

MPDM Chapter 3

Engineering and Environmental Considerations

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Chris Otterness, Lead Writer
Houston Engineering, Inc.



Chapter 3 Subcommittee Members

- Andrea Hendrickson, MnDOT
- Duane Hansel, Bolton & Menk
- Kris Sigford, MCEA
- Les Everett, University of MN
- Nathan Kestner, DNR
- Nick Gervino, MPCA
- Rebecca Kluckhohn, Wenck
- Rob Sip, MDA
- Ron Mortenson, Meeker County
- Scott Henderson, Sauk River Watershed District

Primary Purposes of Chapter 3

- Guidance to Engineers in completing their duties
 - M.S. 103E
 - Other applicable state and federal law
- Guidance to Drainage Authority on what to expect and request from their Engineer
- Guidance to regulators on what to expect in an Engineer's Report
- Inform stakeholders (D.A., regulators, viewers, landowners, etc.) of the Engineer's role and basis for their recommendation

What has changed since 1991?



What has changed since 1991?

2016 Minnesota Statutes

CHAPTER 103E. DRAINAGE

Section	Headnote
	GENERAL PROVISIONS
103E.005	DEFINITIONS.
103E.011	DRAINAGE AUTHORITY POWERS.
103E.015	CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE
103E.021	DITCHES MUST BE PLANTED WITH PERENNIAL VEGET
103E.025	PROCEDURE FOR DRAINAGE PROJECT THAT AFFECTS
	AREA USED FOR CONSERVATION.
103E.031	CONNECTION WITH DRAINS IN ADJOINING STATES.

STATUTES



AG PRACTICES



TECHNOLOGY



REGULATION



COMMUNICATION

PRIORITIES

Major Changes to MPDM Chapter 3

- Environmental Considerations
 - 103E.015 considerations
 - Regulatory requirements
 - Water Quality / TMDL
- Repair Reports / As Constructed and Subsequently Improved Condition (ACSIC)
- Resources
 - Links
 - Checklists
 - Sample Reports

Points of Emphasis in Update

- Reflect changes in law
- Consistent language and “voice”
 - “May” vs. “should” vs. “must” vs. “shall”
- Consistent with current engineering practice
- Not a policy document!

Chapter 3 Organization

1. Introduction

2. Specific Environmental Considerations

3. Preliminary Survey and Engineer's Preliminary Report

4. Detailed Survey and Engineer's Final Report

5. Adequacy of Outlet

6. New Systems, Improvements, or Modifications of Drainage System

Chapter 3 Organization (cont.)

7. Repair/Maintenance of Drainage System

8. Redetermination of Benefits

9. Consolidation of Drainage Systems

10. Construction Plans and Specifications

11. Construction

12. Record Drawings

A. Appendices

CHAPTER 3 CONTENT

AUDITOR'S TABULAR ASSESSMENT STATEMENT IN THE MATTER OF THE PETITION OF HANS HANSON AND OTHERS FOR REPAIRS OF COUNTY DITCH NO. 31, OF ANOKA COUNTY, MINN.

Name of the Owners of Lands and Roads that are assessed for the Repairs of Ditch.	Description of Each Parcel Asses- sed for the Repairs.	Sec.	Twp.	Rng.	Amount of Orig- inal Assessment of Benefits by Construction.	Amount to be paid for Repairs Un- der Petiti-
Beasie W. Brown (E $\frac{1}{2}$) August Turnwald (W $\frac{1}{2}$)	N $\frac{1}{2}$ of NW $\frac{1}{4}$	1	32	22	\$65.00	\$65.66
Hans Hanson	SW $\frac{1}{4}$ of NW $\frac{1}{4}$	1	32	22	45.00	45.45
Philip Rousch	SE $\frac{1}{4}$ of NW $\frac{1}{4}$	1	32	22	10.00	10.10
Alex & Emma C. Swanson	E $\frac{1}{2}$ of SW $\frac{1}{4}$	1	32	22	23.00	23.24
Andrew Hanson	W $\frac{1}{2}$ of SW $\frac{1}{4}$	1	32	22	135.00	136.36
Alex & Emma C. Swanson	SW $\frac{1}{2}$ of SE $\frac{1}{4}$	1	32	22	5.00	5.05
Hans Hanson	N $\frac{1}{2}$ of NE $\frac{1}{4}$	2	32	22	18.00	18.18
Hans & Sophia Hanson	S $\frac{1}{2}$ of NE $\frac{1}{4}$	2	32	22	8.00	8.08
Ivan Anderson	SW $\frac{1}{4}$	2	32	22	30.00	30.32
Andrew Hanson	N $\frac{1}{2}$ of SE $\frac{1}{4}$	2	32	22	20.00	20.20
Andrew Kunehire	S $\frac{1}{2}$ of SE $\frac{1}{4}$	2	32	22	30.00	30.32



Key Terminology in Chapter 3

- “Improvement”
- “Major Repair” vs. “Minor Repair” vs. “Petitioned Repair” vs. “Non-Petitioned Repair” vs. “Maintenance”
- “Drainage System Project”

Introduction

Roles and Responsibilities of the Engineer

- Technical expertise



- Technical application of drainage law;
- Surveying;
- Hydrology and hydraulics;
- Culvert, roadway, and structural design;
- Construction plan development;
- Construction management and observation;
- Erosion and sediment control design;
- Wetland delineation;
- Water quality analysis;
- Communication/liaison between drainage authority and other decision-makers and/or reviewers;
- Environmental review and permitting; and
- Soil and water conservation.

Introduction

Roles and Responsibilities of the Engineer

- Understanding of drainage law
- Understanding and evaluating regulatory requirements
- Evaluating environmental considerations (103E.015)
- Key technical advisor for the drainage authority



Specific Environmental Considerations



Specific Environmental Considerations

General

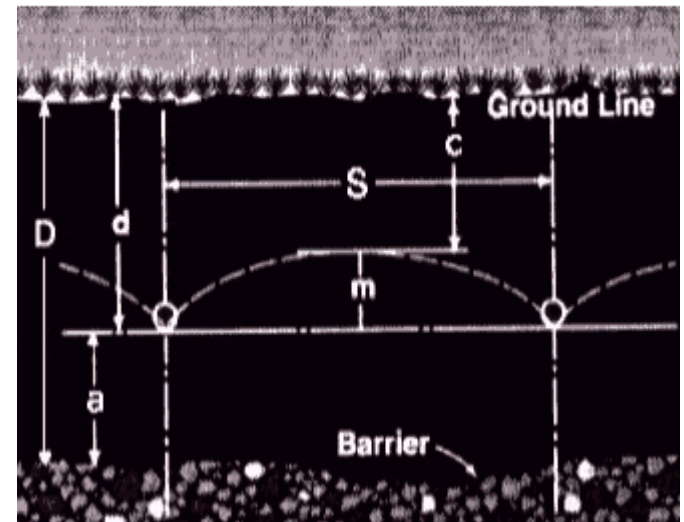
- Roles of Engineer and Regulatory Reviewer
- Pertinent regulations (table)
- Contact info (link)
- Early Coordination

Table 1: Pertinent Regulations

Agency	Local Regs.	State Regs.
Local Government		
Townships	Ordinances	Minn. Stat. 160.20
Counties	Ordinances	Minn. Stat. 103E , Minn. Stat. 160.20
Watershed Districts	WD Rules	Minn. Stat. 103E , Minn. Stat. 103D.335
State Agencies		
BWSR	Rules	WCA (Minn. R. 8420 , Minn. Stat. 103G).

Specific Environmental Considerations **Wetlands**

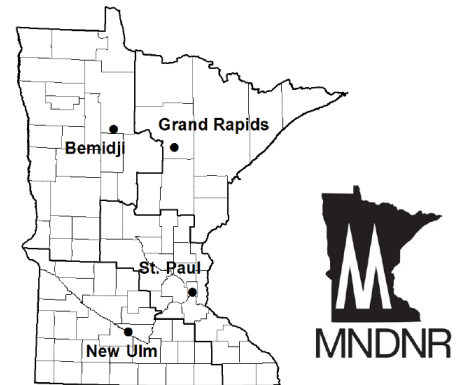
- Wetland Conservation Act (WCA)
- Clean Water Act (CWA)
- Swampbuster
- Determining Wetland Impacts
- Downgradient Wetland Effects



Specific Environmental Considerations

Public Waters

- Work in public waters
- Links to DNR site
- Checklist



Specific Environmental Considerations

Other

- Environmental Review
- Threatened and Endangered Species
- Water Quality
 - NPDES
 - State Standards and Goals



Preliminary Survey and Engineer's Preliminary Report



Preliminary Survey and Engineer's Preliminary Report

Preliminary Survey Procedures

- Guidance vs. mandatory information
- Alternatives to traditional survey
- Consideration of BMP siting (e.g., two-stage ditch)

Detailed Survey and Engineer's Final Report

- Few Changes to this Section
- Required content in report
- Advisory Review
- Example Engineer's Reports (Appendix)



Adequacy of Outlet

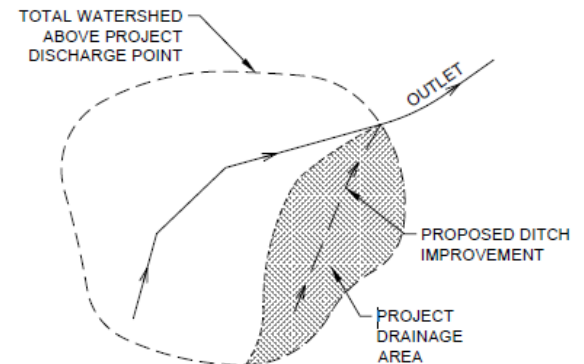


Adequacy of Outlet

Basic Requirements

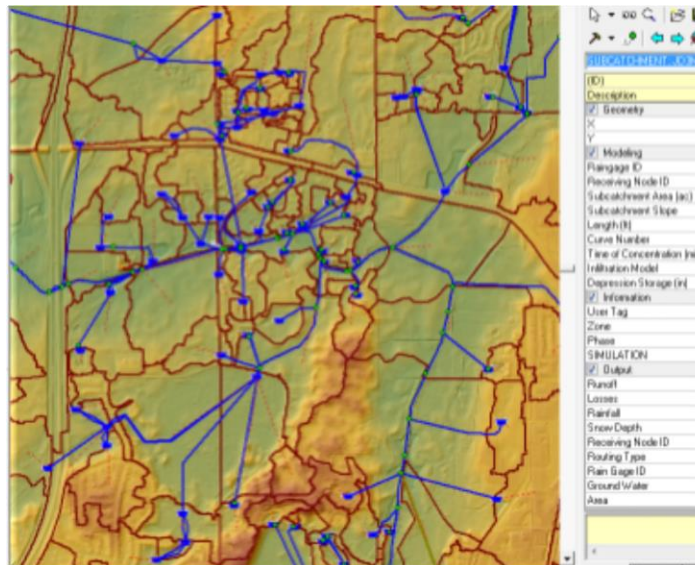
- No loss of function to downstream drainage outlets
- No excessive scour/deposition of sediment
- No flood damages, *unless compensation is made*

Note: These are more or less unchanged from 1991



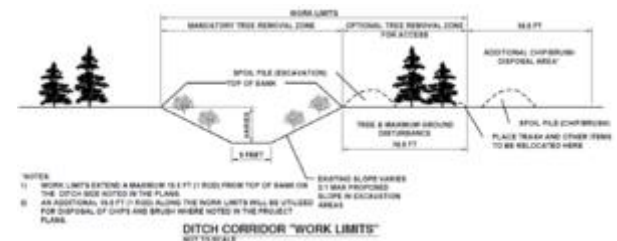
Adequacy of Outlet Methods of Analysis

- Consider regulatory requirements in survey scope
- Modern hydrology/hydraulics techniques
- Matching rigor of analysis to nature and scope of project



New Drainage Systems, Improvements, Laterals, and Other Modifications of Drainage System

- General Information (little change)
- Engineering Requirements
 - Hydrologic and Hydraulic Analysis
 - Ditch/Tile Hydraulic Design
 - Bridge/Culvert Hydraulic Analysis and Design
 - Erosion Control for Drainage Water Entry to a Public Ditch
 - Miscellaneous Structures
 - Channel Geometry
 - Vegetated Ditch Buffer Strips



Repair/Maintenance of Drainage System

“Minor Repair” → *Non-Petitioned Repair*

“Major Repair” → *Petitioned Repair*

Contracting and Levying for Maintenance and Repair



Repair/Maintenance of Drainage Systems

Determination of the As-Built Condition

- Fore Repairs and/or Reestablishment of Drainage System Records
- Test pits
- Soil Borings
- Culvert Comparison
- Cut Sheets
- Drainage Records Modernization



Repair/Maintenance of Drainage Systems

Petitioned Repair

- Recommended examination
- Bridge/culvert capacity
- Repair report outline
- Example repair reports (Appendix)



Other Chapter 3 Sections

- Redetermination of Benefits
- Consolidation of Drainage Systems
- Construction Plans and Specifications
- Construction
- Public Drainage System Records

No. 2750—Petition for Repair of Ditch. MILLER DAVIS Printing Co. Mfg. Stationers, Minneapolis, Minn.

PETITION.

To the County Board of the County of Anoka Minnesota:

The undersigned petitioners respectfully represent and state:

That they are the owners of lands that have been heretofore assessed for the construction of
County Ditch No. 31 of Anoka County.

That the said ditch is in need of repairs and that its usefulness for the purpose for which it was constructed has become greatly impaired by reason of the following facts:

FIRST—That said ditch has become obstructed by the deposit of sediment therein and by the growth of weeds and grasses upon and along the bottom, sides, banks, and right of way thereof.

SECOND—That by reason of the construction of side and lateral ditches emptying into said ditch the volume of water to be taken care of by said County Ditch No. 31 has been increased beyond the capacity thereof.

Chapter 3 Appendices

Checklists

- M.S. 103E.015 Criteria
- Items in a Concept Plan
- Preliminary Report Guidelines
- Key Questions for Considering Water Quality Impact
- Does Your Project Require an Environmental Review?

APPENDIX 1

M.S. 103E.015 CRITERIA

Does your report consider the following....

- ☐ private and public benefits and costs of the proposed drainage project;
- ☐ 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

Chapter 3 Appendices

Resources

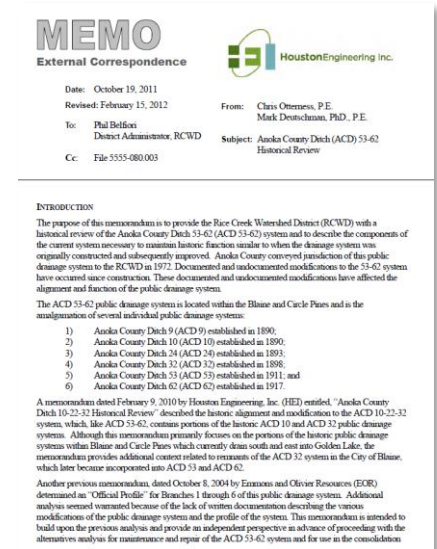
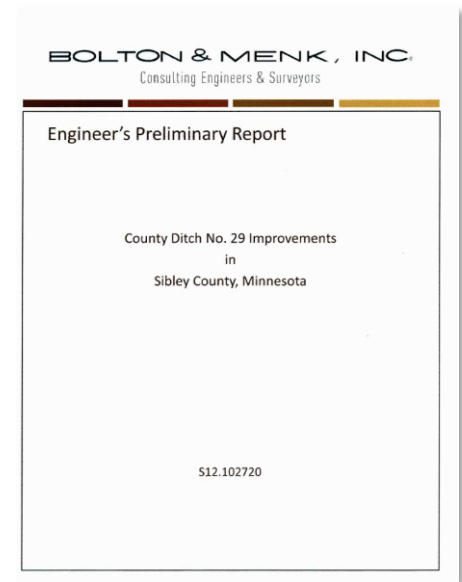
- External sources of funding
- MN water quality standards
- Sample hydraulic structures table
- Rock chute design spreadsheet

Rock Chute Design Data			Plan Sheet
(Version 4.03 - 11/29/11, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)			Instructions
Project: <u>Spillway protection</u>		County: <u>Woodbury</u>	
Designer: <u>Jim Villa</u>		Checked by: _____	
Date: <u>11/04/09</u>		Date: _____	
Input Channel Geometry			
Inlet Channel Bw = 20.0 ft. Side slopes = 4.0 (m:1) n-value = 0.035 Bed slope = 0.0060 ft./ft. Minimum Fill = 1.0 ft. Freeboard = 0.5 ft.	Chute Bw = 20.0 ft. Factor of safety = 1.20 (F_s) Side slopes = 4.0 (m:1) → 2.0:1 max. Bed slope (5:1) = 0.200 ft./ft. → 2.5:1 max. Outlet apron depth, d = 1.0 ft.	Outlet Channel Bw = 40.0 ft. Side slopes = 4.0 (m:1) n-value = 0.045 Bed slope = 0.0050 ft./ft. Base flow = 0.0 cfs	
Design Storm Data (Table 2, NHCP, NRCS Grade Stabilization Structure No. 410)			
Drainage area = 450.0 acres Apron elev. --- Inlet = 105.0 ft. --- Outlet = 99.0 ft. --- (H_{top} = 5 ft.) Chute capacity = Q5-year Total capacity = Q10-year		Rainfall = ☐ 0 - 3 in. ☒ 3 - 5 in. ☐ 5+ in. Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway. Input tailwater (T_w): Q _{high} = 330.0 cfs High flow storm through chute Q _{low} = 75.0 cfs Low flow storm through chute	
		Tw (ft.) = Program Tw from Program	
Profile and Cross Section (Output)			
h _{pv} = 0.38 ft. (0.18 ft.) H _{pe} = 2.67 ft.		Solve Spreadsheet h _{pv} = 0.71 ft. (0.32 ft.)	Notes 1) Output given as High Flow (Low Flow) values. 2) Tailwater depth plus d must be at or above the

Chapter 3 Appendices

Example Reports

- Preliminary survey
- Engineer's final report
- Repair report
- Impoundment proceedings
- Correction of public drainage system record



Questions on Content?

SUBCOMMITTEE DISCUSSION TOPICS



Subcommittee Topics

Adequacy of Outlet

Issue: Does the Engineer need to consider nutrient and sediment loading with regard to the adequacy of the outlet?

*Consensus: **No subcommittee consensus.** However, consensus that no case law indicates use of water quality in considering outlet adequacy under 103E.*

Subcommittee Topics

Adequacy of Outlet

Issue: How far downstream does the Engineer need to consider downstream for adequacy? $\frac{1}{4}$ mile? 1 mile? 10 miles?

Consensus: No one-size-fits-all solution. Engineer needs to use judgement.

Subcommittee Topics

Downgradient Impacts

Issue: Are downgradient effects from drainage projects regulated under WCA or CWA?

Consensus: No. However, Engineer may consider these effects under M.S. 103.015 (Section II.B.5 of Chapter 3).

Subcommittee Topics

Future Regulatory Policy/Process

Issue: Should potential future regulatory changes (e.g., USACE 404 permit) be addressed in the MPDM?

Consensus: No – manual is not to presume what future decision will be. Instead, wiki format will enable “quick” changes to pages when policy/processes change

AND links provided to agency websites for first-hand information

Subcommittee Topics

Cumulative Impacts

Issue: Can/should the Engineer consider cumulative hydrology/hydraulic/water quality impacts?

Consensus: In role as advisor to Drainage Authority (and advocate for benefitting landowners) – No.

However, County or Watershed District may “wear other hats”

“HATS” A COUNTY OR WATERSHED DISTRICT BOARD WEARS

**ZONING
AUTHORITY**

**LOCAL WATER
PLANNER**

**TAXING
AUTHORITY**

ROAD AUTHORITY

**LOCAL GOV.
UNIT (LGU)**

**RESPONSIBLE
GOV. UNIT (RGU)**



DRAINAGE AUTHORITY

How a Drainage Authority May Consider Cumulative Impacts (under a different hat)

- *Rules (e.g., maximum drainage coefficient)*
- *Cost share programs*
- *Regional projects*
- *Multi-purpose drainage management projects*

Subcommittee Topics

Early Coordination

Issue: How to minimize conflict between the Engineer and regulating agencies at the 11th hour of a project?

Consensus: Stress importance of early coordination in the MPDM

CHAPTER 3 FORUM



Ch. 3 Forum Topics

How can the Engineer make the most of the early coordination?

How can the regulating agency make the most of the early coordination?

Ch. 3 Forum Topics

What are common missing elements in an engineer's report?

....from a regulatory reviewer's perspective

....from a drainage attorney's perspective

Ch. 3 Forum Topics

How to advise the drainage authority on differentiating between “low cost” and “best value”?

How to advise the drainage authority on consideration of short term vs. long term cost?



Thank you!