
- ▶ Global Positioning System (GPS)
- ▶ Mapping
- ▶ Metadata
- ▶ Scanning and Digitizing

# Interviews of Authorities with Drainage Records Modernization

- ▶ Blue Earth County – Craig Austinson
- ▶ Chippewa County – Jon Clauson
- ▶ Douglas County – Tom Anderson
- ▶ Lincoln County – Robert Olsen
- ▶ Martin County – Deb Mosloski
- ▶ McLeod County – Renee Rosenow and Christy Christensen
- ▶ Meeker County – Barb Loch and Ron Mortenson
- ▶ Mower County – Rick Morrison
- ▶ Pope County – Allan Kuseske
- ▶ Renville County – Larry Zupke
- ▶ Swift County – Mike Johnson
- ▶ Todd County – Gloria Stevenson
- ▶ Yellow Medicine County – John Kolhei
- ▶ North Fork Crow River Watershed District – Allan Kuseske

# Benefits of Drainage Records Modernization

## ▶ Drainage Records Preservation

- The conversion of paper, mylar and other types of hard copy documents and maps to digital format greatly reduces the need for handling of the originals, and potentially the need to retain them.

## ▶ Improved Access to Drainage System Records

- The accessibility and ease of printing of electronic documents enables more efficient information sharing among the county and/or watershed district staff involved in drainage system administration.

## ▶ Enhanced Drainage System Management Capability

- When paper drainage system map information is converted to digital format, other types of data layers can be overlaid electronically, substantially improving drainage management potential.

# Recommendations of Drainage Records Modernization

- ▶ Start Small – Complete a Test Set
- ▶ Consider Data Format and Compatibility
- ▶ Scanning and Digitizing Drainage System Records
- ▶ Georeferencing Scanned Drainage System Maps
- ▶ Drainage Systems Location and Benefited Area
- ▶ Digital Drainage System Segment Identification
- ▶ Maintenance and Land Use Information
- ▶ Consider a Team Approach to Modernization
- ▶ Make Modern Records Available
- ▶ Consider Public Access to Records

# Funding and Collaboration

- ▶ Local Water Planning/Management Challenge Grants
- ▶ Drainage System Repair Funds
- ▶ General Assessment across all drainage systems
- ▶ Collaboration with Local Entities
  - County Environmental Services
  - County Recorder / Auditor / Assessor
  - County Highway Department
  - Municipalities (where appropriate)
  - Soil and Water Conservation Districts
  - Regional Development Commissions
  - Public Works Department
  - Watershed Districts / Projects

Preservation

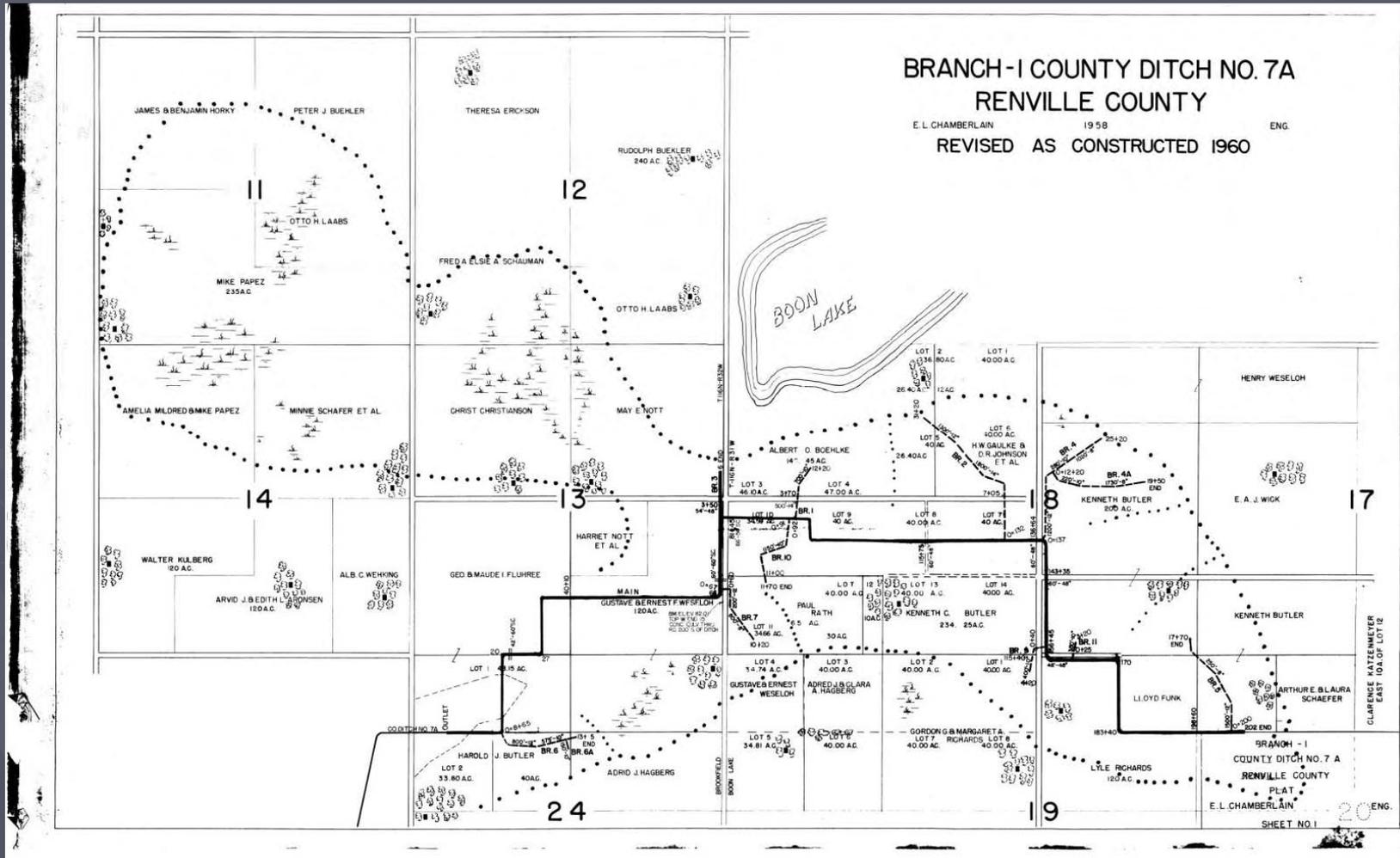


Scanning

# Drainage System History

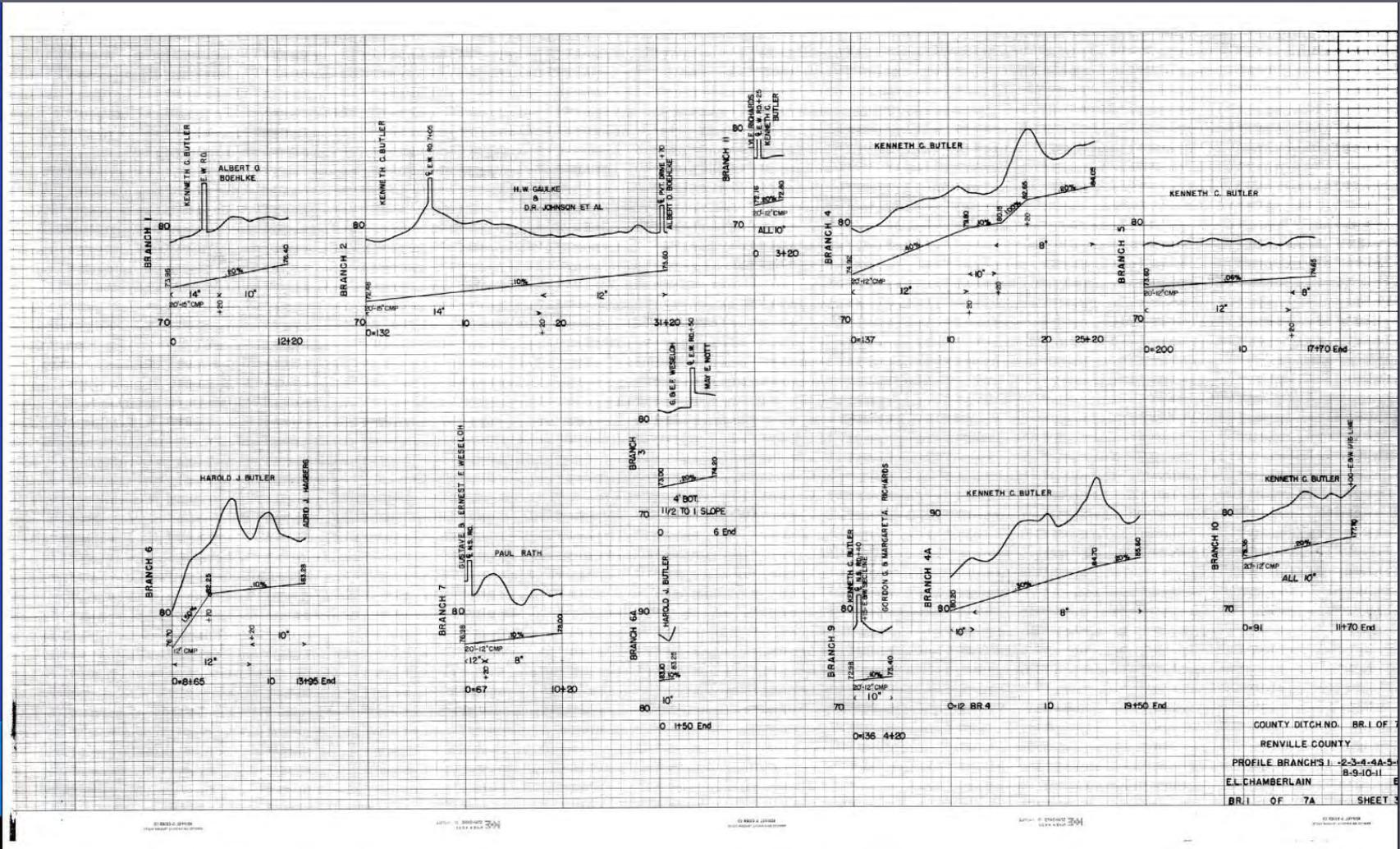
- ▶ Drainage System Number
- ▶ Location – Twp, Range, Section, Watershed
- ▶ Length of System – Open and/or Tile
- ▶ Dates of Key Proceedings – Establishments, Imp, Rep
- ▶ Engineering
- ▶ Benefits – Viewer Appointments, Dollar Value
- ▶ Maintenance History
- ▶ Buffer Strip Locations
- ▶ Oral History

# Levels of Scanning – Level I



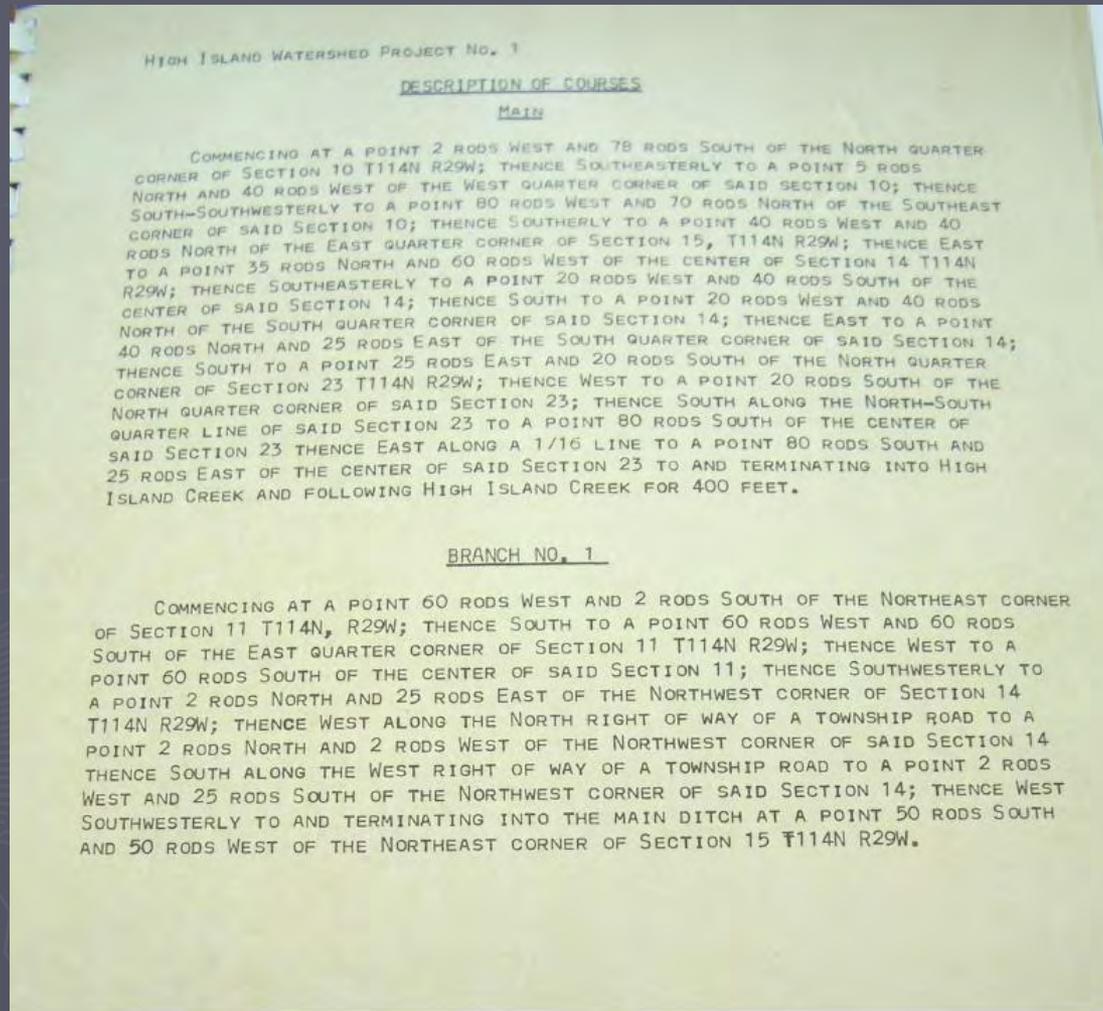
Location / Plan Maps

# Levels of Scanning – Level I



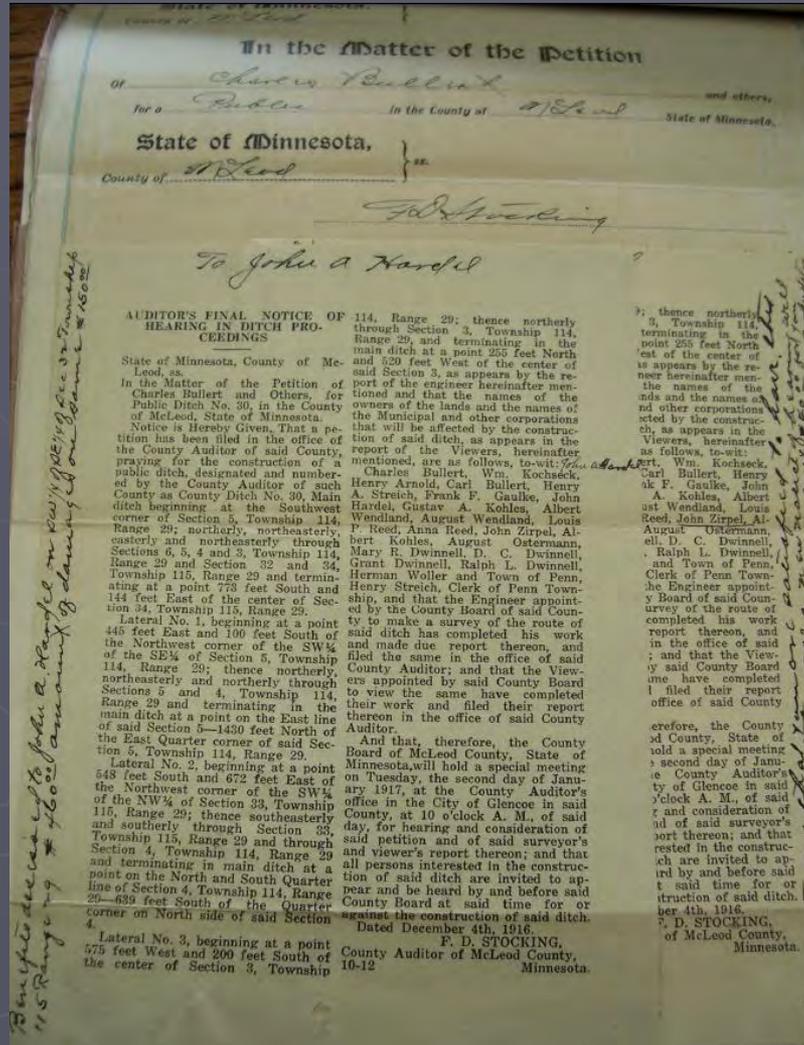
Drainage System Profiles

# Levels of Scanning – Level I



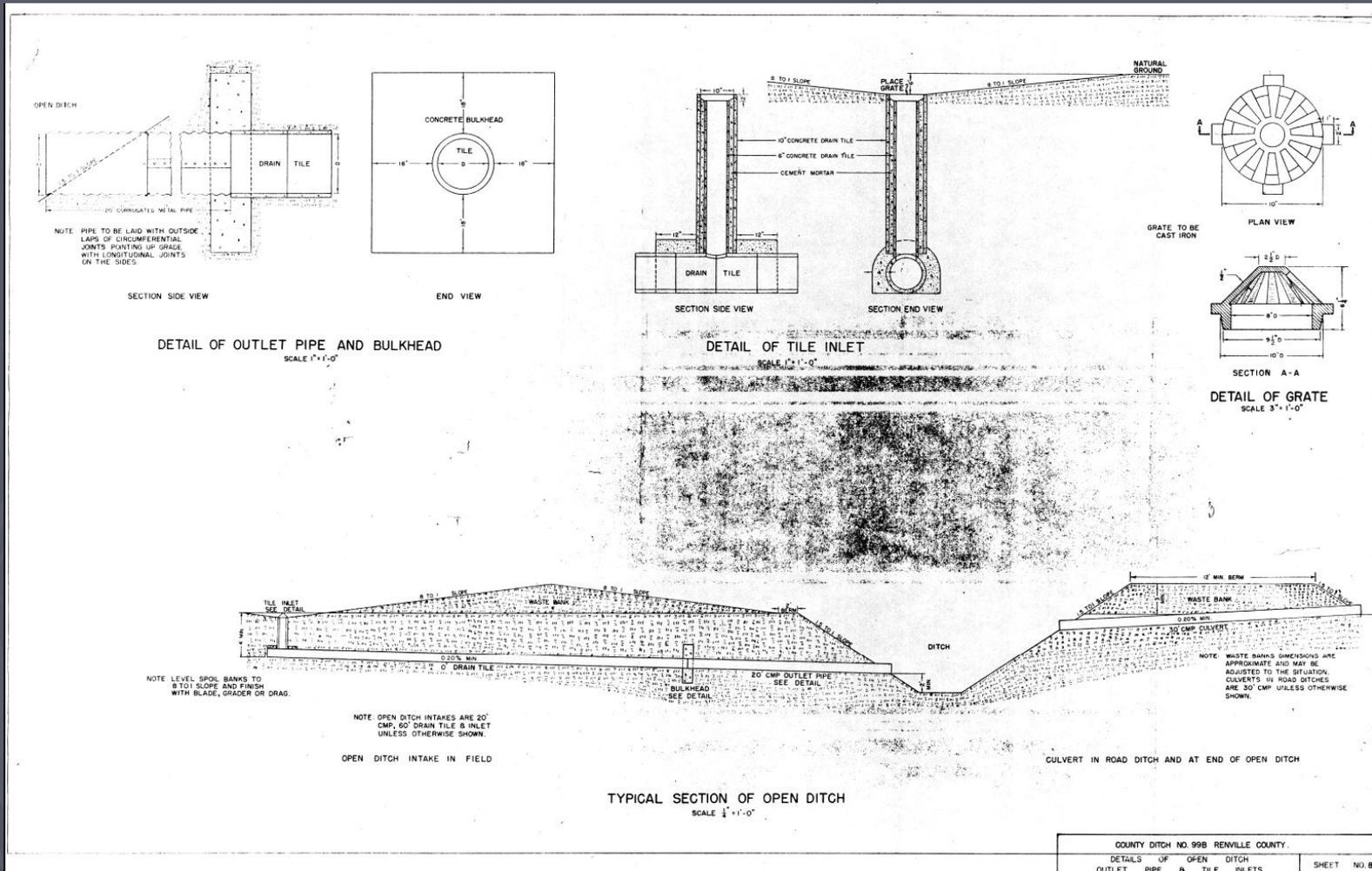
Other Legal Documents

# Levels of Scanning – Level I



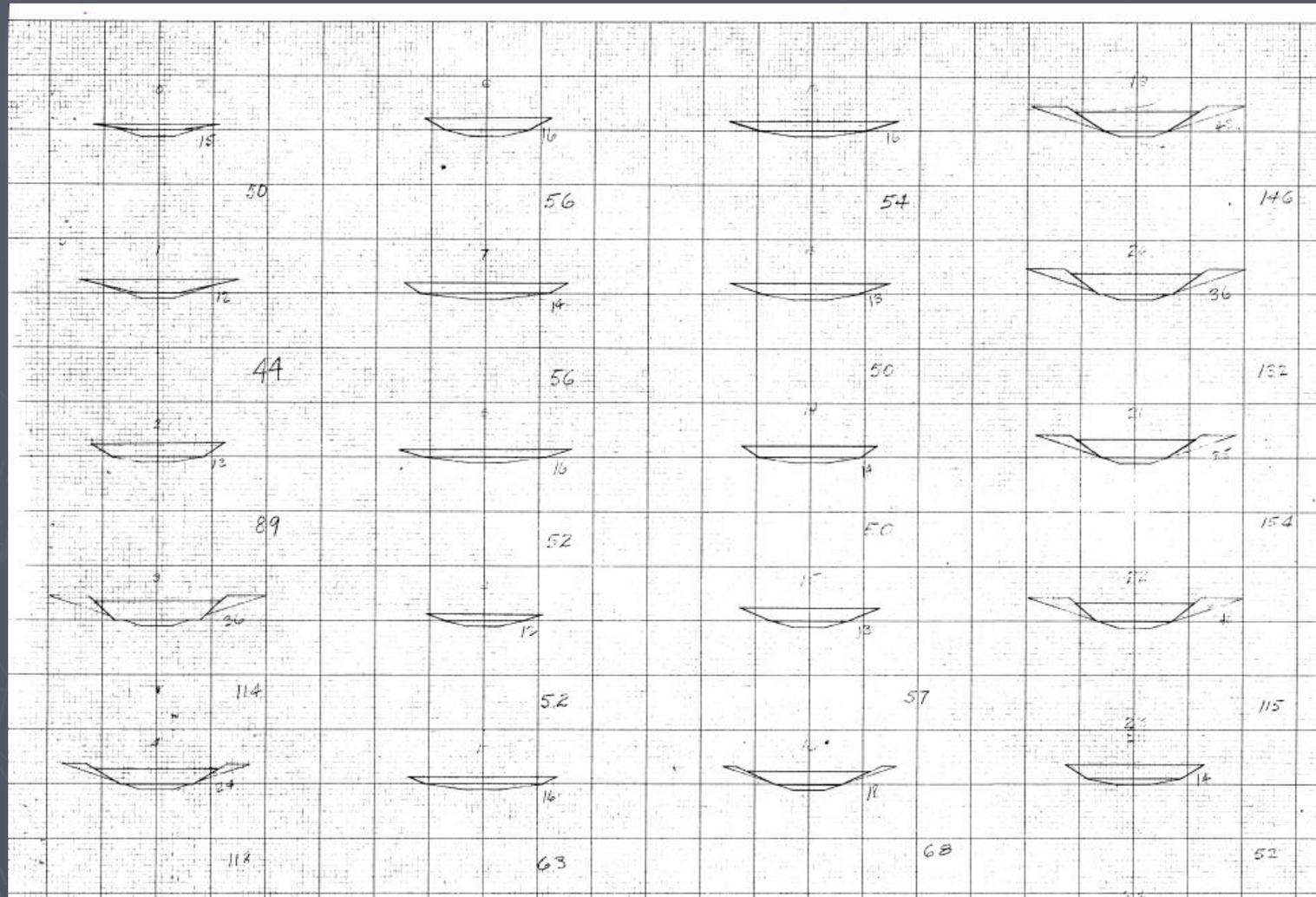
Order for Establishment, improvement, Redetermination, etc.

# Levels of Scanning – Level I



## Typical Design Sections and Details

# Levels of Scanning – Level I



Cross-Section Drawings

# Levels of Scanning – Level II

EXHIBIT I OF VIEWERS REPORT IN DITCH PROCEEDINGS, Showing Names and Owners of Land, Description of Land, Total number of Acres Benefited or Damaged, and Amounts of Benefits or Damages to each Tract of Land Affected by \_\_\_\_\_ Ditch No. \_\_\_\_\_

11686.00  
800.00  
12486.00

NAMES OF OWNERS (Name as appears on County Tax Duplicates)	Location of any Land added by Total or Partial Drainage of any water course and Description of Land Benefited or Damaged	Sec. Town Range			No. of Acres in each Tract	Estimated No. of Acres Benefited	No. of Acres Added to Tract by Total or Partial Drainage of Meandered Lake or by Change of Water Course	Value of Such added Land	No. of Feet of Tile	Damages if Any to Riparian Right	Estimated No. of Acres Damaged	Amount That each Tract Will Be Benefited	Amount That each Tract Will Be Damaged
		Sec.	Town	Range									
John Jenneke	NE $\frac{1}{4}$	9			160	132			2-21-44 - Damages in \$58.00 By Co. Bond		1110.00	7000.00	
John Holtz (Henry Zeller)	NW $\frac{1}{4}$ of NW $\frac{1}{4}$	10			40	37			2-21-44 Reduction by Co. Bond \$ 800.00		324.00	150.00	
John & Ida Krohn	NE $\frac{1}{4}$ of NW $\frac{1}{4}$	10			40	4					59.00		
Edward Stenzel	SW $\frac{1}{4}$ of NW $\frac{1}{4}$ & W $\frac{1}{2}$ of SW $\frac{1}{4}$	10			120	45					414.00	150.00	
August Dose	SE $\frac{1}{4}$ of NW $\frac{1}{4}$ & E $\frac{1}{2}$ of SW $\frac{1}{4}$	10			120	69			2-21-44 Cancelled by Co. Bond		000.00	000.00	
John Biesche and Edward Biesche heirs	SE $\frac{1}{4}$	10			160				2-21-44		100.00	100.00	
					1780.00	1879.00	1030.00				11686.00	1200.00	

We recommend that in addition to the ditch as planned by the engineer, that a lateral be extended in a westerly and northwesterly direction from the point of beginning or station 0, approximately 2500 feet and terminating in the E $\frac{1}{2}$  of the SE $\frac{1}{4}$  of Sec. 6, Twp. 115, Range 27 and that damage be done to Jacob Rehn for the purchase of 1200 feet of 8-inch tile, at present in place.

We further recommend that the open ditch across the W $\frac{1}{2}$  of the S $\frac{1}{4}$  of Sec. 5, Twp. 115, Range 27, for a distance of 620 feet, commencing at approximately station 24 of the open ditch be changed from open ditch to a 24-inch tile at a cost to Herman Klobe of \$500.00 in addition to the regular assessment. We further recommend that lateral No. 2 consisting of 75 feet of 8-inch tile be constructed in a southeasterly direction from station 10 plus 68 into the "orthwest quarter of Sec. 8, Twp. 115, Range 27.

We further recommend that a lateral be constructed from approximately at station 94 in an easterly direction into the E $\frac{1}{2}$  of the SE $\frac{1}{4}$  of Sec. 4, Twp. 115, Range 27, amounting to approximately 400 feet of 8-inch tile.

We further recommend that the existing open ditch be extended southwesterly from station 102 a distance of approximately 2000 feet be widened and deepened into the "orthwest quarter of Sec. 9, Twp. 115, Range 27 and that the outlet be extended from station 157 plus 54 a distance of 500 feet in an easterly direction.

2-21-44 Co. Bond 11609.00 1300.00

Benefited Acres Documents

# Levels of Scanning – Level II



Private Ditch and Tile Information

# Scanning Hardware



- Sources of Scanners
  - Rent – RDC, Counties
  - Purchase - Vendors
  - Contract – Private Firms

- Types of Scanners
  - 36" or larger
  - Rolling Scanner
  - High Compression
  - Color

- Document Types
  - TIFF
  - 400 DPI Resolution
  - Convert to PDF Later



# Scanned Document Naming Convention

DD\_##\_MT\_TYPE\_YYYY\_PN\_PT

CD\_01\_PL\_ORIG\_1948\_1\_5

CD\_132\_PR\_ORIG\_1939\_2\_12

DD = Drainage System Type

CD – County Ditch or Tile

JD – Judicial or Joint Ditch or Tile

PD – Public Ditch or Tile

MT- Map Type

PL – Plan

PR – Profile

EN – Engineers Drawings

Type – Type of Drawings

ORIG – Original Drainage System

IMP – Improvement

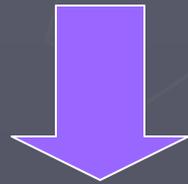
REP - Repair

PN – Page Number of

PT – Page Total

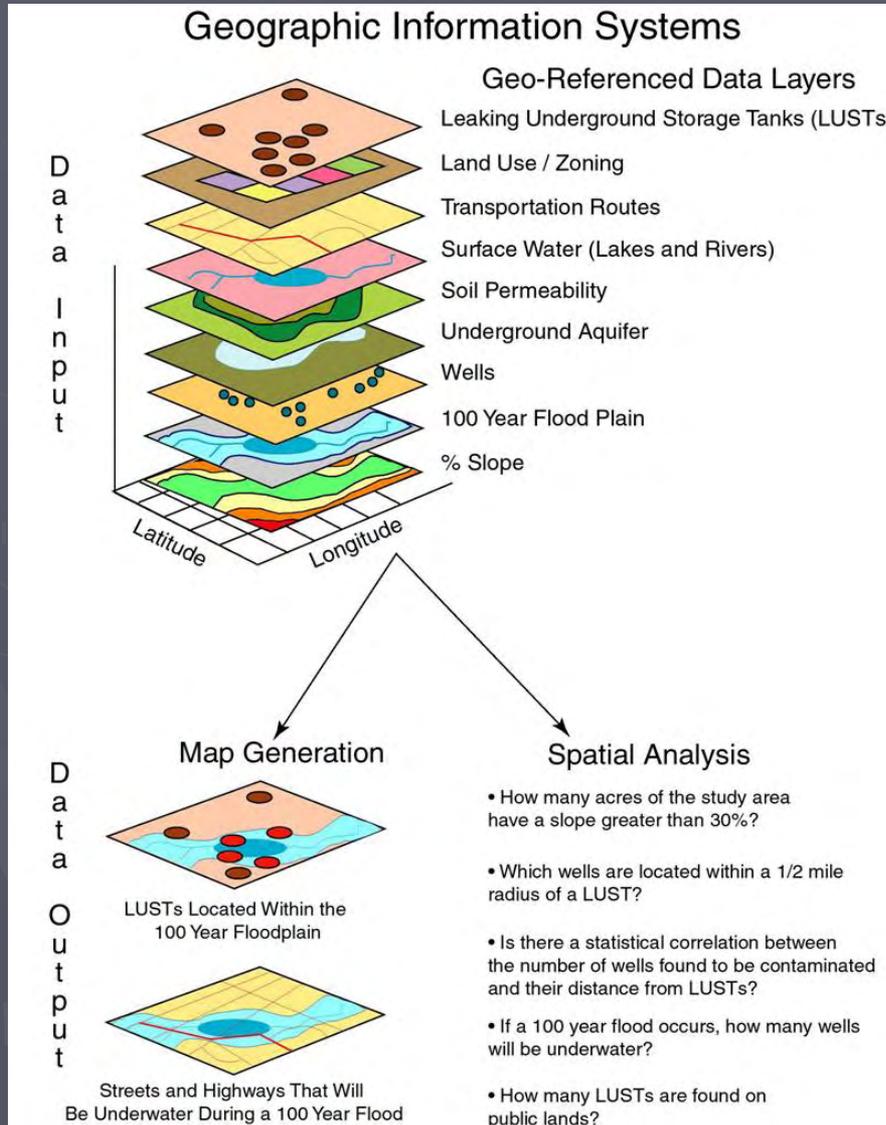


Modernization



Mapping / GIS

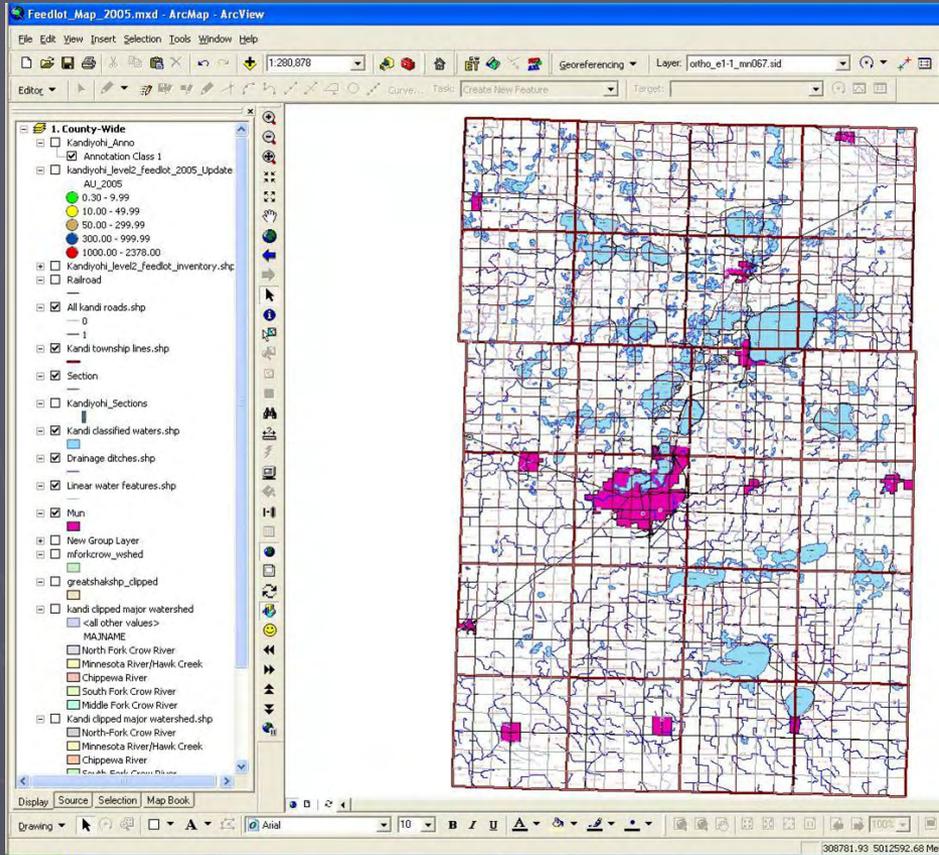
# Mapping: Level I



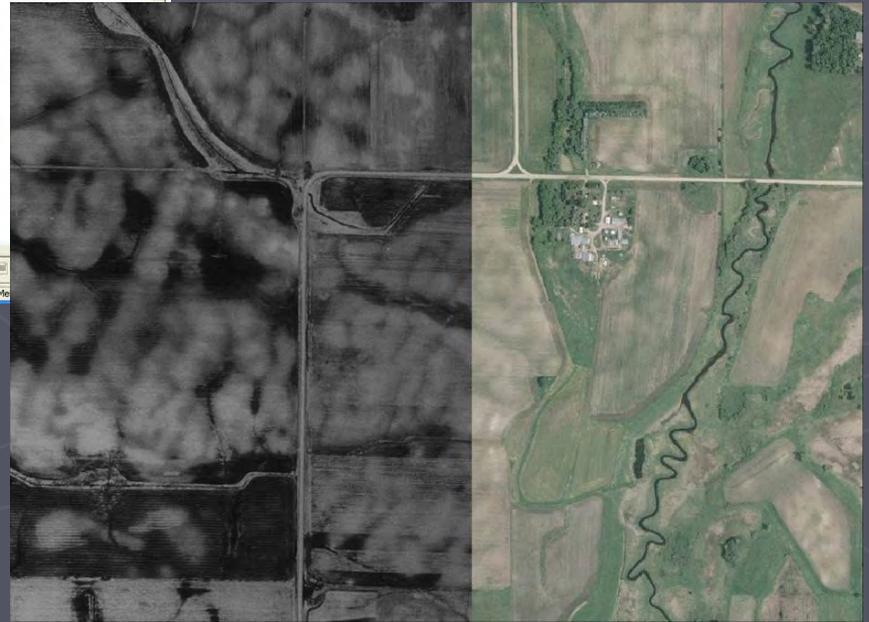
*Geographic Information System (GIS) –* A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing and displaying all forms of geographically referenced information.

In a more generic sense, GIS applications are tools that allow users to create interactive queries (user created searches), analyze spatial information, edit data and maps, and present the results of these operations.

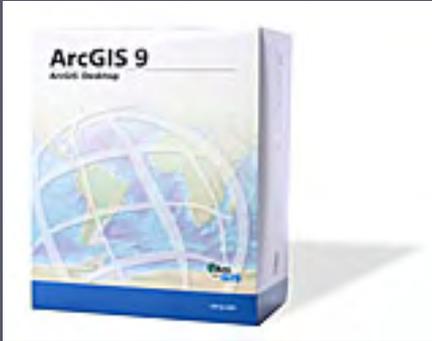
# Mapping Development



- Aerial Photography – 2003 FSA (1939, 1950, 1991, 2003, 2006, 2008)
- Township polygons or lines (DNR)
- Section polygons or lines (DNR)
- Quarter-Quarter Lines (DNR)
- USGS Topographic Maps
- Railroads (DNR)
- Road Network (DNR)
- Minor Watersheds (DNR)
- Major Watersheds (DNR)
- Protected waters and waterways (DNR)



# Mapping Software/Hardware



- ✓ ESRI ArcMap 9.2
- ✓ ESRI ArcView 3.3
- ✓ Photo Manipulation Software (Photoshop or Microsoft Document Imaging)
- ✓ Microsoft Office Suite 200, 2003 or 2007 Professional version (suggested components are Word, Excel, and Access)



The following list of hardware is suggested to be used for the modernizing of drainage records.

- ✓ Computer
- ✓ Printer
- ✓ Scanner



# Digitizing – Mapping Methods

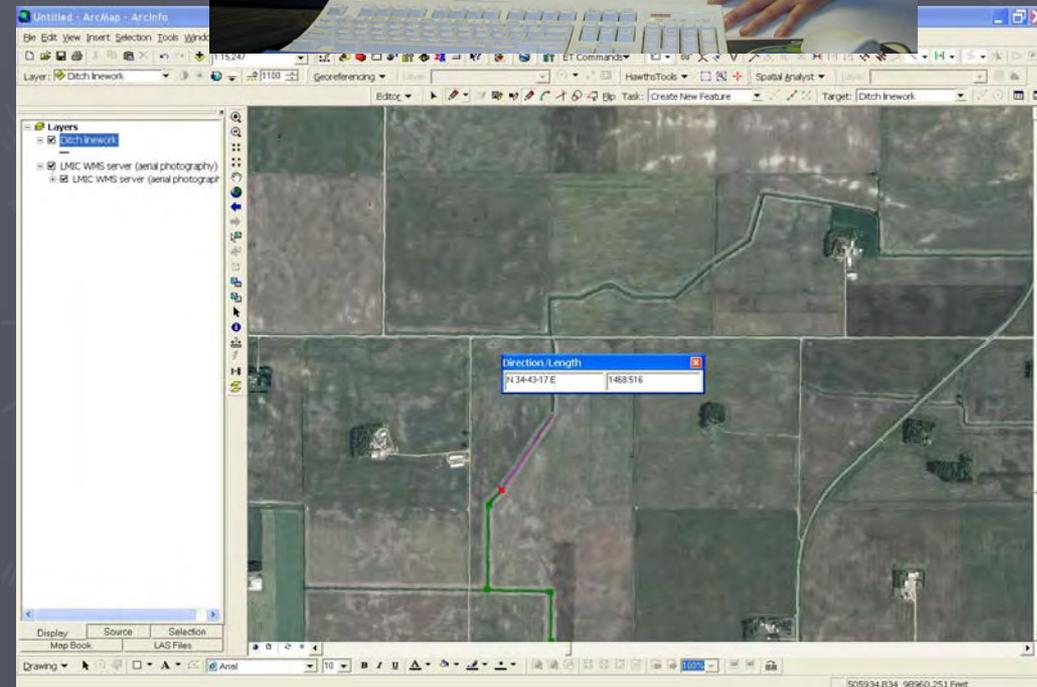


## ► Manual Digitizing

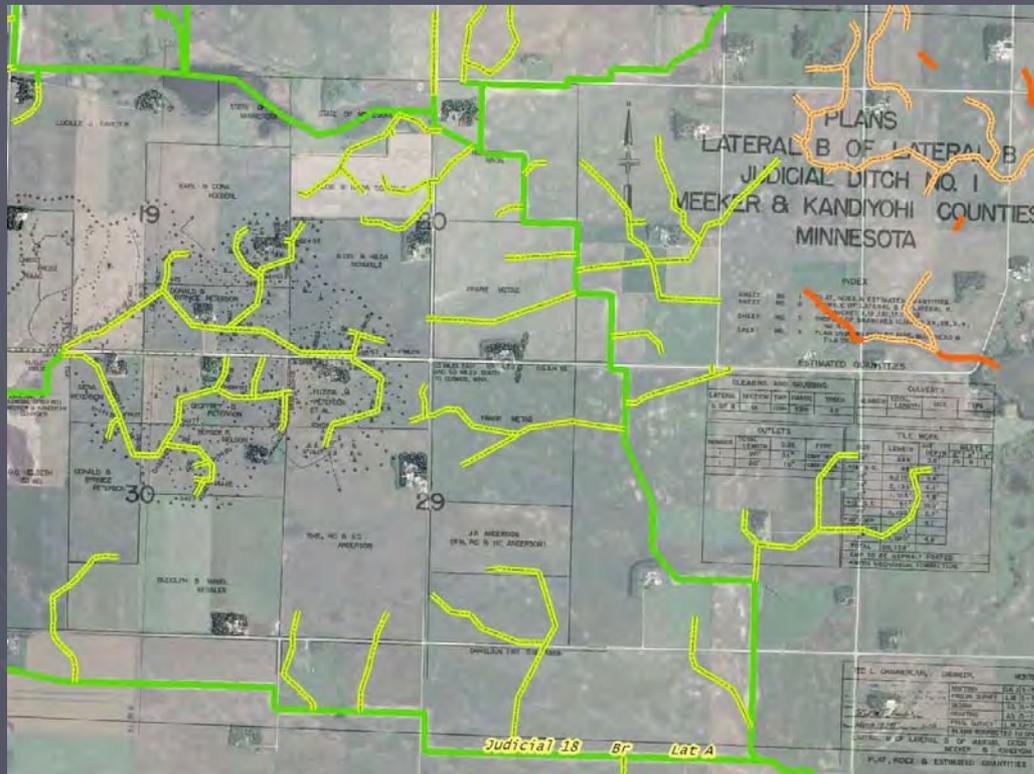
- Placing a paper map on a digitizing board and entering elements of the map into a database using a digitizing puck

## ► Coordinate Geometry

- From survey data, entering explicit coordinates of features from some known monument or point
- Very precise but need legal descriptions from of the feature being mapped



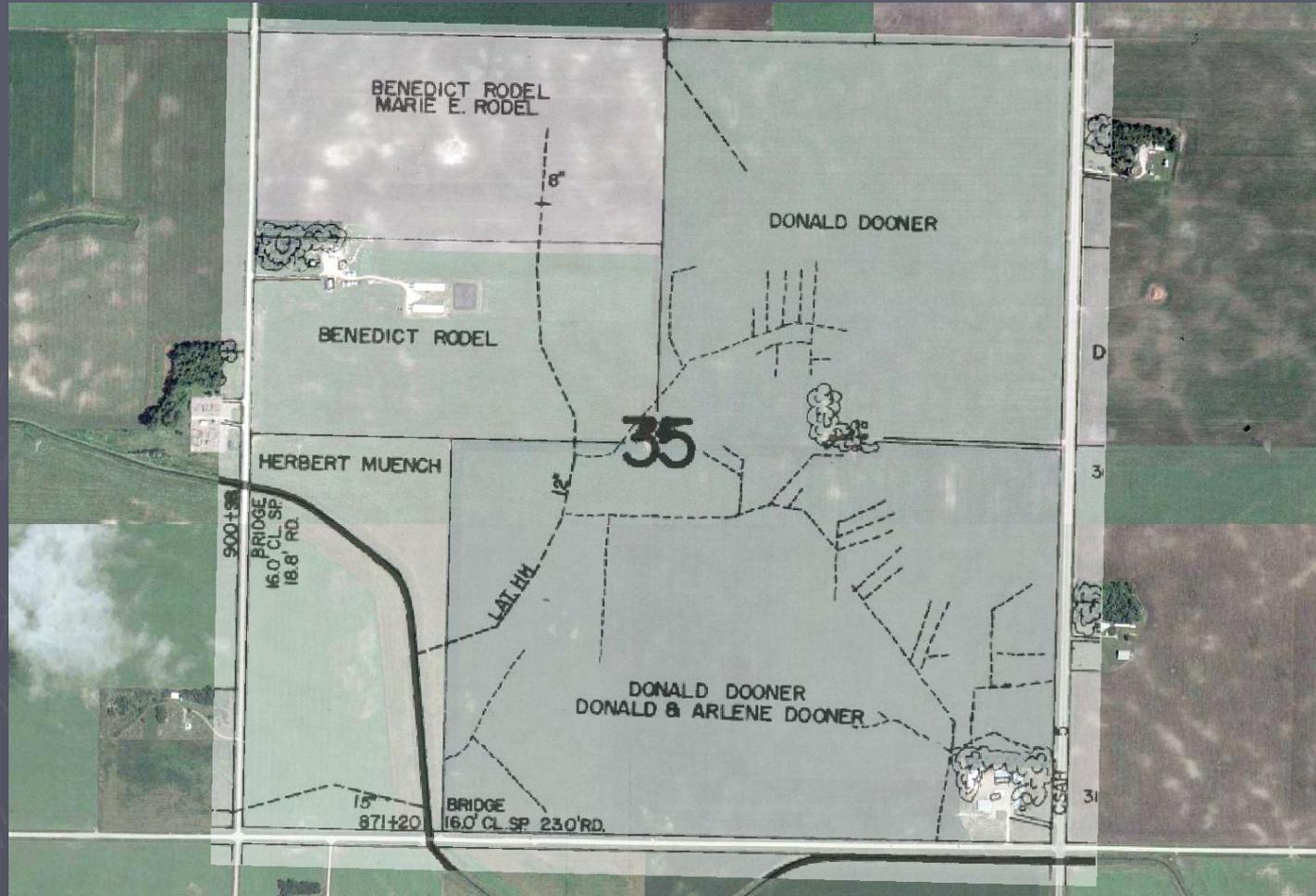
# Digitizing – Mapping Methods



- ▶ Heads-Up Digitizing
  - Digitizing is done directly on the computer screen using scanned raster image as backdrop
  - Commonly called “Heads-up digitizing” because the attention of the user is focused on the screen and not on the digitizing table
  - Display tools, such as zoom in and zoom out allow for a higher level of accuracy
  - Accuracy is dependent on the original scanned image

# Digitizing – Mapping Methods

## ► Heads-Up Digitizing & Georeferencing





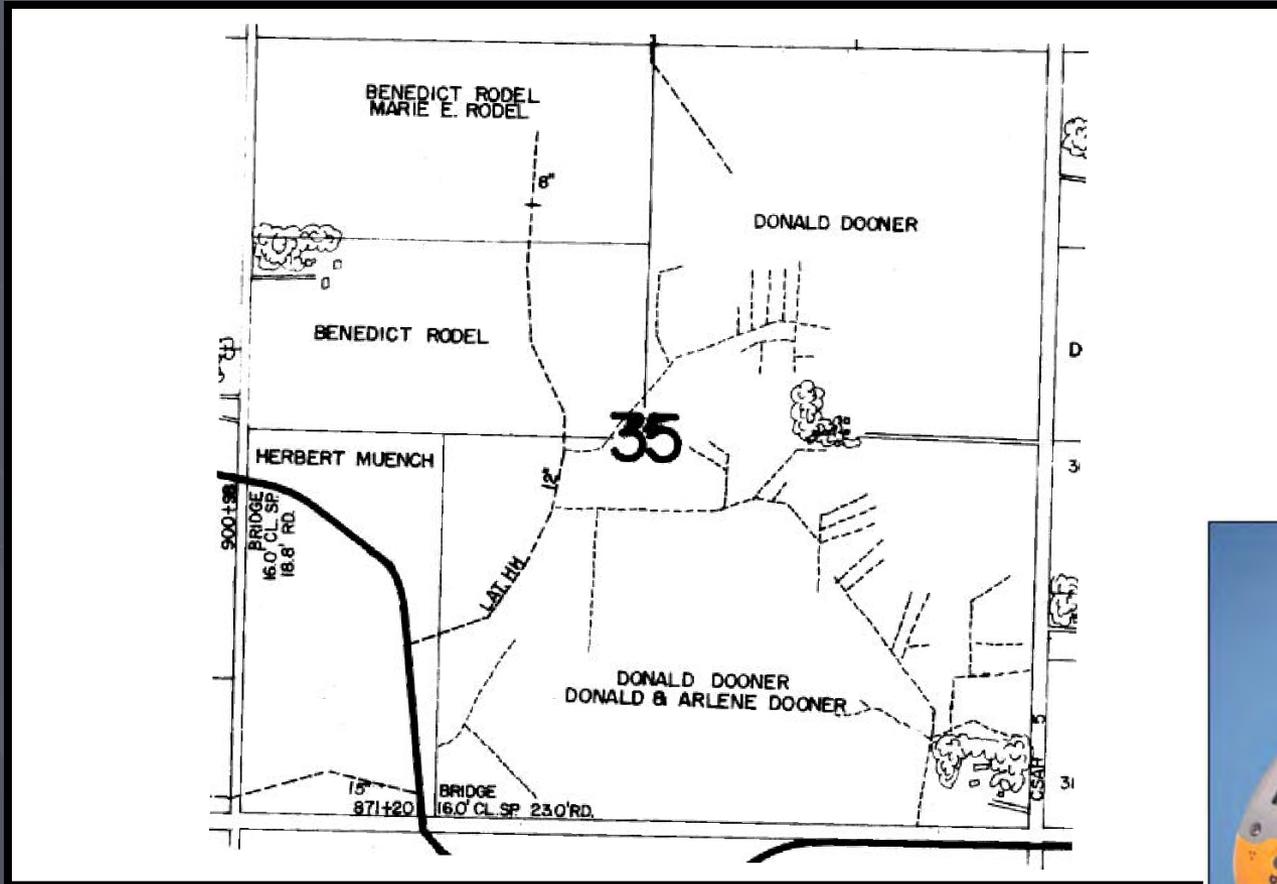
# Mapping: Level II - Field Surveys

## Side Inlets / Outlets and Tile Inlets

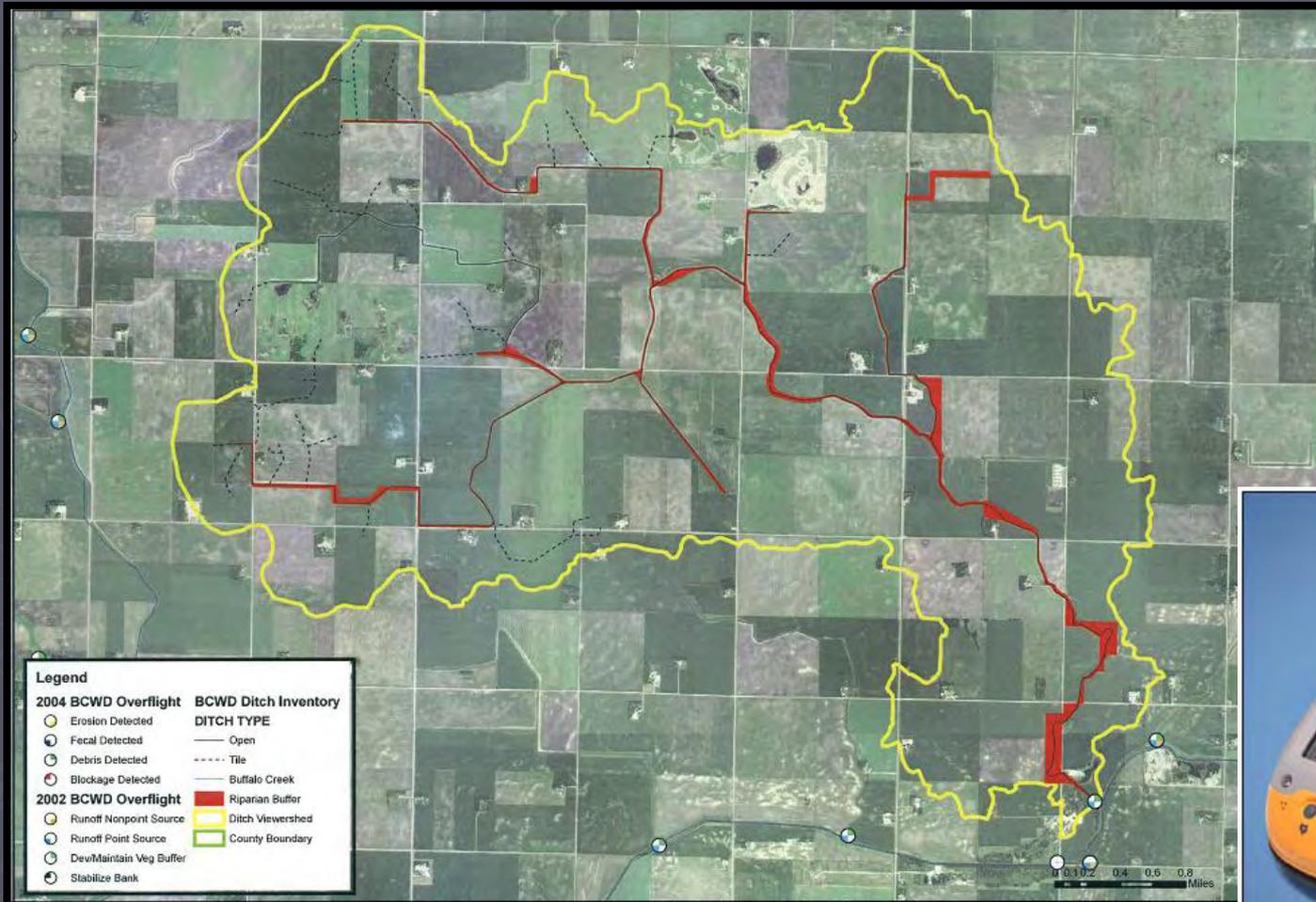


# Mapping: Level II

## Private Tile and Ditch Alignments



# Mapping: Level II Riparian Buffers/Buffer Strips



# Mapping: Level II Culvert & Bridge Inventory

DITCH SYSTEM: CD 29

Crossing Number: 167

Cooperative project between Todd County Soil and Water Conservation, Todd County Public Works, and Todd County GIS and Land Services.

Minnesota County Coordinate System  
Todd County  
NAD 83(1996 adj.)  
NAVD 88



## Existing Culvert Cross Section Data

DATEGPS	TWP	RANGE	SEC	TYPE	SIZE	GROUP	DESCRIPTION	DIR	NORTHING	EASTING	ELEV
1/8/2007	T131N	R34W	36	CMP	48	SINGLE	Invert of Pipe	SOUTH	226861.34	498340.03	1301.86
1/8/2007	T131N	R34W	36	CMP	48	SINGLE	Top of Pipe		226861.67	498339.85	1305.96
1/8/2007	T131N	R34W	36	CMP	48	SINGLE	Shoulder		226874.35	498338.98	1312.18
1/8/2007	T131N	R34W	36	CMP	48	SINGLE	Centerline1		226889.17	498340.82	1312.87
1/8/2007	T131N	R34W	25	CMP	48	SINGLE	Shoulder		226904.11	498341.20	1312.15
1/8/2007	T131N	R34W	25	CMP	48	SINGLE	Top of Pipe		226916.71	498339.84	1306.45
1/8/2007	T131N	R34W	25	CMP	48	SINGLE	Invert of Pipe	NORTH	226917.27	498339.81	1302.17

# Mapping: Level II Benefited Acres

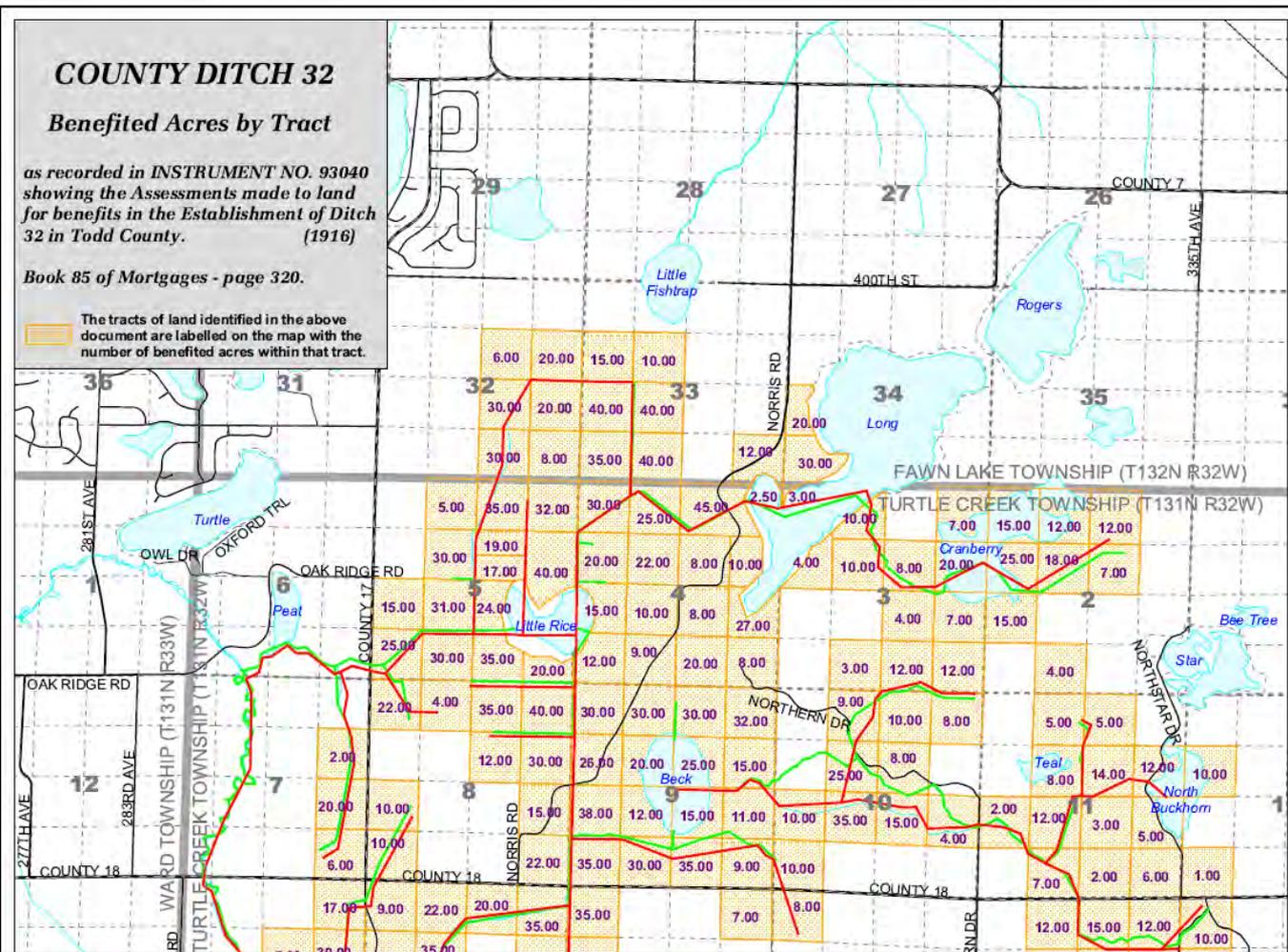
## COUNTY DITCH 32

### Benefited Acres by Tract

as recorded in INSTRUMENT NO. 93040  
showing the Assessments made to land  
for benefits in the Establishment of Ditch  
32 in Todd County. (1916)

Book 85 of Mortgages - page 320.

 The tracts of land identified in the above document are labelled on the map with the number of benefited acres within that tract.

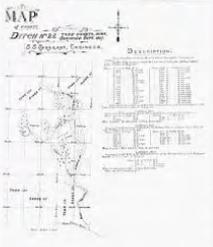


# Mapping: Level II Public Accessibility

**TODD COUNTY COMMUNITY CENTER**

HOME | [Property Information](#) > County & Judicial Ditch Information

## County & Judicial Ditch Information



The first sets of maps, hand drawn at the turn of the century, illustrate the **original ditch design**. For many of the ditch systems there are other maps displaying the **benefitted tracts** as described in documents recorded. These maps indicate which tracts of land were billed for the initial ditch construction.

- \* Select the Ditch number to view maps in pdf format.
- \* Click on the document link to view.

[\\* General Overview Map](#)  
[\\* Todd County Drainage System Management Policy](#)  
[\\* Checklist - Repair / Maintenance Process](#)  
[\\* Drainage System Repair Request Form](#)  
[\\* Minnesota Local/State/Federal Application Forms for Water/Wetland Projects](#)

**Search Ditch Information**

Ditch Name:  COUNTY DITCH 1  
 COUNTY DITCH 2  
 COUNTY DITCH 3

## Lincoln County Ditches



DITCH NAME	ENGINEER	MAP DATE	NOTES
<a href="#">County Ditch No. 10</a>	Elmer Keeler	7/1/1916	
County Ditch No. 11	Arthur E. Morgan	9/1/1906	
County Ditch No. 14	Ted L. Chamberlain	10/26/1983	
County Ditch No. 15	Arthur E. Morgan	4/1/1907	
<a href="#">County Ditch No. 16</a>	Arthur E. Morgan	10/1/1907	Now Joint County Ditch No. 16
County Ditch No. 19	Elmer Keeler	11/1/1907	Stations unreadable
County Ditch No. 2	M.B. Waynes		Book 30 p. 67
County Ditch No. 20	Elmer Keeler	9/1/1907	Station numbers unreadable
County Ditch No. 24		1/1/1911	Very Faded
<a href="#">County Ditch No. 3</a>	M.B. Waynes	1/1/1905	
<a href="#">County Ditch No. 33</a>	Walter I. Larson	11/1/1915	
County Ditch No. 34	Elmer Keeler	9/1/1916	Now Yellow Medicine Ditch 17
County Ditch No. 35	Elmer Keeler	4/1/1917	
<a href="#">County Ditch No. 36</a>	Walter I. Larson		
County Ditch No. 37	Elmer Keeler	1/1/1917	1950's copies located in Engineers Map Drawer
County Ditch No. 38	Elmer Keeler	3/1/1917	

Questions?



Solutions