

# EIR supplement: Wisconsin wastewater discharge pipeline for the Crandon Project. Volume IIIa

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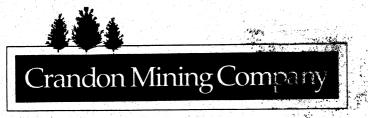
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7 N. BROWN ST., 3RD FLOOR RHINELANDER, WI 54501-3161 Jerome D. Goodrich, Jr.
PRESIDENT

DEC 0 6 1895

November 21, 1995

Mr. Bill Tans
Wisconsin Department of Natural Resources
Bureau of Environmental Analysis and Review
P.O. Box 7921
Madison, WI 53707

Mr. David L. Ballman, Ecologist U.S. Army Corps of Engineers St. Paul District 190 Fifth Street East St. Paul, MN 55101

Dear Mr. Tans and Mr. Ballman:

Re: Crandon Project - Environmental Impact Report

Crandon Mining Company (CMC) is pleased to submit the enclosed update to Volume IIIa, Appendix 3-2, the EIR Supplement: Wiscsonsin River Wastewater Discharge Pipeline.

The second section of

This update has been prepared on behalf of CMC by Foth & Van Dyke and Associates, Inc. As noted on the attached distribution list, CMC has distributed the information to appropriate state and federal agencies, to local officials, and to various interested parties. It is our understanding that the Wisconsin Department of Natural Resources (WDNR) and the U.S. Army Corps of Engineers (USCOE) will be responsible for distribution of the document to their appropriate staff members.

The page contained in this update needs to be inserted into EIR Volume IIIa, which was submitted to you in September, 1995, according to the attached reference list. The list has been prepared to not only facilitate insertion of the additional information, but also to serve as a log and reference identifying changes made to the EIR Supplement by CMC throughout the permitting process. If subsequent revisions are made, they will be added to the attached list in sequential order and the list will be forwarded with the changes.

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(3)

Telephone: (715) 365-1451

FAX: (715) 365-1457

Mr. Bill Tans/Mr. David L. Ballman November 21, 1995 Page 2

If you or your staff have any questions regarding the EIR or EIR Supplement, please contact me at (715) 365-1450.

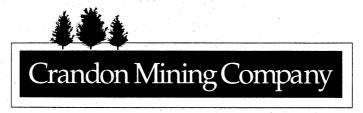
Sincerely,

Jerome D. Goodrich, Jr.

President

Crandon Mining Company

JDG:mld2



7 N. BROWN ST., 3RD FLOOR RHINELANDER, WI 54501-3161

October 21, 1996

Mr. Bill Tans
Wisconsin Department of Natural Resources
Bureau of Environmental Analysis and Review
P.O. Box 7921
Madison, WI 53707

Mr. David L. Ballman, Ecologist U.S. Army Corps of Engineers St. Paul District 190 Fifth Street East St. Paul, MN 55101

DCT 3 0 1996

Dear Mr. Tans and Mr. Ballman:

Re: Crandon Project - Environmental Impact Report

Crandon Mining Company (CMC) is pleased to submit the enclosed update to Volume IIIa, Appendix 3-2, the EIR Supplement: Wisconsin River Wastewater Discharge Pipeline.

This update has been prepared on behalf of CMC by Foth & Van Dyke and Associates, Inc. As noted on the attached distribution list, CMC has distributed the information to appropriate state and federal agencies, to local officials, and to various interested parties. It is our understanding that the Wisconsin Department of Natural Resources (WDNR) and the U.S. Army Corps of Engineers (USCOE) will be responsible for distribution of the document to their appropriate staff members.

The pages contained in this update need to be inserted into Volume IIIa of the EIR according to Items 4 through 14 on the attached reference list. This list serves as a log and reference identifying changes made to the EIR by CMC throughout the permitting process. Items 1 through 3 on the list were previously submitted. If additional revisions are made, they will be added to the attached list in sequential order and the list will be forwarded with the changes.

Please note that through this update Comment 172 from the May 3, 1996, WDNR letter pertaining to CMC's EIR has been addressed.

MLD2\93C049\GBAPP\38148\10000



Mr. Bill Tans Mr. David L. Ballman October 21, 1996 Page 2

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If you or your staff have any questions regarding the EIR, please contact me at (715) 365-1450.

Sincerely,

Don Moe

Technical/Permitting Manager Crandon Mining Company

D. E. Mac

DM:mld2

# Crandon Project EIR Supplement: Wisconsin River Wastewater Discharge Pipeline Log of Updates and Additional Information

Entry Number	Date of Revision	Page(s)	Document Section Number	Description	
1	11/21/95	3	Log of Updates	Addition (Place Behind Original Cover Letter)	
2	11/21/95	4-10	Distribution List	Updated (Place Behind Log of Updates)	
3	11/21/95	39	Table 4-1	Insert Updated Page	
4	10/21/96	3	Log of Updates	Updated	
5	10/21/96	4-9	Distribution List	Updated	
6	10/21/96	v and vii	Table of Contents	Updated	
7	10/21/96	15-16	Section 3.2	Updated to include work performed in 1996	
8	10/21/96	25	Section 3.7	Added paragraph on 1996 aquatic threatened and endangered species surveys	
9	10/21/96	30	Section 3.7.2.7	Added paragraph on 1996 aquatic threatened and endangered species surveys	
10	10/21/96	36 and 36a	Section 4.2.1	Updated Section 4.2.1 to include work performed in 1996; Section 4.2.2 moved to new page	
11	10/21/96	37	Section 4.2.6.1.1	Added new section subheading	
12	10/21/96	39a	Section 4.2.6.1.2	Added new section	
13	10/21/96	54-55	Section 5	Updated reference list	
14	10/21/96		Appendix F	New Appendix	

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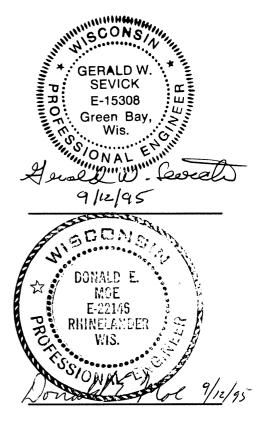
# EIR Supplement: Wisconsin River Wastewater Discharge Pipeline for the Crandon Project

93C049

Prepared for
Crandon Mining Company
7 North Brown Street, 3rd Floor
Rhinelander, Wisconsin 54501-3161

Prepared by Foth & Van Dyke and Associates Inc.

September 1995



#### Crandon Mining Company Environmental Impact Report Supplement Wisconsin River Discharge Pipeline

#### **Executive Summary**

#### Introduction

Crandon Mining Company (CMC) plans to discharge treated water from its Crandon mine into the Wisconsin River by way of an underground pipeline from the mine site to the Hat Rapids Dam, south of the City of Rhinelander. All water discharged will be treated to meet strict standards set by the Wisconsin Department of Natural Resources (WDNR). This document, a supplement to the project's Environmental Impact Report, shows that pipeline construction and the water discharge will not adversely affect the environment.

#### **Description of the Project**

The water pipeline will extend approximately 38.3 miles from the mine site to Hat Rapids Dam, following road rights-of-way. The fully sealed pipe will be buried a minimum of 4.5 feet underground, below the frost line. The pipeline route will run:

- From the project's wastewater treatment plant along the mine access road to Hwy. 55.
- Along the west side of Hwy. 55 north to Hwy. S.
- Along the west side of Hwy. S. to Hwy. 8.
- Along the north side of Hwy. 8 to Hwy. V, under the county snowmobile trail.
- Along the south side of Hwy. 8 from Hwy. V to the Rhinelander beltline.
- Along the north side of the Rhinelander beltline to HWY 17.
- Along the west side of Hwy. 17 to Hat Rapids Road.
- Along the south side of Hat Rapids Road to the Wisconsin River.
- Along the east side of the river to Hat Rapids Dam under land owned by Wisconsin Public Service Corporation.

The normal flow through the pipeline will be approximately 460 gallons per minute (gpm), but the pipeline will have a capacity of 1,200 gpm. The water will discharge directly into the turbine intakes of the dam, where it will mix with river water.

#### **Environmental Impacts**

Wisconsin River water discharge. The treated water will not have any adverse effect on water quality in the Wisconsin River. Excess water from the mine will be treated in a wastewater treatment plant built according to plans approved by the WDNR. The plant will use a lime/sulfide treatment process that has been tested under WDNR supervision to prove its effectiveness. The discharge must meet strict WDNR water quality standards designed to protect public health and welfare, protect the use of waters for public and private water supplies, and protect fish and wildlife. CMC studies show that the discharge will consistently meet WDNR limits for all substances. Comprehensive controls at the treatment plant will ensure that water is released through the pipeline only if it meets WDNR standards. Even during seasonal low-flow periods, the discharge rate of 460 gpm represents only 0.3 percent of the river's flow at the Hat Rapids Dam, and 0.08 percent of the river's flow 45 miles downstream at Merrill.

Interbasin water transfer. Piping water from the mine to Hat Rapids Dam will move water from the Wolf River drainage basin and into the Wisconsin River drainage basin. However, this will have no measurable effects on the environment because the amount of water transferred will be very small in relation to the sizes of the two river systems.

Pipeline construction. The environmental effects of pipeline construction will be small and temporary. The rights-of-way in which the pipeline will be built pass mainly through second-growth northern hardwood forests, wetlands, and farm and residential land. Because these lands are already disturbed by road construction and maintenance, they provide only limited wildlife habitat. When construction is completed, the land will be restored.

Where the pipeline crosses streams, CMC will use proven directional drilling methods to place the pipe several feet below the stream bed without disturbing the stream. At a minimum, the pipeline will be installed beneath the Wolf River, Gliske Creek, Mud Creek, Monico Creek, Venus Creek, Neptune Creek, the Pelican and North Branch Pelican Rivers, George Creek, and one unnamed creek.

The pipeline will temporarily disturb at most 13.1 acres of wetlands on or next to highway rights-of-way and along the snowmobile trail. After construction, the lands will be restored, and the wetlands will recover fully within one or two years.

CMC studies show that leaks in the pipeline are highly unlikely during the entire life of the mine. Even if a leak did occur, its effects would be negligible because of the high quality of the treated water. Nonetheless, systems will be in place to detect leaks, and procedures will be in place to shut down the system and make prompt repairs.

### EIR Supplement: Wisconsin River Wastewater Discharge Pipeline Crandon Mining Company Crandon Project

#### **Contents**

					Page
1	Intro	duction			. 1
2	Proje 2.1 2.2	Location Pipe M 2.2.1 2.2.2 2.2.3 2.2.4	In Interial, Purple Inc. Pipeline A Pipeline A Leak Prev Closure	mping Facilities and Appurtenances and Pumping Facilities Appurtenances vention and Monitoring Equipment	. 2 . 10 . 10 . 12 . 12
3		iption o Regior Histori	f Environm al and Loc cal and Are ortation an Transport	dental Setting al Setting chaeological d Utilities ation Utilities Along Proposed Pipeline Route Wisconsin Public Service Corporation Natural Gas Distribution	. 15 . 15 . 15 . 16 . 16 . 16
		au.	3.3.2.2 3.3.2.3 3.3.2.4	Wisconsin Public Service Corporation Electric Transmission and Distribution Lines	. 17 . 17
	3.4 3.5	Geolog 3.5.1 3.5.2	y and Soils Geology Soils	corology and Air Quality	<ul><li>. 18</li><li>. 18</li><li>. 19</li></ul>
	3.6 3.7	Ground Surface 3.7.1	Water and	d Aquatic Biology River Basin Gliske Creek Wolf River Mud Creek	<ul><li>25</li><li>26</li><li>27</li></ul>
		3.7.2		Sconsin River Basin  Monico Creek  Venus Creek (Venus Lake Outlet)  Neptune Creek  North Branch of the Pelican River  George Creek (George Lake Outlet)  Pelican River  Wisconsin River  Unnamed Creeks	. 27 . 28 . 28 . 28 . 28 . 29 . 29

# Contents (continued)

					Page
	20	Т	mial Dialas		30
	3.8	3.8.1		zy	
		3.8.2			
		3.8.3		oile Trail	
		3.8.4		om CTH V to River Bend Road	
		3.8.5		der Beltline (USR 8 from River Bend Road to STH 17)	
		3.8.6			
	2.0	3.8.7	_	ds Road	
	3.9	Wetlan			
	3.10			ibration	
	3.11			oning	
	3.12				
	3.13	Socioe	conomics.	•••••	35
					•
4					
	4.1			ative	
	4.2			ative	
		4.2.1		l and Archaeological	
		4.2.2		tation and Utilities	
		4.2.3		ity	
		4.2.4		and Soils	
		4.2.5		ater	
		4.2.6		Vater and Aquatic Biology	
			4.2.6.1	Wisconsin River	
				4.2.6.1.1 Flow and Water Quality	
				4.2.6.1.2 Aquatic Biology	
			4.2.6.2	Interbasin Transfer	
			4.2.6.3	Other Surface Waters	
		4.2.7		al Biology	
		4.2.8	Wetlands		
		4.2.9		Noise/Vibration	
		4.2.10		e and Zoning	
		4.2.11		S	
		4.2.12		nomics	
			4.2.12.1	Population	
			4.2.12.2	Employment	
			4.2.12.3	Housing	
			4.2.12.4	Government Structure and Public Finance	
			4.2.12.5	Public Facilities and Services	
			4.2.12.6	Human, Health and Social Services	
	4.3			e Proposed Action	
		4.3.1	Other Su	rface Water Discharge Locations	
			4.3.1.1	Discharge to Swamp Creek	48
			4.3.1.2	Little Sand Lake	48
			4.3.1.3	Lake Metonga	48
			4.3.1.4	Oconto River, Peshtigo River, Neptune Creek, Haymeadow	
				Creek, Monico Creek and Pelican River	49

	Page
2	1.3.2 Seepage Cells
J Referen	Tables
Table 2-1 Table 2-2 Table 2-3 Table 3-1 Table 3-2 Table 3-3 Table 3-4 Table 4-1 Table 4-2 Table 4-3 Table 4-4 Table 4-5	Pipeline Location Data Horizontal Pipe Placement Within Public Right-of-Way Summary of Pipe Velocity and Headloss Forest-Oneida County Soil Associations Stream Crossing Observation Site Locations Wetland Acreage Within 500 Feet of Roadway Centerlines Types of Development Along the Proposed Pipeline Corridor Estimated Treated Wastewater Quality Strimated Temporary Habitat Disturbance Within Undisturbed ROW Estimated Temporary Wetland Disturbance Within Undisturbed ROW Aummary of Data Collected for Potential Pipeline Routes  Alternative Route Evaluation  5
	Figures
	Figures for the EIR Supplement: Wisconsin River Wastewater Discharge Pipeline are ocated at the end of the text, following page 56.)
Figure 1-1 Figure 2-1 Figure 2-2 Figure 2-3 Figure 2-4 Figure 2-5 Figure 2-6 Figure 2-7 Figure 2-8 Figure 2-9 Figure 2-10 Figure 2-11 Figure 3-1	

#### Contents (continued)

Figure 3-2 Figure 3-3 Figure 3-4 Figure 3-5	Soil Association Map Stream Crossing Observation Points Wetlands Along Discharge Pipeline Alternative Discharge Pipeline Corridors
	Appendices
Appendix A	Historical/Archaeological Reconnaissance and Literature Review of the Wisconsin River Wastewater Discharge Pipeline Corridor Alternative, Forest and Oneida Counties, Wisconsin
Appendix B	Oneida County Soil Survey Data Sheets
Appendix C	Forest County and Oneida County Soil Association Maps
Appendix D	Wisconsin Department of Natural Resources Correspondence
Appendix E	Habitat Characterization Field Data Forms
Appendix F	Addendum 1 - Supplement: Wisconsin River Discharge Pipeline for the Crandon Project

#### 1 Introduction

Crandon Mining Company's (CMC) proposed mine/mill process will be a net consumer of water. However, even during a drought year, the total amount of mine drainage due to groundwater inflow will likely exceed the demand for makeup water in the mine process water system. Therefore, dewatering of the mine will result in a surplus of water which must be discharged from the site. CMC proposes to treat this water on-site to meet applicable effluent standards for ultimate discharge to the Wisconsin River approximately 38.3 miles west of the facility. The proposed route is shown on Figure 1-1.

This document provides a description of the proposed action and the existing environment the pipeline traverses, an assessment of the potential environmental impacts, and an alternatives evaluation. The document addresses the pipeline corridor from the intersection of the proposed plant site access road and State Trunk Highway (STH) 55 to the Wisconsin River. The portion of the pipeline extending from the plant site along the proposed access road to STH 55 is addressed separately in the main body of the project's 1995 Environmental Impact Report (EIR) (Foth & Van Dyke, 1995a).

#### 2 Project Description

#### 2.1 Location

As shown on Figure 1-1, beginning at the intersection of the site access road and STH 55, the pipeline is proposed to be routed along and buried within the right-of-way (ROW) of federal, state, county and locally designated public roads with the exception of a short segment along the Wisconsin River, where the pipeline will parallel the river on Wisconsin Public Service Corporation (WPSC) property from Hat Rapids Road north to the Hat Rapids Dam.

The proposed pipeline route begins at the CMC project site wastewater treatment facility and follows the proposed plant site access road to STH 55. The route then follows STH 55 north to County Trunk Highway (CTH) S, continuing north to United States Route (USR) 8. The proposed route will follow USR 8 to Rhinelander where it will head south along STH 17 to Hat Rapids Road. The route will follow Hat Rapids Road to the Wisconsin River, turn north and proceed to the Hat Rapids Dam. The total length of the proposed pipeline is approximately 38.3 miles. The Hat Rapids Dam is owned and operated by WPSC.

Table 2-1 provides specific information regarding the location of the proposed pipeline. As shown in Table 2-1, the pipeline will be routed on the west side of STH 55 and CTH S; to the north of USR 8 from CTH S to CTH V along an existing snowmobile trail; to the south of USR 8 between CTH V and River Bend Road; to the north of the Rhinelander Beltline; to the west of STH 17; and to the south of Hat Rapids Road. Per discussions with the Wisconsin Department of Transportation (WisDOT), the pipeline will be placed 25 feet from the edge of pavement along STH 55, STH 17 and all of USR 8, with the exception of the portion along the snowmobile trail. The pipeline will be installed down the centerline of the snowmobile trail. At the recommendation of the Forest County Highway Commission, the pipeline will be installed along the west top-of-ditch line (this varies but averages approximately 25 feet from the edge of pavement) on CTH S. Due to the narrow ROW, the pipeline will be installed at the edge of pavement on Hat Rapids Road. At the Wisconsin River, the pipeline will parallel the river on the east bank north to the Hat Rapids Dam on property owned by WPSC.

Table 2-1

Pipeline Location Data<sup>1</sup>

Segment	Length (miles)	ROW Ownership	ROW Width <sup>2</sup> (feet)	Side of Road	Distance from Edge of Pavement (feet)
STH 55	2.5	WisDOT	33-125	West	25
CTH S	2.0	Forest Co.	40-85	West	≈25
Snowmobile Trail	9.6	WisDOT	125-200	North	NA³
USR 8 from CTH V to River Bend Road	9.4	WisDOT	41-230	South	25
Rhinelander Beltline	5.8	WisDOT	100-150	North	25
STH 17	4.2	WisDOT	100-150	West	25
Hat Rapids Road	1.7	Crescent Township	66⁴	South	0

<sup>&</sup>lt;sup>1</sup>Does not include the 3.1 mile portion of the pipeline corridor along the CMC site access road.

<sup>4</sup>Total ROW width on both sides of roadway.

Prepared by: RFS Checked by: JWS

Figures 2-1 through 2-7 are typical cross-sections showing the location of the pipeline in reference to public roadway centerlines at a minimum depth of cover over the pipeline of 4.5 feet. Where the pipeline crosses or is embedded below roadways, the depth of cover over the pipeline will be a minimum seven feet. Where the pipeline distance is farther than the slope-intercept distance (i.e., the intersection of roadway sideslopes with undisturbed ground), the pipeline would be in undisturbed ROW. For the most part, as shown in Table 2-2 the pipeline will be within the roadway slope-intercept and therefore within disturbed ROW.

<sup>&</sup>lt;sup>2</sup>Width of ROW on indicated side of road. Width is from roadway centerline.

<sup>&</sup>lt;sup>3</sup>The pipeline will be placed down the centerline of the snowmobile trail.

Table 2-2

Horizontal Pipeline Placement Within Public Right-of-Way¹

STH 55 CMC Entrance Rd. - CTH S

Pipe S	tation	ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe
From:	То:	C.L. to West	C.L. to West	C.L. to West	C.L. to West
262+00	266+45	60'- 90'	42'	50'- 72'	40'
266+45	270+75	90'- 55'	42'	46'- 72'	40'
270+75	271+09	55'- 70'	42' 45'- 46'		40'
271+09	271+58	70'- 100'	42'	44'- 45'	40'
271+58	272+00	100'- 88'	42'	44'- 45'	40'
272+00	273+00	88'- 60'	42'	45'- 49'	40'
273+00	279+49	60'- 100'	42'	34'- 49'	40'
279+49	275+00	100'	42'	34'- 45'	40'
275+00	276+00	100'- 70'	42'	34'- 52'	40'
276+00	278+00	70'	42'	45'- 59'	40'
278+00	279+00	70'- 60'	42'	44'- 47'	40'
279+00	292+00	60'	42'	44'- 47'	40'
292+00	295+00	60'- 70'	42'	49'- 60'	40'
295+00	298+33	70'- 60'	42'	36'- 62'	40'
298+33	310+00	60'	42'	41'- 47'	40'
310+00	303+50	60'- 110'	42'	39'- 41'	40'
303+50	304+71	110'- 77'	42'	33'- 80'	40'
304+71	307+00	77'- 94'	42'	37'- 44'	40'
307+00	311+07	94'- 50'	42'	32'- 34'	40'
311+07	314+00	50'- 60'	42'	34'- 46'	40'
314+00	324+00	60'	42'	33'- 52'	40'
324+00	325+00	60'- 70'	42'	43'- 66'	40'
325+00	329+00	70'	42'	50'- 66'	40'
329+00	332+00	70'- 50'	42'	44'- 52'	40'
332+00	334+50	50'	42'	39'- 44'	40'
334+50	336+00	40'- 50'	42'	29'- 39'	40'-35'
336+00	338+00	40'- 70'	42'	36'- 41'	35'
338+00	343+00	70'- 33'	42'	28'- 51'	35'-30'
343+00	345+00	33'- 44'	42'	28'- 30'	30'-35'
345+00	349+00	40'	42'	30'- 37'	35'
349+00	353+00	40'- 60'	42'	37'- 46'	35'
353+00	363+57	60'	42'	44'- 51'	35'-40'
363+57	365+00	60'- 50'	42'	41'- 45'	40'

Table 2-2 (Continued)

Pipe S	Station	ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe C.L. to West	
From:	To:	C.L. to West	C.L. to West	C.L. to West		
365+00	366+00	50'- 45'	42'	37'- 41'	40'	
366+00	368+50	45'	42'	34'- 41'	40'	
368+50	371+00	45'- 50'	42'	34'- 51'	40'	
371+00	374+00	60'	42'	43'- 50'	40'	
374+00	377+00	60'- 75'	42'	48'- 58'	40'	
377+00	382+00	75'	42'	40'- 63'	40'	
382+00	386+97	75'- 100'	42'	63'- 81'	40'	
386+97	391+53	100'- 125'	42'	67'- 101'	40'	
391+53	393+30	125'- 80'	42'	38'- 92'	40'	

CTH S STH 55 - USR 8

Pipe S	Station	ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe	
From:	То:	C.L. to West	C.L. to West	C.L. to West	C.L. to West	
393+30	397+74	40'- 45'	32'	19'- 33'	37'	
397+74	399+74	45'- 65'	32'	33'- 59'	37'	
399+74	401+74	65'	32'	59'- 65'	37'	
401+74	402+74	65'- 45'	32'	27'- 65'	37'	
402+74	416+74	45'	32'	27'- 44'	37'	
416+74	418+74	45'- 50'	32'	27'- 47'	37'	
418+74	420+74	50'- 60'	32'	43'- 57'	37'	
420+74	421+99	60'- 85'	32'	57'- 91'	37'	
421+99	423+74	85'- 60'	32' 52'- 91'		37'	
423+74	430+74	60'	32'	47'- 59'	37'	
430+74	431+74	60'- 55'	32'	37'- 49'	37'	
431+74	438+74	55'	32'	37'- 53'	37'	
438+74	439+74	55'- 80'	32'	48'- 49'	37'	
439+74	440+74	80'	32'	48'- 55'	37'	
440+74	441+74	80'- 40'	32'	36'- 55'	37'	
441+74	443+74	40'- 55	32'	36'- 48'	37'	
443+74	444+74	55'	32'	45'- 48'	37'	
444+74	446+74	55'	32'	45'- 51'	37'	
446+74	447+74	55'- 45'	32'	41'- 49'	37'	
447+74	470+74	45'	32'	33'- 50'	37'	
470+74	474+74	45'- 75'	32'	33'- 74'	37'	
474+74	475+74	75'- 60'	32'	38'- 64'	37'	
475+74	482+74	60'	32'	38'- 57'	37'	

Table 2-2 (Continued)

Pipe Station		ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe	
From: To: C.L. to West		C.L. to West	C.L. to West	C.L. to West	C.L. to West	
482+74	489+74	40'	32'	33'- 37'	37'	
489+74	490+74	40'- 50'	32'	37'- 49'	37'	
490+74	497+74	50'	32'	33'- 50'	37'	
497+74	498+74	50'- 70'	32'	39'- 43'	37'	

#### USR 8 (Snowmobile Trail) CTH S - CTH V

Pipe	Station	ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe
From:	То:	C.L. to North	C.L. to North	C.L. to North	C.L. to North
498+74	550+13	125'-220'	50'	N.A.	40'-170'
550+13	554+88	200'	50'	N.A.	170'-145'
554+88	561+88	200'-185'	50'	N.A.	145'-135'
561+88	537+88	185'-175'	50'	N.A.	135'-115'
537+88	579+49	175'-160'	50'	N.A.	115'-105'
579+49	601+88	160'-145'	50'	N.A.	105'-100'
601+88	606+03	145'	50'	N.A.	100'
606+03	631+73	145'-150'	50'	N.A.	100'-90'
631+73	654+88	150'	50'	N.A.	90'
654+88	660+33	150'	50'	N.A.	90'
660+33	675+06	200'	50'	N.A.	90'-105'
675+06	683+98	150'-160'	50'	N.A.	105'-115'
683+98	688+98	160'-165'	50'	N.A.	115'-120'
688+98	712+88	165'-155'	50'	N.A.	120'-125'
712+88	756+88	155'-190'	50'	N.A.	125'
756+88	780+21	190'-150'	50'	N.A.	125'-110'
780+21	806+21	150'	50'	N.A.	110'
806+21	811+21	150'	50'	N.A.	110'
811+21	819+21	150'-162'	50'	N.A.	110'
819+21	841+94	162'-145'	50'	N.A.	110'
841+94	855+21	145'-142'	50'	N.A.	110'-95'
855+21	925+85	110'-205'	50'	N.A.	70'-110'
925+85	937+21	157'-120'	50'	N.A.	110'-80'
937+21	967+21	120'	50'	N.A.	80'
967+21	975+21	120'	50'	N.A.	80'
975+21	996+21	120'-110'	50'	N.A.	80'-40'
996+21	1004+21	118'	50'	N.A.	40'

Table 2-2 (Continued)

USR 8 Monico - Lake George (≈CTH V to River Bend Road)

Pipe S	tation <sup>4</sup>	ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe
From:	To:	C.L. to South	C.L. to South	C.L. to South	C.L. to South
1080+76	1093+23	60'	50'	26'-38'	40'
1093+23	1096+90	41'-60'	50'	37'-38'	40'
1096+90	1098+90	91'-41'	50'	35'-37'	40'
1098+90	1113+42	91'	50'	35'	40'
1113+42	1120+20	100'	50'	35'-41'	40'
1120+20	1120+34	116'-110'	50'	40'-41'	40'
1120+34	1153+09	116'	50'	40'-80'	40'
1153+09	1343+97	100'	50'	29'-80'	40'
1343+97	1357+97	140'-100'	50'	40'-68'	40'
1357+97	1360+97	140'-200'	50'	60'-70'	40'
1360+97	1374+97	380'-200'	50'	42'-75'	40'
1374+97	1379+97	230'	50'	42'-80'	40'
1379+97	1387+97	230'	50'	48'-71'	40'
1384+97	1389+97	230'	50'	40'-80'	40'
1389+97	1394+97	230'	50'	55'-80'	40'
1394+97	1399+97	230'	50' 52'-100'		40'
1399+97	1402+97	230'	50'	92'-100'	40'
1402+97	1406+97	230'	50'	74'-92'	40'
1406+97	1411+97	230'	50'	52'-90'	40'
1411+97	1416+97	230'	50'	50'-106'	40'
1416+97	1421+97	230'	50'	45'-106'	40'
1421+97	1426+97	230'	50'	43'-52'	40'
1426+97	1431+97	230'	50'	49'-58'	40'
1431+97	1436+97	230'	50'	50'-66'	40'
1436+97	1441+97	230'	50'	48'-60'	40'
1441+97	1446+97	230'	50'	47'-49'	40'
1446+97	1451+97	230'	50'	42'-58'	40'
1451+97	1456+97	230'	50'	48'-55'	40'
1456+97	1461+97	230'	50'	42'-58'	40'
1461+97	1466+97	230'	50'	38'-44'	40'
1466+97	1471+97	230'	50'	44'-74'	40'
1471+97	1476+97	230'	50'	42'-88'	40'
1476+97	1481+97	230'	50'	61'-100'	40'
1481+97	1486+97	230'	50'	40'-100'	40'
1486+97	1493+97	230'	50'	50'-59'	40°

Table 2-2 (Continued)

Pipe Station <sup>4</sup>		ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe	
From:	То:	C.L. to South	C.L. to South	C.L. to South	C.L. to South	
1493+97	1498+97	60'-200'	50'	54'-125'	40'	
1498+97	1503 + 97	60'-200'	50'	55'-108'	40'	

#### USR 8 (Rhinelander Beltline) Lake George - STH 17

Pipe S	Station	ROW	Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe
From:	To:	C.L. to North	C.L. to North	C.L. to North	C.L. to North
1503+97	1508+97	150'	50'	42'-96'	40'
1508+97	1513+97	150'	50'	46'-72'	40'
1513 + 97	1518+97	150'	50'	45'-60'	40'
1518+97	1523+97	150'	50'	50'-100'	40°
1523 + 97	1528+97	150'	50'	52'-100'	40'
1528+97	1533 + 97	150'	50'	40'-52'	40'
1533 + 97	1538+97	150'	50'	40'-65'	40'
1538+97	1543 + 97	150'	50'	66'-89'	40'
1543 + 97	1548+97	150'	50'	45'-125'	40'
1548+97	1553 + 97	150'	50'	104'-125'	40'
1553 + 97	1558+97	150'	50'	45'-104'	40'
1558+97	1563 + 97	150'	50' 49'-85'		40'
1563+97	1568 + 97	150'	50' 46'-81'		40'
1568+97	1573 + 97	150'	50'	44'-90'	40'
1573 + 97	1578+97	150'	50'	90'-124'	40'
1578+97	1583 + 97	150'	50'	108'-136'	40'
1583 + 97	1588 + 97	150'	50'	41'-132'	40'
1588+97	1593 + 97	150'	50'	36'-72'	40'
1593 + 97	1675 + 97	150'	50'	34'-92'	40'
1675 + 97	1691+97	150'	50'	38'-66'	40'
1691+97	1695 + 97	150'	50'	38'-58'	40'
1695 + 97	1710 + 97	150'	50'	38'-146'	40'
1710+97	1728+97	150'	50'	40'-146'	40'
1728+97	1734+97	100'	50'	41'-106'	40'
1734+97	1738+97	150'	50'	41'-64'	40'
1738+97	1754+97	150'	50'	32'-102'	40'
1754+97	1759+97	150'	50'	44'-102'	40'
1759+97	1768+97	100'	50'	36'-58'	40'
1768+97	1779+97	150'	50'	37'-98'	40'
1179+97	1809+97	150'	50'	37'-132'	40'

STH 17 USR 8 - Hat Rapids Road

Pipe S	Pipe Station		Clear Zone <sup>2</sup>	Slope Intercept <sup>3</sup>	Pipe	
From:	To:	C.L. to South	C.L. to South	C.L. to South	C.L. to South	
1809+97	1914+89	150'	32'	14'-42'	39'	
1914+89	1920+74	100'-150'	32'	35'-65'	39'	
1920+74	1960+74	100'	32'	33'-70'	39'	
1960+74	1969+59	120'-100'	32'	33'-65'	39'	
1969+59	1976+74	113'-120'	32'	40'-70'	39'	
1976+74	1989+94	117'-113'	32'	30'-70'	39'	
1989+94	1990+74	100'-117'	32'	60'-70'	39'	
1990+74	2029+74	100'	32'	33'-70'	39'	

<sup>&</sup>lt;sup>1</sup> The pipeline segment within the Town of Crescent is not included in this table since the pipeline in that segment will be located on the edge of the road pavement.

<sup>3</sup> Slope intercept is the intersection of roadway sideslopes with undisturbed ground.

Prepared by: SCH Checked by: PMP1

<sup>&</sup>lt;sup>2</sup> Clear zone is defined as a roadside border free from obstructions located adjacent to the edge of the roadway and designated available for safe use by errant vehicles.

<sup>&</sup>lt;sup>4</sup> From the pipe station 1004+21 to 1080+76 WisDOT information regarding ROW, clear zone and slope intercept is not currently available.

#### 2.2 Pipe Material, Pumping Facilities and Appurtenances

The total length of the proposed pipeline route from the CMC wastewater treatment facility to the Wisconsin River at the Hat Rapids Dam is approximately 202,400 feet or 38.3 miles. The highest point along the route is approximately at elevation 1810 feet located along USR 8 between CTH S and the Forest/Oneida County line. The lowest elevation of 1521 feet is at the Pelican River crossing along USR 8. The maximum elevation difference is 289 feet.

#### 2.2.1 Pipeline and Pumping Facilities

A 1200 gpm design discharge flow rate has been established for the discharge pipeline as part of the project's wastewater engineering evaluations. This flow rate was considered as the basis for the pipeline engineering design. The average discharge flow rate is estimated to be approximately 460 gpm.

The pipeline material will consist of either polyvinyl chloride (PVC) with solvent welded joints, high density polyethylene (HDPE) with butt fusion joints, or epoxy-coated steel with welded joints. The discharge system will consist of discharge pumps located at the plant site, with the potential of one or more booster stations located along the pipeline route.

Table 2-3 provides a summary of velocity headlosses at the design maximum 1200 gpm flow rate for various standard nominal pipe sizes for PVC, HDPE, and steel pipe material. It is desirable to maintain a minimum velocity of two feet per second (fps) in the pipeline to maintain a reasonable self-cleaning velocity. The upper limit velocity should be approximately five fps to minimize the amount of velocity change at startup and shutdown of the pumps, and therefore, minimize the amount of pressure surge in the pipeline as well as reduce velocity headloss in the pipeline.

To provide flexibility, the pumping system will be designed to pump at either 600 gpm or at a maximum of 1200 gpm. To provide reliability, two pumps are proposed with each providing a flow rate of 600 gpm, with a third pump available for installation in case of pump failure. One pump would be used for a 600 gpm discharge rate, while two would be used for a 1200 gpm rate. The discharge piping on the pumps will be equipped with rate-of-flow control valves to maintain constant flow rates as well as surge control to protect the piping on start-up and shutdown of the pumps. The control valves would maintain constant backpressure so that the proper flow rate from the pumps can be maintained when two 600 gpm pumps are used to provide the 1200 gpm maximum flow rate.

Table 2-3
Summary of Pipe Velocity and Headloss<sup>1</sup>

Nominal Size (Inches)	Type of Pipe	Pipe O.D. (Inches)	Wall Thk (Inches)	Pipe I.D. (Inches)	H-W Coef.	Velocity (Feet/Sec.)	Headloss (Ft/1000 Ft)
10	PVC 1120 ASTM D 2241 SDR 17, PC 250	10.75	0.63	9.49	130	5.44	11.14
12	PVC 1120 ASTM D 2241 SDR 17, PC 250	12.75	0.75	11.25	130	3.87	4.86
14	PVC 1120 ASTM D 2241 SDR 17, PC 250	14.00	0.82	12.35	130	3.21	3.08
16	PVC 1120 ASTM D 2241 SDR 17, PC 250	16.00	0.94	14.12	130	2.46	1.61
10	PVC 1120 ASTM D 2241 SDR 21, PC 200	10.75	0.51	9.73	130	5.18	9.88
12	PVC 1120 ASTM D 2241 SDR 21, PC 200	12.75	0.61	11.54	130	3.68	4.30
14	PVC 1120 ASTM D 2241 SDR 21, PC 200	14.00	0.67	12.67	130	3.05	2.72
16	PVC 1120 ASTM D 2241 SDR 21, PC 200	16.00	0.76	14.48	130	2.34	1.43
14	HDPE 3408 ASTM D 3035 DR 9, PC 200	14.00	1.56	10.89	140	4.13	4.96
16	HDPE 3408 ASTM D 3035 DR 9, PC 200	16.00	1.78	12.44	140	3.17	2.60
18	HDPE 3408 ASTM D 3035 DR 9, PC 200	18.00	2.00	14.00	140	2.50	1.46
20	HDPE 3408 ASTM D 3035 DR 9, PC 200	20.00	2.22	15.56	140	2.02	0.87
10	STEEL AWWA C-200, 21,000 psi Stress	10.00	0.18	9.64	120	5.28	12.00
10.75	STEEL AWWA C-200, 21,000 psi Stress	10.75	0.18	10.39	120	4.54	8.31
12	STEEL AWWA C-200, 21,000 psi Stress	12.00	0.18	11.64	120	3.62	4.79

<sup>1</sup>Design Maximum Flow Rate (GPM) = 1,200

Prepared by: GEV Checked by: PMP1

#### 2.2.2 Pipeline Appurtenances

The pipeline will have over 80 high points where an air pocket could build up causing a capacity reducing restriction. Also, at high points and sharp changes in gradient there is the possibility of a vacuum being created as well as secondary pressure surges. Therefore, air release and vacuum relief valves will be installed at high points in the pipeline. Figure 2-8 shows a typical installation of the manhole and valve arrangement.

Rate-of-flow measurement and total flow measurement will be included at each pumping facility. Rate-of-flow measurement and totalizers will also be provided at the discharge to the Wisconsin River. These features will provide information needed to adjust the pump control valves on the pump discharge and will assist in the verification that the pipeline is not leaking.

Discharge to the Wisconsin River is proposed to be accomplished by diffusers discharging on the upstream side of the dam into the turbine intakes. Valving would be installed to direct the discharge to the operational turbine(s).

#### 2.2.3 Leak Prevention and Monitoring Equipment

The pipeline is designed as a sealed system with completely sealed, welded joints. Once installed and prior to backfilling, the pipeline will be pressure and leak tested using either air or water to verify that all joints and connections are properly sealed and there are no leaks. If water is used, it will either be treated water from the project's wastewater treatment plant or water from a potable source. Water used for testing will be left in the pipe.

During operation, pipeline flow rates will be monitored at the discharge from the treatment plant, at an intermediate location near Monico and at the discharge point at the Hat Rapids Dam. Flow rate and volume will be monitored continuously at these locations. Pumping times will also be monitored so that total flows can be calculated and compared with the metered flows. This data will be telemetered back to the plant control room for continuous monitoring. This will provide for leak detection at a level comparable to the accuracy of the flow meters (i.e.,  $\pm 1.5 \%$ ). If a leak is identified the system will be shut down and the leak repaired. A leak in the discharge pipeline is highly unlikely during the duration of the project. The probability of a leak, its significance if one occurs, and contingency measures are addressed in Section 4.13 Risk Assessment of the Crandon Project Mine Permit Application (Foth & Van Dyke, 1995b).

Additionally, special precautions will be taken at the locations where the pipeline will cross under Swamp Creek, the Wolf River and Mud Creek. As discussed in Section 2.3 below, the pipeline will be double encased at these locations as a further protection against leaks.

#### **2.2.4** Closure

At the end of the Crandon Project, the wastewater treatment facilities will be decommissioned in accordance with the project's reclamation plan (Foth & Van Dyke, 1995b). Upon the termination of discharge to the Wisconsin River, closure of the pipeline system will begin. Closure will involve the removal of booster stations, if included in the system, pumping equipment, manholes and air relief structures. The pipeline itself will be left in place.

#### 2.3 Construction Methods

The proposed pipeline will be placed in an open-cut trench and backfilled with native material for most of the route. There are areas along the proposed route where open trench construction is not feasible or practical. These include crossing County and State roads and crossing streams. At County and State road crossings, the construction method will consist of boring or jacking of casing pipe a minimum of seven feet under the roadbed and then placing the pipeline within the casing pipe. These construction techniques are common and proven methods of construction. Streams designated by the Wisconsin Department of Natural Resources (WDNR) as Outstanding Resource Waters will also be crossed by boring or jacking a steel casing in-place a minimum of three feet under the streambed and installing the pipe through the casing. The annular space between the pipeline and the steel casing for both road and stream crossings will be grouted at both ends to provide a seal. Other streams will be crossed using directional boring under the streambed. Figures 2-9 and 2-10 show a cross-section of typical road and stream crossings.

Wetland excavation will be encountered along the pipeline route. It is anticipated that over excavation will be required and that granular material will be used for the pipe bedding to stabilize the pipe from settlement. Trench dewatering will also likely be required as part of wetland excavation. Figure 2-11 shows a typical cross-section for wetland excavation and pipe bedding design.

Clearing and grubbing of existing trees and brush will be required as part of this project. Assuming a 20 foot wide corridor of disturbance during construction, it is estimated that approximately 31.3 acres of clearing and grubbing will be required along the pipeline route. This includes acreage of northern hardwoods, conifer swamp, deciduous swamp, and shrub swamp. Merchantable trees with a diameter at breast height greater than three inches will be salvaged. The remainder of the trees and shrubs will be chipped and mulched. An additional 4.2 acres of lands within the ROW consisting of driveways, parking areas, the edges of lawns or agricultural fields, etc., will also be disturbed. The restoration required for disturbed areas is to replace in kind. That is, if the trench disturbs a grassed area or wooded area, then the disturbed area will be reseeded with local native grass, or if the trench crosses a paved driveway, then the drive will be replaced with similar pavement. If trees are cut down within the ROW of USR 8, STH 55 and STH 17, they do not need to be replaced per direction of WisDOT District 7. Similar procedures would also apply to CTH S. Tree replacement along Hat Rapids Road is not anticipated since the pipeline will be along the south edge of the roadbed.

Bedrock outcroppings exist at Monico and approximately 3.5 miles west of Monico along USR 8. It is anticipated that the depth to bedrock varies in the area and that bedrock may be encountered during construction. If encountered, it may be necessary to blast the bedrock for removal.

A detailed erosion control plan for the project is included in Section 4.10 of the project's Mine Permit Application (Foth & Van Dyke, 1995b). Pipeline specific erosion control facilities will be put in place prior to construction and continuously monitored and maintained throughout construction and until permanent vegetation is established. The purpose of the facilities will be to prevent sediments from entering waterways. As a general practice, straw bales and/or silt fence will be installed along the downslope side of the trench to prevent off-site migration of sediment. The installation will occur in segments as the trench is excavated, backfilled, topsoiled using native soils and seeded immediately upon completion of the pipeline installation. Along

the majority of the pipeline, no excess soil requiring disposal will be generated. Excavated soils will be backfilled into the trench and leveled. Methods employed for soil stabilization, seeding and mulching are dependent upon the site specific characteristics encountered along the pipeline route. Methods available for use and the site conditions they apply to are included in Section 4.10 of the Mine Permit Application (Foth & Van Dyke, 1995b).

Areas with high groundwater levels where the trench may fill with water will be avoided to the extent possible in the final design phase of the project. If these areas cannot be avoided, dewatering systems will be installed based on site specific characteristics. Typically these systems will consist of a series of dewatering wells connected to a header pipe. Extracted water will be discharged to natural drainage ways. In the event that extracted water contains sediments, it will first be clarified in an on site settling basin or tank prior to discharge.

It is anticipated that over-excavation will be required in some wetland areas with granular material placed into the trench to support the pipe. These areas will be backfilled to grade using the excavated topsoil containing the various wetland vegetation parts (e.g., roots, seeds, etc.) necessary for rapid revegetation of these areas. Excess soil material as a result of pipeline construction in wetland areas will be disposed of off-site.

#### 3 Description of Environmental Setting

The purpose of this section is to present a description of the physical, chemical, biological, cultural, and socioeconomic environment associated with the proposed Crandon Project wastewater discharge pipeline corridor. The information provided in this section will facilitate the assessment of the potential project-related environmental impacts discussed in Section 4. Further, the data gathered were incorporated into decisions made during project design and site selection to avoid, minimize and mitigate potential environmental effects.

#### 3.1 Regional and Local Setting

The proposed 38.3 mile discharge pipeline will begin at the Crandon Project plant site and run west where it will discharge into the Wisconsin River just south of Rhinelander, as shown in Figure 1-1. The proposed route will follow existing road corridors through Nashville and Crandon townships in Forest County, and Monico, Pelican, and Crescent townships in Oneida County. The pipeline corridor passes through a generally undeveloped rural setting, with the exception of the unincorporated town of Monico.

The region in which the pipeline will be located is drained by the Fox-Wolf and Upper Wisconsin River drainage basins. The Wolf River drains the eastern one-third of the pipeline corridor, while the western two-thirds are drained by the Wisconsin River. In total nine named streams are crossed along the pipeline corridor. Venus Lake is immediately adjacent to the north side of USR 8 at Monico.

The area surrounding the proposed corridor is generally comprised of three topographical regions. In the eastern portion, from the Crandon Project site to just east of the Forest County line, the topography tends to be hummocky. This is the result of till in drumlins clustered on upland areas and pitted outwash in lowland areas which were deposited on a streamlined, subglacially molded landscape (Simpkins, et al., 1987). The central portion of the pipeline corridor contains a more subdued rolling topography. This area is comprised of outwash plains, water-worked moraines and pitted outwash. There are also large wetland floodplains associated with the streams and rivers which traverse the area. The western portion of the pipeline corridor is slightly more hummocky than the central portion. This is the result of the existence of pitted outwash and morainal material near Rhinelander.

#### 3.2 Historical and Archaeological

Investigations of historical and archaeological resources in the vicinity of the proposed pipeline route have been completed and are discussed below. A review of traditional cultural properties as related to the pipeline route is discussed in Sections 3 and 4 of the project's EIR (Foth & Van Dyke, 1995a).

In mid 1995, Great Lakes Archaeological Research Center, Inc (GLARC) completed a reconnaissance and literature review of the proposed discharge pipeline route. Their report (Richards, 1995) is reproduced in Appendix A. Subsequently, a Phase I archaeological and geoarchaeological study for the proposed discharge pipeline route was also completed by GLARC (Richards and Kolb, 1996). An August 1996 report titled Archaeological and Geoarchaeological Investigations of the Proposed Route of a Waste Water Discharge Corridor, Forest and Oneida Counties, Wisconsin, describing this work was submitted by CMC to the U.S. Army Corps of Engineers, Wisconsin Department of Natural Resources, and others in September 1996.

The results of both studies indicate that no previously reported archaeological sites or cemeteries are located within or adjacent to the proposed alignment. A single archaeological site associated with the structural remains of a former dam keeper's residence was encountered at the western terminus of the proposed route. However, the former residence has been moved from its original location to a new, nearby site. Shovel test data suggests that the original archaeological context has likely been disturbed by activities associated with moving the structure and with the recent construction of the adjacent Hat Rapids Road bridge over the Wisconsin River. Geoarchaeological data suggests that the project route is almost entirely restricted to extensively disturbed locales associated with former or existing highway and utility corridor right of way. In addition, soils along the proposed route are predominantly truncated, buried beneath massive fill deposits, or hydric in character. Finally, subsurface sampling of targeted locales failed to provide evidence of buried archaeological deposits or buried soils potentially capable of harboring in situ archaeological deposits anywhere along the proposed alignment.

#### 3.3 Transportation and Utilities

The transportation and utilities section was complied using information gathered from WisDOT District 7, the Forest County Highway Commission, the WPSC, and the Rhinelander Telephone Company.

#### 3.3.1 Transportation

The main pipeline and alternative routes are located along the following roadway ROW: USR 8, STH 55 and STH 17; CTH S in Forest County and CTH G in Oneida County. In Oneida County, alternative pipeline routes to the Wisconsin River are located along the local roads of River Bend, Germond, and Lassig all in the Town of Pelican and Lassig and Hat Rapids roads in the Town of Crescent. All of the roads are two-lane and hard surfaced, such as bituminous or concrete.

Annual average daily traffic (AADT) counts for 1991 as provided by the WisDOT (1994) are shown in Figure 3-1. As shown in the figure, the highest AADT (4,190 vehicles) in 1991 was recorded on USR 8, just to the east of Rhinelander. The lowest AADT (240 vehicles) in 1991 was recorded on Hat Rapids Road.

The pipeline route does not include any rail crossings.

#### 3.3.2 Existing Utilities Along Proposed Pipeline Route

Utilities located along the proposed pipeline route include the following: electric transmission and distribution; natural gas distribution; natural gas transmission; and telephone. A discussion of each follows. As described in Section 4 there will be no conflicts and only short-term interruptions with existing utilities as a result of pipeline installation.

#### 3.3.2.1 Wisconsin Public Service Corporation Natural Gas Distribution System

Wisconsin Public Service Corporation underground natural gas distribution lines are first encountered along the pipeline route at Monico with a gas line crossing USR 8. There is also a WPSC gas line paralleling USR 8 in Monico, located on the north side of the roadway. Gas lines also cross USR 8 at Pelican Ranch Road, River Bend Road, CTH G and STH 17. At the intersection of USR 8 and STH 17 an existing gas line parallels the roadway along the south side of USR 8 and approximately 1,000 feet along the west side of STH 17 near the ROW line.

# 3.3.2.2 Wisconsin Public Service Corporation Electric Transmission and Distribution Lines

Wisconsin Public Service Corporation has overhead electric transmission and distribution lines paralleling most of the pipeline route. Along STH 55, the lines are located on the east side except for approximately 2,300 feet from CTH B south where it is located on the west side. Along CTH S, the location of the line varies from side to side over the entire length of highway from STH 55 to USR 8.

Along USR 8, the lines are located on the north side of the highway from CTH S to Monico. The line is located on the north side of USR 8, west of Monico for approximately one mile west of USR 45 South, then the line crosses the roadway to the south side of USR 8. From here to STH 17, the lines typically follow the old USR 8 route crossing the roadway at several locations. When the lines follow the current USR 8 route, they are located primarily on the south side of the road.

Along STH 17, the lines are located along the east side from USR 8 south to Boyce Road. At Boyce Road, the lines change to the west side of STH 17 to Hat Rapids Road. The lines are located along the north side of Hat Rapids Road from STH 17 to the Hat Rapids Dam on the Wisconsin River.

#### 3.3.2.3 ANR Natural Gas Transmission Pipeline

An underground ANR natural gas transmission pipeline is first encountered approximately two miles west of Monico, along USR 8. The pipeline crosses USR 8 at that location from the north to the south, then heads westerly. The pipeline crosses USR 8 back to the north side approximately six miles west of Monico, and then crosses back to the south side in less than one mile. ANR pipeline mapping does not show the USR 8 beltline. However, referring to other available mapping, it appears the gas pipeline crosses USR 8 approximately three more times in that area. The ANR gas pipeline also crosses STH 17 approximately one-half mile south of USR 8.

#### 3.3.2.4 Rhinelander Telephone

Rhinelander Telephone has buried cable for local service along the entire proposed pipeline route except along USR 8 between CTH G and STH 17 in Oneida County. There is also fiber optic cable buried along STH 55, USR 8, and STH 17. In general, the telephone lines are located near the ROW line.

Telephone cable is first encountered along STH 55. Fiber optic and local service cables are located on the east side of STH 55. There are some individual service cables on the west side of STH 55. Along CTH S, the telephone cable is located on the east side of the roadway with service cables crossing to the west side.

Along USR 8 there are between one and five telephone cables buried along the south side of the highway from CTH S in Forest County to CTH G in Oneida County. One cable crosses USR 8 to the north along the east side of CTH G and the other cables follow CTH G to the south.

Fiber optic and regular telephone cable service crosses the roadway at the intersection of USR 8 and STH 17. Telephone service cables are located along the east side of STH 17. There are some service cables along the west side of STH 17.

At Hat Rapids Road, the telephone cable is along the north side of the roadway from STH 17 to Washatka Road. The cable then crosses to the south side of Hat Rapids Road from Washatka Road to approximately 1,000 feet east of the Wisconsin River, where it crosses back to the north side of the roadway.

# 3.4 Climatology, Meteorology and Air Quality

The climate of the region is continental, modified slightly by Lake Michigan, to the east, and Lake Superior, to the north. The region has moderately warm summers with prevailing westerly winds and long cold winters. The historical average annual precipitation, at North Pelican Lake, is 30.36 inches. Snow fall in the region averages between 40 and 60 inches per year. A complete description of local and regional meteorological data is presented in Section 3.4 of the Crandon Project's EIR (Foth & Van Dyke, 1995a).

## 3.5 Geology and Soils

The geology and soils section was compiled using information including maps, reports, surveys and inventories from the Wisconsin Geologic and Natural History Survey, United States Geologic Survey and United States Department of Agriculture - Soil Conservation Service.

## 3.5.1 Geology

The pipeline corridor is located in the Northern Highlands physiographic province (Paull and Paull, 1985). The corridor is underlain by igneous and metamorphic Precambrian crystalline rocks, generally of Early Proterozoic Age. The Precambrian bedrock surface is generally overlain by Pleistocene glacial deposits and thin deposits of recent alluvial sediments, lacustrine sediments and peat.

The Early Proterozoic Age crystalline rocks consist mainly of mafic, intermediate and felsic metavolcanic rocks with subordinate metasedimentary units (Greenberg and Brown, 1984). These assemblages are very similar to calcalkaline island-arc volcanic sequences. Within the metavolcanic underlying the pipeline corridor, mainly near Rhinelander, are dioritic intrusive rocks. These dioritic intrusive rocks range from granodiorites to more common quartz diorites and horneblende diorites (Greenberg and Brown, 1984). These intrusive rocks are massive to foliated and commonly intruded by granite dikes.

The overlying unconsolidated Pleistocene sediments consist of a number of stratigraphic units. These include sediments of Pre- or Early Wisconsinan and Wisconsinan Age. Each of these generally consists of at least one till member and in many cases associated undifferential icemarginal, outwash and lacustrine deposits.

The unconsolidated Pre-Wisconsinan deposits of the Forest-Oneida County area include the undifferentiated sediments of the Marathon Formation. Pleistocene units younger than the Marathon Formation include the Pre- or Early Wisconsinan Lincoln Formation, the Wisconsinan Mapleview Member of the Horicon Formation, and the Nashville Member of the Copper Falls

Formation (Michelson et al., 1984). The Mapleview Member and the Nashville Member are considered stratigraphically equivalent (Simpkins, et al., 1987). In the easternmost portion of the pipeline corridor, the Mapleview Member is truncated and overlain by the Nashville Member. The Horicon Formation is present only in the extreme eastern portions of the pipeline corridor as it was deposited during the westward advance of the Green Bay Lobe.

The Marathon Formation is discontinuous along the pipeline corridor. Little is known about its thickness and extent in northern Wisconsin (Mickelson, et al., 1984). The Marathon Formation consists of a pebbly loam to clay loam till, which is generally less than 33 feet thick, and associated outwash (Michelson et al., 1984). This unit is found directly overlying bedrock, grussified bedrock or saprolitic bedrock-weathering residuum (Mickelson et al., 1984).

Overlying the Marathon Formation are discontinuous sediments belonging to the Lincoln Formation. In the Forest-Oneida County area, these sediments are undifferentiated. The Preor Early Wisconsinan Lincoln Formation includes a red-brown sandy loam till and associated sand and gravel outwash (Mickelson, et al., 1984). The Lincoln Formation may directly overlie bedrock in areas.

The Mapleview Member of the Horicon Formation is found only in the eastern portion of the study area. The Mapleview Member was deposited by ice from the Green Bay Lobe in Late Wisconsinan time around 15,000 to 14,000 B.P. (Mickelson, et al., 1984). This unit consists mainly of calcareous, cobbly, pebbly, silt sand till with boulders and associated outwash deposits. According to Mickelson and others (1984), the Mapleview Member is at least partly contemporaneous with the Nashville Member of the Copper Falls Formation deposited by ice of the Langlade Lobe. In the eastern portion of the study area the Mapleview Member is truncated and overlain by the Nashville member.

The majority of the surficial sediments in the Forest-Oneida County region belong to the Nashville Member of the Copper Falls Formation. The Nashville Member consists of a non-calcareous pebbly, cobbly, sandy loam till with numerous sand lenses and associated sand and gravel outwash (Mickelson, et al., 1984). Till of the Nashville Member is generally exposed at the surface in drumlins clustered on upland areas (Simpkins, et al., 1984). The associated outwash sands and gravels filled in low areas around the uplands and exists in the form of pitted and unpitted outwash plains.

Post-Pleistocene sediments have formed or been deposited on the Nashville Member surface. These include alluvial, lacustrine, wind-blown and peat deposits.

#### **3.5.2** Soils

The soils in the vicinity of the pipeline corridor have been mapped and described by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS). Information used to prepare this section was obtained from the draft version of the USDA-SCS-WI Section IIA Technical Guide, Forest County, dated June 13, 1994 (USDA-SCS, 1994), and USDA-SCS-WI Soil Survey of Oneida County dated February, 1993 (USDS-SCS, 1993). The Forest County document is not finalized. As such, some soil series names are new and do not match the series names on the specific soil data sheets which are contained in Appendix 3.5-30, Volume V of the project's EIR (Foth & Van Dyke, 1995a).

The general soil associations the pipeline corridor traverses are presented in Table 3-1. Their extent is portrayed on Figure 3-2. The individual soil series data sheets for Oneida County soils are presented in Appendix B. The extent of the individual series for both Forest and Oneida counties are displayed in Appendix C on reproductions of the USDA-SCS map sheets the pipeline corridor traverses.

Table 3-1
Forest-Oneida County Soil Associations

	·		
Map Unit No.	Soil Association	County	General Description
F-1	Wabeno-Goodwit- Mudlake	Forest	Moderately deep and very deep, nearly level to sloping, moderately well drained and somewhat poorly drained, silty soils on drumlins and moraines.
F-2	Wabeno-Goodwit- Padus	Forest	Moderately deep and very deep, nearly level to steep, moderately well drained and well drained, silty soils on drumlins and moraines.
F-3	Laona-Sarona- Argonne	Forest	Moderately deep and very deep, nearly level to steep, well drained and moderately well drained, loamy soils on drumlins and moraines.
F-4	Lupton-Loxley	Forest	Very deep, nearly level, very poorly drained, mucky and peaty soils on outwash plains, moraines, and glacial lake plains.
F-5	Padus-Stambaugh- Pence	Forest	Very deep, nearly level to steep, well drained, loamy and silty soils on outwash plains, stream terraces, eskers and kames.
O-1	Magnor- Greenwood-Cable	Oneida	Nearly level and gently sloping, somewhat poorly drained to very poorly drained, silty, peaty, and mucky soils on moraines.
O-2	Goodman-Monico- Cable	Oneida	Nearly level to moderately steep, well drained to very poorly drained, silty, loamy, and muck soils on drumlins and moraines.
O-3	Greenwood- Dawson- Carbondale	Oneida	Nearly level, very poorly drained, peaty and mucky soils on outwash plains and moraines.
O-4	Padus-Goodman	Oneida	Nearly level to steep, well drained and moderately well drained, loamy and silty soils on drumlins, moraines, and outwash plains, and in areas of pitted outwash.
O-5	Au Gres-Croswell- Kinross	Oneida	Nearly level and gently sloping, moderately well drained to poorly drained, sandy and mucky soils on outwash plains.

Table 3-1 (Continued)

Map Unit No.	Soil Association	County	General Description
O-6	Sayner-Vilas	Oneida	Nearly level to steep, excessively drained, sandy soils on outwash plains and in areas of pitted outwash.
O-7	Padus-Pence	Oneida	Nearly level to steep, well drained and moderately well drained, loamy soils on outwash plains and in areas of pitted outwash.
O-8	Keweenaw-Vilas	Oneida	Nearly level to steep, moderately well drained, well drained, and excessively drained, loamy and sandy soils on drumlins, water-worked moraines, and outwash plains and in areas of pitted outwash.
O-9	Goodman- Keweenaw	Oneida	Nearly level to steep, moderately well drained and well drained, silty and loamy soils on drumlins and water-worked moraines.

Note: The O-1 and F-3 Soil Associations are peripheral to the pipeline route.

Prepared by: EAS Checked by: BDH The pipeline corridor originates at the Crandon Project plant site. The soil association in this area is the Wabeno-Goodwit-Padus (F-2). This association is dominated by nearly level to steep, moderately well-drained and well-drained, silty solids on drumlins and moraines. This association contains mainly soils of the Wabeno, Goodwit, Goodman, Argonne, Laona, Sarona, Padus, Pence and Vilas series.

The pipeline corridor traverses north along STH 55 and CTH S through the Padus-Stambaugh-Pence Soil Association (F-5). This association is dominated by nearly level to steep, well-drained, loamy and silty soils on outwash plains, stream terraces, eskers and kames. The Padus, Pence, Stambaugh, Mudlake, Lupton, Cathro and Markey series soils dominate this association.

The pipeline corridor then turns west along USR 8 and traverses through the Wabeno-Goodwit-Mudlake Soil Association (F-1). This association is dominated by nearly level to sloping, moderately well-drained and somewhat poorly drained, silty soils on drumlins and moraines. The Wabeno-Goodwit-Mudlake Soil Association in this area contains mainly the Wabeno, Goodwit, Mudlake, Soperton, Goodman, Loxley, Beseman, and Dawson Series soils.

As the pipeline corridor traverses west on USR 8 in Forest County it passes through the Padus-Stambaugh-Pence Soil Association again and into the Lupton-Loxley Soil Association (F-4). This association is dominated by very poorly drained, mucky and peaty soils on outwash plains, moraines and glacial lake plains. The Lupton-Loxley Soil Association in this area contains mainly Lupton, Loxley, Cathro, Markey, Kinross, Flink, Croswell, and Gaastra series soils.

The pipeline corridor then crosses into Oneida County and passes through the Greenwood-Dawson-Carbondale Soil Association (O-3). Similar to the Lupton-Loxley Soil Association in adjacent Forest County, the Greenwood-Dawson-Carbondale Soil Association (O-3) is dominated by nearly level, very poorly drained peaty and mucky soils on outwash plains and moraines. This association contains mainly soils of the Carbondale, Lupton, Markey, Pence, Padus, Goodman and Worchester series.

As the pipeline travels west it crosses through a small area of the Padus-Pence Soil Association (O-7). This association is dominated by nearly level to steep, well-drained and moderately well-drained loamy soils on outwash plains and areas of pitted outwash. The Padus-Pence Soil Association contains mainly soils of the Padus, Pence, Goodman, Keweenaw and Vilas series in this area.

The pipeline corridor then traverses the Goodman-Monico-Cable Soil Association (O-2). This association is dominated by nearly level to moderately steep, well-drained to very poorly-drained, silty, loamy and mucky soils on drumlins and moraines. Goodman, Monico, Cable, Carbondale, Lupton and Markey Series soils are the main components of the Goodman-Monico-Cable Soil Association in this area.

As the pipeline nears Monico it traverses the Au Gres-Croswell-Kinross Soil Association (O-5) dominated by nearly level and gently sloping, moderately well-drained to poorly-drained sandy and mucky soils on outwash plains. This association contains mainly Croswell and Cable series soils and Udorthents along the pipeline corridor. The pipeline corridor then passes back into an area of the Goodman-Monico-Cable Association (O-2) described previously.

After passing the aforementioned association the pipeline corridor traverses through a large area of the Keweenaw-Vilas Soil Association (O-8). This association is dominated by nearly level to steep moderately well-drained, well-drained and excessively-drained, loamy and sandy soils on drumlins, water-worked moraines and outwash plains and in areas of pitted outwash. The Keweenaw-Vilas contains mainly soils of the Keweenaw, Vilas, Cable, Monico, Goodman, Pequaming and Croswell Series in this area.

The corridor then travels west along USR 8 through the Padus-Pence Soil Association (O-7) described previously and into the Padus-Goodman Association (O-4). The Padus-Goodman Association (O-4) is dominated by nearly level to steep, well-drained and moderately well-drained, loamy and silty soils on drumlins, moraines and outwash plains and in areas of pitted outwash. This association contains mainly soils of the Padus, Goodman, Keweenaw, Vilas and Alcona series. The pipeline corridor turns south off USR 8 on STH 17 to Hat Rapids Road where it turns west and runs to the Wisconsin River. Through this entire course the corridor traverses the previously described Padus-Pence (O-7) and Padus-Goodman (O-4) Associations.

#### 3.6 Groundwater

The pipeline corridor is located in the Northern Drift - Precambrian Hydrogeologic District as defined by Zaporozec and Cotter (1985). The pipeline corridor is located in the Fox-Wolf River, and Upper Wisconsin River Hydrologic Basins (Oakes and Cotter, 1975 and Olcott, 1968). The hydrogeologic setting of the area generally consists of thick, productive water-bearing Pleistocene deposits underlain by a complex of generally non-productive Precambrian igneous and metamorphic rocks (Zaporozec and Cotter, 1985).

The pipeline corridor passes through areas underlain by metavolcanic/metasediment complexes with lesser amounts of dioritic intrusives. These rocks are locally fractured and show some secondary permeability features, but typically they yield only small amounts of water.

The glacial aquifer consists of saturated deposits of glacial till and outwash. This may include any of the stratigraphic units described in Section 3.5.1 depending on location. Typically, the till units have relatively low permeabilities and are generally not used as an aquifer except where they interfinger outwash sands and gravels or contain sand and gravel lenses. Outwash deposits are relatively extensive and capable of yielding significant quantities of water. These sand and gravel deposits serve as the primary aquifer for domestic and municipal water supplies for the region.

The depth to groundwater is quite variable within the glacial deposits. This is mainly due to the considerable topographic relief in the area. Near groundwater discharge points (e.g., lakes, streams and wetlands) the depth to groundwater is on the order of several feet. The depth to groundwater can be more than 100 feet in recharge areas and on topographic highs (Foth & Van Dyke, 1995a). However, most groundwater flow systems are relatively small and shallow with discharges to local lakes and streams. There is a general trend for groundwater to flow southerly toward the Wolf or the Upper Wisconsin River. This can vary greatly on a local scale depending on the location of surface water bodies.

The hydrologic basin divide between the Wolf and Wisconsin Rivers occurs west of Crandon and the Forest-Oneida County line along the pipeline corridor. This divide is located between the headwaters of the Wolf River and Monico Creek located in the Wisconsin River Basin.

The groundwater quality within the glacial deposits is good with dissolved solids generally ranging from 100 to 300 mg/L. However, concentrations of dissolved solids can vary greatly on a local scale and high iron and manganese contents can be a problem. Groundwater in the area is typically hard and of the calcium-magnesium bicarbonate type (Oakes and Cotter, 1975 and Olcott, 1968).

## 3.7 Surface Water and Aquatic Biology

Studies were conducted to provide background surface water and aquatic biology data for selected streams that are crossed by the proposed discharge pipeline route. These studies included a review of the available literature and field reconnaissance completed on May 24 and 25, 1995. The 11 sites that were studied along the proposed pipeline route and their respective water bodies are shown in Table 3-2. The specific locations of all road crossing stream observation sites are shown on Figure 3-3.

The proposed pipeline corridor passes through two surface water drainage basins: the Fox-Wolf River Basin and the Upper Wisconsin River Basin (USGS, N.D.). The majority of the lotic systems located along the pipeline route can be characterized as small warm water streams. Site reconnaissance within these streams qualitatively evaluated stream morphology, dimensions, flow rates and floodplain characteristics, as well as the aquatic vegetation and benthic substrate present.

In addition to the above, detailed aquatic threatened and endangered species surveys were conducted in 1996 on the Wisconsin River over an area from the Hat Rapids Dam, which is approximately 6 miles downstream of the City of Rhinelander, Wisconsin, to Menard Island located approximately 7 to 8 miles downstream of Hat Rapids Dam. These studies focused on benthic macroinvertebrates, Odonata (dragonfly and damselfly), mussels, aquatic plants, and fish. The results of this work are discussed in Section 3.7.2.7 which addresses the Wisconsin River.

Table 3-2
Stream Crossing Observation Site Locations

Stream	Drainage Basin	Site ID	Site Location (Section, Township, Range)	Road Crossing
Gliske Creek	Fox - Wolf	GK-01	14, 35N, 12E	STH 55
Wolf River	Fox - Wolf	WR-08	29, 36N, 12E	USR 8
Mud Creek	Fox - Wolf	MD-01	29, 36N, 12E	USR 8
Monico Creek	Upper Wisconsin	MC-01	29, 36N, 11E	USR 8
Venus Creek (Venus Lake Outlet)	Upper Wisconsin	VN-01	30, 36N, 11E	USR 8
Neptune Creek	Upper Wisconsin	NC-01	27, 36N, 10E	USR 8
North Branch Pelican River	Upper Wisconsin	PR-NB	19, 36N, 9E	USR 8
George Creek (George Lake Outlet)	Upper Wisconsin	GO-01	24, 36N, 9E	USR 8
Pelican River	Upper Wisconsin	PR-02	15, 36N, 9E	USR 8
Wisconsin River	Upper Wisconsin	WR-HR	27, 36N, 8E	Hat Rapids Road
Unnamed Creek 1	Upper Wisconsin	UC-01	26, 36N, 8E	Hat Rapids Road

Source: USGS Drainage Area Data, unpublished.

Prepared by: JJA Checked by: BDH

## 3.7.1 Fox-Wolf River Basin

The Fox-Wolf River Basin incorporates a drainage area of 6,330 square miles that includes portions of 17 counties (USGS, N.D.) Specific water bodies evaluated as part of this study are located in Forest County and include Gliske Creek, the Wolf River, and Mud Creek. The three sites that were studied within this basin are discussed in the following section.

#### 3.7.1.1 Gliske Creek

Gliske Creek is a small, hard water stream that originates in Section 11 of T35N, R12E and flows a total of 3.2 miles through an undeveloped wooded watershed before entering the north end of Rice Lake, a 208-acre hard water drainage lake in Forest County (USGS, 1973). As a Class I trout stream, Gliske Creek supports a fishery including brook trout and four species of forage fish (Steuck and Andrews, 1976). Throughout its length, its slightly alkaline, clear water is banked by shrub and coniferous wetlands and shrub uplands.

Gliske Creek is crossed by STH 55 in Section 14 of T35N, R12E at station GK-01 (Figure 3-3). Here the creek has an approximate average width of four feet, an approximate average depth of

0.5 feet and a moderate flow. The creek channel at this location flows through a floodplain of sedge grass and tag alder swamp. The mixed silt/sand/gravel substrate at site GK-01 supports a moderate density of submergent and emergent aquatic macrophytes including water cress.

#### **3.7.1.2 Wolf River**

The Wolf River is a large lotic system that originates from Hiles Mill Pond in Forest County and flows a distance of approximately 223 miles (through a watershed that is ninety-five percent wooded) to Lake Poygan in Winnebago County (Foth & Van Dyke, 1995a). Major tributaries to the Wolf located upstream of the town of Langlade include Swamp Creek, Pickerel Creek, Nine-Mile Creek and the Hunting and Lily Rivers.

The reach of the Wolf River located in Forest County is characteristically medium hard, neutral pH and light brown (Andrews and Threinen, 1966). The type of fishery inhabiting the Wolf River is also a function of stream reach. In Forest County the system is dominated by warm water species including northern pike, largemouth bass, and various species of panfish and forage fish (Andrews and Threinen, 1966).

The Wolf River is crossed by USR 8 in Section 29 of T36N, R12E at station WR-08 (Figure 3-3). The river at this location has an approximate average width of 25 feet, and approximate average depth of two feet, with a moderate flow. The river channel here is lined with sedge grass and tag alders and meanders through mixed northern hardwoods and agricultural land. The predominantly silt/sand substrate that is present supports a moderate density of both submergent and emergent aquatic macrophytes as well as patchy periphyton growth.

#### **3.7.1.3** Mud Creek

Mud Creek is a small tributary to the Wolf River that flows a total of 7.0 miles through a watershed that is primarily wooded and wild (USGS, 1965). Near the Wolf River confluence (Section 31, T36N, R12E) the water in Mud Creek is characterized as hard, slightly acidic and clear (Steuck and Andrews, 1976). Further upstream in Section 24 of T36N, R11E the creek is characteristically soft, dark brown, and acidic (Steuck and Andrews, 1976). Mud Creek is known to support a fishery dominated by warm water forage species.

Mud Creek crosses USR 8 in Section 29 of T36N, R12E at station MD-01 (Figure 3-3). Here the stream flows at a moderate rate through a sedge meadow floodplain that extends to a conifer swamp. The river at this location averages approximately 15 feet wide and one foot deep, is banked by sedge grass, and contains a sand/silt substrate bottom with minor constituents of gravel.

#### 3.7.2 Upper Wisconsin River Basin

The Upper Wisconsin River Basin incorporates a drainage area of 2,760 square miles that includes portions of eight counties (USGS, N.D.). Specific water bodies included in the wastewater discharge study area are located in Oneida County and include the Wisconsin, Pelican and North Branch Pelican Rivers as well as Carlson, Cuenin, George, Neptune, Venus and Monico Creeks and one small unnamed creek. The eight sites studied within these systems are described in the following section.

#### 3.7.2.1 Monico Creek

Monico Creek is a small medium hard water stream that originates in Atkins Lake, a soft water drainage lake, and flows a total of 16.2 miles through a predominantly wooded watershed to its confluence with the Pelican River in Section 34 of T36N, R10E (USGS, 1965). Monico Creek contains slightly acid medium brown water that supports a warm water fishery (Andrews and Threinen, 1966).

Monico Creek is crossed by USR 8 in Section 29 of T36N, R11E at station MC-01 (Figure 3-3). Here the stream has an approximate average width of 10-15 feet and a depth that varies from approximately one to four feet. The banks within this reach of Monico Creek, which flows through a shrub sedge meadow, are steep and edged with sedge. The silt/sand substrate observed at site MC-01 supports a low density population of submergent aquatic macrophytes.

## 3.7.2.2 Venus Creek (Venus Lake Outlet)

Venus Creek is a small soft water tributary to Monico Creek that originates from Venus Lake, a 64.6 acre drainage lake located in Section 30 of T36N, R11E (USGS, 1965). The stream flows a total of 0.7 miles through a wooded and undeveloped watershed and contains water that is classified as highly alkaline and medium brown in color (Andrews and Threinen, 1966). Only forage fish have been recorded to inhabit Venus Creek, although it is likely that portions of the warm water fisheries present in Venus Lake and Monico Creek frequent the system.

Venus Creek is crossed by USR 8 in Section 30 of T36N, R11E at station VN-01 near the town of Monico, Wisconsin (Figure 3-3). This portion of the creek is the immediate outlet of Venus Lake where the stream flows through a sedge/shrub swamp wetland. The silt/sand substrate within this reach supports moderate densities of both submergent and emergent aquatic macrophytes. Ditrital organic substrate is also present.

#### 3.7.2.3 Neptune Creek

Neptune Creek is a small, very soft water stream that originates in Neptune Lake, a drainage lake, and flows a total of 5.0 miles before entering the Pelican River to which it is a tributary (USGS, 1965). Neptune Creek contains acidic, medium brown stained water that flows through a watershed that is entirely wooded and wild (Andrews and Threinen, 1966). Warm water forage fish primarily inhabit Neptune Creek (Andrews and Threinen, 1966).

Neptune Creek is crossed by USR 8 in Section 27 of T36N, R10E at station NC-01 (Figure 3-3). The stream at this location has an approximate average width of 15 feet, an average depth of two to three feet, and a moderate flow rate. The creek channel near the USR 8 crossing has steep and undercut banks and flows through a shrub/sedge/conifer swamp. Bottom substrate at the site is dominated by sand, gravel and wood. A small riffle section exists approximately 100 feet downstream of the USR 8 crossing.

#### 3.7.2.4 North Branch of the Pelican River

The North Branch of the Pelican River is a soft water stream that flows from its origins in the Moen chain of lakes to its confluence with the main branch of the Pelican River in Section 19 of T36N, R9E (USGS, 1982, 1965). The stream contains slightly acidic medium brown water that

flows through a wooded and agricultural watershed and supports a warm water fishery (Andrews and Threinen, 1966). Five Wisconsin special concern freshwater mussel species are known to exist in the North Branch of the Pelican River (WDNR, 1995).

The North Branch of the Pelican River is crossed by USR 8 in Section 19 of T36N, R9E at station PR-NB (Figure 3-3). At this location the river flows at a slow rate through a lowland hardwood/scrub swamp floodplain. The predominantly silt/sand substrate at the site supports a low population of rooted aquatic macrophytes.

## 3.7.2.5 George Creek (George Lake Outlet)

George Creek is a small, soft water stream that originates from Lake Thompson and flows 3.2 miles through George Lake, a 434.5 acre soft water drainage lake, before reaching its confluence with the Pelican River in Section 24 of T36N R9E (USGS, 1982). The creek contains acidic light brown water that flows through a watershed that is 99 percent wooded and undeveloped (Andrews and Threinen, 1966). Like the Pelican River to which it is a tributary, George Creek supports a warm water fishery including northern pike, muskellunge, walleye, bass, panfish and various species of minnows.

George Creek is crossed by USR 8 in Section 24 of T36, R9E at station GC-01 (Figure 3-3). The stream at this location averages approximately 25 feet wide and one to three feet deep as it flows at a low to moderate rate through a floodplain of sedge meadow, shrub brush and wetland. Evidence of beaver activity is apparent upstream of the USR 8 crossing. River substrate in this reach is predominantly of silt, sand and organic composition.

#### 3.7.2.6 Pelican River

The Pelican River is a soft, slightly acid medium brown water stream that flows a total of 28.9 miles through a wooded watershed from its origin in Pelican Lake to the point where it joins the Wisconsin River to which it is a tributary (Andrews and Threinen, 1966). Primary named tributaries to the Pelican River are the Monico, Beaver, Cuenin and Slaughterhouse Creeks, as well as the George Lake outlet and the North Branch of the Pelican River (USGS, 1982, 1965). The Pelican River contains a warm water fishery that, according to the Wisconsin DNR, includes two "relatively uncommon fish species not on the special concern list" (WDNR, 1995). In addition to this, five state special concern freshwater mussel species are known to exist in the North Branch of the Pelican River. According to WDNR correspondence dated June 13, 1995 (Appendix D), these special concern mussel species likely also inhabit the Pelican River itself.

The Pelican River crosses USR 8 in Section 15 of T36N, R9E at station PR-02 (Figure 3-3). Here the river flows at a moderate rate through a deep (>3 feet) wide channel, with an approximate average width of 200 feet, that meanders through a northern lowland hardwood/sedge floodplain. Silt, sand and wood substrate support a low density of rooted aquatic macrophytes in this portion of the river, which has steep and undercut banks.

#### 3.7.2.7 Wisconsin River

The Wisconsin River is a large warm water stream that originates from Lac Vieux Desert in Vilas County. A tributary to the Mississippi, the river flows nearly the entire length of the state

of Wisconsin through developed and undeveloped land before reaching its confluent at the Crawford County line approximately two miles south of Prairie du Chien.

Downstream of Rhinelander, the river ecology has been altered by industrial and municipal discharge (Andrews and Threinen, 1966). Here the characteristically soft, alkaline water supports warm water fish species including: northern pike, largemouth bass, bullheads, and various panfish and forage fish species (Andrews and Threinen, 1966).

The Wisconsin River is crossed by Hat Rapids Road in Section 26 of T36N, R8E (Figure 3-3) at station WR-HR. Approximately 0.1 mile upstream of this crossing, the river flow is impounded by a dam, creating the Hat Rapids flowage. Downstream of the dam, the river contains water of moderate velocity that flows over a mixed boulder/cobble/gravel substrate that supports a low to moderate density of submergent aquatic macrophytes and patches of periphyton. At this location the river is approximately 300 feet wide, and has steep banks that rise to stands of northern hardwood forest and agricultural land.

Detailed aquatic surveys focusing on threatened, endangered, and special concern species were conducted between June and August 1996 on the Wisconsin River from Hat Rapids Dam to Menard Island located approximately 7 to 8 miles downstream. These studies focus on benthic macroinvertebrates, Odonata (dragonfly and damselfly), mussels, aquatic plants, and fish. A detailed report describing field methods, results of the work, and the ecological significance of the findings is contained in Appendix F.

#### 3.7.2.8 Unnamed Creeks

An unnamed creek is crossed by Hat Rapids Road in Section 26 of T36N, R8E at station UC-01 (Figure 3-3). USGS topographic maps of the area indicate that this stream is a small tributary to the Wisconsin River that flows a total distance of approximately 0.4 miles through a low relief floodplain (USGS, 1982). The reach of stream immediately adjacent to Hat Rapids Road flows at a slow to moderate rate through a conifer swamp. Here the stream's steep and undercut banks are edged with sedge grass and alders, and are shaded by a conifer canopy. Average stream width and depth at this location were estimated at eight feet and one foot, respectively. The silt/sand substrate here supports a low density of submergent rooted aquatic macrophytes.

## 3.8 Terrestrial Biology

This section provides a description of the terrestrial habitats present along the proposed pipeline route. The majority of the proposed route is confined to areas of prior disturbance within the highway ROW. As such, the focus is on the area within and immediately adjacent to the highway ROW coincident with the pipeline route.

The ROW corridors are variable in width and degree of disturbance. High quality native plant communities are not common in the ROW due to earlier road construction activities, routine maintenance (i.e., mowing or cutting approximately once per year) and stresses imposed by highway stormwater runoff and application of salt for deicing. These areas have typically been planted with non-native grasses or other cover crops to control erosion, and contain a high proportion of exotic weedy species. Due to the disturbed nature of the vegetative communities within the ROW and activity associated with the highways within these corridors, these areas provide only limited wildlife habitat.

The areas on either side of the prior disturbed areas within the ROW more closely resemble the natural habitats and vegetative communities common in the region. The pipeline corridor traverses an area ecologically similar to the study area described in Section 3.9 of the Crandon Project's EIR (Foth & Van Dyke, 1995a). The area is generally characterized by northern hardwood forests and wetlands with minor amounts of agriculture and residential land uses. As evidenced by a visual survey of the corridor, no old-growth northern hardwood forest exists along

the proposed route. All of the forests have been cut at least once in the past. The younger forests are typified by nearly monotypical stands of quaking aspen while the older forests are generally composed of maple, birch and basswood. Conifer swamp is the most common wetland habitat type followed by shrub swamp, deciduous forested wetlands, emergent marsh/sedge meadow, and bog. Agriculture is limited along the proposed corridor, generally consisting of pasture lands and is primarily confined to areas along STH 55, CTH S and Hat Rapids Road.

These habitats would be expected to support a composition of wildlife similar to that described for the study area surrounding the proposed mine site (Foth & Van Dyke, 1995a). Unlike much of the study area surrounding the proposed mine site, however, the existing roadway and ROW have truncated or traversed these habitat types which may favor those species preferring edge habitat. Although a number of state endangered, threatened and special concern species of terrestrial wildlife have been recorded in the area (Foth & Van Dyke, 1995a), it is unlikely, for the reasons identified above, that these species frequent the habitats provided in or immediately adjacent to the existing ROW.

Habitat characterization of the proposed pipeline route and alternatives was completed in the field by Foth & Van Dyke. Field forms with specific observations are reproduced in Appendix E. For the purpose of this survey the route was divided into seven segments. An overview of the habitats existing along and adjacent to each of these segments is given below.

#### 3.8.1 STH 55

The STH 55 segment is just over two miles long. The prior disturbed ROW ranges from twenty to thirty feet from the edge of pavement. Outside of the disturbed ROW the terrestrial community is generally comprised of northern hardwoods with a small amount of conifer swamp. There are also residential, commercial and some agricultural lands outside of the ROW.

#### 3.8.2 CTH S

The CTH S segment is approximately two miles long. The disturbed ROW is 20 feet from the edge of pavement. Much like STH 55, the area outside of the ROW along this segment is dominated by northern hardwoods. Some residential and agricultural land also exists.

#### 3.8.3 Snowmobile Trail

This segment begins on the snowmobile trail on the north side of USR 8 at CTH S and runs for just less than 10 miles to CTH V. The trail is located within the old USR 8 roadbed. Wisconsin Public Service Corporation has overhead powerlines which run parallel to the north side of the trail. This powerline corridor is regularly maintained, creating a 20 to 40-foot area of disturbance between the trail and the native vegetation. The area north of the powerline corridor is generally comprised of northern hardwoods with a lesser amount of deciduous, conifer, and shrub swamps. There are also approximately twenty areas where one or more single family dwellings, or commercial buildings are located to the north of the ROW.

USR 8 parallels the snowmobile trail to the south. In areas were the trail is within the WisDOT maintained ROW there is little to no woody vegetation. Areas which are not cleared by the WisDOT are generally comprised of young northern hardwoods in upland areas and lowland hardwoods or shrub swamp in lowlands.

#### 3.8.4 USR 8 from CTH V to River Bend Road

The USR 8 segment starts at CTH V and runs west for just less than 10 miles to River Bend Road. This segment starts in the unincorporated town of Monico where the commercial and residential dwellings are close to the road. Because of this the WisDOT cleared ROW is between eight and twenty feet from the edge of pavement.

After leaving the Town of Monico the cleared corridor associated with the highway extends out to an average width of 25 feet from the edge of pavement. Along this portion of the segment northern hardwoods and conifer swamps dominate the landscape outside the disturbed ROW. There is also a lesser component of shrub swamp, shallow marsh, sedge meadow, and bog.

## 3.8.5 Rhinelander Beltline (USR 8 from River Bend Road to STH 17)

This segment runs along the Rhinelander Beltline west from River Bend Road for approximately five miles to STH 17. The width of the WisDOT prior disturbed ROW ranges from 10 to 100 feet from the edge of pavement. The landscape outside of the disturbed ROW is dominated by northern hardwoods in the uplands with a smaller element of shrub, conifer, and deciduous swamps in the lowland.

## 3.8.6 STH 17

STH 17 runs south from USR 8 for just over two miles to Hat Rapids Road. The width of the previously disturbed ROW ranges from 10 to 15 feet from the edge of pavement. The landscape outside of the disturbed portion of the ROW is dominated by northern hardwoods in the uplands and conifer swamp with a lesser amount of shrub swamp in the lowlands. Several small areas of residential/agricultural land uses also exist.

## 3.8.7 Hat Rapids Road

Hat Rapids Road runs west from STH 17 just less than two miles to the Wisconsin River. The width of the previously disturbed ROW ranges from five to ten feet from the edge of the pavement. Outside of the disturbed ROW, this corridor is dominated by residential/agricultural land and coniferous swamp. There is also a lesser element of northern hardwoods and shrub swamp.

#### 3.9 Wetlands

The wetland characteristics along the proposed pipeline corridor were extrapolated from the Department of Natural Resources Wisconsin Wetland Inventory maps (1983, 1984a, 1984b, 1984c, 1984d, 1985). This work was verified in the field by Foth & Van Dyke in the spring of 1995.

Table 3-3 presents a breakdown of the type and acreage of wetlands that occur within 500 feet of the pipeline route. The data presented in Table 3-3 includes only those wetlands existing on the sides of the roadway in which the pipeline will be routed. The specific wetland types mapped by the WDNR, as shown in Figure 3-4, were grouped in Table 3-3 into four general categories; shallow marsh, shrub swamp, deciduous swamp, and coniferous swamp. These wetlands are

generally associated with the many named, and unnamed waterways traversed by the road corridor.

Table 3-3
Wetland Acreage Within 500 Feet of Roadway Centerlines

	Side of Road	Shallow Marsh	Shrub Swamp	Deciduous Swamp	Coniferous Swamp	Total Area
STH 55	West	0	0	1.4	6.5	7.9
CTH S	West	0	0	0	0	0
Snowmobile Trail	North	0	23.03	15.00	79.25	117.28
USR 8 CTH V to River Bend Road	South	2.67	89.24	66.5	55.43	213.84
Rhinelander Beltline	North	0	0	50.24	3.5	53.74
STH 17	West	0	2.5	0	6.5	9
Hat Rapids Road	South	0	0	0	22	22

Source: WDNR Wetland Inventory Maps.

Prepared by: BDH Checked by: RFS

#### 3.10 Ambient Noise/Vibration

Existing noise levels in the vicinity of the Crandon Project site are described in Section 3.11 of the Crandon Project's EIR (Foth & Van Dyke, 1995a). Existing ambient noise levels were measured along STH 55 in an area representing residential backyards adjacent to this roadway. Based on these measurements, the day/night noise level at this location was determined to range from 45 to 55 dBA (Foth & Van Dyke, 1995a). This range should be typical for similar areas along the majority of the proposed pipeline route.

## 3.11 Land Use and Zoning

In general, the land use adjacent to the ROW along the pipeline corridor is mostly undeveloped and wooded. There are, however, small concentrations of residential, commercial, and agricultural land. The most concentrated of these is the unincorporated town of Monico, in Oneida County. Here, there are several homes, a bar, and a church, all of which are relatively close to USR 8.

There is no industrial development along the route. There is, however, a public snowmobile trail which crosses USR 8 at Vieth Road, west of Monico. Types of development along each of the road segments are presented in Table 3-4.

In addition to the environmental reviews completed by WDNR and the U.S. Army Corps of Engineers, WisDOT will have approval authority over the construction and operation of the pipeline within the ROW of STH 55, USR 8, and STH 17. Forest County will have approval authority over the construction and operation of the pipeline within the ROW of CTH S. The Town of Crescent will have approval authority over the construction and operation of the pipeline within the ROW of Hat Rapids Road. See Wis. Stats § 86.16(1). In addition, Oneida County will have zoning authority over the portion of the pipeline located within county shorelands that lie outside of the Hat Rapids Road ROW. CMC is presently discussing the necessary approvals with the WisDOT, Forest County, Oneida County, and the Town of Crescent.

Table 3-4

Types of Development Along the Proposed Pipeline Corridor

Development Type	STH 55	стн s	USR 8 (CTH S to Monico)	USR 8 (Monico)	USR 8 (Monico to River Bend Road)	Rhinelander Beltline/STH 17/Hat Rapids Road
Private Residence	9	10	5	3	31	34
Commercial Property	-	-	3	1	-	-
Churches	_	_	1	-	_	_
Wayside	_	_		· –	1	

Prepared by: GMS Checked by: RFS

### 3.12 Aesthetics

The discharge pipeline will primarily follow existing road corridor from the proposed Crandon Project site access road to the Wisconsin River. The view when traveling this corridor is typical of northern Wisconsin: generally rural, mostly forested, with many lakes and streams. The aesthetic view along the pipeline corridor road segments are described in the following paragraphs.

STH 55 is comprised of mostly agricultural and commercial land, and has little topographic variation. Because of the relatively flat topography and the agricultural openings the view of the area tends to be fixed on the commercial buildings and residences.

Continuing on CTH S there is a distinct rise in topography and the northern hardwood forest restricts the view. Traveling on, the topography flattens and there is some agricultural and commercial land. Because of this, the view is widened as USR 8 is approached.

USR 8 is the longest segment of the corridor. The first several miles are dominated by rolling hills with northern hardwoods in the uplands, and swamp conifers in the lowlands. After this, the topography tends to flatten causing the swamp conifer element to become more prevalent in the scenery. The entire corridor is in a forested rural setting with occasional commercial buildings, agricultural land or residences. For the most part, the roadside vegetation constricts the view which causes the road ahead to be the main focal point. The largest concentration of residential and commercial property along USR 8 is the unincorporated town of Monico. Here the view is dominated by residential and commercial buildings, and ultimately Venus Lake which is immediately adjacent to north side of the highway.

STH 17 is generally flat with some residential and agricultural areas. For the most part however, the view along the road is limited by vegetation.

Hat Rapids Road is a typical secondary road characterized by a small surface area and vegetation crowding the road. There are some private residences and agriculture which open the view but, for the most part the view is dominated by northern hardwood in the upland areas and swamp conifer in the low lying areas, which create a more closed range of vision.

#### 3.13 Socioeconomics

The following evaluation provides a brief description of socioeconomic conditions for the area in which the pipeline corridor is to be located. For more information on socioeconomic conditions within Forest, Langlade, and Oneida counties including the area potentially affected by the mine project and pipeline corridor, refer to Section 3.14 of the Crandon Project's EIR (Foth & Van Dyke, 1995a).

In summary, the area is characterized as sparsely populated, with a significant amount of seasonal and secondary dwelling units. Much of the land is undeveloped. The economic base within Forest and Oneida counties is less industrialized and the residents are less affluent than Wisconsin as a whole. Per capita personal income is lower than statewide per capita income and the unemployment rates have historically been higher. Services are the most significant employment sector for both Forest and Oneida counties.

Housing stock in both Forest and Oneida counties includes a significant number of seasonal housing units. Most residential parcels have limited public services such as sewer and water.

# 4 Environmental Impacts

#### 4.1 No-Action Alternative

The no action alternative would result in no discharge of wastewater from the Crandon Project facility. In addition to wastewaters which will be generated due to operations at the mine, mill, and ancillary facilities, two sources of wastewater will be generated at the facility which are independent of facility operations: groundwater inflow to the mine and net precipitation on the surface facilities. Groundwater inflow to the mine will occur continuously, and will have to be pumped from the mine as mine drainage in order to operate the mine. Net precipitation occurs because the annual amount of precipitation at the site exceeds the annual amount of evaporation from the site over a typical year. The volume of water generated by the net precipitation must be discharged.

The mill process is a net consumer of water, so some of the mine drainage and net precipitation can be reused as makeup water for the mill process water system. However, even during a drought year, the total amount of mine drainage due to groundwater inflow is likely to exceed the demand for makeup water in the mine process water system. Under all conditions, dewatering the mine will result in a surplus of water which must be discharged from the site. Therefore, the no discharge alternative is not technically feasible.

#### 4.2 Preferred Alternative

As described in Section 2, the preferred alternative involves a pipeline from the Crandon Project site primarily along highway ROW to the Wisconsin River at the Hat Rapids Dam. The total length of the preferred route is approximately 38.3 miles.

## 4.2.1 Historical and Archaeological

A report prepared by GLARC (Richards and Kolb, 1996) detailing the results of archaeological and geoarchaeological investigations conducted along the proposed pipeline route was submitted to the U.S. Army Corps of Engineers and the Wisconsin Department of Natural Resources in September 1996. Investigations included literature and archival review of existing cultural resource related data, compilation of a geoarchaeological assessment based on existing geomorphic and land use history data, and field investigations that combined conventional pedestrian survey with geoarchaeological sampling of subsurface deposits.

Results indicate that: 1) approximately 30 percent of the route has been subjected to previous archaeological survey and determined to be devoid of archaeological sites; 2) 19 percent of the route is coincident with massively cut highway right-of-way in which no archaeological deposits are preserved; 3) 34 percent of the route traverses areas of hydric soil or locales characterized as unlikely to harbor archaeological deposits; 4) approximately 17 percent of the route is coincident with areas potentially capable of harboring archaeological deposits. However, archaeological and geoarchaeological testing within these areas indicates that no subsurface archaeological deposits are present within the proposed pipeline right-of-way. A single early 20th Century Euroamerican habitation site was identified near Hat Rapids Dam at the western terminus of the route. Shovel test data indicates that site deposits are disturbed and thinly scattered; consequently, the site is unlikely to be eligible for listing on the National Register of Historic Places. Planned construction has been designed to avoid any archaeological deposits associated with this site. Thus, project development should have no affect on the Hat Rapids Dam site.

Results of the historical and archaeological investigations indicate that no archaeological sites are present within the planned pipeline route. In the unlikely event that unidentified archaeological sites are encountered during construction, procedures outlined on page 23 of Appendix A will be implemented.

# 4.2.2 Transportation and Utilities

The proposed construction activities will not result in any long-term traffic/transportation impacts. County, state, and federal highway crossings will be directionally bored. The only impacts may involve temporary reduced speed limits and minor delays while equipment is moved into place. Short-term road closings may be required when construction activities trench across local roads. These closings will likely be for a time period of less than one day.

Other utilities (e.g., phone lines, natural gas, etc.) may be crossed resulting in potential temporary short-term (i.e., a matter of hours) losses of service within limited local areas. These impacts are expected to be very minor and result only in temporary inconveniences.

## 4.2.3 Air Quality

The proposed pipeline will not generate air emissions when operating and is not subject to regulation under Wisconsin air quality rules.

Particulate emissions may be present during the construction of the pipeline from cutting trees and earth moving, however, these impacts will be temporary and are expected to be negligible.

## 4.2.4 Geology and Soils

The proposed pipeline will be installed in an open-cut trench and backfilled with native material for the majority of the route. Areas of bedrock may be encountered that would require blasting. At county and state roads and stream crossings, the installation will require boring or jacking under these features. The pipeline will be buried to a minimum depth of 4.5 feet (seven feet under roadways).

Impacts to geology and soils will be temporary in nature. The cut trenches will be backfilled as soon as the pipe is installed and tested and the ground surface will be returned to existing grades. The proper use of sediment and erosion control will minimize the potential for impacts. Blasting, if needed, will be accomplished by qualified blasting contractors in accordance with applicable state codes.

The potential exists to encounter previously contaminated soils during the trenching process. A Phase I Environmental Assessment will be conducted prior to construction to specifically identify these areas, if they exist. Encountered contaminated soils will be disposed of, or treated in accordance with applicable Wisconsin Statutes.

#### 4.2.5 Groundwater

The pipeline will be designed and constructed so that leakage will be less than that which is allowable according to the Standards and Specifications for Sewer and Water Construction in Wisconsin Fifth Edition - March 1, 1988 (PWIIP, 1988). Leak testing will be performed in accordance with the standards and specifications applicable to the pipe material used. Since the pipeline will be sealed, it will not act as a sink or source of waters to encountered groundwater. In addition, the system will be monitored for potential leaks. Given the nominal diameter of the pipeline (i.e., 14 or 16 inches), it will not act as a barrier to groundwater flow.

#### 4.2.6 Surface Water and Aquatic Biology

#### 4.2.6.1 Wisconsin River

## 4.2.6.1.1 Flow and Water Quality

During the operational phase of the mine, wastewater will be generated from the inflow of groundwater to the mine, mine backfilling activities, contact stormwater and excess process water, as allowed under current regulations. This water will be treated in a wastewater treatment plant built according to a facilities design approved by the WDNR and using a lime/sulfide treatment

process that has been tested to demonstrate its effectiveness. The discharge from the treatment system will be routed via the proposed pipeline into the inlet piping of the turbines at the WPSC Hat Rapids Dam. This will provide instantaneous mixing and diffusion of the treated wastewater with the river water. Comprehensive controls will be in place at the treatment plant so that water is released through the pipeline only if it meets WDNR standards. In addition, the treated water must meet toxicity tests so that it will not harm the most sensitive organism in the river at the point of discharge. Complete information about the wastewater treatment plant and the treatment process can be found in the project's Preliminary Engineering Report for Wastewater Treatment Facilities which was forwarded to the WDNR, U.S. Army Corps of Engineers and others in September, 1995.

Maximum discharge to the Wisconsin River is estimated at 2.67 cubic feet per second (cfs) or 1,200 gpm. This represents approximately 0.9 percent of the river's  $Q_{7,10}$  flow rate at Rhinelander, which is upstream of the proposed discharge point. The  $Q_{7,10}$  flow rate is a historic low-flow rate defined as the seven day, ten year low flow level.

The treated water discharged to the Wisconsin River will be required to meet stringent effluent limits set by WDNR. These effluent limits are established to protect public health and welfare, protect the present and prospective use of all surface waters for public and private water supplies, and protect the propagation of fish and aquatic life and wild and domestic animal life (Wisconsin Administrative Code Chapters NR 105, NR 106 and NR 207). These water quality standards were developed to protect the most sensitive species and often go beyond protecting the organisms occurring naturally in a stream.

The quality of treatment plant effluent has been estimated based on treatability studies conducted by Foth & Van Dyke. This quality was then compared against the expected WDNR effluent limits for the Wisconsin River. The results, shown in Table 4-1, show that the discharge to the Wisconsin River is expected to be within the estimated WDNR limits for all substances. Therefore, no adverse water quality impacts to the river are anticipated.

During the operation of the mine the discharge of treated wastewater will be monitored to assure there will be no adverse impacts to the Wisconsin River. The discharge will be monitored for chemical specific parameters and whole effluent toxicity (e.g., both chronic and acute bioassays).

In calculating the expected WDNR effluent limits for the Wisconsin River, a conservative margin of safety consisting of one-third of the river's assimilative capacity was used. The expected daily, weekly and monthly effluent limits were calculated. The daily maximum effluent limits were conservatively calculated assuming 25 percent of the Wisconsin River  $Q_{7,10}$  flow for dilution. Table 4-1 lists only the most stringent of the three limits for each substance. The effluent limits were calculated based on the peak effluent discharge of 2.67 cfs (1,200 gpm), and based on the following Wisconsin River flow rates at Rhinelander:

Q <sub>7.10</sub> (historic 7-day, 10-year low-flow rate)	304 cfs (136,400 gpm)
Q <sub>72</sub> (recent 7-day, 2-year low-flow rate)	443 cfs (198,800 gpm)
Average flow	752 cfs (337,500 gpm)

The discharge will contain a negligible concentration (10 mg/L or less) of BOD<sub>5</sub>. The quantity of BOD<sub>5</sub> will be very small in comparison to other point source and non-point source discharges in

this area of the river and will have no significant adverse impact on the assimilative capacity of the Wisconsin River.

Table 4-1
Estimated Treated Wastewater Quality

Substance	Units	Estimated Effluent  Quality <sup>1</sup>	Estimated Water Quality Based Effluent Limits <sup>2</sup>
Total Antimony	mg/L	< 0.05	734
Total Arsenic	mg/L	< 0.004	4.70
Total Beryllium	mg/L	< 0.005	0.019
Total Recoverable Cadmium	mg/L	0.0015	0.0048
Total Recoverable Chromium (+3)	mg/L	< 0.005	0.787
Total Recoverable Chromium (+6)	mg/L	< 0.005	0.358
Total Recoverable Copper	mg/L	0.010	0.090
Cyanide, Free	mg/L	0.09	0.190
Total Recoverable Lead	mg/L	< 0.003	0.080
Total Mercury	mg/L	N.D. <sup>3</sup>	0.000014
Total Recoverable Nickel	mg/L	< 0.02	0.755
Total Recoverable Selenium (+4)	mg/L	0.09	0.270
Total Recoverable Silver	mg/L	< 0.001	0.015
Total Thallium	mg/L	< 0.010	1.03
Total Recoverable Zinc	mg/L	0.02	0.563
рН	S.U.	8.0	6-9

<sup>&</sup>lt;sup>1</sup> Average When Treating Mine Drainage Water.

Prepared by: HJA Checked by: RJC1

<sup>&</sup>lt;sup>2</sup> Limits based on maximum flow rate of 1,200 gpm.

<sup>&</sup>lt;sup>3</sup> N.D. = Not Detectable. The accepted detection level for mercury is 0.0002 mg/L. Crandon Project effluent when tested is estimated to show a no detect. In computing the monthly average mercury content in the effluent a value of zero is used for no detect test results.

#### 4.2.6.1.2 Aquatic Biology

As discussed in Section 4.2.6.1.1 above, treated wastewater will be routed via a pipeline from the mine site and discharged to the Wisconsin River. The pipeline will terminate at the Hat Rapids Dam with discharge into the turbines. This will result in complete and immediate mixing of the treated wastewater with the river. Because the pipeline will discharge directly to the turbine structure, there will be no impact to aquatic or terrestrial communities associated with the shoreline of the river.

Field studies conducted by CMC during 1996, and review of existing agency and other studies were used to identify any sensitive aquatic organisms within the study area that may have special status. In total, 15 species, which are currently listed on the Wisconsin Natural Heritage Inventory, were either observed during the 1996 study or have been published in historical records. These species include: one endangered and seven special concern dragonflies; two endangered, one threatened and three special concern mussels; and one threatened fish.

The WDNR currently regulates discharges to water bodies to protect the most sensitive organisms. Chapter NR 106 of the Wisconsin Administrative Code, Procedures for Calculating Water Quality Based Effluent Limitations for Toxic and Organoleptic Substances Discharged to Surface Waters, states that, "water quality based effluent limitations for toxic and organoleptic substances are needed to assure attainment and maintenance of surface water quality standards as established in accordance with s. 144.025 (2) (b), Stats., and as set forth in chs. NR 102 to 105." In addition Chapter NR 207, Water Quality Antidegredation, "... sets procedures applicable to proposed new or increased discharges to outstanding resource waters, exceptional resource waters. Great lakes waters, [and] fish and aquatic life waters. ...". Knowing this, the wastewater discharge to the Wisconsin River will be regulated to protect the most sensitive species or community. Therefore, it is anticipated that there will be no impact to aquatic communities within the Wisconsin River as a result of the proposed project.

## 4.2.6.2 Interbasin Transfer

The discharge of treated wastewater from the project site to the Wisconsin River will be an interbasin transfer of water from the Wolf River to the Wisconsin River. On a larger scale, this is a transfer from the Great Lakes Basin to the Mississippi River Basin. Wisconsin Administrative Code NR 142 regulates such transfers. Transfers greater than 100,000 but less than two million gallons per day require registration per NR 142.03. Transfers greater than two million gallons per day require approval per NR 142.06.

Under peak design flow conditions the Crandon Project discharge pipeline will be capable of transporting 1,200 gpm of water from the Crandon Project plant site to the Wisconsin River. This is equivalent to approximately 1.7 million gallons per day or 2.67 cfs. On an average annual basis the flow rate will be approximately 460 gpm, which is equivalent to 1.02 cfs or 0.66 million gallons per day. Based on these volumes, the transfer of water from the Great Lakes system to the Mississippi River system will require registration with the WDNR. As discussed below, interbasin transfer of water from the Wolf River basin to the Wisconsin River basin will be insignificant when compared to current flow conditions in the two systems.

The Wolf River's closest USGS monitoring station downstream from the project site is station 04074950 at Langlade, WI. The Wolf River, at this station, has a mean annual flow of 455 cfs (USGS, 1993a). The lowest recorded flow from 1966 through 1993 was 326 cfs (USGS, 1993a). Under annual average pipeline flow conditions a total of 1.02 cfs will be transferred from the Wolf River basin to the Wisconsin River basin. This will be equivalent to 0.2 percent of Wolf River mean average annual flow or 0.3 percent of the lowest recorded flow from 1966 to 1993. This change in flow will be negligible to the Wolf River System. Even under peak discharge flow rates (2.67 cfs) which will not occur on an annual average basis, only a 0.6 percent and 0.8 percent change in Wolf River flow at Langlade would occur for the mean annual flow and low flow conditions, respectively. Perceptible impacts on the biological communities in the Wolf River and adjacent terrestrial ecosystems are not anticipated as a result of interbasin transfers. A more detailed discussion of the potential impacts of mine dewatering relating to tributaries to the Wolf River system near the project site is contained in Section 4 of the project's EIR.

To evaluate the transfer of water to the Wisconsin River, three points on the river have been studied. The change in flow at the discharge point will be less than 0.9 percent under low flow conditions. The Wisconsin River at Rhinelander has a  $Q_{7,10}$  of 304 cfs. With a peak flow of 2.67 cfs from the discharge, the change in water flow will be insignificant even under low flow conditions. Under normal or peak flow conditions for the Wisconsin River, the percent change in flow will be considerable less.

The use of the gaging data from Rhinelander is conservative. Additional tributaries, such as the Pelican River, enter the Wisconsin River below Rhinelander, yet above the proposed discharge location at the Hat Rapids Dam. In actuality, the change in flow attributable to the discharge is less than the estimated 0.9 percent discussed above.

The impact of the Wisconsin River under peak flow conditions is best discussed at the nearest down stream gaging station. The USGS monitoring station 05395000 at Merrill, WI is the closest down stream USGS monitoring station with significant historical data. The Wisconsin River at this station has a mean annual flow of 2,664 cfs, with the lowest recorded flow from 1903 through 1993 being 1,348 cfs (USGS, 1993b). Under average pipeline discharge rates an increase

in base flow of 1.02 cfs will equal less than a 0.08 percent increase during the lowest recorded year. For an average year this is equivalent to a 0.04 percent increase. This increase in flow will not be measurable at the Merrill, WI gaging station. The 100 year flood flow at Merrill is 30,500 cfs (USGS, 1992). Under average pipeline discharge rates the Crandon Project discharge will change the 100 year flood flow by 0.003 percent. Therefore, the change in flow will not measurably impact flood flow. The increase in flow on the Wisconsin River from the Crandon Project will therefore be negligible.

On a more regional scope, changes in flow to the entire Wisconsin River Drainage basin become even more insignificant. The Wisconsin river flow at the USGS monitoring station 05407000 at Muscoda, WI has a mean annual flow of 8,746 cfs, with the lowest recorded flow from 1914 through 1993 being 4,145 cfs (USGS, 1993b). The 100 year flood flow is 74,200 cfs (USGS, 1992). The Muscuda, WI station is near the confluence of the Wisconsin River and the Mississippi River. For either the mean annual flow or the low flow condition, the changes in flow due to the Crandon Project discharge will be negligible. Under either the mean annual or the low flow conditions the increase in flow will be less than 0.02 percent. Under 100 year flood and mean annual discharge conditions the change in flow on the Wisconsin River due to a Crandon Project discharge would be less than 0.002 percent. The change in flow will not measurably impact flood flow or low flow conditions. Because of this, perceptible impacts on the biological communities in the Wisconsin River, Mississippi River or the adjacent terrestrial ecosystems are not anticipated.

#### 4.2.6.3 Other Surface Waters

As shown in Table 3-2, the proposed pipeline route crosses nine named streams and one significant unnamed stream. A number of additional small, unnamed, intermittent streams and drainage ways will also be crossed. No disturbance is proposed for any stream with a defined bed and banks. The pipeline will be routed under such streams through directional boring. With the use of proper sediment and erosion control measures, no impacts to these streams are anticipated. Intermittent drainages without a defined bed and bank will be traversed with an open cut trench which will be backfilled as soon as the pipe is installed. These areas will be seeded and restored as soon as construction is complete. Potential downstream impacts from soil losses will be prevented through the use of proper sediment and erosion controls during construction.

## 4.2.7 Terrestrial Biology

Because the pipeline is proposed to be located within or directly adjacent to previously disturbed highway ROW and along an existing maintained snowmobile trail, the overall impacts to the terrestrial ecosystem are expected to be minimal and temporary in nature.

With the exception of approximately 35.5 acres along the 38.3 mile corridor, the pipeline will be installed entirely within previously disturbed ROW. The estimated project disturbance by habitat type within undisturbed ROW is listed in Table 4-2. The temporary loss of habitat listed in Table 4-2 will be the result of clearing narrow strips ranging from approximately 5 to 20 feet in width adjacent to existing disturbed ROW. Temporary habitat loss will result from approximately 31.3 acres of clearing and grubbing in northern hardwoods, shrub swamp, conifer swamp, and deciduous swamp; and 4.2 acres of surface disturbance in bog, shallow marsh, residential, commercial and industrial areas. The type of disturbance depicted in Table 4-2 will

have little impact on the habitats in which it occurs, since areas will be reclaimed immediately after pipeline installation. It is anticipated that the disturbed areas will return to their original state as part of natural vegetation succession within one to two years.

Although endangered, threatened and rare species are known to occur in the region through which the proposed pipeline will pass, their use of the marginal disturbed habitat in which the pipeline will be installed is likely minimal. No impacts to these species are anticipated.

Table 4-2
Estimated Temporary Habitat Disturbance Within Undisturbed ROW

	Estimated Temporary Disturbance Within Undisturbed ROW by Habitat Type in Acres										
Corridor Segment	Northern Hardwoods	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Shallow Marsh	Residential	Commercial	Agricultural	Total	
STH 551	0.84	0	0.36	0	0	0	0.21	0.06	0.03	1.5	
CTH S1	2.42	0	0	0	0	0	0.09	0	0.54	3.05	
Snowmobile Trail <sup>2</sup>	0	3.8	0.1	0	0	0	0	0	0	3.9	
USR 8 from CTH V to River Bend Road <sup>1</sup>	5.12	1.44	4.78	0.12	0.12	0.28	1.35	0.71	0	13.92	
Rhinelander Beltline <sup>1</sup>	0.87	0	0.3	0.48	0	0	0.18	0	0	1.83	
STH 171	9.27	1.21	0.15	0	0	0	0	0.15	0.48	11.26	
Hat Rapids Road <sup>3</sup>	0	0	0	0	0	_0_	0	0		_0_	
	18.52	6.45	5.69	0.60	0.12	0.28	1.83	0.92	1.05	35.46	

Area of temporary disturbance based on placing the pipeline 25 feet from the edge of pavement, a 20 foot wide area of disturbance, and widths of maintained ROW from Appendix E.

Prepared by: RFS Checked by: JWS

<sup>&</sup>lt;sup>2</sup> Area of temporary disturbance based on placing the pipeline in the center of the existing snowmobile trail. Disturbance of natural vegetation is minimal due to the regular maintenance by WPSC to the north, and WisDOT to the south of the trail.

<sup>3</sup> Area of temporary disturbance based on placing the pipeline on the edge of pavement.

#### 4.2.8 Wetlands

The location of wetlands along the proposed pipeline route is shown on Figure 3-4. Table 4-3 presents a summary of the wetland impacts based on a review of the Wisconsin Wetland Inventory Maps (WDNR, 1983, 1984a, 1984b, 1984c, 1984d, 1985) for the corridor as well as on a visual survey conducted along the route. Although wetland conditions may persist in a degraded state within the previously disturbed ROW, the quantities reported in Table 4-3 represent the area of estimated temporary wetland disturbance by the portion of the approximate 20 foot wide construction corridor located outside of the disturbed ROW. The Wisconsin Wetland Inventory Maps indicate a total temporary disturbance of approximately 8.1 acres of wetland, while the field verification indicates that the total temporary disturbance may approach approximately 13.1 acres.

As with the impacts to terrestrial biology, wetland impacts will be minimal and temporary due to the pipeline's location within or directly adjacent to previously disturbed highway ROW and along the existing snowmobile trail. Trenching through these wetlands should have minimal long-term impact and the wetland functions currently provided by these wetlands should recover within one to two years.

Table 4-3
Estimated Temporary Wetland Disturbance Within Undisturbed ROW

Corridor Segment	Estimated Temporary Wetland Disturbance Within Undisturbed ROW by Habitat Type in Acres											
	Shrub Swamp		Conifer Swamp		Deciduous Swamp		Bog		Shallow Marsh			
	Field Data	WWIM	Field Data	WWIM	Field Data	WWIM	Field Data	WWIM	Field Data	WWIM		
STH 55 <sup>1</sup>	0	0	0.36	0.22	0	0	0	0	0	0		
CTH S1	0	0	0	0	0	0	0	0	0	0		
Snowmobile Trail <sup>2</sup>	3.8	1.1	0.1	1.76	0	0	0	0	0	0		
USR 8 from CTH V to River Bend Road <sup>1</sup>	1.44	2.83	4.78	1.43	0.12	0.16	0.12	0	0.28	0.2		
Rhinelander Beltline <sup>1</sup>	0	0	0.3	0.23	0.48	0	0	0	0	0		
STH 17 <sup>1</sup>	1.21	0	0.15	0	0	0.2	0	0	0	0		
Hat Rapids Road <sup>3</sup>	0	0	0		_0_	0	0	0	0	0		
Totals	6.45	3.93	5.69	3.64	0.60	0.36	0.12	0	0.28	0.2		

Area of temporary disturbance based on placing the pipeline 25 feet from the edge of pavement, a 20 foot wide area of disturbance, and widths of maintained ROW from Appendix E.

Prepared by: RFS Checked by: JWS

Area of temporary disturbance based on placing the pipeline in the center of the existing snowmobile trail. Disturbance of natural vegetation is minimal due to the regular maintenance by WPSC to the north, and WisDOT to the south of the trail.

<sup>&</sup>lt;sup>3</sup> Area of temporary disturbance based on placing the pipeline on the edge of pavement. WWIM = Wisconsin Wetland Inventory Maps.

## 4.2.9 Ambient Noise/Vibration

The only potential impacts from noise and vibration would be temporary and would occur during pipeline installation. The majority of this route traverses rural and wooded areas with very few residences. Some areas may experience increased noise for short periods of time during the actual construction, similar to a highway improvement or repair project. The equipment used and the proposed construction methods should not result in any noticeable vibration impacts. Since any booster stations located along the pipeline route will be constructed below ground, noise will not be heard by the public.

## 4.2.10 Land Use and Zoning

Permanent land use impacts are not anticipated as a result of the project. The entire pipeline will be installed within existing ROW and restored to pre-existing conditions once construction is complete. The portion of the pipeline to be installed in the snowmobile trail will not be installed during the winter and will be resurfaced with a material compatible with snowmobile use. As discussed in Section 3.11, CMC is presently seeking approvals to construct and operate the pipeline from WisDOT, Forest County, Oneida County, and the Town of Crescent.

#### 4.2.11 Aesthetics

For the majority of the pipeline route, potential visual impacts will be minimal and will only occur during the construction phase of the project. Pipeline installation will create an approximate 20 foot wide disturbance corridor in which most of the vegetation will be cleared and the soil will be temporarily exposed. With the exception of the portion of the route along the snowmobile trail, this will be visible from the roadways paralleling the route. This visual effect will be lessened immediately upon completion of construction when the disturbed corridor is restored to existing grades and revegetated. Within one to two years it will not be possible to distinguish this corridor from the adjacent maintained highway ROW.

As currently proposed, the proposed action will also involve at least one pump station and a number of air relief valves along the route. These features will be installed below grade. The only visible portions of these features will be similar to standard manhole covers and a short vent pipe. These are not expected to have any aesthetic impact.

#### 4.2.12 Socioeconomics

Socioeconomic impacts to the six communities encompassing the proposed route of the pipeline corridor are outlined as follows. Impacts to population, employment, housing, government structure and public finance, public facilities and services, and human, health, and social services were considered. Only construction related impacts are addressed. Pipeline operations and maintenance manpower is included in the operations manpower estimates presented in Section 4.2.13 of the project's EIR. Therefore impacts associated with pipeline operation and maintenance are also addressed in that section of the EIR.

#### **4.2.12.1** Population

While construction of the pipeline will temporarily increase employment, no long-term impacts to population are anticipated. The general contractor and related subcontractors responsible for

pipeline construction will hire employees from within and outside the project area. It is anticipated that these employees will not change their place of residence as a result of the project, therefore no population impacts are anticipated.

## 4.2.12.2 Employment

Temporary employment for construction related workers will be generated during the installation of the pipeline and related restoration. Employment is estimated to be approximately 60 full time equivalent jobs over a six month period. The impact of pipeline construction employment is negligible in the overall context of total employment within Forest, Langlade and Oneida counties which is estimated to be over 22,000 people (Foth & Van Dyke, 1995a).

#### **4.2.12.3** Housing

Pipeline construction is not anticipated to affect permanent housing because of its temporary duration. During the construction phase, some workers may use temporary housing during the work week as opposed to commuting from their permanent homes. This will impact the demand for motels, hotels, and other temporary lodging units by 48 total units during the six month construction period. This assumes 80 percent of the construction workers are from outside the local study area and do not commute. This impact is considered to be negligible in relation to the over 2,500 lodging units in the Forest, Langlade and Oneida county area (Foth & Van Dyke, 1995a).

## 4.2.12.4 Government Structure and Public Finance

Pipeline construction is anticipated to have a negligible impact on revenue generation or expenditures for the six affected communities. Since the pipeline will not generate tax revenue nor require public expenditure by any taxing authority it is not anticipated to create government structure or public finance impacts.

## 4.2.12.5 Public Facilities and Services

Because pipeline construction will not generate population impacts, and the pipeline will not be available for public facility use, it is anticipated that no significant public facility or service impacts will be generated.

## 4.2.12.6 Human, Health and Social Services

Because pipeline construction will not generate population impacts, it is not anticipated to generate human, health and social service impacts.

# 4.3 Alternatives to the Proposed Action

Potential alternatives to the proposed action include no-action, discharge to another surface water body, or the use of seepage cells. As described in Section 4.1, the no action alternative is not feasible. A discussion of the remaining alternatives and the reasons they are no longer being considered is provided in the following paragraphs.

## 4.3.1 Other Surface Water Discharge Locations

Other surface water bodies were considered in this alternatives analysis. The 1980's Crandon Project permitting documents identified Swamp Creek as the primary location for the discharge of treated project effluent. Other surface waters that were considered include: Little Sand Lake, Lake Metonga, Oconto River, Peshtigo River, Neptune Creek, Haymeadow Creek, Monico Creek, and Pelican River. A discussion of each of these locations follows.

## 4.3.1.1 Discharge to Swamp Creek

As with the preferred alternative, discharge to Swamp Creek would involve the construction of a pipeline from the plant site to the discharge point on Swamp Creek, a distance of approximately 6.1 miles. A feasible corridor would traverse mostly forested land, requiring the clearing of trees. As presented in the project's 1986 WDNR Final Environmental Impact Statement (FEIS) (WDNR, 1986), this pipeline would result in a temporary impact to approximately seven acres of wetland, 25 acres of northern hardwoods, and five acres of open agricultural lands. Impacts to both wetlands and the terrestrial ecosystem are similar in quantity to the preferred alternative and also would be temporary in nature. However, unlike the preferred alternative which follows existing disturbed ROW, much of this corridor would cross relatively undisturbed lands.

Unlike the preferred alternative, Swamp Creek is tributary to the Wolf River which has been designated as an Outstanding Water Resource (ORW). An advanced treatment process would be required to comply with the Wolf River's ORW status. In addition, the advanced treatment process would be costly and would result in the generation and disposal of additional solids removed during treatment. This alternative was dropped from further consideration for these reasons.

#### 4.3.1.2 Little Sand Lake

Little Sand Lake is less than one mile south of the project site and thus offers a potentially convenient surface water body for discharge. The lake discharges to a small stream, Creek 12-9, which is a part of the Wolf River watershed. The effluent limits for a Little Sand Lake discharge would require advanced treatment of the water similar to that described for Swamp Creek. Thus, Little Sand Lake was eliminated as a potential receiving water for the full discharge from the Crandon Project wastewater treatment process for the same reasons a discharge to Swamp Creek was eliminated.

#### 4.3.1.3 Lake Metonga

Lake Metonga falls into the same category as Little Sand Lake. Located approximately 2½ miles north, it is convenient to the site, but it also discharges to the Wolf River watershed. Given this fact, Lake Metonga was eliminated as a potential receiving water for the full discharge from the Crandon Project wastewater treatment process.

# 4.3.1.4 Oconto River, Peshtigo River, Neptune Creek, Haymeadow Creek, Monico Creek and Pelican River

As compared to the Wisconsin River, these streams are closer to the project site. The Oconto and Peshtigo Rivers are in the Great Lakes watershed. Neptune, Haymeadow, and Monico Creeks as well as the Pelican River are within the Mississippi River watershed. Each of these waters have very low background flow levels. The Pelican River, which is the largest of the four streams, has a ten year, seven day low flow  $(Q_{7,10})$  of 10 cfs. None of these water bodies have sufficient volume to support the proposed discharge.

## 4.3.2 Seepage Cells

Seepage cells were considered as a discharge alternative. Preliminary evaluations of five seepage cell sites in the vicinity of the plant site were completed. Two of the sites had preliminary indications that the soil types would be suitable for construction of seepage cells. For one of these locations, extensive excavation of upper soil strata would be required to expose underlying soils which possess the potential hydraulic characteristics required for a seepage cell system. It is uncertain whether seepage cells constructed on these two sites would have sufficient capacity to dispose of the treated effluent at the maximum expected rate of 1,200 gpm. If seepage cells were pursued, the area needed to accept the volume of generated wastewater would be between 80 to 150 acres or more. This would result in considerably greater impacts to the terrestrial ecosystem than the preferred alternative (i.e., the temporary disturbance of less than 36 acres for the preferred alternative compared to 80 to 150 acres or more for a seepage system). The likely lack of an area of sufficient size and the greater amount of surface disturbance associated with the seepage cell concept were the primary reasons this alternative was not pursued further.

## 4.3.3 Comparison of Discharge Alternatives

Potentially feasible alternatives include discharge to other water bodies and discharge to seepage cells. Of the surface water bodies evaluated, only Swamp Creek, Little Sand Lake and Lake Metonga have sufficient water volumes to possibly support the discharge. It would be impractical to discharge to the lakes due to the difficulty in achieving adequate mixing. Impacts associated with Swamp Creek are similar to those associated with the preferred alternative, however, unlike the preferred alternative much of the pipeline corridor to Swamp Creek traverses undisturbed habitat. Further, Swamp Creek and both lakes are tributary to the Wolf River, an Outstanding Resource Water. When compared to the preferred alternative, seepage cells would result in a two to three times greater impact to the terrestrial ecosystem.

## 4.3.4 Pipeline Routing Alternative

An analysis of alternative routes for a discharge pipeline to the Wisconsin River was conducted. As a result of this analysis, three potential primary routes were identified: 1) WisDOT highway ROW, 2) Wisconsin Central Limited Railroad property and 3) the ANR pipeline corridor. After a preliminary investigation, the ANR corridor was eliminated from consideration because ANR does not own the land through which its pipeline traverses and therefore could not provide land for CMC use.

A description of the Wisconsin Central Limited Railroad and USR 8 routes is presented below. As shown on Figure 3-5, both routes commence at the plant site, and terminate at a common

point at the intersection of USR 8 and River Bend Road, southeast of Rhinelander. From this point, three supplemental routes were evaluated to bring the pipeline from USR 8 to Hat Rapids Road. Hat Rapids Road crosses the Wisconsin River just a few hundred feet downstream of Hat Rapids Dam. These three supplemental routes are common to both the railroad route and the highway route alternatives.

#### 4.3.4.1 Wisconsin Central Limited Railroad Route

As shown on Figure 3-5, the Wisconsin Central Limited Railroad route begins at the Crandon Project site and follows the proposed railroad spur route toward the northeast to the mainline track approximately one-quarter mile south of Keith's Siding Road. The pipeline would then follow the mainline track north through Crandon, to a point approximately 1½ miles directly west of Argonne; then follow the railroad as it turns west entering Oneida County north of Atkins Lake and approximately 3¾ miles east of USR 45. The route continues west along the railroad through Starks to Lake Shore Drive. At this point the pipeline route leaves the railroad ROW and follows Lake Shore Drive south to CTH C, then southerly and southeast along CTH C to River Bend Road, then southwest on River Bend Road to USR 8.

#### 4.3.4.2 USR 8 Route

The highway route begins (Figure 3-5) at the Crandon Project site, follows the proposed site access road toward the northwest to STH 55 approximately one-half mile south of Airport Road, then north on STH 55 to CTH S, then north on CTH S to USR 8, then west on USR 8 to River Bend Road, southeast of Rhinelander.

## 4.3.4.3 Alternative Routes from USR 8 to Wisconsin River

#### Route 1

Route 1 begins (Figure 3-5) at the intersection of USR 8 and River Bend Road and follows River Bend Road south and west to CTH G. The route continues on CTH G northwest to Lassig Road, then south and west on Lassig Road to Hat Rapids Road at the intersection with STH 17, then west on Hat Rapids Road to the Wisconsin River where the pipeline discharges at the Hat Rapids Dam.

#### Route 2

Route 2 begins (Figure 3-5) at the intersection of USR 8 and River Bend Road, then follows USR 8 west to CTH G, then follows south on CTH G to Lassig Road, then south and west on Lassig Road to Hat Rapids Road at the intersection with STH 17, and finally west on Hat Rapids Road to the Wisconsin River where the pipeline discharges at the Hat Rapids Dam.

#### Route 3

Route 3 begins (Figure 3-5) at the intersection of USR 8 and River Bend Road and follows USR 8 west to STH 17, then south on STH 17 to Hat Rapids Road, and west on Hat Rapids Road to the Wisconsin River where the pipeline discharges at the Hat Rapids Dam.

#### 4.3.4.4 Evaluation Criteria

Available collected information was reviewed and a visual site survey of each potential pipeline route was performed to verify and determine existing conditions. Based on available information

and the visual site survey, data were generated about each potential pipeline route. These data are summarized in Table 4-4. The information is grouped by a series of evaluation criteria. The criteria relate to permitting requirements and/or to specific conditions relating to project impacts. A brief explanation of the evaluation criteria is presented below:

- Route distances are broken down by jurisdiction (e.g., railroad, U.S. and state highway, etc.) to provide an indication of what agency/owner has jurisdiction for each segment of the potential route, and for the length of the segment. A total distance for the two main routes and each of the three alternative routes is provided.
- Construction/maintenance access provides a general assessment of the ease of access. Ease of access will affect project impacts and project costs.
- Wetlands in the vicinity of the routes were identified based on a review of Wisconsin Wetland Inventory Maps, USGS maps and aerial photography.
- Rock outcrops and forested areas in the vicinity of the pipeline corridor were identified through a review of available maps, soil surveys, aerial photographs and observations made during the visual site survey.
- The number of waterway crossings were identified through a review of available maps and the visual site survey.
- The number of road crossings were identified from available maps and the site survey.
- Potential utility conflicts and residential areas were subjective determinations based on increased population or development density as compared to other areas of the potential routes. In both cases, increased care would be required during construction.
- Distance in national forest identifies the miles each respective route passes through the Nicolet National Forest.

Table 4-4
Summary of Data Collected for Potential Pipeline Routes

Evaluation Criteria	Railroad Route	Highway Route	Alternative Route 1	Alternative Route 2	Alternative Route 3	
Distance - railroads	32.3 miles	0 miles	0 miles	0 miles	0 miles	
Distance - U.S. & State highways	2.8 miles	21.7 miles	0 miles	3.0 miles	8.6 miles	
Distance - County Trunk highways	2.7 miles	3.4 miles	.5 miles	2.0 miles	0 miles	
Distance - Local roads	1.4 miles	0 miles	7.9 miles	6.2 miles	1.6 miles	
Distance - Mine Site access road	3.0 miles	3.0 miles	0 miles	0 miles	0 miles	
Total distance	42.2 miles	28.1 miles	8.4 miles	11.2 miles	10.2 miles	
Construction/Maintenance access	Poor along railroad	Good along entire road	Good to fair	Good to fair	Good along entire road	
Wetlands	13.2 miles	5.8 miles	0.8 miles	0.8 miles	1.2 miles	
Rock outcrop	None observed	None observed	None observed	None observed	None observed	
Forested Areas (Requires clearing)	18.8 miles	2.9 miles	3.2 miles	2.8 miles	1.4 miles	
Number of waterway crossings	16	. 8	5	4	. 2	
Number of Road Crossings	20	19	7	7	5	
Potential utility conflicts	Crandon & CTH "C"	Monico	Minimal	Minimal	Minimal	
Residential Areas	Crandon & CTH "C" & Lake Shore	Minimal	Minimal	Minimal	Minimal	
Distance in Nicolet National Forest	3.4 miles	0 miles	0 miles	0 miles	0 miles	

Prepared by: GEV Checked by: JWS

#### 4.3.4.5 Primary Route Alterative Evaluation

Table 4-4 shows that the distance of the railroad route is 14.1 miles longer than the highway route (42.2 miles versus 28.1 miles). Construction and maintenance access is better along the highway route than the railroad route. Wetland areas along the highway route are almost 2.3 times less (5.8 miles versus 13.2 miles for the railroad route). There are more than twice as many waterway crossings (16 versus 8) for the railroad. Additionally, more utilities would be encountered along the railroad route. The comparison shows that the highway route is the best choice for the discharge pipeline corridor from the plant site access road to USR 8 at River Bend Road.

#### 4.3.4.6 Alternative Route Evaluation

To complete a comparative evaluation of alternative Routes 1, 2 and 3, a list of the major items from Table 4-4 was prepared with the three alternative routes ranked against each other for each item. The ranked alternative routes were assigned values of 1, 2 or 3, where 1 is the most desirable, and 3 is the least desirable. Each evaluation item was weighted equally during the comparison. The comparison is illustrated in Table 4-5.

Table 4-5
Alternative Route Evaluation

	Alternate Route 1	Alternate Route 2	Alternate Route 3
Shortest Distance	. 1	3	. 2
WisDOT ROW	3	2	1
Best Construction/Maintenance Access	2	2	1
Least Amount of Wetlands	1	1	2
Least Amount of Site Clearing	3	2	1
Least Number of Waterway Crossings	3	2	1
Least Number of Road Crossings	2	2	1
Least Potential for Utility/Residential Area Conflict	_1_	_1_	_1_
Total Score	16	15	10

Prepared by: GEV Checked by: JWS

The above scoring system indicates that, based on the evaluation criteria listed in Table 4-4, Alternative Route 3 is the best alternative route for the discharge pipeline corridor from USR 8 to the Hat Rapids Dam.

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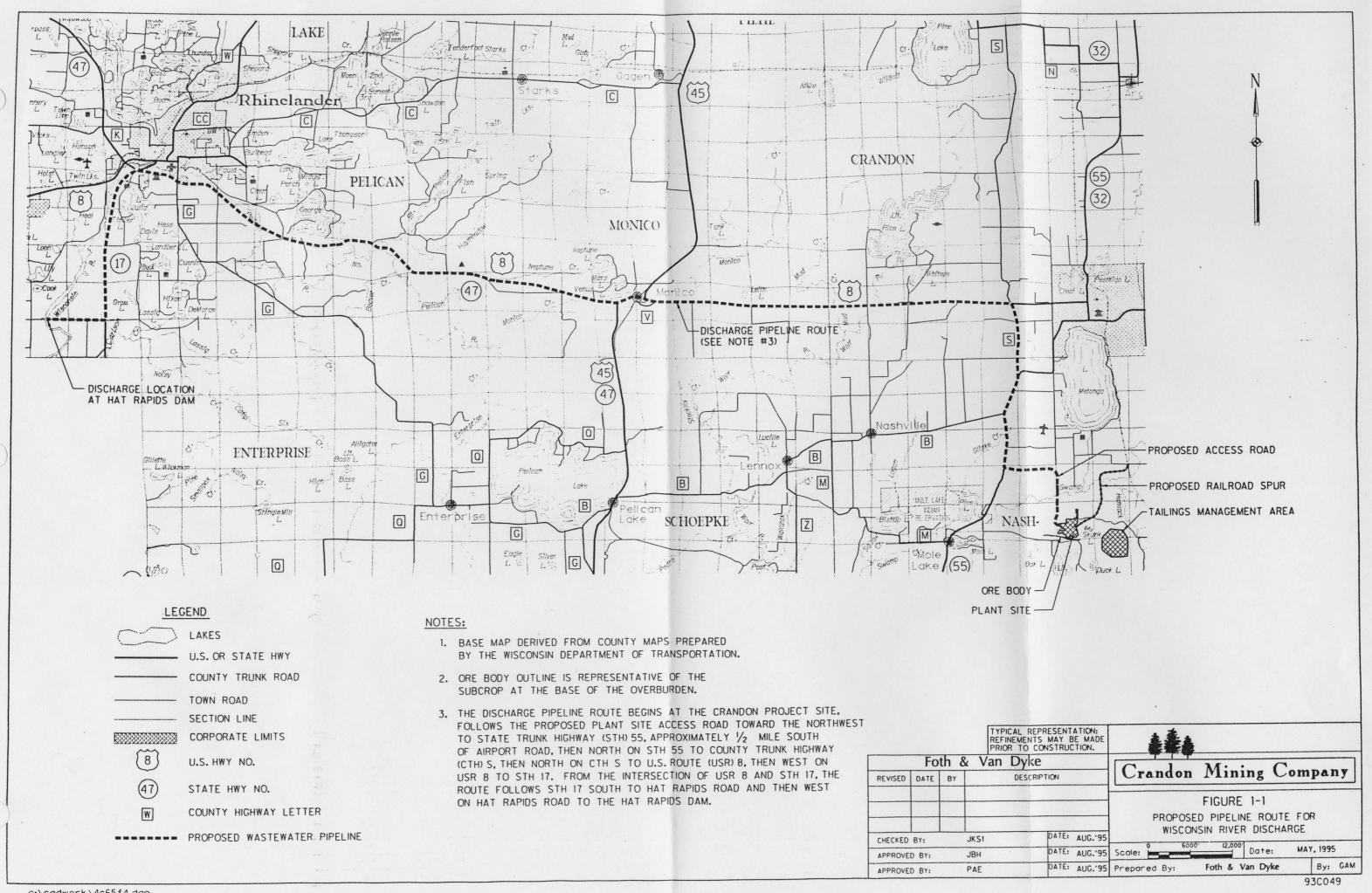
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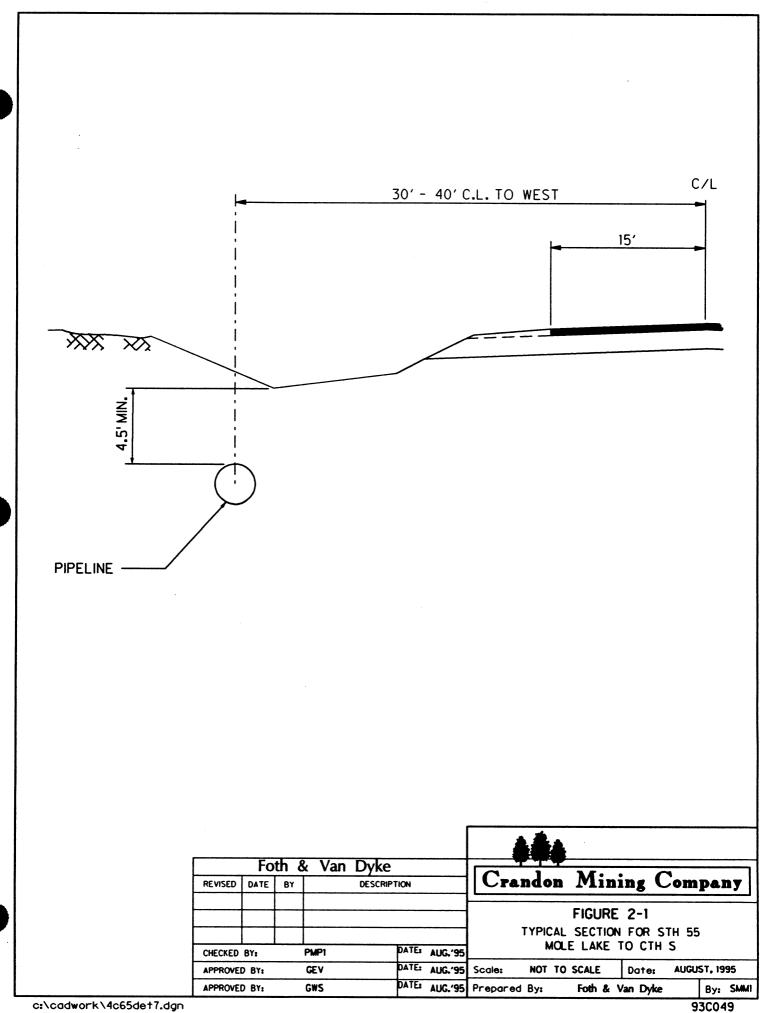
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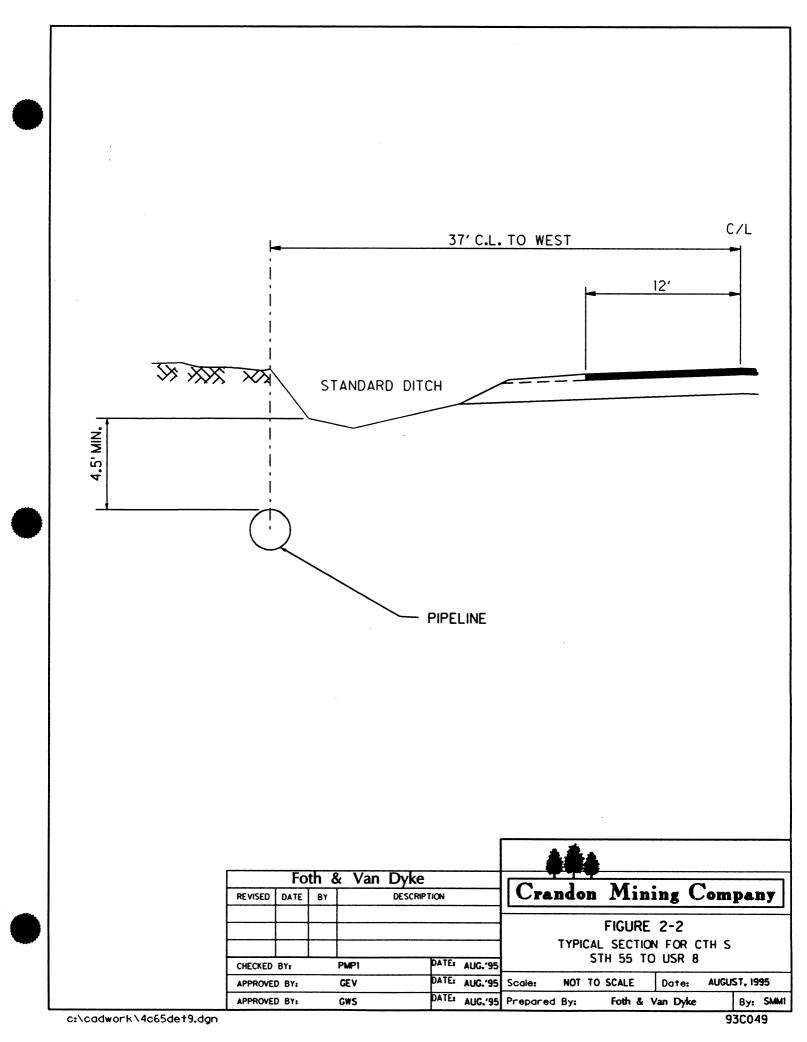
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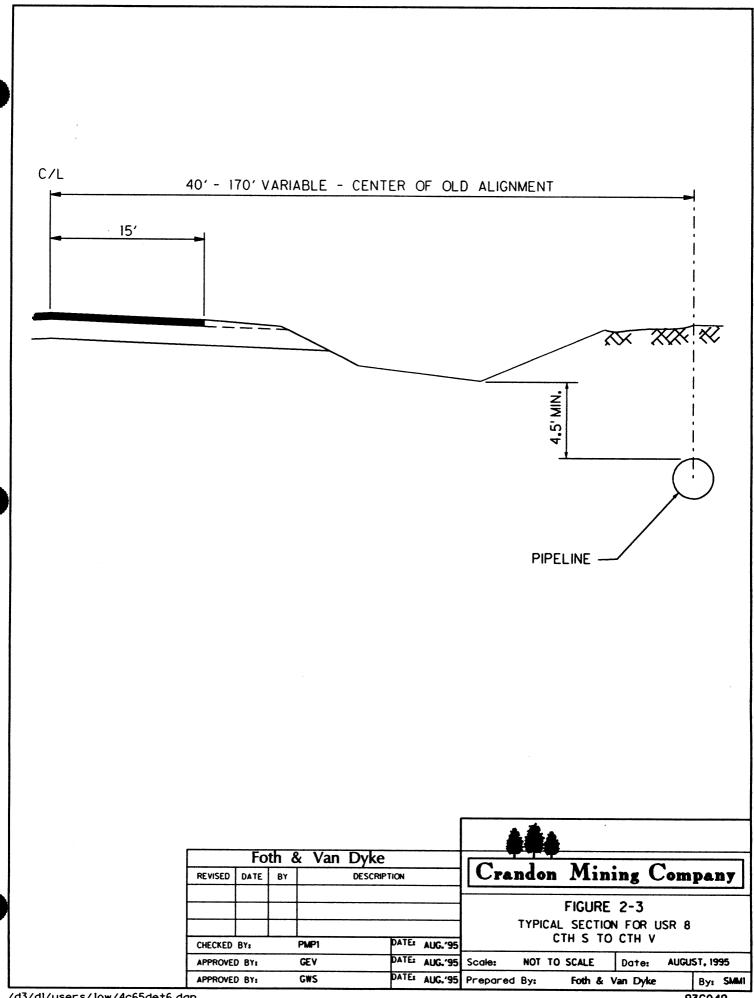
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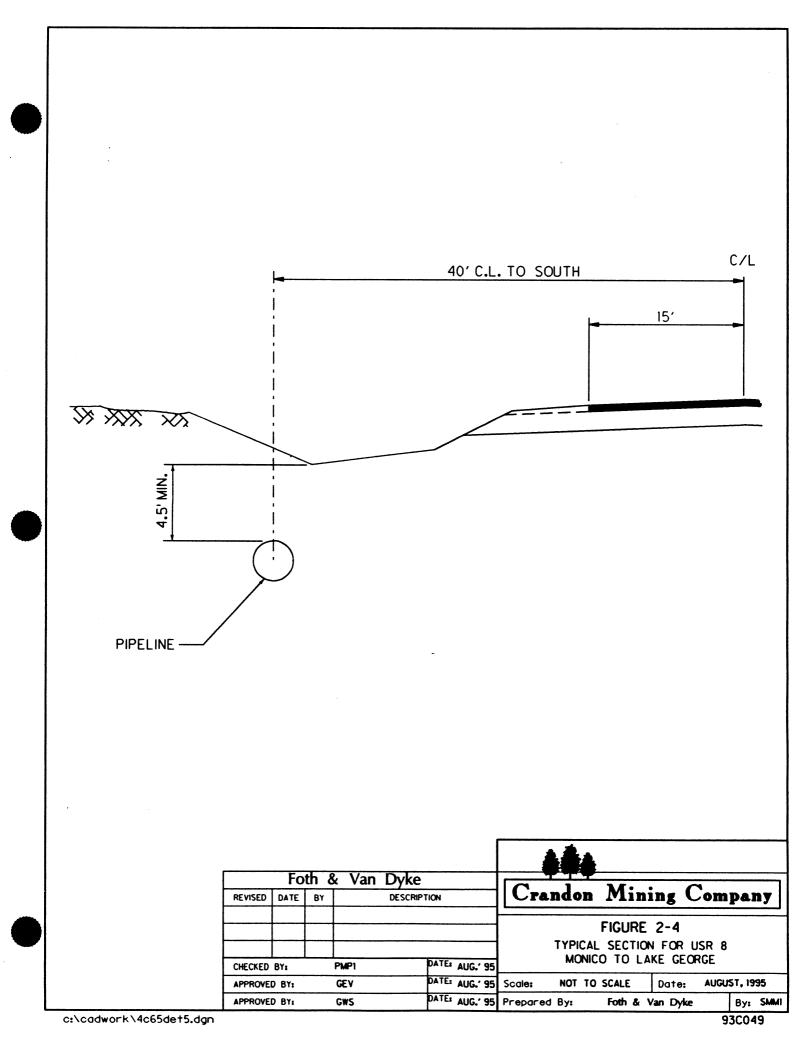
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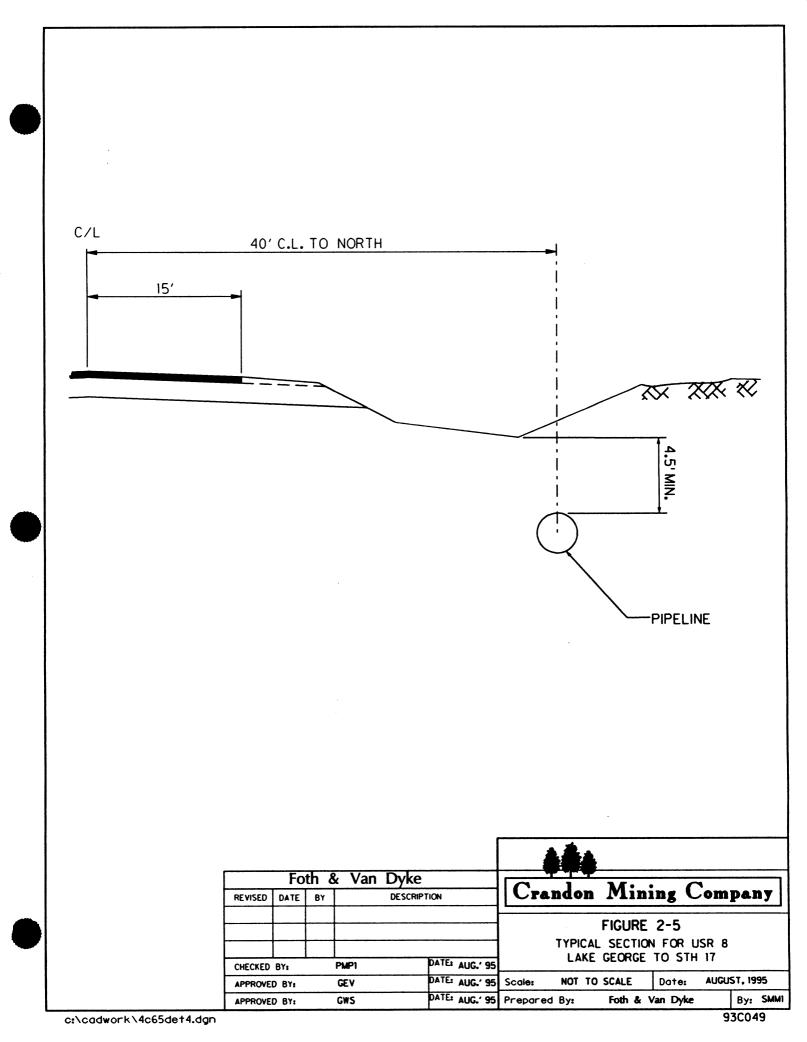


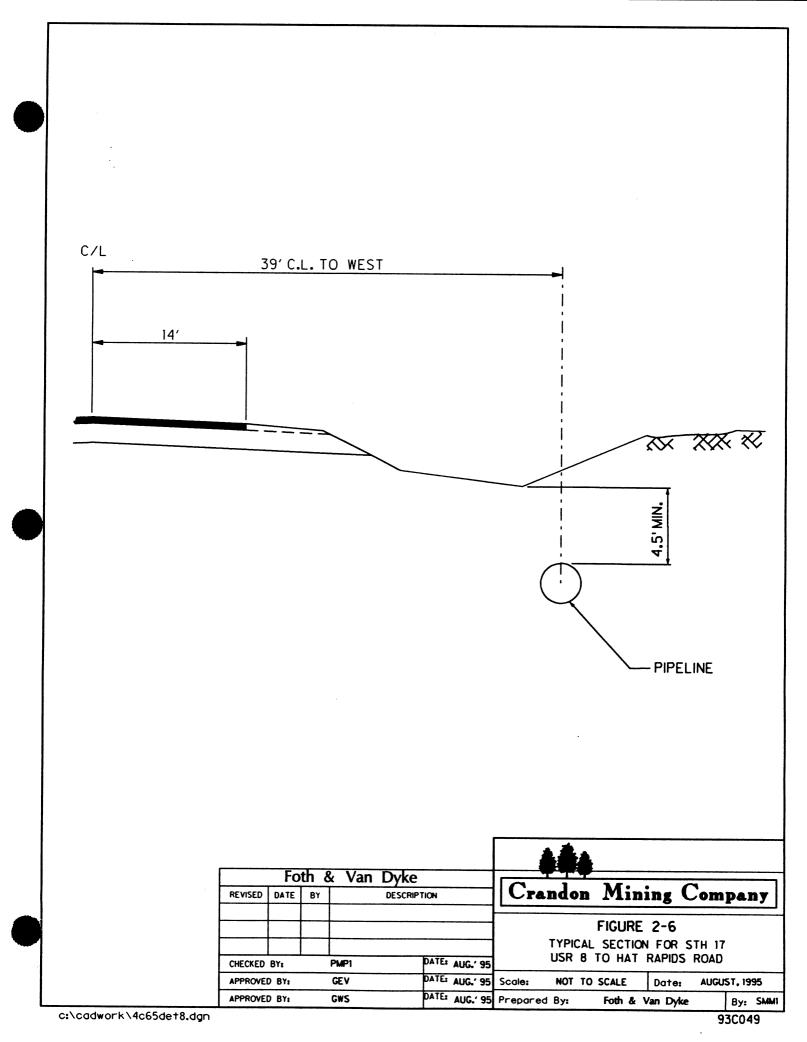


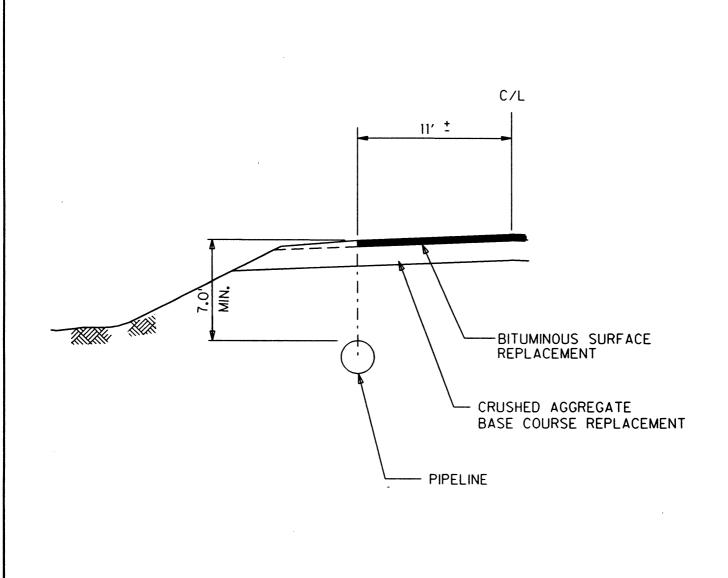












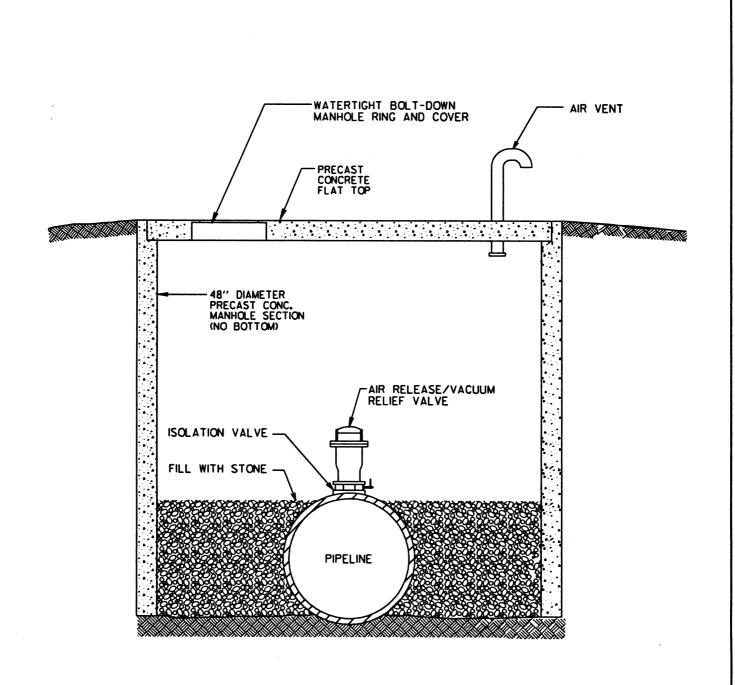
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# Crandon Mining Company

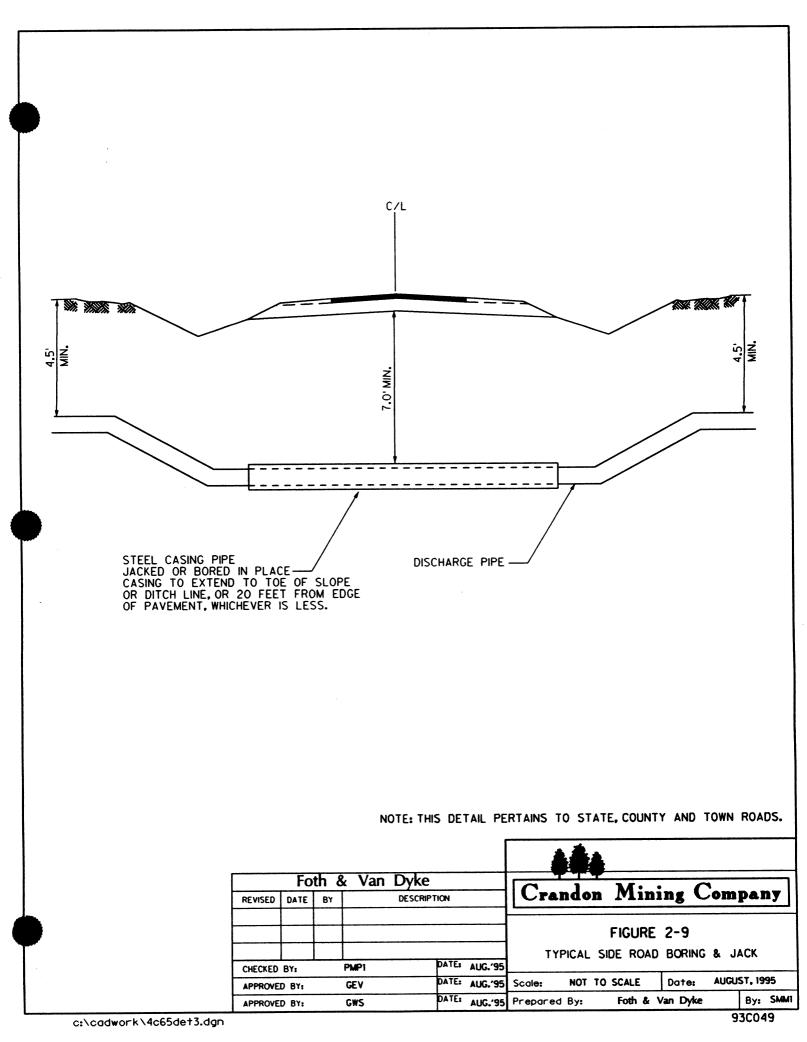
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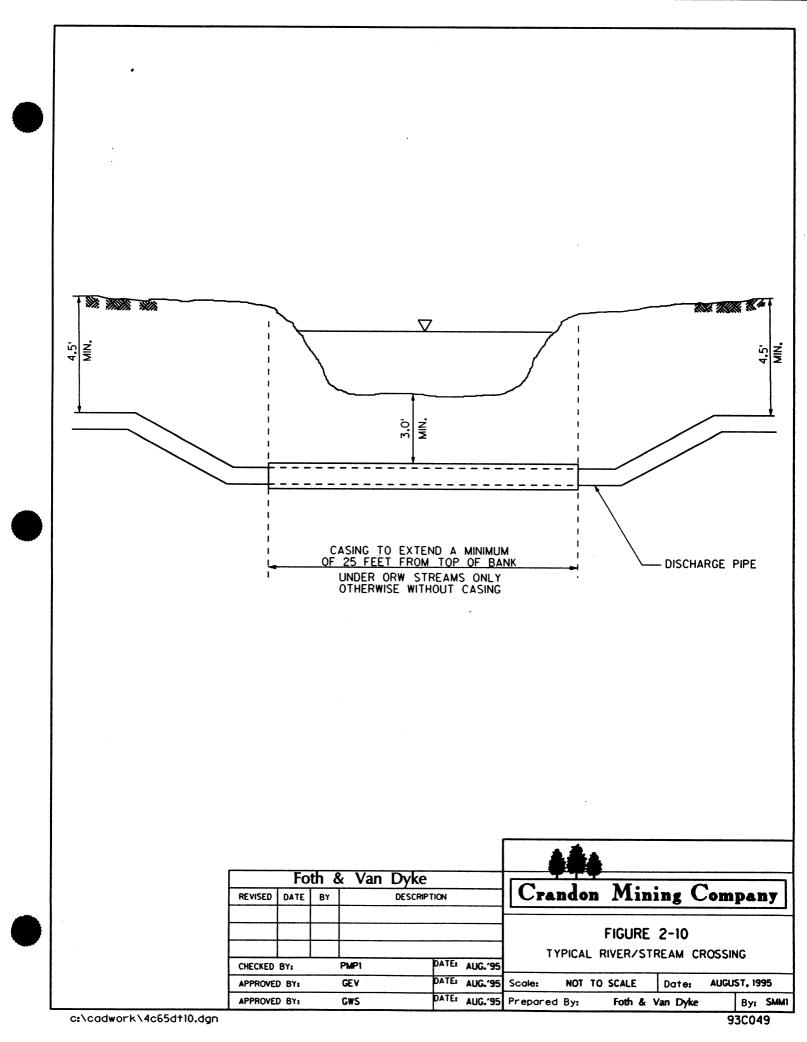
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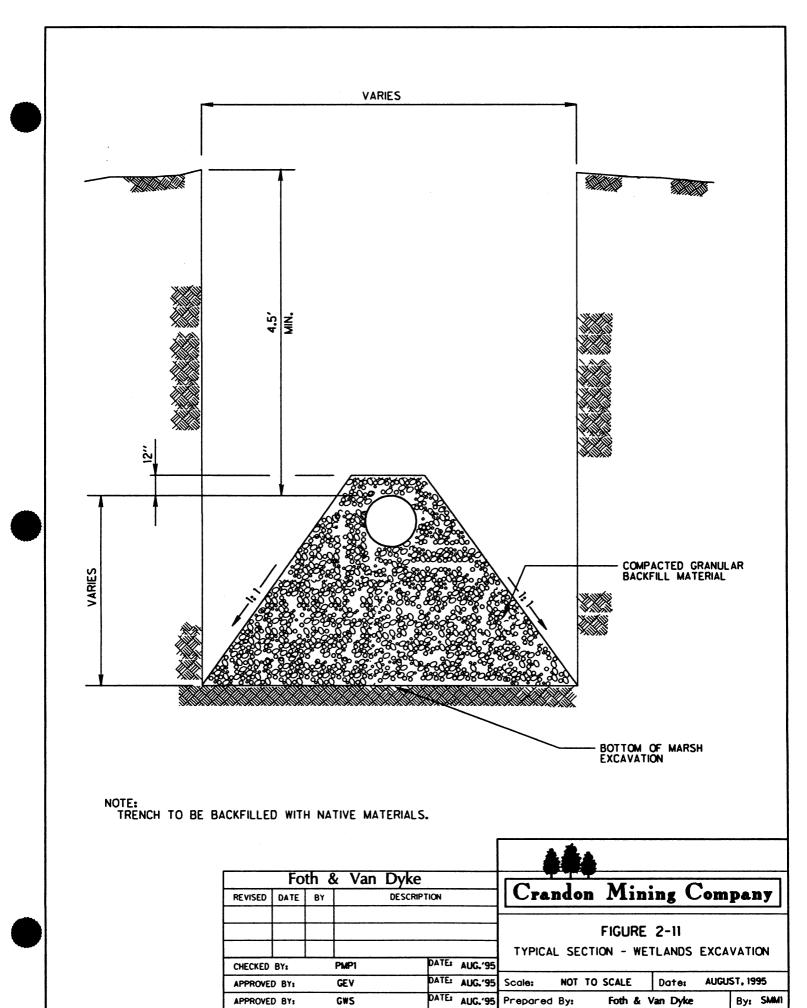
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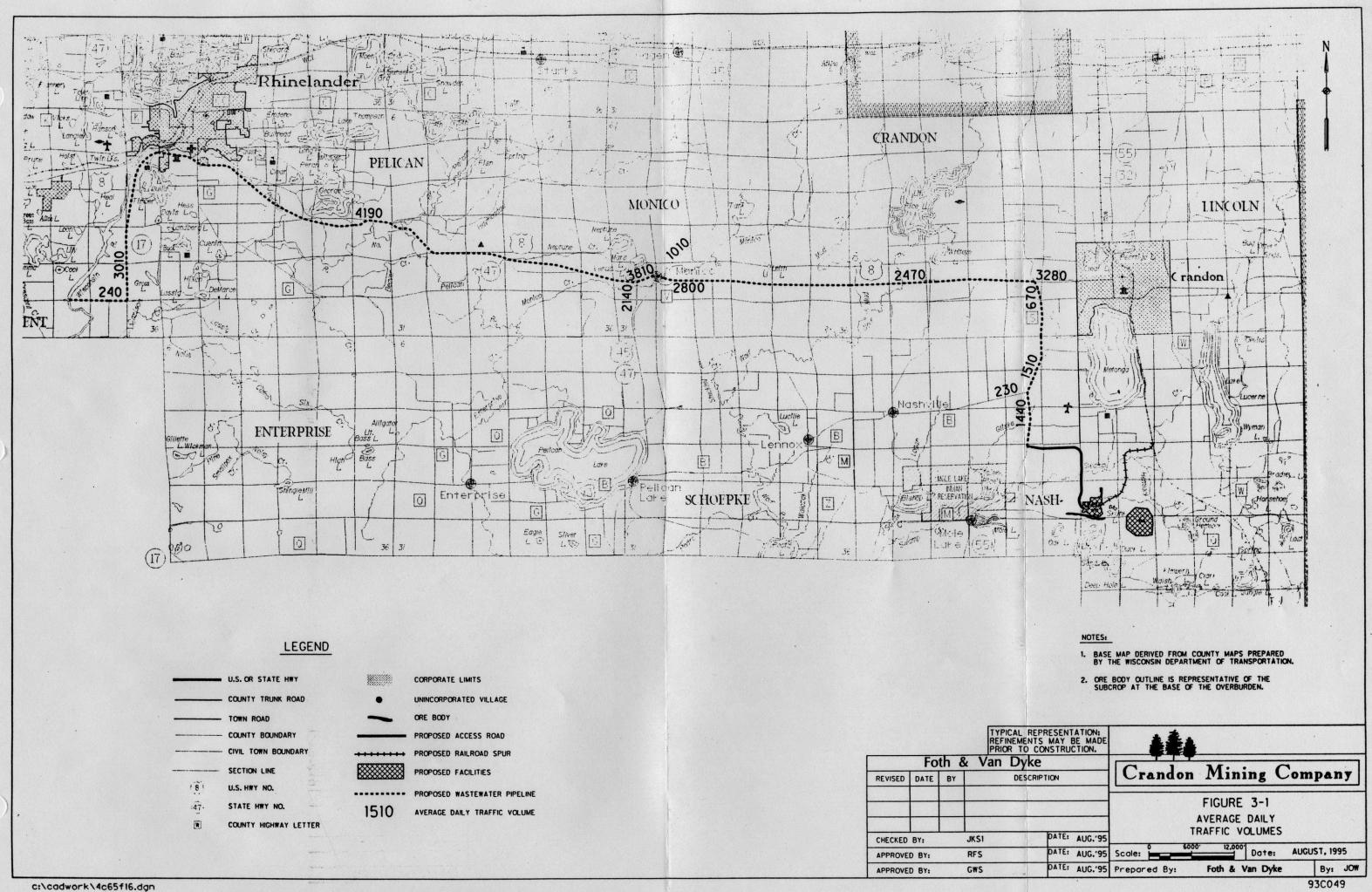
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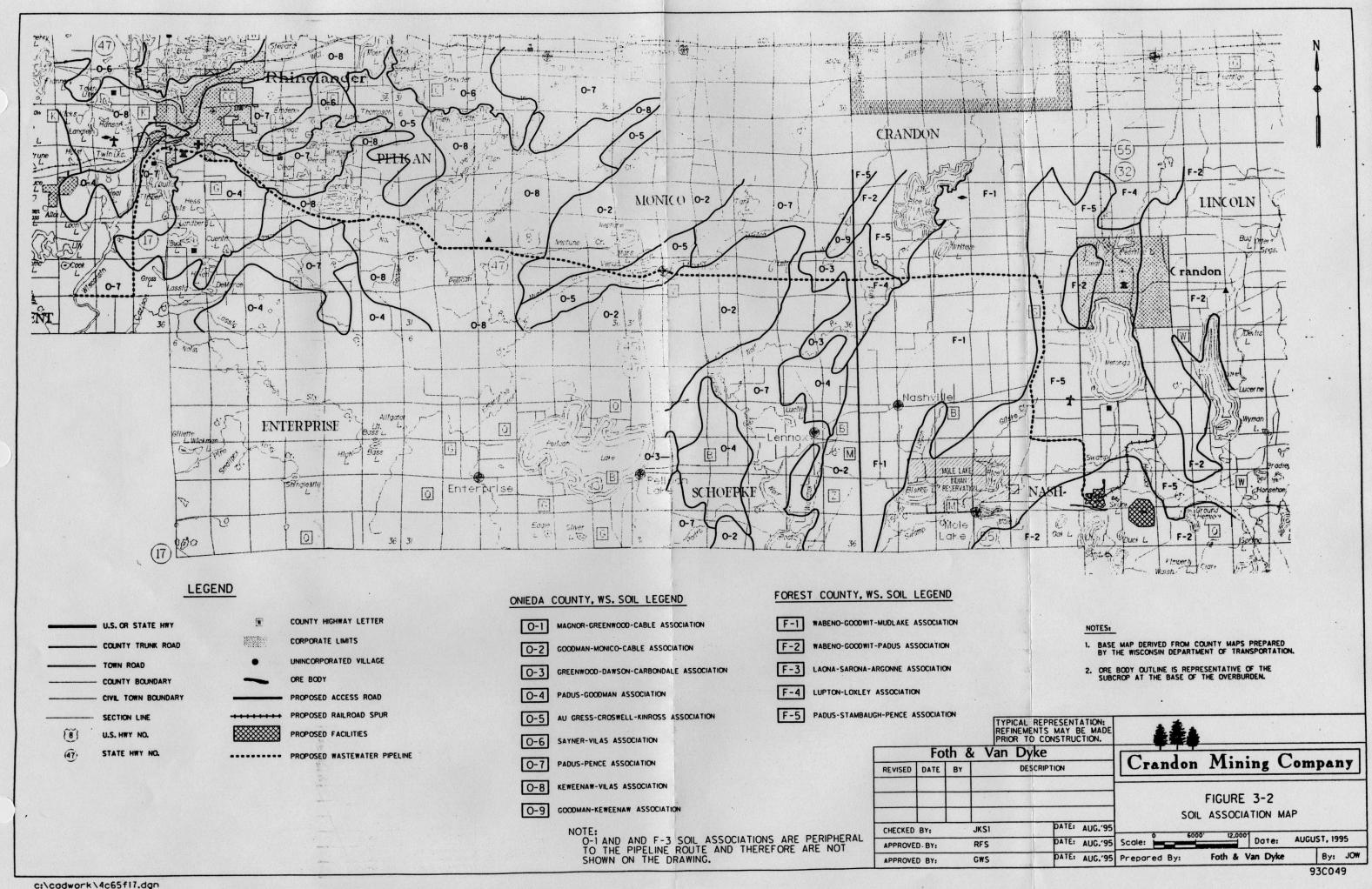
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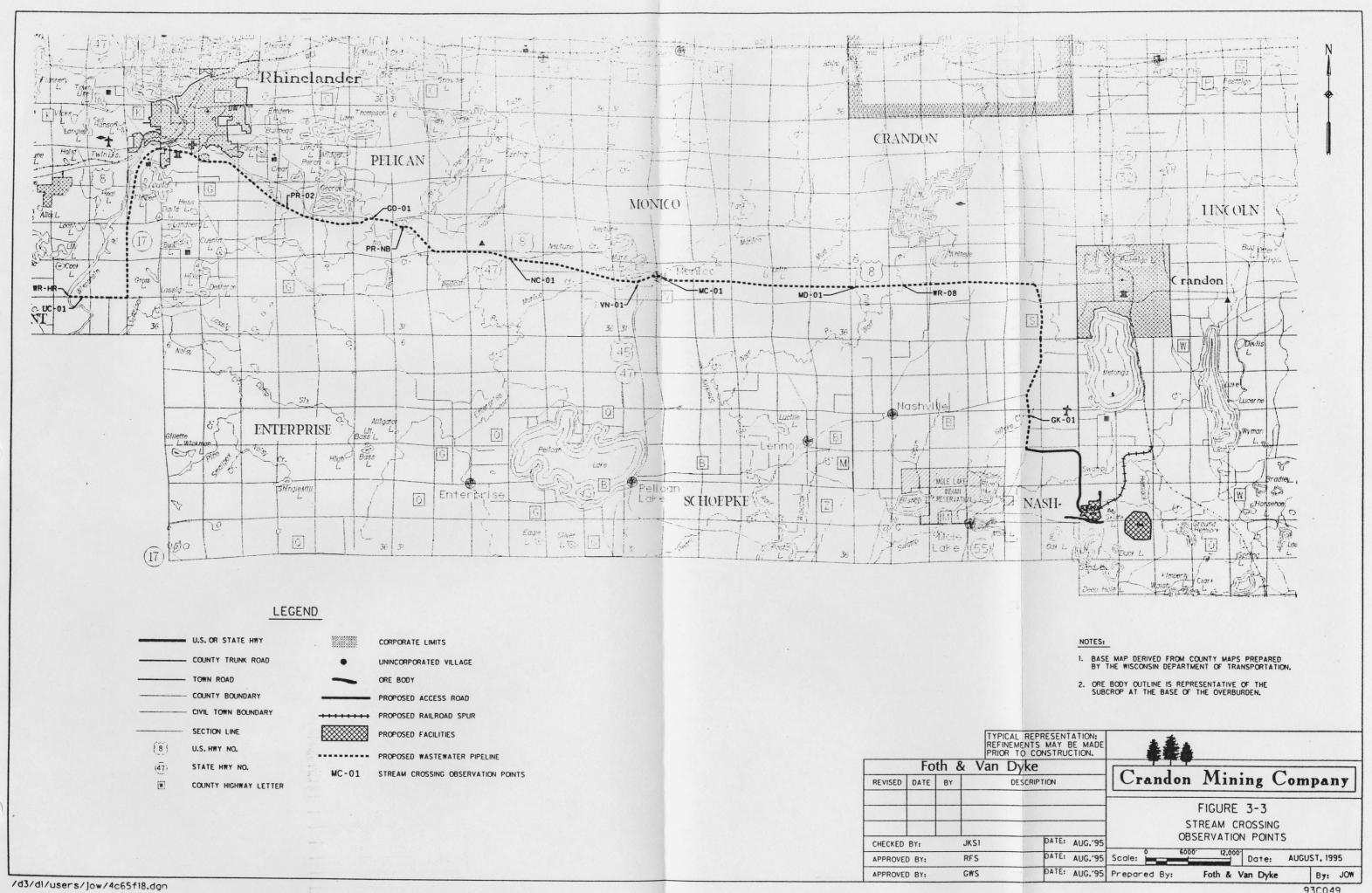
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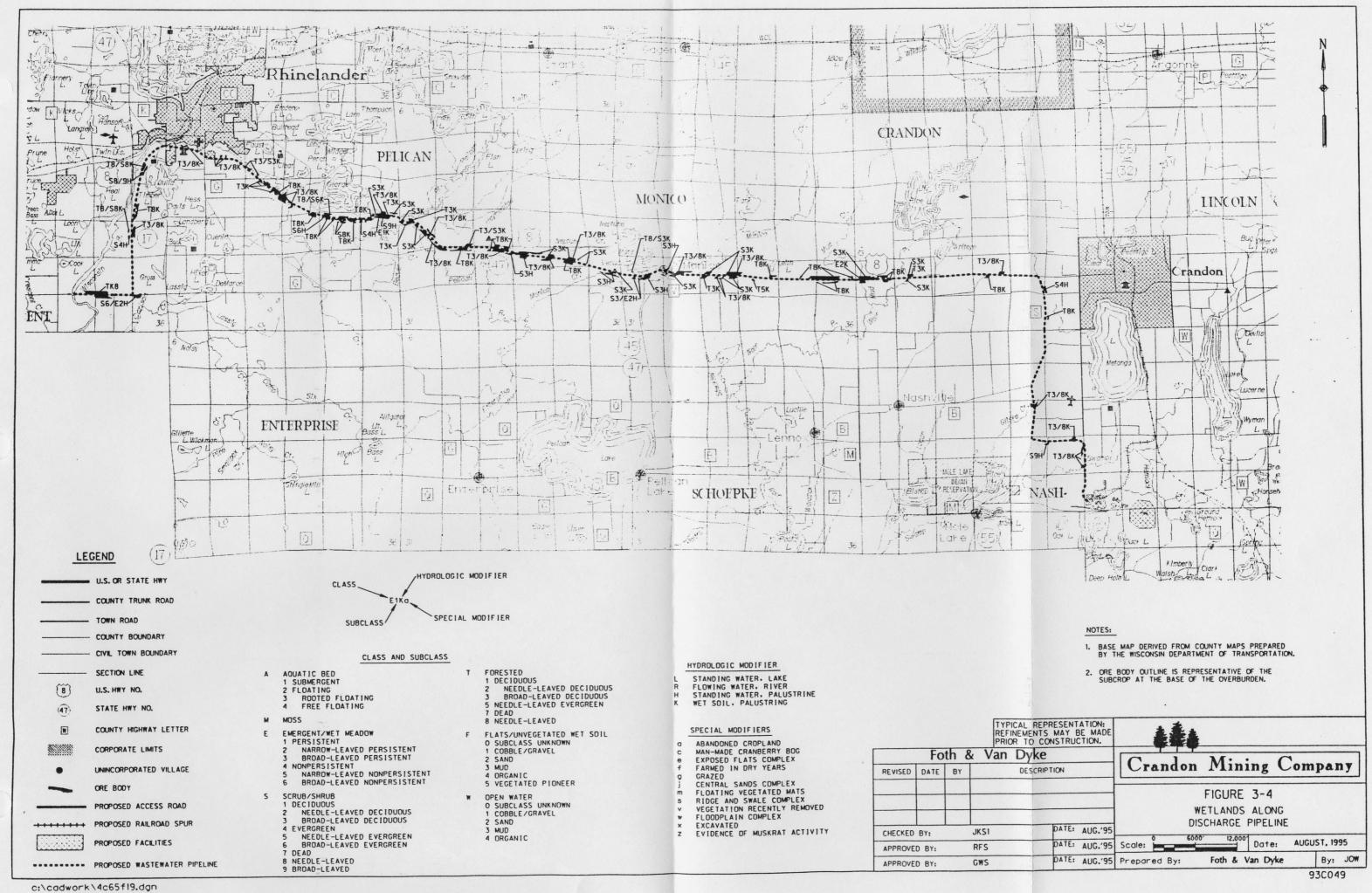
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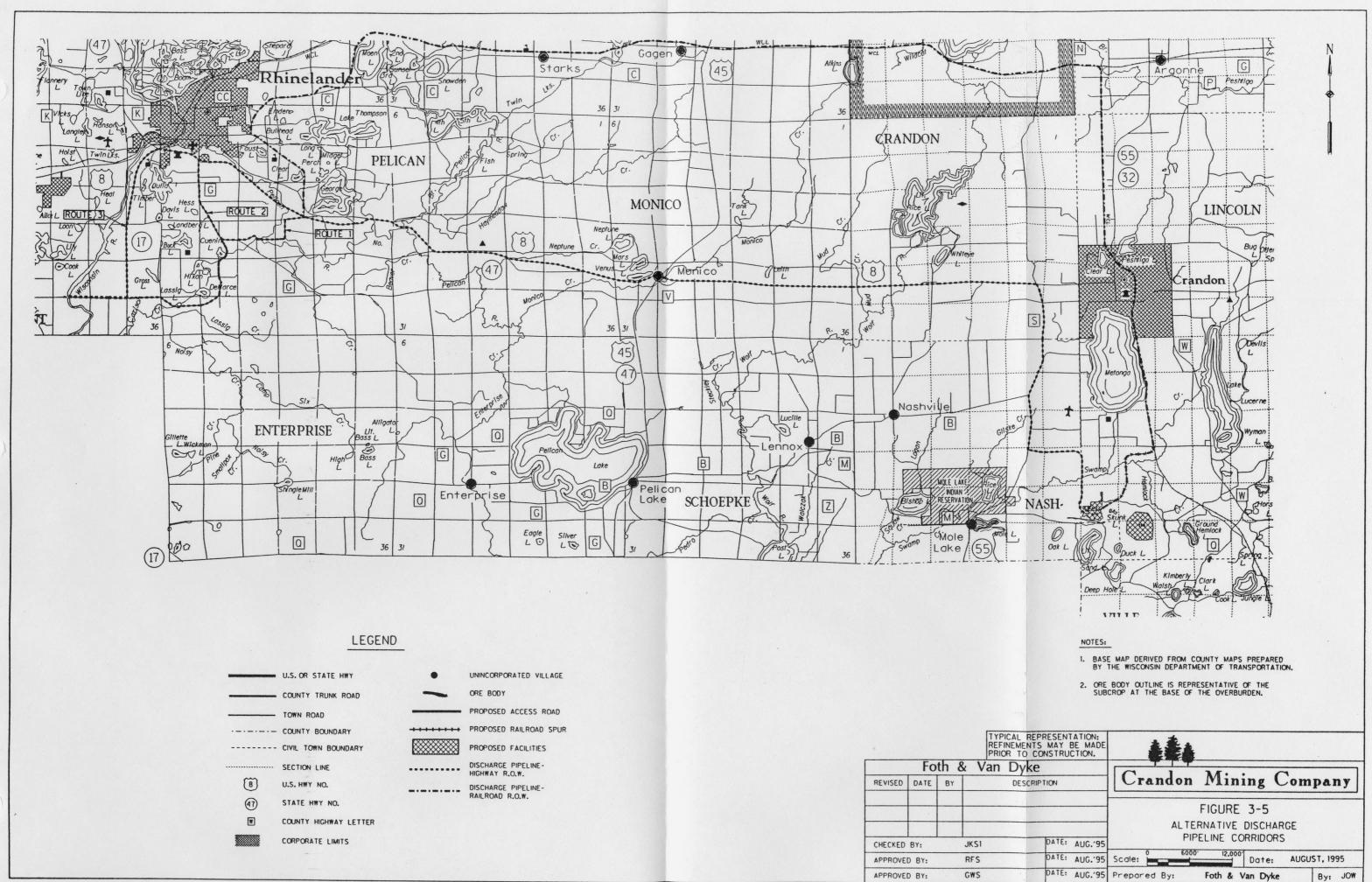
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# Appendix A

Historical/Archaeological Reconnaissance and Literature Review of the Wisconsin River Wastewater Discharge Pipeline Corridor Alternative, Forest and Oneida Counties, Wisconsin

# GREAT LAKES ARCHAEOLOGICAL RESEARCH CENTER TECHNICAL MEMORANDUM

DATE:

28 July 1995

TO:

Jerry Sevick, Foth & Van Dyke

CC:

Don Moe, Crandon Mining Company

FR:

John D. Richards, Great Lakes Archaeological Research Center

RE: Crandon Project: Reconnaissance and Literature Review of the Wisconsin River Wastewater Discharge Pipeline Corridor Alternative, Forest and Oneida Counties, Wisconsin

#### 1.0 Introduction

Great Lakes Archaeological Research Center, Inc. (GLARC) was asked by Foth and Van Dyke to conduct an archival and literature search in conjunction with a visual reconnaissance of the route of a proposed discharge pipeline extending to the Wisconsin River from the wastewater treatment facility at the Crandon Project site. The proposed alignment is restricted to existing highway and/or snowmobile trail right-of-way. The proposed route alignment is shown in figure 1.

The proposed construction easement is currently designed to coincide with: (1) the previously surveyed right-of-way of the Crandon Project's site access road (2) various existing state and county highway right-of-way; and (3) existing right-of-way coincident with the alignment of a snowmobile trail which parallels the northern half of the existing USH 8 right-of-way from CTH S to CTH V.

The route originates at the Crandon Project site in Forest County and follows the previously surveyed right-of-way of the North Access Road to the intersection of the North Access Road and STH 55. At this point, the proposed route follows the STH 55 right-of-way north to the intersection of STH 55 and CTH S. The route continues north along the CTH S right-of-way to the CTH S and USH 8

intersection. From this point, the project route follows the existing right-of-way of a snowmobile trail which is wholly coincident with portions of the USH 8 right-of-way west to the intersection of USH 8 and CTH V. At this intersection, the route continues west within the USH 8 right-of-way to the city of Rhinelander in Oneida County, Wisconsin. From Rhinelander, three alternate routes extend south and east coincident with existing highway right-of-way to intersect with the Wisconsin River and discharge below the Hat Rapids Dam. Accordingly, GLARC implemented a visual inspection of all affected highway and snowmobile trail right-of-ways in order to determine: (1) the degree of ground alteration; and (2) the potential of each to harbor achaeological deposits. A literature search was also completed in order to inventory previously reported burial sites and archaeological sites within one mile of the project route.

#### 2.0 Summary of Available Information

Previous cultural resource investigations pertinent to the proposed route include surveys of intermittent sections of STH 55 (SHPO Compliance No. 88-1328), the USH 8 Rhinelander Bypass, and adjacent areas (Salzer and Birmingham 1977; Overstreet and Brazeau 1982; and Overstreet 1983a and 1983b). Also cogent is an overview by Richards (1994). Additional archival sources reviewed are listed in Appendix A.

## 3.0 Description of Project Area(s)

## 3.1 Project Route

The total length of the proposed USH 8 pipeline route is approximately 38 miles. The total length of the surveyed area is about 47 miles. The project area is located in Forest and Oneida counties which lie within the physiographic province known as the Northern Highlands as described by Martin (1965). The local terrain is dominated by glacial deposits. These deposits occur in the form of drumlinized ground moraine in the eastern portion of the project area within the Wolf River drainage basin, and pitted outwash plains which are more prominent in the

western project area within the Wisconsin River drainage basin. The relative youth of the landscape is evident in numerous swamps and lakes which reflect a poorly developed drainage system. Original vegetation as mapped by Finley (1976) was a mixed coniferous-hardwood forest with varying dominant tree species occurring in discrete communities. The route traverses four such communities: (1) hemlock, yellow birch, white pine, and red pine forest (2) white pine and red pine forest, (3) aspen, white birch, and pine forest, and (4) swamp conifer forests with white cedar, black spruce, tamarack, and hemlock. Minor areas of sedge meadow also occur in open lowland settings. The components of these original forest communities have been greatly altered by logging activities.

#### 4.0 Methodology

#### 4.1 Archival and Literature Search

Great Lakes Archaeological Research Center, Inc.'s pre-field research entailed a comprehensive review of the data housed at Great Lakes Archaeological Research Center, Inc. and at Madison, Wisconsin. Archives and serial file systems were also searched for site-specific information. Published literature sources consulted include: The Wisconsin Archeologist, a quarterly journal published since 1901; The Wisconsin Magazine of History, the journal of the State Historical Society of Wisconsin; The Wisconsin Historical Collections consisting of 20 volumes published between the years 1903 and 1920; and the Bulletin of the Public Museum of the City of Milwaukee, several of which detail archaeological investigations conducted in various Wisconsin localities.

Unpublished sources subjected to scrutiny are represented by four different formats: 1) serial entry files; 2) map files; 3) manuscript files; and 4) archaeological survey reports. Two serial file systems were consulted. The first of these is the Wisconsin Archaeological Site Inventory Files, housed at the Historic Preservation Division, State Historical Society of Wisconsin. This file consists of an inventory of previously reported archaeological sites from both historic and prehistoric times and provides information relating to site locations, cultural affiliation, artifacts, and literature sources. The second file consulted is the

Great Lakes Archaeological Research Center, Inc.

Historic Preservation Division inventory file also housed at the Historic Preservation Division, State Historical Society of Wisconsin. This file includes both archaeological sites and standing structures that have been identified as possessing architectural and/or historical significance.

Several map files were reviewed. They include: 1) The Charles E. Brown Archaeological Atlas; 2) the Government Land Office survey records; 3) the Trygg map files; and 4) local plat and deed maps. The Charles E. Brown Archaeological Atlas provides the locations of sites on county plat maps. The prehistoric and historic sites include camps, villages, mounds, springs, rock art, workshops, quarries, cemeteries, trails and various other types of archaeological manifestations reported to Brown during his long tenure as Secretary of the Wisconsin Archeological Society and as an employee of the State Historical Society of Wisconsin. The Government Land Office records consist of plats and survey notes that may provide information regarding presettlement vegetation, topography, and aquatic features, all important variables in determining potential site locations. In addition, dependent on the interests of individual land surveyors, cultural information such as the locations of Indian trails, camps and villages, maple sugar processing stations ("sugar bushes"), pioneer settlements, and early industrial improvements such as mills, roads, and early homes and farmsteads are frequently noted on these maps. Both map files are housed at the Archives Division, State Historical Society of Wisconsin and the latter is available on microfilm at various repositories.

The Trygg map file is a privately published composite of the GLO land survey records. While the Trygg maps are less detailed in scale than the GLO plats, the file is an important source for understanding the chronology and magnitude of regional development during the late historic period (ca. 1850). Finally, early plats and topographic maps were reviewed to assess historical settlement and development of the project environs.

Manuscript files investigated include the Charles E. Brown manuscript files and the State Archaeologist's county files. The former are housed at the Archives

Division and the latter at the Museum Division, State Historical Society of Wisconsin. The Brown manuscripts consist of 50 years of notes, correspondence, sketches, maps, and other data relating to historic and prehistoric archaeological sites. The county files include reports (unpublished), photographs, sketch maps, letters, and information derived from the Museum's highway archaeology program.

# 4.2 Field Investigations

Archaeological survey methods employed during the present reconnaissance of the proposed Wisconsin River wastewater discharge pipeline route were restricted to simple visual inspection. This technique is commonly employed to provide an initial assessment of a project area. Attempts are made to identify those portions of the project area not surveyable by conventional means.

In the present instance the entire route was subjected to visual inspection. A drive-by reconnaissance was conducted noting topography, ground cover, and the degree of alteration of existing highway right-of-way. The route was divided into 21 survey segments beginning at STH 55 one half mile south of Airport Road in Forest County and ending at Hat Rapids Road at the Wisconsin River in Oneida County (figure 2). The portion of the proposed route which extends from the Crandon Project Plant site to intersect with STH 55 (CTH S) was not subjected to visual reconnaissance. This segment is coincident with previously surveyed right-of-way associated with the proposed North Access Road (Overstreet 1983a).

#### 5.0 Survey Results

#### 5.1 Archival and Literature Research

Background information pertinent to the proposed Wisconsin River wastewater discharge pipeline route indicates that no previously reported prehistoric or historic period archaeological sites are coincident with the route. In addition, no reported burial sites are within the project right-of-way. Previously reported sites within one mile of the proposed route include 15 archaeological sites and six burial sites. These sites are inventoried in tables 1 and 2. Site locations are plotted in figure 2.

TABLE 1
PREVIOUSLY REPORTED ARCHAEOLOGICAL SITES
WITHIN ONE MILE OF THE PROJECT AREA.

Site #	Site Name	Description	Location
Fr-0152	Sokaogon Chippewa Housing Authority I	Late Woodland/Middle Woodland campsite/village	T35N,R12E SE,SW,SW,SW,SW Sec. 23 Mole Lake Quad
Fr-0271	Locus # 4856	Historic Euro-American/near logging road remnant	T35N,R12E SE,NE,NE Sec. 25 Mole Lake Quad
Fr-0119	Titus	Unknown prehistoric campsite/village, cemetery/burial	T35N,R12E SE,NW,NW & SW,NE,NW Sec. 26 Mole Lake Quad
Fr-0144	Skunk Lake Structure and Midden	Unknown Historic cabin/ homestead	T35N,R13E SE,SE,NW,SE Sec. 30 Mole Lake Quad
Fr-0150	Plant Site Midden and Structure	Unknown Historic cabin/ homestead	T35N,R13E SW,NW,SW Sec. 30 Mole Lake Quad
Fr-0658	Locus 5854	Historic Euro-American sugar bush	T35N,R13E SW,SE,SW,SW Sec. 30 Mole Lake Quad

# TABLE 1 (CONCLUDED)

Site #	Site Name	Description	Location
Fr-0185	Schallock	Historic Euro-American cabin/ homestead	T36N,R12E SE,SE,SE,NE Sec. 36 Crandon Quad
On-0237	McDermott Site	Historic Euro-American cabin/ homestead	T36N,R8E SE,NE,NE Sec. 11 Rhinelander Quad
On-0249	Denny Nordquist Site	Historic Indian/Woodland campsite/village	T36N,R8E SW,NE,NW,NW Sec. 26 Lake Julia Quad
On-0030	Pelican River	Unknown Campsite/Village	T36N,R9E S1/2,SW,SE,SW,SW Sec. 6 N1/2,NE,NW,NW Sec. 7 Rhinelander Quad
On-0031	Koszarek	Late Woodland campsite/village	T36N,R9E NW,NE,SE Sec. 14 George Lake Quad
On-0247	St. Germain Homestead and Cemetery	Historic Indian cabin/ homestead, cemetery	T36N,R9E NE,SE,NE & NW,SE,NE Sec. 18 Lake Julia Quad
On-0032	Harris	Unknown campsite/village	T36N,R9E SE,NE Sec. 24 George Lake Quad
On-0095	Pelican Lake Foundation	Recent Historic Euro- American cabin/homestead	T36N,R10E SE,SE,SE Sec. 18 George Lake Quad
On-0057	Hubbard	Unknown cache/pit/hearth	T36N,R9E SE,SW,SW Sec. 5 Rhinelander Quad

TABLE 2
PREVIOUSLY REPORTED BURIAL SITES WITHIN ONE MILE OF THE PROJECT AREA.

PREVIOU	PREVIOUSLY REPORTED BURIAL SITES WITHIN ONE MILE OF THE PROPERTY.						
Site #	Site Name	Description	Location				
BFr-0026	Titus Burial Site	unknown	T35N,R12E SE,NW,NW & SW,NE,NW Sec. 26 Mole Lake Quad				
BFr-0006	Crandon Cemetery	unknown	T36N,R12E SE,NE,NE Sec. 35 Crandon Quad				
BOn-0009	St. Mary's Cemetery	unknown	T36N,R9E SW,NW,SW & NW,SW,SW Sec. 4 Rhinelander Quad				
BOn-0037	St. Germain Homestead and Cemetery	Chippewa/Ojibwa family cemetery	T36N,R9E NE,SE,NE & NW,SE,NE Sec. 18 Lake Julia Quad				
BOn-0036	St. Germain Homestead and Cemetery	Chippewa/Ojibwa family cemetery	T36N,R9E NE,SE,NE & NW,SE,NE Sec. 18 Lake Julia Quad				
BOn-0042	Forest Home Cemetery	unknown	T36N,R9E SE,SW & W,SW,SW,SE Sec. 5 & NW,NW,NE Sec. 8 Rhinelander Quad				

Prehistoric archaeological sites within a one mile radius of the project route include Woodland period campsites (Fr-152, On-249, On-31), unknown prehistoric campsites (Fr-119, On-30, On-32), and a cache of prehistoric copper implements (On-57). Historic period sites include Euro-American, Historic Indian, or unknown historic homesteads (Fr-271, Fr-144, Fr-150, FR-185, On-237, On-247, On-95), in addition to Fr-658, a sugar bush, a documented locus for tapping sugar maple trees.

Burial sites include the Titus Burial site (BFr-26), the Crandon Cemetery (BFr-6), St. Mary's Cemetery (BOn-9), Forest Home Cemetery (BOn-42), and the St. Germain Homestead and Cemetery (On-247/BOn-36/BOn-37). The St. Germain Homestead and Cemetery site is the site of a nineteenth century Chippewa family homestead and cemetery situated approximately 150 m west of the proposed pipeline route. The family name was St. Germain. No descriptions are available for the remaining cemeteries.

# 5.2 Survey Segment Descriptions

# 5.2.1 Segment 1 (Plant site to STH 55)

Segment 1 is 3.5 miles in length originating at the Crandon Mining Company plant site. It continues cross country for three miles before joining STH 55 south of Airport Road in the Town of Nashville. The route continues north along STH 55. Segment 1 terminates at the Airport Road intersection. The route traverses an undulating pitted outwash plain with elevations ranging from 1,560 feet above mean sea level (famsl) to 1,620 famsl. The area is comprised of open fields to the east and second growth forest to the west along STH 55. The previously surveyed portion of the route is coincident with the alignment of the proposed North Access Road. This portion of the pipeline route crosses Swamp Creek north of the plant site, continues north, then turns due west within and adjacent to the Swamp Creek lowlands to intersect with STH 55.

No previously reported sites are present within or adjacent to the proposed route; however, the probability is high that prehistoric sites are present in the immediate area of the route given the proximity to waterways and adjacent lowlands. Nonetheless, the highway right-of-way is altered and the slope intercept is coincident with the highway right of way. No additional survey is recommended as long as the proposed pipeline construction is restricted to the existing right-of-way, and to the previously surveyed corridor of the off-road portion, from the plant site to STH 55.

#### 5.2.2 Segment 2 (STH 55)

Continuing north on STH-55, Segment 2 is one mile in length, commencing at the Airport Road intersection and ending at the CTH B intersection at Sherman Corners. With the exception of a narrow conifer swamp drained by Gliske Creek, the terrain is an undulating upland, with elevations ranging from 1,600 to 1,650 famsl, supporting a second growth forest of poplar, birch, and conifers.

No previously reported sites are present within or adjacent to the route although it is possible that sites are present given the proximity of the route to the headwaters of Gliske Creek. In any event, a previous archaeological survey of the Gliske Creek crossing (SHPO Compliance No. 88-1328) and another separate archaeological survey at Sherman Corners (SHPO Compliance No. 88-1328) did not encounter archaeological sites. The STH 55 right-of-way is altered and the slope intercept is coincident with the highway right-of-way. No additional survey is recommended if construction is restricted to the existing highway right-of-way.

# 5.2.3 Segment 3 (STH 55)

Segment 3 follows STH 55 from CTH B north to the CTH S intersection, a linear distance of one mile. The terrain is an undulating upland with elevations ranging from 1,650 to 1,680 famsl. Fallow agricultural land, some of which is planted in spruce, is characteristic of the southern portion. Land use in the north portion of

the segment is characterized by second growth maple forest with a sparse hemlock understory.

A previous archaeological survey of the northern portion of Segment 3 (SHPO Compliance No. 88-1328) did not locate any archaeological sites. Furthermore, no previously reported sites are present within or adjacent to the route. The potential for encountering sites in Segment 3 is moderate due to the proximity to Lake Metonga. Nonetheless, the STH 55 right-of-way is altered and the slope intercept is coincident with the highway right-of-way. Therefore no additional survey is recommended if construction is restricted to the existing highway right-of-way.

#### 5.2.3 **Segment 4 (CTH S)**

Continuing north on CTH S from the STH 55 intersection, Segment 4 terminates at USH 8, a linear distance of two miles. The terrain is an undulating upland with elevations ranging from 1,660 to 1,720 famsl and with small knolls along the south portion. Second growth forest abuts both sides of the right-of-way along the south portion with a new growth of poplar on the west side, and more diverse second growth on the east side. Approximately 0.6 miles north of Sherman Corners the route leaves Nashville Township to enter the Town of Crandon. The second growth forest gives way to fallow agricultural land interspersed with woodlots.

While no prehistoric sites have been reported adjacent to Segment 4, The Crandon Cemetery (BFr-0006) is situated directly west of the highway right-of-way. The potential for unreported archaeological sites in Segment 4 is high given the proximity to the headwaters of an unnamed stream draining into Lake Metonga. However, if construction is limited to the existing highway right-of-way no additional survey is recommended since the slope intercept is coincident with the right-of-way.

## 5.2.5 Segment 5 (USH 8/Snowmobile Trail)

Segment 5 originates at the intersection of CTH S and USH 8. The route is in the northern portion of the USH 8 right-of-way and extends due west a distance of 3.5 miles. This segment is restricted to a snowmobile trail which follows the abandoned route of Old USH 8. Segment 5 terminates within the Wolf Riverlowlands 0.1 mile east of the Wolf River channel. The route traverses a drumlinized upland landscape supporting a second growth forest of poplar, birch, and sparse hemlock on northeast-southwest trending elevations. Willow, red osier, sedges, and grasses occupy the interlying lowlands. Surface elevations range from 1,680 to 1,750 famsl. This portion of the route follows the right-of-way of a snowmobile trail coincident with the abandoned alignment of Old USH 8. Remnants of abandoned asphalt roadway are still visible in portions of this alignment. Much of the original USH 8 alignment appears to have been built on cut grades rather than filled roadbed. In addition, the northern boundary of the right-of-way is coincident with the right-of-way of an electric transmission line corridor.

No previously reported sites are present within 1.5 miles of the proposed route. This lacunae is likely due to a lack of formal survey, since the potential for prehistoric sites in the general area is extremely high due to the extensive lowlands and adjacent terrace settings at the outlet of Little Rice Lake. However, the snowmobile right-of-way has been heavily disturbed by use as a former highway alignment and current utilities corridor. No additional archaeological investigations are warranted as long as construction is confined to the snowmobile trail/Old USH 8 right-of-way

# 5.2.6 Segment 6 (USH 8/Snowmobile Trail)

Segment 6 is 0.2 miles in length commencing 0.1 mile east of the Wolf River. The segment ends 0.1 mile west of the Wolf River. Here, the snowmobile trail

alignment traverses a willow lowland (with elevations of 1,620 famsl) which rises west of the river to open agricultural land on an elevated terrace.

No previously reported sites are present, but, as with Segment 5, this is probably due to a lack of formal survey. The likelihood of either near surface, or deeply buried archaeological deposits within the general area is high considering the local depositional setting. Nonetheless, the snowmobile trail route is coincident with the heavily disturbed alignment of former USH 8 and no additional survey is recommended if construction is restricted to the snowmobile trail/Old USH 8 right-of-way.

#### 5.2.7 Segment 7 (USH 8/Snowmobile Trail)

This segment is coincident with an elevated terrace west of the Wolf River (approximately 1,620 famsl) traversed by the proposed route for a distance of 0.3 mile. The west terminus of the segment is at the Cole Road/USH 8 intersection, east of a conifer swamp. The route is flanked by existing USH 8 right-of-way to the south and existing utility corridor to the north.

No previously reported sites are present, although the terrace setting suggests that archaeological sites may be present in the general area. However, no additional survey is recommended if construction is restricted to the heavily disturbed and altered snowmobile trail/Old USH 8 right-of-way.

# 5.2.8 Segment 8 (USH 8/Snowmobile Trail)

Segment 8 continues due west following the snowmobile trail right-of-way and traversing the Wolf River-Mud Creek lowlands (at an elevation of approximately 1,610 famsl). This segment, one mile in length, originates at the Cole Road intersection and terminates at the Forest County line coincident with the east side of an elevated peninsula (ca. 1,620 famsl) which juts out into a black spruce lowland drained by Mud Creek. Open areas are populated by red osier and sedges.

The route is flanked by existing USH 8 right-of-way to the south and existing utility corridor to the north.

No previously reported sites are present; again, this is probably due to a lack of formal survey since the elevations flanking the lowland are suited for prehistoric habitation. Similarly, the lowlands should not be arbitrarily disregarded as unsuitable for habitation, since these settings may have been used as locations of seasonal extraction activities. Nonetheless, no additional survey is recommended if construction is restricted to the heavily disturbed and altered snowmobile trail/Old USH 8 right-of-way.

# 5.2.9 Segment 9 (USH 8/Snowmobile Trail)

Continuing due west on USH 8 for 5.0 miles, Segment 9 commences at the Forest-Oneida County line, enters the Town of Monico, and terminates at the intersection of USH 8 and CTH V east of Monico Creek. The route traverses a drumlinized landscape of northeast-southwest trending elevations and interlying swamplands. Vegetation is primarily black spruce, poplar, birch, and sedges in the lowlands and second growth poplar and conifers in the upland forest. Campbell's Training Center at the intersection of Slizenski Road occupies an area of open agricultural land. The route is flanked by existing USH 8 right-of-way to the south and existing utility corridor to the north.

No previously reported sites are present adjacent to Segment 9. The general area is considered to harbor potential for prehistoric site locations due to the presence of numerous swamps. However, no additional survey is recommended if construction is restricted to the heavily disturbed and altered snowmobile trail/Old USH 8 right-of-way.

## 5.2.10 Segment 10 (USH 8)

Continuing westward on USH 8, Segment 10 originates at the intersection of USH 8 and CTH V east of Monico, crosses Monico Creek, passes through Monico on the south side of Venus Lake, and terminates at the USH 8 and USH 45 intersection west of town. This is a distance of 1 mile. The road grade rises high above the Monico Creek floodplain before descending to grade in residential portions of Monico. Ditched roadsides are characteristic of this portion of Segment 10. Surface elevation on the floodplain is less than 1,600 ft. rising to 1,610 famsl in Monico as the route skirts the prominent south bank of Venus Lake. Lowland vegetation consists of willow, sedges, and Labrador tea.

While no previously reported sites are present, this absence is due to a lack of formal survey of the Venus Lake area. The potential is very high for prehistoric site locations in this area. However, the slope intercept is coincident with the highway right-of-way and unless construction should occur outside of the altered right-of-way, no additional survey is recommended. Due to the potential archaeological sensitivity of Segment 10 detailed project design sheets should be reviewed to determine the precise location of the construction easement in relation to the existing highway right-of-way.

# 5.2.11 Segment 11 (USH 8)

Segment 11 begins at the USH 8/USH 45 intersection west of Monico and continues west on USH 8 approximately seven miles. The segment terminates at the North Branch of the Pelican River. This segment originates in a residential area on the high south bank of Venus Lake. Westward the landscape is drumlinized ground moraine with northeast-southwest trending elevations supporting a maturing second growth, along with new growth forest consisting of hardwoods and conifers. The lowlands support black spruce (at an elevation ranging from 1,590 to

1,620 famsl). West of the Neptune Creek crossing in the Town of Pelican, the route traverses an outwash plain which is also supports second growth forest.

No previously reported sites are present within or adjacent to the existing USH 8 right-of-way. This is likely due to a lack of formal survey since the potential is high for prehistoric site locations. Locales which may be characterized as archaeologically sensitive include the area south of Venus Lake, the area adjacent to Neptune Creek, the North Branch of the Pelican River at its confluence with the Pelican River, and areas adjacent to local lowlands. South of Venus Lake the right-of-way is minimally altered by a shallow roadside ditch sometimes only 50 cm in depth. Archaeological deposits, if present, are likely preserved in this area. West of Venus Lake alteration of the right-of-way is complete; the slope intercept is coincident with the right-of-way. As stated in the summary of Segment 10, a detailed project design sheet of the Venus Lake area should be reviewed prior to planned construction.

# 5.2.12 Segment 12 (USH 8)

Continuing westward on USH 8, Segment 12 extends for a distance of six miles. This segment originates at the North Branch of the Pelican River, skirts the south side of George Lake, and terminates at the USH 8 /CTH G intersection. The route traverses a pitted outwash plain (with elevations ranging from 1,550 to 1,620 famsl) supporting a second growth forest of poplar, birch, and conifers on the upland areas, and black spruce in lowland areas. An unnamed outlet of George Lake crosses the USH 8 alignment approximately 0.7 miles west of the North Branch of the Pelican River. The Pelican River crossing is 3.2 miles west of the North Branch. Here, the 800 m wide Pelican River valley floor lies about 15 m below the upland plain.

Four previously reported sites are located within the Segment 12 literature search corridor, but well outside of the existing USH 8 right-of-way. Two Euro-American burial sites, including St. Mary's Cemetery (BOn-9) located 1.8 km north of Segment 12, and Forest Home Cemetery (BOn-42) located 1.2 km north of Segment

12. The third reported site, the Koszarek site (On-31), is a Late Woodland campsite situated on the east shore of George Lake. The fourth archaeological site is the Hubbard site (On-57), the reported location of a cache of prehistoric copper artifacts recovered from a garden on the east bank of the Pelican River.

The probability that archaeological sites are present is high for sites on lands adjacent to Segment 12. However, the slope intercept is coincident with the existing highway right-of-way, and no additional survey is recommended if construction is restricted to the altered right-of-way. If staging areas for boring operations associated with tunneling beneath waterways are located outside of the altered right-of-way, these areas should be subjected to archaeological survey.

## 5.2.13 Segment 13 (USH 8)

Continuing northwest on USH 8 for 1.3 miles, Segment 13 originates at the USH 8 /CTH G intersection and terminates at the intersection of USH 8 /STH 17 in the Town of Crescent. The route traverses a pitted outwash plain (with elevations ranging from 1,550 to 1,600 famsl) which supports a second growth forest south of the Pelican River-Wisconsin River confluence.

One prehistoric archaeological site (On-30) is located 500 m north of the Segment 13 right-of-way. There is little doubt that Segment 13 is an archaeologically sensitive area. However, a previous survey (Salzer 1977) of this portion the USH 8 alignment failed to identify any unreported site locations. In any case, the slope intercept is coincident with the existing highway right-of-way; and no additional survey is recommended if construction is restricted to the existing right-of-way.

# 5.2.14 Segment 14 (Route 3)

This segment originates at the USH 8 /STH 17 intersection and continues 4.35 miles southward along the STH 17 alignment parallel to the Wisconsin River. Segment 14 terminates at the intersection of Hat Rapids Road and STH 17. The

terrain is pitted outwash with knolls, swales, and river terraces supporting a mix of second growth poplar and spruce. Areas of Jack pine and black spruce are present in wet swales. Surface elevations range from 1,550 to 1,650 famsl. Minor areas of cleared land are present as well.

No previously reported archaeological sites are present within or adjacent to the existing STH 17 right-of-way. The nearest reported archaeological site, the Denny Nordquist site (On-249), inventoried as a Woodland and Historic Indian campsite is situated 1.4 km west of the proposed route on the southeast bank of the Wisconsin River. Nonetheless, the potential for the presence of unreported archaeological sites is very high in the surrounding area along the Wisconsin River. Within the project right-of-way, however, the slope intercept is coincident with the highway right-of-way and no additional survey is recommended if construction is restricted to the altered right-of-way.

# 5.2.15 Segment 15 (Route 3)

At the Hat Rapids Road/STH 17 intersection the proposed route follows Hat Rapids Road 1.8 miles due west to the planned discharge station at the Wisconsin River. Segment 15 terminates on the summit of the west terrace of the Wisconsin River. The terrain is pitted outwash plain with knolls and swales and river terraces. The land supports a second growth forest of white pine and Jack pine on upland areas, and black spruce in the lowlands. Surface elevations range from less than 1,520 to 1,610 famsl. Forested land is interspersed with open agricultural land in upland areas.

No previously reported sites have been inventoried adjacent to Segment 15 even though the Wisconsin River crossing was subjected to formal survey in the past (Salzer 1977). The potential is nonetheless quite high for unreported prehistoric sites to be present on lands adjacent to Hat Rapids Road. However, the slope intercept is coincident with the highway right-of-way and no additional survey is recommended if construction is restricted to the altered right-of-way.

# 5.2.16 Segment 16 (Route 2)

Originating at the intersection of Lassig Road and STH 17, Segment 16 follows Lassig Road for 0.95 miles east to the intersection of Range Line Road. The terrain is a pitted outwash plain consisting of knolls and swales (with elevations ranging from 1,590 to 1,610 famsl) supporting new growth poplar and sparse white pine.

No previously reported sites occur near the route although the potential is high for unreported sites to be present in the immediate area. The slope intercept extends approximately four meters on either side of the road. If construction is restricted to the existing altered right-of-way, no additional archaeology survey is recommended.

# 5.2.17 Segment 17 (Route 2)

Continuing eastward along Lassig Road in the Town of Pelican, the 1.8 mile segment traverses a pitted outwash plain, crosses Carlson Creek, and leaves a new growth forest of poplar and white spruce to enter open agricultural land. A tamarack swamp borders Lassig Lake. Open land is present north of the road, and forest borders the south side of the road east of Sugar Bush Road. Surface elevations range from 1,560 to 1,610 famsl. Segment 17 terminates at the Lassig Road /CTH EZ Road intersection.

No previously reported sites are present although the potential for unreported archaeological sites to be present is high due to the numerous kettle lakes and streams characteristic of this portion of the project area. The existing slope intercept is coincident with the highway right-of-way. Therefore, no additional survey is recommended if construction is restricted to the altered right-of-way.

# 5.2.18 Segment 18 (Route 2)

Continuing north along Lassig Road from the Lassig Road /CTH EZ intersection, the route traverses an outwash plain (with elevations ranging from 1,555 to 1,580 famsl) for a distance of 1.6 miles. Segment 18 terminates at the Lassig Road /CTH G intersection. The route skirts the southeast side of Cuennin Lake and crosses Cuennin Creek approaching the north terminus. A second growth forest of poplar, red pine, and birch is interspersed with open agricultural land.

No previously reported sites are present within or adjacent to the existing right-of-way; however the potential is high for unreported archaeological sites to be present in this area of lakes, swamps, and connecting streams. The existing slope intercept is coincident with the right-of-way, extending for approximately four meters on either side of the highway. Therefore, no additional survey is recommended if construction is restricted to the altered right-of-way.

# 5.2.19 Segment 19 (Route 1)

Segment 19 continues east along CTH G and terminates 0.45 miles eastward at the CTH G and Germond Road intersection. The terrain is a pitted outwash plain (with elevations ranging from 1,580 to 1,620 famsl) supporting a second growth forest of white pine, birch, and poplar.

No previously reported sites are present within or adjacent to the existing highway right-of-way although the potential for unreported archaeological sites to be present in the immediate vicinity is high given the close proximity to swamps, kettle lakes, and streams. However, the slope intercept is coincident with the right-of-way. Therefore, no additional survey is recommended if construction is restricted to the altered right-of-way.

# 5.2.20 Segment 20 (Route 1)

From the CTH G and Germond Road intersection, the route follows Germond Road a short distance to River Bend Road. Segment 20 then follows River Bend Road eastward to USH 8, a distance of 2.5 miles. The terrain is pitted outwash plain (with elevations ranging from 1,550 to 1,580 famsl) supporting a second growth forest. Open areas are interspersed along the way. Cuennin Creek and the Pelican River are both crossed by Segment 20. River Bend Road also skirts the west edge of a swampland.

No previously reported sites are present within or adjacent to the existing highway right-of-way although the potential for unreported archaeological sites to be present is high due to the close proximity to the Pelican River, small streams, and local lowlands. However, the slope intercept is coincident with the existing right-of-way. Therefore, no additional survey is recommended if construction is restricted to the altered right-of-way.

# 5.2.21 Segment 21 (Route 2)

Commencing at the Lassig Road /CTH G intersection, Segment 21 traverses a pitted outwash plain (with elevations ranging from 1,580 to 1,630 famsl) northward to USH 8, a distance of two miles. Second growth forest of poplar, birch, and red pine is interspersed with fallow agricultural land and other open areas occupied by private residences and commercial buildings.

No previously reported archaeological sites are present within or directly adjacent to the existing CTH G right-of-way. The St. Germain Homestead and Cemetery site (On-247/BOn-37) is situated approximately 150 m west of the proposed route. Other unreported sites are likely given the close proximity to the Pelican and Wisconsin rivers and the interlying lowlands. However, the existing slope intercept is coincident with the highway right-of-way. Therefore, no additional survey is recommended if construction is restricted to the altered right-of-way.

## 6.0 Conclusions

Archival research indicates 15 previously reported archaeological sites and six burial sites are located within one mile of either side of the proposed wastewater discharge corridor. No reported site locations are coincident with the proposed right-of-way. However, portions of the project route are characterized by a generally elevated potential to harbor unreported archaeological sites. Alteration of highway right-of-way coincident with the proposed route is typically severe throughout the project area. A visual reconnaissance of the route suggests that the existing slope intercept is generally coincident with the limits of the existing highway right-of-way. An exception is the Venus Lake area at Monico within survey Segment 11, where USH 8 right-of-way alteration is minimal west of USH 45.

### 7.0 Recommendations

If the construction easement associated with development of the proposed wastewater discharge corridor is restricted to that portion of the existing right-of-way between the pavement and the limits of the existing slope intercept project development should have no effect on project area cultural resources. However, additional archaeological investigations may be warranted in any of the following three instances. Scenarios in which additional archaeological investigations may be warranted include: (1) construction easements extending beyond the existing slope intercept, (2) staging areas for underground borings at road intersections and waterways located beyond the existing slope intercept, and (3) pipeline excavation which penetrates below the existing slope intercept deposits.

Investigation is recommended at two locations since alteration of the existing right-of-way appears to be less severe than is typical of other portions of the proposed route. Hence, it is possible that undisturbed archaeological sites are present within the existing highway right-of-way in these locales. Locales where additional archaeological investigations may be warranted include the Mud Creek lowlands within Segment 8 and the eastern portion of Segment 10 west of

the USH 8/USH 45 intersection south of Venus Lake. These areas should be further investigated in order to determine the degree of prior disturbance since truncated archaeological deposits have been encountered within shallow roadside ditches elsewhere in Wiscinsin (Richards and Overstreet 1990).

Current conventional archaeological survey techniques are inadequate to determine the presence of deeply buried archaeological or paleontological deposits. In the event that archaeological or paleontological materials are encountered during the course of the project, all construction should be halted.

If archaeological or paleontological materials are encountered immediate consultation to insure compliance with (1) 36 CFR 800.11, The Regulations of the Advisory Council on Historic Preservation Governing the 106 Process; or (2) S. 44.40, Wis Stats, may be obtained by contacting:

The Compliance Section
Historic Preservation Division
State Historical Society of Wisconsin
Phone #: 608-262-2970

If human remains are encountered immediate consultation to insure compliance with S. 157.70, Wis Stats may be obtained by contacting:

The Burial Sites Preservation Office Historic Preservation Division State Historical Society of Wisconsin Phone #: 800-342-7834

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# Overstreet, David F., and Linda A. Brazeau

1982 Archaeological Inventory and Evaluation at Exxon Minerals Company, Crandon Project Site in Forest County and Langlade County, Wisconsin Great Lakes Archaeological Research Center Inc. Reports of Investigations No. 107.

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1994 Overview: Cultural Resource Investigations for the Crandon Mining Company Crandon Project, Crandon, Wisconsin. Great Lakes Archaeological Research Center, Inc., Reports of Investigations No. 360.

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1977 An Archaeological Survey of Two Highway Projects in Oneida County, Wisconsin. Beloit College.

# APPENDIX A

## ARCHIVAL SOURCES CONSULTED

# Bernsteen, Robert T.

1969 Atlas of the Eight Counties of Forest, Florence, Iron, Langlade, Lincoln, Oneida, Price, Vilas. State Historical Society of Wisconsin, Archives Division Call Number: D/GX902/B53/1969.

# Brown, Charles E.

1906 A Record of Wisconsin Antiquities. The Wisconsin Archeologist os 5(3-4): 289-429.

1908 Additions to the Record of Wisconsin Antiquities II. The Wisconsin Archeologist os 7(1): 1-33.

1909 Additions to the Record of Wisconsin Antiquities III. The Wisconsin Archeologist os 8(4): 113-138.

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1925 Additions to the Record of Wisconsin Antiquities. The Wisconsin Archeologist ns 4(1): 9-143.

Papers - Archaeology - Forest and Oneida Counties. State Historical Society of Wisconsin, Archives Division, Call Number: WIS/Mss/HB

n.d. Atlas

# Forest County Map Company

1900 Map of Forest County, Wisconsin. Published by the Forest County Map Company, Crandon, WI. State Historical Society of Wisconsin, Microforms Collections No. 92-1173.

## Government Land Office

Federal Land Survey Plat Book, Township 35N surveyed 1857 by Alfred MillaRoad State Historical Society of Wisconsin, Archives Division Call Number: Series 698

Federal Land Survey Plat Book, Township 36N Surveyed in 1839 and 1859 by H. C. Fellows and Wm E. Daugherty. State Historical Society of Wisconsin, Archives Division Call Number: Series 698

# Hixson Map Company

1924 Plat Book of Forest County. W.W. Hixson and Company, Rockford, IL.

1925? Plat Book of Oneida County. W.W. Hixson and Company, Rockford, IL.

# McGinley, B.

1919 Map of Forest County, Wisconsin, Map No. 2 Keith and Hiles Lumber Company. B. McGinley, Crandon, WI. State Historical Society of Wisconsin, Archives Division Call Number: GX9028/F71/1919/M

## Moody, F. B.

1910 Field Plat Book of the Northern Highlands of Wisconsin. Forest Management, Wisconsin Conservation Comm. State Historical Society of Wisconsin,, Archives Division Call Number: S/GZ902/1910.

## Rand McNally

1896 Map of Lincoln, Oneida, Villas and Parts of Iron, Price and Langlade Counties, Wisconsin. Rand McNally & Co., Chicago. State Historical Society of Wisconsin, Archives Division Call Number: GX9028/L73/1896/R

## Ritter, I. R.

1920 Map of Forest County, Wisconsin. I.R. Ritter, County Surveyor, Crandon, Wisconsin. State Historical Society of Wisconsin, Archives Division Call Number: GX9028/F71/1920/R

# Rockford Map Publishers

1958 Forest County Wisconsin Plat Book. Rockford Map Publishers, Rockford, IL.

# Shepard, E.S.

1908 Map of Forest County, WI. E.S. Shepard State Historical Society of Wisconsin, Archives Division Call Number: H/GX9028/F71/1908/S

# Great Lakes Archaeological Research Center, Inc.

## Star Map Service

1947 Plat Book of Oneida County, Wisconsin. Star Map Service, Milwaukee. State Historical Society of Wisconsin, Archives Division Call No. B/G1418/O5/P58/1947.

## Trygg, W. J.

nd Composite Map of U.S. Land Surveyors Original Plat & Field Notes. Wisconsin Sheets. State Historical Society of Wisconsin, Archives Division Call Number: H/GX89/T87/Folder 1.

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1908 Map of Oneida County, Wisconsin. State Historical Society of Wisconsin, Archives Division Call Number: GX9028/05/1908/0

# Wisconsin State Planning Board

nd Wisconsin Land Economic Inventory, Forest and Oneida Counties, Wisconsin. Box 2. State Historical Society of Wisconsin, Archives Division Call Number: Series 1958, 1959.

# **APPENDIX B**

MAPS

PROJECT LOCATION

SURVEY SEGMENTS AND SITE LOCATIONS

Figure 1

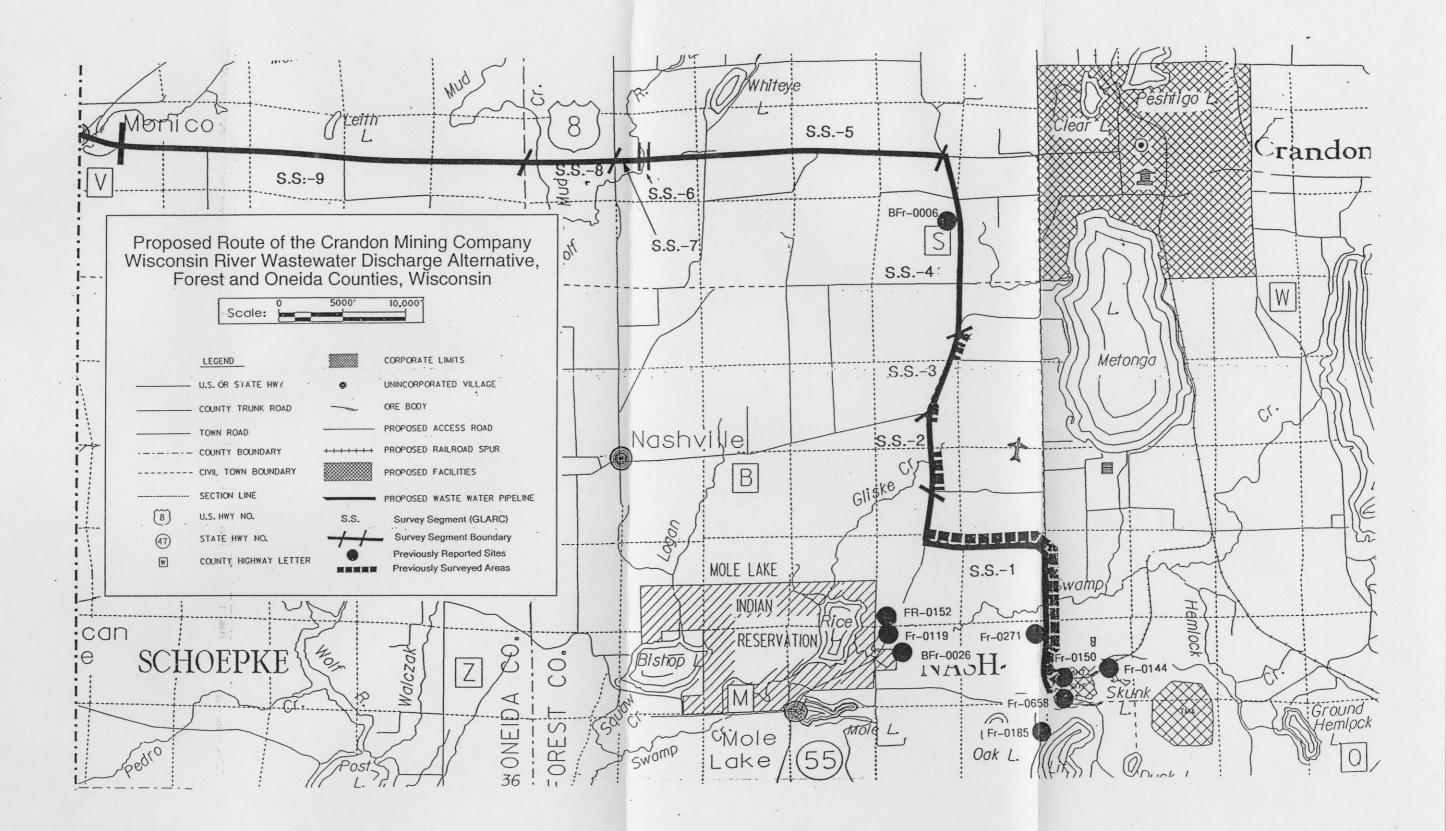


Figure 2

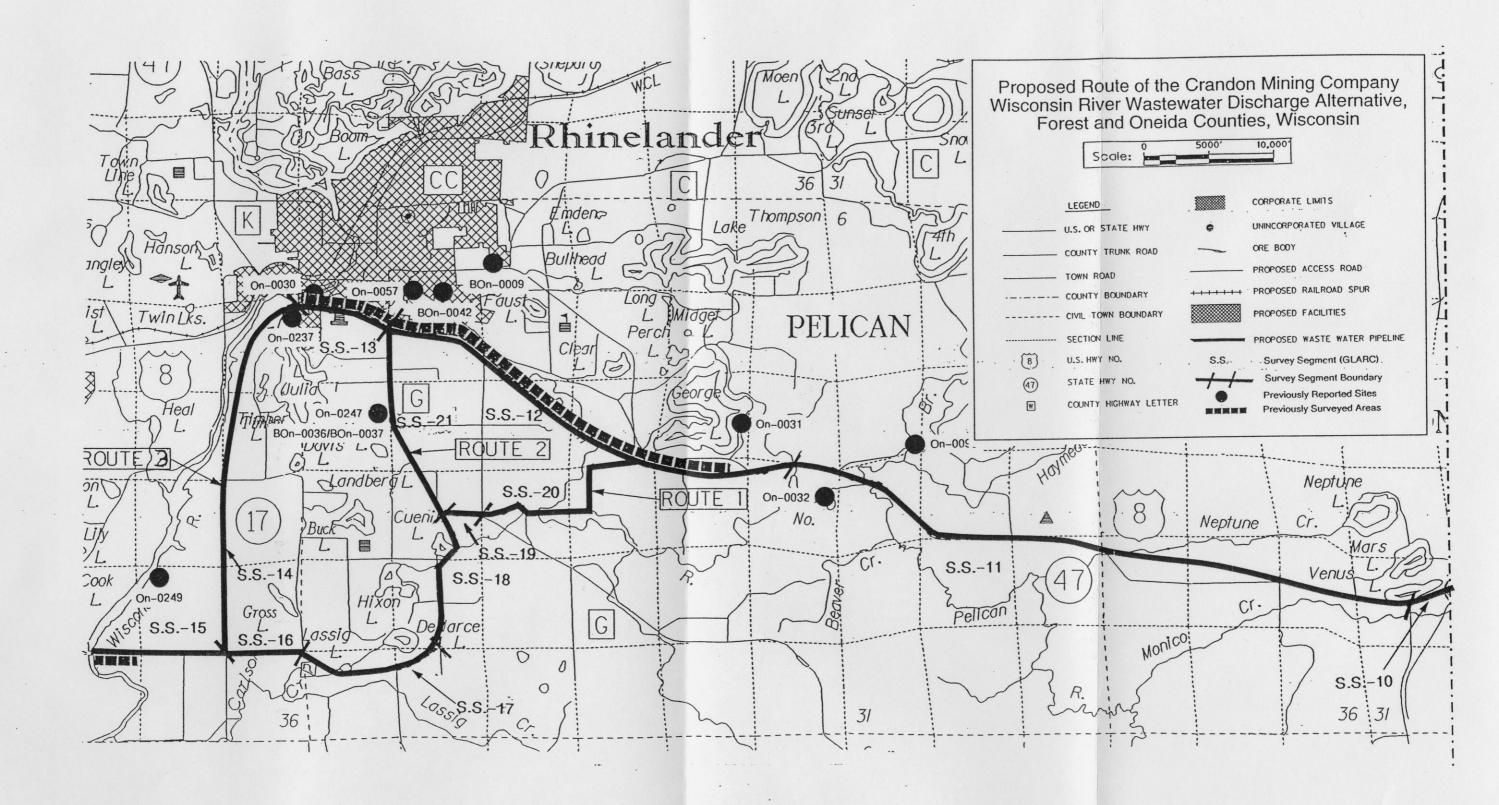


Figure 2 (continued)

# Appendix B

# Oneida County Soil Survey Data Sheets

# SOIL DESCRIPTION REPORT

# ONEIDA COUNTY, WI

Map Unit Symbol	Map unit name / Description
AcB	ALCONA FINE SANDY LOAM, 0 TO 6 PERCENT SLOPES  Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy lacustrine deposits. This map unit is not highly erodible. The land capability classification is 2E. This map unit is prime farmland.
AcC	ALCONA FINE SANDY LOAM, 6 TO 15 PERCENT SLOPES Sloping, moderately well drained soil formed in sandy and loamy lacustrine deposits. This map unit is potentially highly erodible. The land capability classification is 3E.
Au	AU GRES LOAMY SAND, 0 TO 2 PERCENT SLOPES  Nearly level, somewhat poorly drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 4W. This map unit may have hydric inclusions.
CaA	CABLE MUCK, 0 TO 3 PERCENT SLOPES, STONY  Nearly level and gently sloping, poorly drained and very poorly drained soil formed in thin organic material overlying loamy deposits underlain by sandy loam glacial till. This map unit is not highly erodible. The land capacity classification is 6W. This map unit is hydric.
СЪ	CARBONDALE, LUPTON, AND MARKEY MUCKS, 0 TO 1 PERCENT SLOPES Nearly level, very poorly drained soils formed in organic material more than 51 inches thick or underlain by sandy glacial outwash at depth of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.
CrA	CROSWELL SAND, 0 TO 3 PERCENT SLOPES  Nearly level and gently sloping, moderately well drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 4S.
CsA	CROSWELL LOAMY SAND, LOAMY SUBSTRATUM, 0 TO 3 PERCENT SLOPES Nearly level and gently sloping, moderately well drained soil formed in sandy glacial outwash over silty and sandy lacustrine deposits. This map unit is not highly erodible. The land capability classification is 4S.

# SOIL DESCRIPTION REPORT

## ONEIDA COUNTY, WI

Map Unit Symbol	Map unit name / Description
EmE	EMMERT VERY GRAVELLY SAND, 20 TO 45 PERCENT SLOPES  Moderately steep and steep, excessively drained soil formed in very gravelly sand glacial outwash. This map unit is highly erodible. The land capability classification is 75.
Fh	FORDUM MUCKY VERY FINE SANDY LOAM, 0 TO 2 PERCENT SLOPES Nearly level, frequently flooded, poorly drained and very poorly drained soil formed in loamy and sandy alluvium. This map unit is not highly erodible. The land capability classification is 6W. This map unit is hydric.
GoB	GOODMAN SILT LOAM, 1 TO 6 PERCENT SLOPES, STONY Nearly level and gently sloping, moderately well-drained soil formed in silty deposits underlain by gravelly loamy sandy glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.
GoC	GOODMAN SILT LOAM, 6 TO 15 PERCENT SLOPES, STONY Sloping, moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.
GoD	GOODMAN SILT LOAM, 15 TO 25 PERCENT SLOPES, STONY Moderately steep, well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is highly erodible. The land capability classification is 7S in stony areas.
·Gr	GREENWOOD, LOXLEY, AND DAWSON PEATS, 0 TO 1 PERCENT SLOPES Nearly level, very poorly drained soil formed in acid organic material more than 51 inches thick or underlain by sandy glacial outwash at depths of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.
KaB	KARLIN LOAMY FINE SAND, 0 TO 6 PERCENT SLOPES  Nearly level and gently sloping, somewhat excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 3S.

# SOIL DESCRIPTION REPORT

# ONEIDA COUNTY, WI

Map Unit Symbol	Map unit name / Description
KeB	KEWEENAW SANDY LOAM, 1 TO 6 PERCENT SLOPES, STONY Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift. This map unit is not highly erodible. The land capability classification is 6S in stony areas.
KeC	KEWEENAW SANDY LOAM, 6 TO 15 PERCENT SLOPES, STONY Sloping, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.
KeD	KEWEENAW SANDY LOAM, 15 TO 25 PERCENT SLOPES, STONY Moderately steep, well drained soil formed in sandy and loamy deposits over gravelly, loamy sand glacial drift. This map unit is potentially highly erodible. The land capability classification is 75 in stony areas.
KnB	KEWEENAW-VILAS COMPLEX, 1 TO 6 PERCENT SLOPES, STONY Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and nearly level, and gently sloping, excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 6S in stony areas.
KnC	KEWEENAW-VILAS COMPLEX, 6 TO 15 PERCENT SLOPES. STONY Sloping, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and sloping, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.
KrD	KEWEENAW-SAYNER COMPLEX, 15 TO 30 PERCENT SLOPES, STONY Moderately steep and steep, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and moderately steep and steep, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel. This map unit is highly erodible. The land capability classification is 7S in stony areas.

## SOIL DESCRIPTION REPORT

## ONEIDA COUNTY, WI

Map Unit Svmbol	Map unit name / Description
Ks	KINROSS MUCK, 0 TO 2 PERCENT SLOPES  Nearly level, poorly drained soil formed in thin organic material overlying sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 6W. This map unit is hydric.
MaB	MAGNOR SILT LOAM, 1 TO 6 PERCENT SLOPES, STONY  Nearly level and gently sloping, somewhat poorly drained soil formed in silty deposits underlain by sandy loam glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.
Mc	MINOCQUA SILT LOAM, 0 TO 2 PERCENT SLOPES  Nearly level, poorly drained and very poorly drained soil formed in silty and loamy deposits underlain by gravelly coarse sand glacial outwash. This map unit is not highly erodible. The land capability classification is 6W. This map unit is hydric.
МоВ	MONICO LOAM, 1 TO 6 PERCENT SLOPES, STONY  Nearly level and gently sloping, somewhat poorly drained soil formed in silty and loamy deposits underlain by sandy loam glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.
PaB	PADUS LOAM, 0 TO 6 PERCENT SLOPES  Nearly level and gently sloping, moderately well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 2E. This map unit is prime farmland.
PaC	PADUS LOAM, 6 TO 15 PERCENT SLOPES  Sloping, well drained soil formed in lomay deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 3E.
PaD .	PADUS LOAM, 15 TO 25 PERCENT SLOPES  Moderately steep, well drained soil formed in loamy depostis underlain by stratified sand and gravel glacial outwash. This map unit is highly erodible. The land capabiltiy classification is 6E.

#### SOIL DESCRIPTION REPORT

#### ONEIDA COUNTY, WI

Map Unit	
Symbol	Map unit name

/ Description

РЪВ

PADUS-GOODMAN COMPLEX, 1 TO 6 PERCENT SLOPES, STONY Nearly level and gently sloping, moderately well drained soil formed in loamy deposits underlain by stratified sand and gravel glacialoutwash, and nearly level and gently sloping moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

PbC

PADUS-GOODMAN COMPLEX, 6 TO 15 PERCENT SLOPES, STONY Sloping, well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash and moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

PbD

PADUS-GOODMAN COMPLEX, 15 TO 25 PERCENT SLOPES, STONY Moderately steep, well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash and moderately steep, well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is highly erodible. The land capabiltiy classification is 7S in stony areas. This map unit may have hydric inclusions.

PeB

PADUS-PENCE SANDY LOAMS, 1 TO 6 PERCENT SLOPES Nearly level and gently sloping, well drained soils formed in loamydeposits underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is potentially highly erodible. The land capability classification is 3E.

PeC

PADUS-PENCE SANDY LOAMS, 6 TO 15 PERCENT SLOPES Sloping, well drained soils formed in loamy deposits underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is potentially highly erodible. The land capability classification is 4E.

PeD

PADUS-PENCE SANDY LOAMS, 15 TO 45 PERCENT SLOPES Moderately steep and steep, well drained loamy soils underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is highly erodible. The land capability classfication is 7E.

# SOIL DESCRIPTION REPORT

# ONEIDA COUNTY, WI

Map Unit Symbol	Map unit name / Description
PrB	PEQUAMING LOAMY SAND, 1 TO 3 PERCENT SLOPES, STONY Nearly level and gently sloping, somewhat poorly drained soil formed mainly in sandy deposits over sandy and loamy glacial drift. This map unit is not highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.
Pt	PITS, GRAVEL Pits, sand or gravel
PvA	PLOVER FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES  Nearly level and gently sloping, somewhat poorly drained soil formed in sandy, loamy, and silty lacustrine deposits. This map unit is not highly erodible. The land capability classification is 2W. This map unit is prime farmland where drained. This map unit may have hydric inclusions.
RsB	ROUSSEAU LOAMY FINE SAND, 0 TO 6 PERCENT SLOPES  Nearly level and gently sloping, well drained soil formed in sandy, glacial outwash and lacustrine deposits. This map unit is not highly erodible. The land capability classification is 3S.
RsC	ROUSSEAU LOAMY FINE SAND, 6 TO 15 PERCENT SLOPES Sloping, well drained soil formed in sandy glacial outwash and lacustine deposits. This map unit is potentially highly erodible. The land capability classification is 3E.
SaB	SAYNER LOAMY SAND, 0 TO 6 PERCENT SLOPES  Nearly level and gently sloping, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 45.
SaC	SAYNER LOAMY SAND, 6 TO 15 PERCENT SLOPES  Sloping, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S.
SaD	SAYNER LOAMY SAND, 15 TO 45 PERCENT SLOPES

SAYNER LOAMY SAND, 15 TO 45 PERCENT SLOPES

Moderately steep and steep, excessively drained soil formed in sandy depostis underlain by stratified sand and gravel glacial outwash. This map unit is highly erodible. The land capability classification is 7S.

# SOIL DESCRIPTION REPORT

# ONEIDA COUNTY, WI

Map Unit Symbol	Map unit name / Description
VsB	VILAS LOAMY SAND, 0 TO 6 PERCENT SLOPES  Nearly level and gently sloping, excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 4S.
VsC	VILAS LOAMY SAND, 6 TO 15 PERCENT SLOPES Sloping, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S.
VsD	VILAS LOAMY SAND, 15 TO 25 PERCENT SLOPES  Moderately steep, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 7S.
WoA	WORCESTER SANDY LOAM, 0 TO 3 PERCENT SLOPES  Nearly level and gently sloping, somewhat poorly drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash. This map unit is not highly erodible. The land capability classification is 2W. This map unit is prime farmland where drained. This map unit may have hydric inclusions.

AcB

Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy lacustrine deposits. This map unit is not highly erodible. The land capability classification is 2E. This map unit is prime farmland.

Component Name: ALCONA

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

					_	STIMATED SOI							
1					Classi	fication		>10 3·	-10   Per	cent <	3 in. pass	ing sieve	Clay %
epth	USDA Te	xture	Unified			AASHTO			ches   No	4 No.	10 No.40	No.200	<.002 m
0-9 FSL SM SM-SC ML C				A-4 A-2-4		- (	0-8   95-	-100 90	-100 55- 9	95 25- 65	5-15		
9-16 LFS VFSL GR-SL SM ML SC CL			CD III	A-4 A-2-4			:			95 15- 65	:		
•	9-16 LFS VFSL GR-SL SH ML SC CL  6-29 SL VFSL L SC SM-SC CL (		CL-ML	A-2-4 A-4		- (	0-8   95-	-100 90	-100 55- 8	85 <b>25- 7</b> 0	10-20		
	SR- FS S		SM			A-4 A-2-4	•	- (	0-8   95-	-100 90	-100 60- 9	95 25- 85	5-18
I	Liquid	Plas-	Moi	.st	Perme-	Avail	able	Soil	CEC	CaCO3	Organic	Shrink	Erosio
Depth	Limit	ticity	Bulk I	ensity	ability	Water Ca	pacity	Reaction	n (me/		Matter	Swell	Factor
(In)		Index	g/	'cc	In/hr	(In./	'in)	(pH)	100g)	Pct	Pct	Potentia	al K
0- 9		NP-7	1.1-	1.6	0.6-6.	0.12-	0.18	4.5-7.3		-	1 3.	LOW	0.24
9-16		NP-10		1.7	0.6-6.	0.1-	0.17	4.5-7.3	-	-	-	LOW	0.17
16-29	20-30	4-10	1.4-	1.7		0.13-	0.2	5.1-7.8	-	-	-	· LOW	0.24
29-60	<30	NP-7	1.5-	1.7	0.6-2.	0.08-	0.2	5.1-7.8	-	-	<b>.</b>	LOW	0.24
										- Wind	:	Corrosion	
		_				e-(feet)				Erod.	Uncoated		frost
Freque	ncy Dura	tion	Months	Depth			Depth	:	GRP Fact		•	Concrete	Action
IONE	-		-	2.5-6.0	PERCHED	SEP-MAY	:		B 5	86	MODERATE	LOW	MODERATE
		RY FACIL				RATING		RE	STRICTIVE	FEATURE	(S)	}	
-		sorption	Fields		1 0000	LD 1							
Daily (					SEV	:	Wetness	-	}		ļ	ļ	
	Cover ic	r Landfi			POO	:	Wetness Too Sar	-	<u> </u> 			l	
		or Landfi  NG SITE	11		P00	:		ad <del>y</del>	         STRICTIVE	FEATURE	; ; ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	   	
		NG SITE	11		P00	R    RATING	Too Sar	ad <del>y</del>	         	FEATURE	       	   	
Shallow Dwelli	BUILDI w Excava ngs With	NG SITE tions out Base	11  DEVELOPM ments		P00	R   	Too Sar	nd <del>y</del> RE	         	FEATURE	       		
Shallow Swellin	BUILDI w Excava ngs With	NG SITE ations out Base Basemen	ll  DEVELOPM ments ts		POO SEV SLI	RATING   ERE   GHT   ERATE	Too Sar	ndy RE	       STRICTIVE     	FEATURE	 		
Shallow Dwellin Dwellin Small (	BUILDI w Excava ngs With ngs With	NG SITE tions out Base Basemen	ll DEVELOPM ments ts Lings		POO   SEV   SLI   MOD   SLI	R   RATING   ERE   GHT   ERATE   GHT	Too Sar Cutbank	RE RE RS Cave	             	FEATURE	 		
Shallowellin Dwellin Small (	BUILDI w Excava ngs With ngs With Commerci Streets	NG SITE ations nout Base a Basemen al Build and Road	ll DEVELOPM ments ts ings	 Ent	POO SEV SLI MOD SLI	R   RATING   ERE   GHT   GHT   GHT   ERATE   ERATE	Cutbank Wetness	RE RE RE RACTION			 	         	
Shallowellin Owellin Small (	BUILDI w Excava ngs With ngs With Commerci Streets	NG SITE tions out Base Basemen	ll DEVELOPM ments ts ings	 Ent	POO SEV SLI MOD SLI	R   RATING   ERE   GHT   ERATE   GHT	Too Sar Cutbank	RE RE RE RACTION	STRICTIVE		 	           	
Shallon Dwellin Dwellin Small ( Local :	BUILDI w Excava ngs With ngs With Commerci Streets Landsca	NG SITE ations nout Base a Basemen al Build and Road	DEVELOPM ments ts tings is d Golf I	 Ent	POO SEV SLI MOD SLI MOD MOD	RATING   RATING   ERE   GHT   ERATE   ERATE   ERATE   ERATE   ERATING	Cutbani Wetness Frost i	RE Cave  S Action Stones		y 	       		
Shallon Owellin Small ( Local ! Local !	BUILDI w Excava ngs With ngs With Commerci Streets Landsca	NG SITE ations about Basement Basement al Build and Road aping, an	DEVELOPM ments ts tings is d Golf I	 Ent	POO SEV SLI MOD SLI MOD MOD	RATING   RATING   ERE   GHT   ERATE   GHT   ERATE   ERATE   ERATE   RATING   R	Cutbani Wetness Frost i	RE	         Drought	y 	       		
Shallow Dwelling Dwelling Small ( Local : Lawns,	BUILDI w Excava ngs With ngs With Commerci Streets Landsca CONSTR	NG SITE ations about Basement Basement al Build and Road aping, an	DEVELOPM ments ts tings is d Golf I	 Ent	POO SEV SLI MOD SLI MOD FAI	RATING   RATING   ERE   GHT   ERATE   GHT   ERATE   ERATE   ERATE   RATING   R ROBABLE	Cutbank Wetness Frost Large S Wetness Excess	RE S	         Drought	y 	       	               	
Shallon Owellin Owellin Small ( Local : Lawns, Roadfin Sand Gravel	BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	NG SITE ations about Basement Basement al Build and Road aping, an	DEVELOPM ments ts tings is d Golf I	 Ent	POO SEV SLI MOD SLI MOD FAI	RATING   RATING   ERE   GHT   ERATE   ERATE   ERATE   ERATE   RATING   R   ROBABLE   ROBABLE	Cutbani Wetness Frost i	RE R	         Drought	y 	       		
Shallon Owellin Owellin Small ( Local : Lawns, Roadfin Sand Gravel	BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	NG SITE ations about Basement Basement all Build and Road aping, an accuracy and accuracy accuracy and accuracy accuracy and accuracy accuracy accuracy and accuracy	DEVELOPM ments ts ings s d Golf H	 Ent	POO SEV SLI MOD SLI MOD MOD FAI IMP	RATING   RATING   ERE   GHT   ERATE   ERATE   ERATE   RATING   R   ROBABLE   R	Cutbank Wetness Frost k Large S Wetness Excess Excess	RE R	         Drought           	y FEATURI	(s)		
Shallowelling Small (Cocal Stawns, Cocadfic Stand Gravel Fopsoi	BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	NG SITE Ations Basement Basement Al Build And Road Aping, an BUCTION M	DEVELOPM ments ts ings s d Golf H	 Ent	POO SEV SLI MOD SLI MOD MOD I FAI IMP	RATING   RATING   ERE   GHT   ERATE   GHT   ERATE   ERATE   RATING   ROBABLE   RATING   RATING	Cutbani Wetness Frost i Large S Wetness Excess Excess Too Sai	RE R		y FEATURI	(s)		
Shallowelling Owelling Small (Cocal Stawns, Cocadfic Sand Gravel Popsoid Record	BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	NG SITE ations nout Base Basemen al Build and Road aping, an CUCTION M	DEVELOPMENTS ts tings s d Golf F	 Ent	POO SEV SLI MOD SLI MOD MOD FAI IMP POO	RATING   RATING   ERE   GHT   ERATE   ERATE   ERATE   RATING   R   ROBABLE   R	Cutbani Wetness Frost i Large S Excess Excess Too Sai	RE R	         Drought           	y FEATURI	(s)		
Shallowelling Small (Cocal Stawns, Cocadfing Sand Gravel Popsoi Combanka	BUILDI w Excava ngs With ngs With Commerci Streets Landsca CONSTR 11  WATER eservoir ments, E	NG SITE Ations Basement Basement Al Build And Road Aping, an BUCTION M	DEVELOPMENTS ts tings s d Golf F	 Ent	POO SEV SLI MOD SLI MOD FAI IMP POO	RATING   RATING   ERE   GHT   ERATE   GHT   ERATE   ERATE   RATING   ROBABLE   ROBABLE	Cutbani Wetness Frost i Large S Wetness Excess Excess Too Sai	RE R		y FEATURI	(s)		
Shallon Dwellin Small ( Local : Lawns, Roadfi Sand Gravel Pond Ro Embanka	BUILDI w Excava ngs With ngs With Commerci Streets Landsca CONSTR 11  wATER eservoir ments, E	NG SITE ations nout Base Basemen al Build and Road aping, an CUCTION M	DEVELOPMENTS ts tings s d Golf F	 Ent	POO SEV SLI MOD SLI MOD FAI IMP IMP POO	RATING   ERE   GHT   ERATE   GHT   ERATE   ERATE   ERATE   ROBABLE   ROBABLE	Cutbani Wetness Frost i Large S Excess Excess Too Sai	RE R	Drought  STRICTIVE  STRICTIVE  STRICTIVE	FEATURI FEATURI	(s)		
Shallon Dwellin Dwellin Small ( Local : Lawns,  Roadfin Sand Gravel Topsoi Pond Re Emband Drainae	BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR 11  WATER eservoir ments, D ge tion	NG SITE ations nout Base Basemen al Build and Road aping, an CUCTION M	DEVELOPA  ments ts tings s d Golf H	 Ent	POO SEV SLI MOD SLI MOD FAI IMP POO SEV LIM	RATING ERE GHT ERATE GHT ERATE ERATE ERATE RATING R ROBABLE ROBABLE RE	Cutbank Wetness Frost i Large S Excess Excess Too San Seepage	RE R	Drought   STRICTIVE	FEATURI FEATURI	E(S)		

RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE	FEATURE(S)	í
Camp Areas	j slight	1 -		1	.
Picnic Areas	SLIGHT	1	1	1	)
Playgrounds	MODERATE	Slope	1	1	1
Paths and Trails	SLIGHT	1	1	1	j
1					1

### CROPS AND PASTURE YIELDS

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0ats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanent Pasture
	**********			75	4.2	3.3	5.3	3.5

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES	(E)	SITE	WOODLAND PRODUCT-
21				OT TOUR	MADEEN ME		TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
3L	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE					
							red maple	E	0	0
							sugar maple	E	61	3
							yellow birch	E	0	0
							American beech	E	0	0
			•				white ash	E	0	0
							northern red oak	E	0	0
							American basswood	E	0	0
							red pine	EP	0	0
							eastern white pine	EP	0	0
							white spruce	P	0	0

### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Height Plant Name	Height Plant Name Height
li arrowwood	14 eastern white pine 30
· 11 nannyberry v	viburnum 14 Norway spruce 28
rabapple 13 silky dogwoo	od 10 white spruce 22
1	11 nannyberry

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Sloping, moderately well drained soil formed in sandy and loamy lacustrine deposits. This map unit is potentially highly erodible. The land capability classification is 3E.

Component Name: ALCONA

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

### ESTIMATED SOIL PROPERTIES

						TIMATED SOI								
Depth	USDA Te	exture		Unifi		ication AASHI	10	>10 3 In. Ir				3 in. pass 10 No.40	ing sieve No.200	Clay %   <.002 m
						) ) -4 ) -2-4			0-8	05-	100 00	 -100 55-	 95 25- 65	   E_1E
0- 9		CD CI		SM-SC MI ML SC CL		A-4 A-2-4		_	0-8				95 25-65 95 15-65	
:	LFS VFSI SL VFSL			SM-SC CL				- 0-8		:			85 25- 70	:
	SR- FS S		SM		CP-MP	A-4 A-2-4		-	0-8	•			95 <b>25-</b> 85	
		.====== >TP	)FI			A-7 A-2-7								
1	Liquid	Plas-	Moi	.st	Perme-	Avail		Soil	(	CEC	CaCO3	Organic	Shrink	Erosio
Depth	Limit	ticity	Bulk D	ensity	ability	Water Ca	apacity	Reactio	מכ	(me/		Matter	Swell	Facto
(In)		Index	g/	'cc	In/hr	(In./	'in)	(Hq)		100g)	Pct	Pct	Potenti	
0- 9l		NP-7	1 1-	1.6	0.6-6.	0.12-	-0.18	4.5-7.3	· 3	_		1 3.	LOW	0.24
9-16		NP-10			0.6-6.		-0.17	4.5-7.3		_	_	-	LOW	0.17
:	20-30	4-10		1.7			- 0.2			_	-	-	LOW	0.24
29-60		NP-7			0.6-2.		- 0.2			_	_	-	LOW	0.24
											Wind	Risk of	Corrosion	
	Floo	ding		Wa	ter Table	(feet)	Bedroo	k-(in)	HYD	T	Erod.	Uncoated		Frost
		-	Months								Index	Steel	Concrete	Action
							:		:			:		
NONE	-	•	-	2.5-6.0	PERCHED	SEP-MAY	>60		В	5	<b>8</b> 6	MODERATE	LOW	MODERATI
			ITIES			ATING			ESTRI	TIVE	FEATURE	(S)		
	Tank Al		fields		SEVE POOR	RE	Wetness Too Sar	5	estri(	CTIVE	FEATURE	(s)   		
	Tank Ab	osorption or Landfi	fields		) SEVE	RE		s nd <del>y</del> 			FEATURE	)   		
Daily	Tank Ab	osorption or Landfi	fields		) SEVE	RE		s ndy Ri				)   	       	
Daily	Tank Ah Cover fo BUILDI w Excava	osorption or Landfi	Fields		POOR	RE	Too Sar	s ndy Ri				)   	            	
Daily  Shallo  Dwelli	Tank Ah Cover for BUILDI w Excava	osorption or Landfi  NG SITE ations	o Fields ill DEVELOPM		POOR    SEVE	RE RATING RE	Too Sar	s ody R _ RI ss Cave		CTIVE		)   		
Daily Shallo Dwelli Dwelli	Tank Ar Cover for BUILDI w Excava ngs With	osorption or Landfi CNG SITE ations nout Base	o Fields ill DEVELOPM mements		POOR    SEVE	RE RATING RE RATE RATE	Too Sar Cutban Slope	s ody R _ RI ss Cave	ESTRIC	CTIVE		)   		
Daily Shallo Dwelli Dwelli Small	Tank Ar Cover for BUILDI W Excava ngs With ngs With	osorption or Landfi CNG SITE ations out Base or Basemen	o Fields ill DEVELOPM ments its ings		POOF SEVE	RE RATING RE RATE RATE	Too Sar Cutban Slope Wetness	s ody R _ RI ss Cave	ESTRIC	CTIVE	 FEATURE	   (s)       		
Daily Shallo Dwelli Small Local	Tank Ar Cover for BUILDI w Excava ngs With ngs With Commerci Streets	osorption or Landfi NG SITE ations nout Basement al Build and Road	o Fields ill DEVELOPM ments its ings	ent	POOF SEVE	RE RATING RE RATE RATE RE RE RATE RE RE RE	Too Sar Cutbani Slope Wetness Slope Slope	s ody R _ RI ss Cave	ESTRIC	CTIVE  ope	FEATURE	)   		
Daily Shallo Dwelli Dwelli Small Local	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca	osorption or Landfi NG SITE ations nout Basement al Build and Road	o Fields ill DEVELOPM mements ots ilings ds od Golf F	ent	SEVE   POOR	RE RATING RE RATE RATE RE RE RATE RE RE RE	Too Sar Cutbani Slope Wetness Slope Slope	ady  RI  RS Cave	ESTRIC	ope ost Acoughty	FEATURE	(S)                         Slope		
Daily Shallo Dwelli Small Local Lawns,	Tank At Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca	osorption or Landfi CNG SITE ations nout Basemental Build and Road aping, an	o Fields ill DEVELOPM mements ots ilings ds od Golf F	ent	SEVE   POOR	RE RATING RE RATE RATE RATE RATE RATE RATE RATE	Too Sar Cutbani Slope Wetness Slope Slope	ady  Ri  RS Cave  S  Stones	ESTRIC	ope ost Acoughty	FEATURE	(S)                       Slope		
Daily Shallo Dwelli Dwelli Small Local Lawns,	Tank At Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca	osorption or Landfi CNG SITE ations nout Basemental Build and Road aping, an	o Fields ill DEVELOPM mements ots ilings ds od Golf F	ent	SEVE   POOR   SEVE   MODE   SEVE   MODE   MODE	RE RATING RE RATE RATE RATE RATE RATE RATE RATE	Too Sar Cutbani Slope Wetness Slope Slope Large S	s ady Ri RS Cave S Stones RI RI	ESTRIC	ope ost Acoughty	FEATURE	(S)                       Slope		
Daily Shallo Dwelli Dwelli Small	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca	osorption or Landfi CNG SITE ations nout Basemental Build and Road aping, an	o Fields ill DEVELOPM mements ots ilings ds od Golf F	ent	SEVE   POOF	RE RATING RE RATE RATE RATE RATE RATE RATE RATE R	Cutbanl Slope Wetness Slope Slope Large	ndy Rics Cave Stones Rics	ESTRIC	ope ost Acoughty	FEATURE	(S)                       Slope		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel	Tank Ar Cover fo  BUILDI W Excava ngs With ngs With Commerci Streets Landsca  CONSTR	osorption or Landfi CNG SITE ations nout Basemental Build and Road aping, an	o Fields ill DEVELOPM mements ots ilings ds od Golf F	ent	SEVE   POOF	RE RATING RE RATE RATE RATE RATE RATE RATE RATE R	Cutbanl Slope Wetness Slope Slope Large Wetness	Rics Cave  Stones  Rics  Fines  Fines	ESTRIC	ope ost Acoughty	FEATURE	(S)                       Slope		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	osorption or Landfi CNG SITE ations nout Basemental Build and Road aping, an	DEVELOPMENTS outs dings dis and Golf F	ent	SEVE   POOF	RE RATING RE RATE RATE RATE RATE RATE RATE RATE R	Cutbani Slope Wetness Slope Slope Large S	RI RIS Cave	ESTRIC	ope ost Acoughty	FEATURE	(S)		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel Topsoi	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	DISORPTION MANAGEME	DEVELOPMENTS outs dings dis and Golf F	ent	SEVE   POOF	RE RATING RE RATE RATE RATE RATE RATE RATING ROBABLE ROBABLE RATING	Cutbani Slope Wetness Slope Slope Large S	RI RIS Cave	ESTRIC	ope ost Acoughty	FEATURE tion FEATURE	(S)		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel Topsoi Pond R	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR 11	DISORPTION MANAGEME	DEVELOPMENTS  The sements of the sem	ent	SEVE   POOR	RATING RE RATE RATE RATE RATE RATE RATE RATING ROBABLE ROBABLE RATING RE RATING	Cutbani Slope Wetness Slope Slope Large S Wetness Excess Excess	RI RIS Cave	ESTRIC	ope ost Acoughty	FEATURE tion FEATURE	(S)		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel Topsoi Pond R Embank	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	DISTRIBUTION MANAGEME	DEVELOPMENTS  The sements of the sem	ent	SEVE	RATING RE RATE RATE RATE RATE RATE RATE RATING ROBABLE ROBABLE RATING RE RATING	Cutbani Slope Wetness Slope Slope Large S Excess Excess Too San	RI RIS Cave	ESTRICE	ope ost Acoughty	FEATURE tion FEATURE	(S)		
Daily  Shallo Dwelli Dwelli Small Local Lawns,  Roadfi Sand Gravel Topsoi  Pond R Embank Draina	Tank Ar Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR 11  WATER eservoir ments, I	DISTRIBUTION MANAGEME	DEVELOPMENTS  The sements of the sem	ent	SEVE	RATING RE RATE RATE RATE RATE RATE RATE RATE R	Cutbani Slope Wetness Slope Slope Large S Excess Excess Too San	RI RIS Cave	ESTRIC	ope ost Acoughty	FEATURE  tion  FEATURE	(S)		
Daily  Shallo  Dwelli  Dwelli  Small  Local  Lawns,  Roadfi  Sand  Gravel  Topsoi   Pond R  Embank  Draina  Irriga  Terrac	Tank Ar Cover for BUILDI W Excave ngs With ngs With Commerci Streets Landsca CONSTR 11  WATER eservoir ments, I ge tion	Diversion	DEVELOPMENTS of Sold Golf F	ent	SEVE   POOF	RE RATING RE RATE RATE RATE RATE RATE RATE RATING ROBABLE ROBABLE RE RATING RE	Cutbani   Slope   Wetness   Slope   Large S   Excess   Excess   Excess   Too San   Slope   Piping   Slope	RI RIS Cave	ESTRICE STRICE STRICE CONTRACT CU Wee Wee	ope ost Accoughty	FEATURE  tion  FEATURE  FEATURE	(S)		

					-1
RECREATIONAL DEVELOPMENT	RATING	<b>I</b> -	RESTRICTIVE I	FEATURE(S)	į
Camp Areas	MODERATE	Slope	ļ		!
Picnic Areas	MODERATE	Slope	ļ	ļ	!
Playgrounds	SEVERE	Slope	1	!	!
Paths and Trails	SLIGHT	1	1	I	ļ
i de la companya de					- i

### CROPS AND PASTURE YIELDS

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	bu/a	Alfalfa Hay	Red Clover Hay tons/acre	Improved Pasture	Permaneut Pasture
				65	3.5	2.5	5.1	3.

### WOODLAND INTERPRETATIONS

ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION MODERATE	INTERP	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT		SITE INDEX	WOODLAND PRODUCT- IVITY
3TL	SLIGHT	MODERATE	SLIGHT	SPIGUI	MODERALE		red maple	E	0	0
							sugar maple	E	61	3
				,			yellow birch	E	0	0
							American beech	E	0	0
							white ash	E	0	0
							northern red oak	E	0	0
							American basswood	E	0	0
							red pine	EP	0	0
					t		eastern white pine	EP	0	0
							white spruce	P	0	0 *

### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	 Height 	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush	10	Amur privet	11	arrowwood	14	eastern white pine	30
imperial Carolina popla	r 70	lilac	11	nannyberry viburnum	14	Norway spruce	28
red pine	<b>2</b> 9	Siberian crabapple	13	silky dogwood	10	white spruce	22

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level, somewhat poorly drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 4W.

Component Name: AU GRES

Classification: ENTIC HAPLAQUODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

						EST	IMATED SOII	L PROPER	TIES								
Depth	USDA Te	xture		Unifi	Class ied		cation AASHIN	)	>10 In.			Per		-	assi .40	ng sieve No.200	<.002 m
0- 3  3-25  25-60	S LS		SP-	SP-SM SM SM SM SM SM SM			A-2-4 A-1 A-2-4 A-3 A-3 A-2-4	A-1-B	-		0 0 0	95-	100 85- 100 85- 100 85-	100 4	10- 7		1-15
	Liquid Limit	Plas- ticity Index	Bulk D	st ensity cc	Perme- abilit In/hr		Avail Water Ca (In./	pacity	Read	il tic	n a	CEC (me/ 100g)	CaCO3 Pct	Orga Mati Po		Shrink Swell Potentia	Erosion Factor
0- 3 3-25 25-60	<25 <25	NP-7 NP-7 NP		-1.5 -1.7 -1.7		).	0.07- 0.06- 0.05-	0.09	3.6- 4.5- 5.1-	7.3	3 3	-	- - - Wind	•	 - 8. - - of C	LOW LOW LOW	0.17 0.15 0.15
	Floo	-	Months				(feet) Months				HYD	T		Uncoa	ated	Concrete	Frost
NONE			-	0.5-1.	5 APPARI	ent	NOV-MAY	>60			В	5	134	row		MODERATE	
Daily Shallo Dwelli Dwelli Small Local	BUILDI W Excavangs With ngs With Commerci Streets Landsca	or Landf:  ING SITE ations nout Basener al Build and Road	n Fields ill DEVELOPM ements nts dings		PO	EVER OOR RI EVER EVER EVER EVER EVER	ATING   RE   RE   RE   RE   RE	Wetness Seepage Cutbanl Wetness Wetness Wetness Wetness	ks Car	Ri ve	Po To ESTRI We	or Fil		   Wetno (S)         	ess	              	
Roadfi Sand Gravel Topsoi	11				P		ABLE OBABLE	Wetness Too Sa Too Sa	ndy		       We	tness			·	     	
Embank Draina Irriga	Reservoin ments, l agé ation	Dikes an	d Levees		S L L	EVE EVE	RE TATION TATION	Seepag Seepag Cutban Wetnes	e ks Ca s		Pi	ping ought		Wetr			
	ces and led Water		ens		:		TATION TATION	Wetnes   Wetnes				oo San cought	_	Soi]	l Blo	wing	

			•	,
RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE F	EATURE(S)	1
Camp Areas	SEVERE	Wetness	1	ļ
Picnic Areas	SEVERE	Wetness	1	1
Playgrounds	SEVERE	Wetness	1	Ì
Paths and Trails	SEVERE	Wetness	1	1
;				

## CROPS AND PASTURE YIELDS

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture   AUM	Permanent Pasture	1
					45	2.2	1.7	4.6	1.6	

## WOODLAND INTERPRETATIONS

1							v			
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
6W	SLIGHT	SEVERE	MODERATE	SEVERE	SEVERE		,			
i							balsam fir	E	0	0
i							red maple	E	0	0
i							yellow birch	E	0	0
j							paper birch	E	0	0
i					•		bigtooth aspen	E	0	0
i							quaking aspen	E	<b>7</b> 0	6
i							northern whitecedar	E	0	0
i							eastern hemlock	E	0	0
i							eastern white pine	EP	0	0
i							Norway spruce	P	0	0
i							white spruce	P	0	0
i							red pine	P	0	0
:		_					-			

## RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush green ash nannyberry viburnum	30	Amur maple imperial Carolina poplar Norway spruce		common ninebark jack pine silky dogwood	<b>2</b> 8	eastern white pine Manchurian crabapple white spruce	28   19   24

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, poorly drained and very poorly drained soil formed in thin organic material overlying loamy deposits underlain by sandy loam glacial till. This map unit is not highly erodible. The land capacity classification is 6W. This map unit is hydric.

Component Name: CABLE

Classification: TYPIC HAPLAQUEPTS, COARSE-LOAMY, MIXED, NONACID, FRIGID

### ESTIMATED SOIL PROPERTIES

!						sifica			>10			cent <		-	_		Clay %
Depth)	USDA Te	xture		Unif	ied		MASA	0	In. :	Inch	hes   No	4 No.	10 I	No.40	No.2	200	<.002 m
0- 3	SP		PT			1	<b>8</b> -8		-	25-	-50	-	-	-	-	-	0-
3-31	SIL L FS	L	SM	SC ML CI	L	1	-2 A-4		-	0-	-25   75	-100 <b>7</b> 5	-100	50-10	0 30-	- 90	8-18
31-34	L SL GR-	SL	SM	SC ML CI	i.	1	-2 A-4 I	· <b>-1</b>	-	0-	-25   65-	- <b>100 6</b> 0	-100	35- 9	5 20-	- 75	8-16
34-60)	SL GR-SI	,	SM	GM ML CI	L-ML	1	-2 A-1 A	-4	-4 -		-25   65·	-100 60	-100	40- 9	0 20-	- 70	5-10
}	Liquid	Plas-	Moi	ist	Perme			able	Soil		CEC	CaCO3			Shr	ink	Erosio
Depth	Limit	ticity	Bulk I	Density	abilit	<b>.</b> y	Water Ca	pacity	React	ion	(me/		Mat	tter	Sw	vell	Factor
(In)		Index	9/	/cc	In/hr		(In./	'in)	Hq)	)	100g)	Pct	1	Pct	Pote	entia	
0- 3		-	0.1-	-0.3	26		0.35-	0.45	4.5-7	.3			60.	90.	LOW		0.1
3-31		NP-10	1.4-		0.2-2			0.22	4.5-7	.3	_	_		_	LOW		0.37
31-34		NP-8	1.4-		0.2-2		0.03-		4.5-7		-	-		-	LOW		0.37
34-60		NP-6	1.7-		0.2-0		0.03-		5.1-7		-	-		-	LOW		0.28
												- Wind	Ris	k of C	crrosi	lon	Potentia
	Floo	ding		Wa	ater Tal	ole-(f	eet)	Bedroo	k-(in)	1	T DYH	Erod.	Unc	oated		Ì	Frost
Freque	ency Dura	tion 1	Months	Depth	Kind	1 1	ionths	Depth	Hard.	10	GRP Fact	Index	Ste	el	Concre	ete	Action
				:												}	
NONE	-		- 1	+1-1.0	APPARI	INT YE	AR-ROUNI	) >60		1 1	B/D 5	0	HIG	Н	HIGH	)	HIGH
Septic		RY FACIL: sorption			) ) si	RATI EVERE	DNG	Ponding			TRICTIVE Percs S		(S)			-    	
_	Tank Ab	sorption r Landfi	Fields				ING	Ponding Small S	Į	1			(S)   			-1	
_	Tank Ab	sorption	Fields ll			EVERE		-	tones	1	Percs S	lowly	1			-        -	
Daily 	Tank Ab	sorption or Landfii	Fields ll	 ÆNT	j po	EVERE OOR		-	Stones	1	Percs Si	lowly	1			-   -   -	
Daily	Tank Ab Cover fo BUILDI W Excava	sorption or Landfii	Fields 11  DEVELOPM	 ÆNT	) PO	EVERE OOR RATI		Small S	Stones	1	Percs Si	lowly	1				
Daily Shallo	: Tank Ab Cover fo BUILDI w Excava	sorption r Landfi NG SITE I	Fields  11  DEVELOPMENTS	 Hent	P(	EVERE OOR RATI		Small S	stones	1	Percs Si	lowly	1				
Daily Shallo Dwelli Dwelli Small	E Tank Ab Cover for BUILDI W Excava ngs With ngs With	sorption or Landfil NG SITE ! tions out Basement al Build:	Fields  11 DEVELOPM ments ts ings	 ÆNT	PO	EVERE  CVERE  EVERE  EVERE  EVERE  EVERE		Ponding Ponding Ponding Ponding	Stones	REST	Percs Si Ponding  TRICTIVE	lowly  FEATURE	1			-	
Daily Shallo Dwelli Dwelli Small	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets	sorption r Landfil NG SITE I tions out Basement al Build and Roads	Fields  11  DEVELOPM  ments  ts  ings		PO	EVERE EVERE EVERE EVERE EVERE		Ponding Ponding Ponding Ponding Ponding	itones	REST	Percs S. Ponding TRICTIVE	lowly FEATURE	(S)			-	
Daily Shallo Dwelli Dwelli Small	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets	sorption or Landfil NG SITE ! tions out Basement al Build:	Fields  11  DEVELOPM  ments  ts  ings		PO	EVERE  CVERE  EVERE  EVERE  EVERE  EVERE		Ponding Ponding Ponding Ponding	itones	REST	Percs Si Ponding  TRICTIVE	lowly FEATURE	(S)	ess Hu	umus		
Daily Shallo Dwelli Dwelli Small Local Lawns,	E Tank Ab Cover for BUILDI W Excavangs With ngs With Commerci Streets Landsca	sorption r Landfil NG SITE I tions out Basement al Build and Roads	Fields  ll  DEVELOPM  ments  ts  ings  s  d Golf I		P(	EVERE	DNG .	Ponding Ponding Ponding Ponding Ponding Large S	stones	 	Percs S. Ponding TRICTIVE	FEATURE	(S)	ess Hu	umus		
Daily Shallo Dwelli Dwelli Small Local Lawns,	E Tank Ab Cover for BUILDI W Excavangs With ngs With Commerci Streets Landsca	sorption r Landfil NG SITE I tions out Basement al Build and Roads ping, and	Fields  ll  DEVELOPM  ments  ts  ings  s  d Golf I		P(	EVERE	DNG	Ponding Ponding Ponding Ponding Ponding Large S	stones	 	Percs S. Ponding TRICTIVE Frost A. Ponding	FEATURE	(S)	ess Hu	umus		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	sorption r Landfil NG SITE I tions out Basement al Build and Roads ping, and	Fields  ll  DEVELOPM  ments  ts  ings  s  d Golf I		P(	EVERE	ING ING ABLE	Ponding Ponding Ponding Ponding Ponding Ponding Large S Wetness Excess	Stones  Stones  Fines	 	Percs S. Ponding TRICTIVE Frost A. Ponding	FEATURE	(S)	ess Hu	amus		
Daily Shallo Dwelli Dwelli Small Local Lawns,	E Tank Ab Cover for BUILDI W Excava ngs With Commerci Streets Landsca CONSTR	sorption r Landfil NG SITE I tions out Basement al Build and Roads ping, and	Fields  ll  DEVELOPM  ments  ts  ings  s  d Golf I		PC	EVERE	ING ING ABLE	Ponding Ponding Ponding Ponding Ponding Large S	Stones  Stones  Fines  Fines	REST	Percs S. Ponding TRICTIVE Frost A. Ponding	FEATURE ction FEATURE	(S)	ess Hu	amus		
Daily  Shallo  Dwelli  Dwelli  Small  Local  Lawns,  Roadfi  Sand  Gravel	E Tank Ab Cover for BUILDI W Excava ngs With Commerci Streets Landsca CONSTR	NG SITE I tions out Baser Basement al Build and Roads ping, and	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf I		PO	RATION RA	ING ING ABLE ABLE	Ponding Ponding Ponding Ponding Ponding Large S Wetness Excess	stones Stones Fines Fines eclaim	REST	Percs S. Ponding TRICTIVE  Frost A. Ponding TRICTIVE  Small S	FEATURE FEATURE	(S)     Exc		umus		
Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel Topsoi	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	Sorption r Landfil NG SITE I tions out Basement al Build and Roads ping, and UCTION MI	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf I		P(	RATION RA	ING  LNG  ABLE  ABLE  ING	Ponding Ponding Ponding Ponding Ponding Ponding Earge S  Wetness Excess Excess Area Re	Stones Stones Fines Fines Fines Fines	REST	Percs S. Ponding TRICTIVE  Frost A Ponding TRICTIVE	FEATURE FEATURE	(S)     Exc		armus		
Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel Topsoi	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR	Sorption r Landfil NG SITE I tions out Basement al Build and Road ping, and UCTION MI	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf H  ATERIAL		PO	RATION RA	ING  LNG  ABLE  ABLE  ING	Ponding Ponding Ponding Ponding Ponding Ponding Earge S  Wetness Excess Excess Area Re	Stones Stones Fines Fines Fines	REST	Percs S. Ponding TRICTIVE  Frost A. Ponding TRICTIVE  Small S. TRICTIVE	FEATURE TEATURE TEATURE	(S)     Exc		zmıs		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel Topsoi Pond R Embank	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR 11 1 WATER eservoir ments, D	Sorption r Landfil NG SITE I tions out Basement al Build and Roads ping, and UCTION MI	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf H  ATERIAL		PC	EVERE EVERE EVERE EVERE EVERE EVERE EVERE APROBI	ING  ABLE  ABLE  ING  ING	Ponding Ponding Ponding Ponding Ponding Ponding Large S  Excess Excess Excess Area Re  Seepage Piping	Stones Stones Fines Fines eclaim	REST	Percs S. Ponding TRICTIVE  Frost A. Ponding TRICTIVE  Small S	FEATURE  tones  FEATURE	(S)     Exc		imis		
Daily  Shallo  Dwelli  Dwelli  Small  Local  Lawns,  Roadfi  Sand  Gravel  Topsoi  Pond Re  Embanka	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR 11  WATER eservoir ments, D ge	Sorption r Landfil NG SITE I tions out Basement al Build and Road ping, and UCTION MI	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf H  ATERIAL		PO	RATION RA	ING  LNG  LBLE  LNG  PE	Ponding Ponding Ponding Ponding Ponding Ponding Large S  Excess Excess Excess Area Re  Seepage Piping Ponding	Stones Stones Fines Fines eclaim	REST	Percs Single Ponding TRICTIVE  Frost And Ponding TRICTIVE  Small Single Ponding TRICTIVE	FEATURE  tones  FEATURE	(S)     Exc		umus		
Daily  Shallo  Dwelli  Dwelli  Small  Local  Lawns,  Roadfi  Sand  Gravel  Topsoi  Pond Re  Embanka  Drainae  Irriga	E Tank Ab Cover for BUILDI W Excava ngs With ngs With Commerci Streets Landsca CONSTR ll  WATER eservoir ments, D ge tion	Sorption r Landfil NG SITE I tions out Basement al Build and Road ping, and UCTION MI	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf H  ATERIAL		PC	EVERE EVERE EVERE EVERE EVERE EVERE EVERE EVERE RATI DOOR RATI RATI	ING  LNG  LNG  LNG  LNG  TE  TION  TION	Ponding Ponding Ponding Ponding Ponding Ponding Large S  Excess Excess Excess Area Re  Seepage Piping	Stones  Fines Fines eclaim	REST	Percs Sire Ponding TRICTIVE  Frost A Ponding TRICTIVE  Small S TRICTIVE  Ponding Frost A	FEATURE  tones  FEATURE	(S)     Exc.		umus		

1			
RECREATIONAL DEVELOPMENT	RATING		RESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Ponding	Excess Humus
Picnic Areas	SEVERE	Ponding	Excess Humus
Playgrounds	SEVERE	Ponding	1
Paths and Trails	SEVERE	Ponding	Excess Humus

## CROPS AND PASTURE YIELDS

white ash

black ash

balsam fir red maple

quaking aspen

white spruce

black spruce

E E

E

ΕP

EP EP 48

56

2

2

Crop yield	ls in this ta	able are a	verages fo	r high lev	el management	where th	ne crop is	commonly grown or	n th	e map un	it.
Corn Grain	Corn Silag	ge Soybe bu/		t Oats bu/a	Alfalfa Hag   tons/acre 		Clover Hay ns/acre	Improved Pastu   AUM 	re 		t Pasture UM
					WOODLAND INT	ERPRETATI	ions				
WOODLAND E			SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT		EXISTING TREES and/or COMENDED TO PLANT	(E)	SITE	WOODLAND PRODUCT- IVITY

For more information contact: Area Resource Soil Scientist, Soil Conservation Service, Hwy 70 E. and Timberland Road, Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

SEVERE

**2**X

SLIGHT

SEVERE

SEVERE

SEVERE

Сb

Nearly level, very poorly drained soils formed in organic material more than 51 inches thick or underlain by sandy glacial outwash at depth of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.

Component Name: CARBONDALE

This map unit has 3 components and 3 interpretation sheets.

Classification: HEMIC BOROSAPRISTS, EUIC

1		Classification						>10	3-10	Per	cent < 3	ng sieve	ve   Clay %	
- :	pth USDA Texture		Unified		AASHTO		In.	Inches	No	4 No.1	0 No.40	No.200	<.002 m	
0-35			PT			A-8		-	0	j -	-	-	- j	0-
35-60			PT			A-8		-	0	<u> </u>		-	- )	0-
	Liquid Limit	Plas- ticity Index	Moi Bulk D g/	ensity	Perme- ability In/hr	Availa Water Cap (In./	pacity	Soi React (pH	ion	CEC (me/ 100g)	CaCO3	Organic Matter Pct	Shrink Swell Potential	Erosion Factor K
0-35 35 <b>-</b> 60		-	0.3-	0.4 0.2	0.2-6. 0.6-6.	0.35-		5.6-7 5.6-7		-	- Wind	4065. -	Corrosion	0.1 Potentia
	Floo		Months		ter Table Kind	-(feet) Months	Bedroo	k-(in) Hard.	HY GR	D T P Fact.	Erod.	Uncoated		Frost
NONE			-	+1-1.0	APPARENT	YEAR-ROUND	>60		A/	D 5	134	HIGH	MODERATE	HIGH
	SANITA	ARY FACII	.ITIES		) B	ATING			RESTR	ICTIVE	FEATURE	(S)		
Septic Tank Absorption Fields			SEVE	ne i	Subside	20	l p	onding		Percs Sl	owly			

SANITARY FACILITIES	RATING						
Septic Tank Absorption Fields	SEVERE	Subsides	Ponding	Percs Slowly			
Daily Cover for Landfill	POOR	Ponding	Excess Humus				
BUILDING SITE DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)					
Shallow Excavations	SEVERE	Excess Humus	Ponding	1			
Dwellings Without Basements	SEVERE	Subsides	Ponding	Low Strength			
Dwellings With Basements	SEVERE	Subsides	Ponding	Low Strength			
Small Commercial Buildings	SEVERE	Subsides	Ponding	Low Strength			
Local Streets and Roads	SEVERE	Subsides	Ponding	Frost Action			
Lawns, Landscaping, and Golf Fairways	SEVERE	Ponding	Excess Humus	}			
CONSTRUCTION MATERIAL	RATING	) RI	RESTRICTIVE FEATURE(S)				
Roadfill	POOR	Wetness	1	1			
Sand	IMPROBABLE	Excess Humus		}			
Gravel	IMPROBABLE	Excess Humus		1			
Topsoil	POOR	Excess Humus	Wetness				
WATER MANAGEMENT	RATING	) R	RESTRICTIVE FEATURE(S)				
Pond Reservoir Area	SEVERE	Seepage	1	1			
Embankments, Dikes and Levees	SEVERE	Excess Humus	Ponding	1			
Drainage -	LIMITATION	Ponding	Subsides	Frost Action			
Irrigation	LIMITATION	Ponding	Soil Blowing				
Terraces and Diversions	LIMITATION	Ponding	1				
Grassed Waterways	LIMITATION	Wetness	1	1			

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)							
Camp Areas	SEVERE	Ponding	Excess Humus						
Picnic Areas	SEVERE	Ponding	Excess Humus						
Playgrounds	SEVERE	Excess Humus	Ponding						
Paths and Trails	SEVERE	Ponding	Excess Humus						

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

- 1											4
1	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	:	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture	ļ
1						1					
j						1					j
j					1	١		1	•		
j						1					ı
:						•					i

## WOODLAND INTERPRETATIONS

WOODLAND	EROSION	EQUIPMENT	SEEDLING	WIND TH.	PLANT	INTERP	COMMONLY EXISTING TREES	(E)		WOODLAND
ORD. SYB.	HAZARD	LIMITATION	MORTALITY	HAZARD	COMPETITION	ASPECT	and/or		SITE	PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
5W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	-				
							balsam fir	E	40	5
1							silver maple	E	78	2
1							paper birch	E		
1							tamarack	E		!
							black spruce	E	15	2
1							northern whitecedar	E		
1		•								

Nearly level, very poorly drained soils formed in organic material more than 51 inches thick or underlain by sandy glacial outwash at depth of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.

Component Name: LUPTON This map unit has 3 components and 3 interpretation sheets.

Classification: TYPIC BOROSAPRISTS, EUIC

1						Classif	ication		>10	3-10	Per	cent < 3	in. pass:	ing sieve	Clay %
Depth	USDA	Text	ure		Unif	ied	OTHRAA		In. Inches		s   No	4 No.1	10 No.40	No.200	<.002 ma
0-12	SP			PT			A-8		-	0	-			-	-
12-60)	SP			PT			<b>A-8</b>		-	0	1 -	•	-	<del>-</del>	-
1	Liqui	d P	las-	Moi	.st	Perme-	Availa	able	Soi	 1	CEC	CaCO3	Organic	Shrink	Erosion
Depth	Limit	t:	icity	Bulk D	ensity	ability	Water Cap	pacity	Reacti	ion	(me/		Matter	Swell	Factor
(In)		L	ndex	g/	cc	In/hr	(In./i	in)	(Hq)	)	100g)	Pct	Pct	Potentia	L K
0-12	-		-	0.1-	0.3	0.2-6.	0.35-0	.45	5.6-7	.8	-	-	7090.		0.1
12-60)	-		-	0.1-	0.3	0.2-6.	0.35-0	.45	5.6-7	.8	-	-	-		
												Wind	Risk of	Corrosion	Potential
	Fl	oodir	ng	}	Wa	ter Table	(feet)	Bedroo	k-(in)	HYI	T	Erod.	Uncoated	j	Frost
reque	ncy Du			ionths	Depth	Kind	Months	Depth	Hard.	GRI	Pact.	Index	Steel	Concrete	Action
NONE				) - 1	+1-1.0	APPARENT	YEAR-ROUND	>60		1 4/0	 ) 5	134	HIGH	LOW ]	HIGH

SANITARY FACILITIES	] RATING	] R	ESTRICTIVE FEATURE	E(S)	
Septic Tank Absorption Fields	SEVERE	Subsides	Ponding	Percs Slowly	
Daily Cover for Landfill	POOR	Ponding	Excess Humus	1	
BUILDING SITE DEVELOPMENT	RATING	) RI	ESTRICTIVE FEATURE	E(S)	
Shallow Excavations	SEVERE	Excess Humus	Ponding	1	
Dwellings Without Basements	SEVERE	Subsides	Ponding	Low Strength	
Dwellings With Basements	SEVERE	Subsides	Ponding	Low Strength	
Small Commercial Buildings	SEVERE	Subsides	Ponding	Low Strength	
Local Streets and Roads	SEVERE	Ponding	Frost Action	Subsides	
Lawns, Landscaping, and Golf Fairways	SEVERE	Ponding	Excess Humus	1	
CONSTRUCTION MATERIAL	RATING	) RI	ESTRICTIVE FEATURE	E(S)	
Roadfill	POOR	Wetness	Low Strength	1	
Sand	IMPROBABLE	Excess Humus	1	1	
Gravel	IMPROBABLE	Excess Humus	1	)	
Topsoil	POOR	Excess Humus	Wetness	1	
WATER MANAGEMENT	RATING	) RI	ESTRICTIVE FEATURE	E(S)	
Pond Reservoir Area	SEVERE	Seepage	}	1	
Embankments, Dikes and Levees	SEVERE	Excess Humus	Ponding	1	
Drainage ,	LIMITATION	Ponding	Subsides	Frost Action	
Irrigation	LIMITATION	Ponding	Soil Blowing	1	
Terraces and Diversions	LIMITATION	Ponding	Soil Blowing		
Grassed Waterways	LIMITATION	Wetness	}	1	

RECREATIONAL DEVELOPMENT	RATING	RI	ESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Ponding	Excess Humus
Picnic Areas	SEVERE	Ponding	Excess Humus
Playgrounds	SEVERE	Excess Humus	Ponding
Paths and Trails	SEVERE	Ponding	Excess Humus
1			1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain bu/a	Corn Silage tons/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture   AUM 	Permaneurt Pasture   AUM
						1	

## WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
2W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	-				
	•						balsam fir	E	<b>4</b> 6	6
	•						red maple	E		
							paper birch	E		
							black ash	E		
							tamarack	E		
							white spruce	E		
							black spruce	E	20	2
,							quaking aspen	E		
							northern whitecedar	E		

Mearly level, very poorly drained soils formed in organic material more than 51 inches thick or underlain by sandy glacial outwash at depth of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.

Component Name: MARKEY This map unit has 3 components and 3 interpretation sheets.

Classification: TERRIC BOROSAPRISTS, SANDY OR SANDY-SKELETAL, MIXED, EUIC

#### ESTIMATED SOIL PROPERTIES

Depth	USDA Te	xture		Unifi		sifi	.cation AASHTO	)	>10 In. :						g sieve No.200	Clay %   <.002 mm
0-261			 PT				A-8				-		-	-	-	) } 0-
•	S LS FS			SM SP-SM	I		A-2 A-3 A	-1	, <del>-</del>	0	95-	100 75	-100 3	35 <b>- 7</b> 5	0- 30	0-10
	Liquid Limit	Plas- ticity Index	Bulk I	.st ensity cc		ty				ion	CEC (me/ 100g)			anic ter ct		Erosion Factor l K
0-26 26-60	-	 NP	0.2-	·0.4		j.	0.35-		5.6-7 5.6-8		-	-		 -85. -	row	0.1
Freque	Floo ncy Dura	ding	Months	Wa	ter Ta	able-	(feet) Months	Bedroo	k-(in) Hard.	H	MD T RP Fact.	Erod.	Unco	ated	į	
NONE			-	l			YEAR-ROUND	,		:			HIGH	I	ow	HIGH
-	Tank Al	ARY FACIL osorption or Landf	Fields		:	RI SEVEI POOR	:	Subside Seepage	es	] 1	RICTIVE Ponding Too San		(S) Poor Pond		er	
Dwelli Dwelli Small Local	w Excava ngs With ngs With Commerci Streets	ations nout Base n Basemen tal Build and Road	nts lings			RI SEVEI SEVEI SEVEI SEVEI SEVEI	RE   RE   RE   RE	Cutbank Subside Subside Subside Ponding	ks Cave es es es	1	RICTIVE Excess Ponding Ponding Ponding Frost A	ction	Pond Low Low	-	j	
Roadfi Sand Gravel	CONSTR	RUCTION 1			·     1	RI POOR PROBI	ATING	Wetness	S			FEATURE	(s)   		       	
Topsoi					j 1	POOR	i	Excess	i:umus		Wetness		1			
	WATER	MANAGEM	ENT		}	R	ATING			REST	RICTIVE	FEATURE	E(S)		1	

Seepage

Seepage

Ponding

Ponding

Ponding

Wetness

Piping

Subsides

Too Sandy

| Soil Blowing

Ponding

| Frost Action

| Soil Blowing

SEVERE

SEVERE

LIMITATION

LIMITATION

LIMITATION

LIMITATION

Pond Reservoir Area

Terraces and Diversions

Grassed Waterways

Drainage -

Irrigation

Embankments, Dikes and Levees

RECREATIONAL DEVELOPMENT	RATING	R	RESTRICTIVE FEATURE(S)					
Camp Areas	SEVERE	Ponding	Excess Humus	)				
Picnic Areas	SEVERE	Ponding	Excess Humus	1				
Playgrounds	SEVERE	Excess Humus	Ponding	1				
Paths and Trails	SEVERE	Ponding	Excess Humus	1				

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

- 1										1
	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM	
- 1										1
Ì					1		1		,	١
1					1					1
١					}					1

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
2W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	•				
							balsam fir	E		
							red maple	E		
							paper birch	E		
							black ash	E		
					•		tamarack	E		
							white spruce	E		
						•	black spruce	E		
•							quaking aspen	E	45	2
							northern whitecedar	E		

CrA

Nearly level and gently sloping, moderately well drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 4S.

Component Name: CROSWELL

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

					L	STIMATED SO.	T PROPER	(1159							
Donth	USDA Te	evture		Unifi		fication	<b>r</b> o	>10 In.	3-10 Inches		cent < :	•		g sieve No.200	Clay %
										-					
0- 4	•		SP-	-SM SM		A-3 A-2-		-	0	:	100 85				:
	s Ls			-SM SM SP		A-3 A-2-4		-	0		100 85				:
38-60	s		SP-	-SM SM SF	)	A-3 A-2-	4 A-1-B	-	0	-90	100 85	-100 40	)- 70 	3- 15	0-10
	Liquid	Plas-	Moi	ist	Perme-	Avai	lable	Soi	1	CEC	CaCO3	Organ	nic	Shrink	Erosi
	Limit		Bulk I	Density	ability	Water C	apacity	React	ion	(me/		Matte	er	Swell	Facto
(In)	:	Index	g,	/cc	In/hr	(In.,	/in)		•	100g)	Pct		t	Potentia	
 0- 4	:	NP	1 3	-1.5	620.	0.06	-0.09	3.6-6				0.5-		LOW	0.15
4-38		NP		-1.6	620.			4.5-7		-	_	-		LOW	0.15
38-60	•	NP		-1.6			-0.07	5.1-8		-	-	-		LOW	0.15
			·								Wind	Risk	of Co	rrosion	Potenti
	Floo	-		•	ter Tabl	.e-(feet)	- Bedroo	ck-(in)	HYI	T	Erod.	Uncoa	ted		Frost
-	ency Dura		Months	-	Kind	Months	: :		:		Index	Steel	C	concrete	Action
none				!	APPAREN	T NOV-MAY	>60		A	 5		LOW	 M	ODERATE	LOW
Daily Shalle Dwell: Dwell: Small Local	BUILDI OW Excava ings With ings With Commerci Streets , Landsca	DIG SITE ations nout Basemental Build and Road	DEVELOPI		SEV POO	RATING PERE POR  RATING PERE PERATE PERATING	Wetness   Seepage   Cutbani   Wetness   Wetness   Wetness   Wetness	ks Cave	Por	oor Fil	y  FEATURE	(s)               			·
Roadf:		KUCTION I	TATERIAL		FA]		   Wetnes		RESIR.	ICITAE	LENIUKE			j	
Sand					PRO	BABLE	)		•					1	
Grave:	ı				IMI	PROBABLE	Too Sa	ndy	1					!	
Topso:	il				POC	OR	Too Sa	ndy	1					1	
	WATER	MANAGEM	ent Ent		1	RATING			RESTR	ICTIVE	FEATURE	(S)			
Pond l	Reservoir				SE	/ERE	Seepag		1			1		İ	
Emban	koments, I	Dikes and	d Levees		SEV	/ERE	Seepag	е	P.	iping		1		1	
Drain	agé				LI	TITATION	Cutban	ks Cave	:			1		į	
Irrig					LI	MOITATION	Wetnes			roughty		]		}	
	ces and I		ns			NOITATION	Wetnes		T	oo San	ly	!		]	
Grass	ed Waterv	ays .			LI	NOITATION	Drough	ty	1			ì		}	

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Too Sandy
Picnic Areas	SEVERE	Too Sandy
Playgrounds	SEVERE	Too Sandy
Paths and Trails	SEVERE	Too Sandy
i		

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
				40	2.5	2.	4.3	1.5

## WOODLAND INTERPRETATIONS

											٠1
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E) (P)	SITE INDEX	WOODLAND PRODUCT- IVITY	1
5S	SLIGHT	MODERATE	MODERATE	MODERATE	MODERATE	•					1
							red maple	E	0	0	1
							jack pine	E	53	5	1
		•					bigtooth aspen	E	0	0	١
				•			quaking aspen	E	68	5	1
							black cherry	E	0	0	1
							northern red oak	E	0	0	
							red pine	EP	55	6	1
							eastern white pine	EP	0	0	1
							white spruce	P	O	0	1
											-1

## RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Diant Name		Dlant Name	Poight	Plant Name	 Weight	Plant Name	Height
Plant Name	neight	Plant Name		LIGHT NOTE	nerght	TABL Name	
Amur maple	10	Amur privet	10	eastern redcedar	16	eastern white pine	28
imperial Carolina popla	ar 65	lilac	10	manyflower cotoneaster	6	Norway spruce	30
red pine	28	Siberian crabapple	<b>2</b> 0	silky dogwood	9	white spruce	26

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, moderately well drained soil formed in sandy glacial outwash over silty and sandy lacustrine deposits. This map unit is not highly erodible. The land capability classification is 4S.

Component Name: CROSWELL

Grassed Waterways

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

## ESTIMATED SOIL PROPERTIES

						EST	TIMATED SOIL	PROPER:	ries						
Depth	USDA Te	exture		Unifi		assifi	cation AASHTC	)	>10 In. I		•		in. pass	ing sieve	<.002
			 SM				A-2 A-1			 0	1 90-	 100 85·	 -100 40-	75 15- 30	0-10
0- 8				SM SM SP	,		A-3 A-2 A-	-1	_	0	•		-100 40-		
8-24				SM SM SP			A-3 A-2 A-		_	0	•		-100 40-		0- 5
24-54 54-60	SR- FS :	SIL		SC SM-SC		ML	A-6 A-4 A-		-	0	•			95 20- 90	10-25
									Soil		CEC	CaC03	Organio	Shrin	Erosi
	Liquid		Moi		_	me-	Availa				(me/	Cacos	Matter		
-	Limit	ticity		Density		lity 		_	(pH)		100g)	Pct	Pct		
(In)		Index	g/	/cc	10/	hr 	(In./		(pii)						
	<20	NP-4	1.2-	-1.6	6.	-20.	0.09-0	0.12	4.5- 6	i.	-	-	0.5- 1	. LOW	0.17
8-24	<b>2</b> 00	NP-4	1.4-	-1.8	6.	-20.	0.06-	0.1	5.1-6.	5	-	-	-	LOW	0.15
24-54	:	NP	1.5-	-1.7	6.	-20.	0.04-0	0.06	5.1-6.	5	-	-	-	LOW	0.15
	:	4-15	1.3-	-1.9	0.2	-0.6	0.05-	0.21	5.1-7.	.8	-	-	-	rom	0.24
												Wind	Risk of	Corrosion	Potenti
	Flo	oding		Wa	ater	Table '	-(feet)	Bedroc	k-(in)	HYL	T	Erod.	Uncoate	đ	Frost
Freque	ency Dura	ation	Months	Depth	· K	Cind	Months	Depth	Hard.	GRE	Fact.	Index	Steel	Concrete	:
				1 2 5 5 6			NOV-MAY	   >60			. <b></b> 5	134	LOW	MODERATE	LOW
NONE		-			J PER	CHED	MOA_UVI			, <u>, , , , , , , , , , , , , , , , , , </u>			1 20%		
	SANIT	ARY FACI	LITIES		1	R	ating		. F	RESTRI	CTIVE	FEATURE	(S)	ļ	
Septi	c Tank A	bsorption	n fields			SEVE	RE )	Wetness	3		ercs Si	_	Poor Fi	lter	
Daily	Cover f	or Landf	ill			POOR	1	Seepage	:	To	o San	ly 	l 	 	
	RUTT.D	TNG STTE	DEVELOP	MENT		R	ATING		1	RESTR	CTIVE	FEATURE	(S)		
Shall	ow Excav					SEVE	i	Cutbank	s Cave	1			1	. 1	
	ings Wit		ements			SLIG	нт ј			j			1	1	
	ings Wit					MODE	RATE	Wetness	3	j			1	}	
	Commerc					SLIG	HT			1			1	1	
	Streets					SLIG	ht l			-				1	
Lawns	, Landsc	aping, a	nd Golf	Fairways		MODE	RATE	Drought	t <b>y</b>	1			1	ļ	
	CONST	יייידטא פווכיידטא	MATERIAL			 I R	ATING			RESTR	ICTIVE	FEATURE	E(S)		
Roadf						FAIR	,	Wetnes		1			1	j	
Sand							OBABLE	Thin L		ĺ			1	1	
Grave	1					:	OBABLE	Too Sa		1			1	1	
Topso						POOR	ı İ	Too Sa	ndy	1			}	1	
	WATER	MANAGEM	ENT			R	RATING			 RESTR	 ICTIVE	FEATURI	E(S)		
Pond	Reservoi					SEVE		Seepag		1			}	ĺ	
,			d Levees	}				Seepag		P	iping		1	1	
	Embankments, Dikes and Levees Drainage							Cutbanks Cave				1	1		
	orainage Irrigation					!		Wetness		D	rought	y	1	}	
_	<del>-</del>				:	TATION	Wetnes	ness Too Sandy			Soil B	lowing			
	races and Diversions								1				1	1	

Droughty

LIMITATION

| Rooting Depth |

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)
Camp Areas	MODERATE	Too Sandy
Picnic Areas	MODERATE	Too Sandy
Playgrounds	MODERATE	Small Stones   Too Sandy
Paths and Trails	MODERATE	Too Sandy
· i		

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0ats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
				50	2.5	2.	4.3	1.6

## WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
7A	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE					
!							red maple	E	0	0
							paper birch	E	0	0
							bigtooth aspen	E	0	0
							quaking aspen	E	0	0
							northern pin oak	E	0	0
							northern red oak	E	0	0
							American basswood	E	0	0
				•			jack pine	EP	0	0
							red pine	EP	60	7 .
							eastern white pine	EP	0	0
1										

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name He	eight
eastern redcedar  jack pine  Norway spruce	28	eastern white pine lilac red pine	28 12 28	green ash Manchurian crabapple Siberian peashrub		imperial Carolina poplar nannyberry viburnum white spruce	r 60 8 22

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Moderately steep and steep, excessively drained soil formed in very gravelly sand glacial outwash. This map unit is highly erodible. The land capability classification is 7S.

Component Name: EMMERT

Classification: TYPIC UDORTHENTS, SANDY-SKELETAL, MIXED, FRIGID

						TIMATED SO	IL PROPE									
Depth	USDA Te	xture		Unifi		ication AASH						10	No.40	) ]	No.200	
	GRV-S GRV-COS	GRV-S		SP GW GP GP SP SW		A-1 A-1				•		- 75 10- - 45 5-		50	0- 20	
Depth		ticity	Bulk I		Perme- ability	Water C	lable		ion	CEC (me/	CaC03	Ma	ganic atter		Shrink Swell	
(In)		Index	g/	/cc	In/hr	(In.,	/in)	(pH)	) :	100g)	Pct		Pct		Potentia	ı K
0- 2	15-25	NP NP	1.5-	1.6	>20.	0.06	-0.04	5.1-7	.3	-	-	0.	5- 1.	]	ron ron	0.1 0.1
			Months	Wa	Kind	(feet)	-  Bedroo	k-(in) Hard.	HYD GRP	T Fact.	Index	Unc	coated	l	į	Potentia Frost Action
 NONE				<b>≻6.0</b>			>60					1 700	 1		 DERATE	100
	w Excava	tions	DEVELOPM	ENT	SEVE		   Cutbank				FEATURE	(S)				
Dwelli	ngs With ngs With	Basemer	nts		SEVE	RE	Slope   Slope		.						1	
Local	Commerci Streets	and Road	is		SEVE	RE	Slope   Slope					 				
Lawns,	Landsca	ar	nd Golf F	alrways	SEVE	·	Small S	cones	l Dro	oughty		! 				
Roadfi		UCTION 1	ATERIAL		POOR	ATING	   Slope	I	RESTRIC	TIVE	FEATURE	(S) 			j	
Sand Gravel					PROB							 				
Topsoi.	1 				POOR		Too Sar	ndy 	Sona	all St	ones	Are	a Rec	lai	m   1	
Dond P	WATER :	MANAGEME	ent		) RI SEVE	ATING	   Seepec		RESTRIC		FEATURE	(S)				
	ments, D		Levees		SEVE		Seepage   Seepage   Deep To	:		, pe		   				
Irriga		iversion	ıs		LDI	TATION TATION TATION	Slope   Slope	, water	:	ge St		:	oughty Sand			
	d Waterw		_		:	NOITAT	Large S	Stones	Slo	-		i	oughty	-	i	

				•
RECREATIONAL DEVELOPMENT	RATING	1.	RESTRICTIVE FEATURE(S)	1
Camp Areas	SEVERE	Slope	- 1	!
Picnic Areas	SEVERE	Slope	1	
Playgrounds	SEVERE	Slope	Small Stones	!
Paths and Trails	SEVERE	Too Sandy	1	-
1				

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
i					1			
!					•			

## WOODLAND INTERPRETATIONS

		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP   COMMONLY EXISTING TREES ASPECT   and/or   TREES RECOMENDED TO PLA	(E) VT (P)	SITE INDEX	WOODLAND PRODUCT- IVITY
6R	MODERATE	MODERATE	SEVERE	SLIGHT	SLIGHT	white spruce	E	55	7
1						jack pine	EP	60	6
1 3						red pine	EP	52	6
1.						eastern white pine	EP	50	6

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level, frequently flooded, poorly drained and very poorly drained soil formed in loamy and sandy alluvium. This map unit is not highly erodible. The land capability classification is 6W. This map unit is hydric.

Component Name: FORDUM

Grassed Waterways

Classification: MOLLIC FLUVAQUENTS, COARSE-LOAMY, MIXED, NONACID, FRIGID

#### ESTIMATED SOIL PROPERTIES

						ficati			>10	3-10	:			•	ing siev		Clay %
Depth	USDA Te	xture		Unifi	ed 		AASHT	0	In. I	nche	No 	4 No.	10	No.40	No.20	0   	<.002 m
0- 7	MK-VFSL		SM	SM-SC ML	CL-ML	<b>A-4</b>	A-2 A-	-1	-	0-15	s <b>  8</b> 0-	100 75	-100	45- 9	95 20-	65	8-15
7-39	SIL FSL	L	SM	SC ML CL		A-2	A-4 A-	-1	-	0-1	80-	100 75	<b>-10</b> 0	45-10	00 20-	90	8-18
39-60	s FS LFS	}	SP	SM		<b>A-3</b>	A-2 A-	-1	-	0-15	5   80-	100 75	-100	35- 8	30 2-	35	2- 5
	Liquid	Plas-	Moj	ist	Perme-		Availa	able	Soil		CEC	CaCO3	3 Or	ganic	Shri	nk	Erosio
	Limit	ticity		Density	ability	Wa	ter Cap	pacity	Reacti	on	(me/		Ma	atter	Swe	11	Factor
(In)		Index		/cc	In/hr		(In./	in)	(pH)	)	100g)	Pct		Pct	Poten	tial	. K
0- 7	15-25	3-7	1.4-	-1.5	0.6-6.		0.11-	0.18	5.6-8.	4	_	-		312.	LOW		0.2
7-39	15-30	3-10	1.4-	-1.5	0.6-6.		0.1-0	0.22	5.6-8.	4	-	-		-	LOW		0.43
39-60	-	NP	1.5	-1.7	620.		0.04-	0.1	5.6-8.	4	-	-		-	LOW		0.15
												Wind	Ris	sk of (	Corrosio	n	Potentia
	Floo	ding		Wa	ter Tabl	.e-(fee	t)	Bedroo	k-(in)	HY	T	Erod.	) Dno	coated		1	Frost
Freque	ency Dura	tion	Months	Depth	Kind	Mon	ths	Depth	Hard.	GRI	P Fact.	Index	Ste	eel	Concret	e	Action
				,												-	
FREQUI	ENT LONG	;	MAR-JUN	+1-1.0	APPAREI	T YEAR	-ROUND	>60		D [	4	0	HIG	SH	HIGH	1	HIGH
	SANITA	RY FACI	LITIES		1	RATING	1					FEATURI			į		
-	c Tank Ab				SE	ERE	]	Floodin	-	•	onding		:	or Fil	ter		
Daily	Cover fo	r Landf	ill 		) PO	)R		Seepage	: 	) T	oo Sand	ły 	Por	nding	 		
	BUILDI	ng site	DEVELOP	MENT	1	RATING	; ]		i	- R <b>EST</b> R	ICTIVE	FEATURI	E(S)		i		
Shallo	ow Excava	tions			SE	ERE	1	Cutbank	cs Cave	P	onding		1		İ		
Dwelli	ings With	out Bas	ements		SE	ERE	1	Floodir	ıg	P	onding		1				
Dwelli	ings With	Baseme	nts		SE	ERE	1	Floodin	ng	P	onding		1				
Small	Commerci	al Buil	dings		SE	ERE	1	Floodin	ng .	P	onding		1				
Local	Streets	and Roa	ds		SE	ERE	1	Ponding	3	F	looding	3	Fre	ost Ac	tion		
Lawns	, Landsca	ping, a	nd Golf 1	Fairways	SE	ÆRE		Ponding	) 	F	looding	J					
	CONSTR	RUCTION	MATERIAL		1	RATING	;		1	RESTR	ICTIVE	FEATUR	E(S)	7			
Roadf	ill I				PO	)R	- 1	Wetness	5	1			1				
Sand					PRO	BABLE	]			1			1		1		
Grave.	1				,	ROBABI		Too Sar	-	1			1				
Topso	ij				PO	OR	1	Small S	Stones	W	etness		ì				
	WATER	MANAGEM	 ENT		1	RATING	; l		1	RESTR	ICTIVE	FEATUR	 E(S)				
Pond 1	Reservoir				SE	ÆRE	i	Seepage		1						j	
	kments, I		d Levees		:	/ERE	í	Seepage		Í P	iping		Po	nding		i	
Draina	•		_ 201003			TTATIC	) I NC	Ponding			loodin	3	- 1	ost Ac	tion	ĺ	
Irriga	_					TATIC	i	Ponding			loodin	-	j			İ	
-	ces and D	)iversio	ns			TATIC	:	Ponding	•	:	oo San	-	i			j	
					, 22				•	: -		4				i	

Wetness

LIMITATION

RECREATIONAL DEVELOPMENT	RATING	1.	RESTRICTIVE FEATURE(S)	1
Camp Areas	SEVERE	Flooding	Ponding	1
Picnic Areas	SEVERE	Ponding		1
Playgrounds	SEVERE	Ponding	Flooding	- 1
Paths and Trails	SEVERE	Ponding		
·				

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

, <b>02.0</b> p								
Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre 	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture   AUM

## WOODLAND INTERPRETATIONS

  WOODLAND  ORD. SYB. 	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E) (P)	SITE INDEX	WOODLAND   PRODUCT-   IVITY
2W 	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE		balsam fir tamarack	E	0 0	0 1
1				-			white spruce	E	0	0
į							black spruce northern whitecedar	E	0	0
		٠					red maple silver maple	EP EP		0 2
							white ash	EP	0	0

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, moderately well-drained soil formed in silty deposits underlain by gravelly loamy sandy glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.

Component Name: GOODMAN

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

						TIMATED SOI									
) Depth	USDA Te	exture		Unifi	Classifi ed	ication AASHT	0			-				ing sieve No.200	<.002 mm
 0- 3				CL-ML		A-4			25-	 -50	90-1		100 80-1	00 55- 90	5-12
3-23				CL-ML		n-4		-			•			00 55- 90	1
:	FSL SL I				SM-SC	A-2 A-1 A	-4	<u>-</u>			•			90 13- 70	
	SL GR-SI			SM-SC	Sir Bo	A-2 A-1	•	-		-	•			80 13- 35	:
 [	Liquid	Plas-	 Moi	 .st	Perme-	Avail	able	Soi	il	CI	CEC CaCO3		Organio	: Shrink	Erosio
Depth (In)		ticity Index		ensity cc	ability In/hr	Water Ca (In./		React	tion H)	•	me/ 00g)	Pct	Matter Pct		Factor il K
	 (23	NP-6		.1 5	0.6-2.	0 11-	0.2	3.6-6					3 7.	LOW	0.37
3-23		NP-7			0.6-2.		0.22				_	-	-	LOW	0.37
	<b>C23</b>	NP-6			0.6-2.		0.16				_	_	-	LOW	0.24
ے۔۔ 38 <b>-6</b> 0		NP-6			0.6-2.		0.12	5.1-			-	-	-	LOW	0.24
												Wind	Risk of	Corrosion	Potentia
	Floo	odina		Wa	ter Table	-(feet)	Bedro	k-(in	) ] 1	HYD	T	Erod.	Uncoate	i	Frost
					Kind	Months	Depth	Hard	. ]	GRP	Fact.	Index	Steel	Concrete	Action
 NONE						NOV-MAY	•		-   :	 B	 5	0	LOW	HIGH	MODERATI
•		-	n Fields		R   SEVE   FAIR		Wetnes:		RES	TRIC	TIVE	FEATURE	(S)   	1	
													/c)		
a. 33			DEVELOP	MENT	:	ATING	   Cutban	ré Cau			ness	FEATURE	(3)	í	
	ow Excava				) SEVE	RATE	Wetnes		- 1	wet	71622		1	1	
	ings With ings With				SEVE		Wetnes		1				i	i	
	Commerc					RATE	Wetnes		i				i	j	
	Streets		-		:	RATE	Wetnes	_	j	Fro	ost Ac	tion	İ	j	
			nd Golf	Fairways	;		Large	Stones	; j				İ	j	
	CONST	RUCTION	MATERIAL		F	RATING	 		RES	TRI	TIVE	FEATURE	.(S)	)	
Roadf	ill				FAIF	₹	Wetnes	s					!	}	
Sand					IMPE	ROBABLE	Excess	Fines	3				}	}	
Grave	1				IMPE	ROBABLE	Excess						1	1	
	il 				POOF	₹ 	Large	Stones	5 	Ar	ea Red	claim	·		
Topso		MANACEN	ENT		) I	RATING	1 .		RES			FEATURE	E(S)	į	
	WATER						Seepag	_		1 27	ope		1		
Pond	Reservoi	r Area			:	ERATE	:			i			i	1	
Pond Emban	Reservoi kments,	r Area	nd Levees	:	SEVI	ERE	Piping			j			j		
Emban Drain	Reservoi kments, age	r Area	nd Levees	:	SEVI	ERE ITATION	Piping   Slope			   De-	<b>+</b> nc==		]		
Pond Emban Drain Irrig	Reservoi kments, age	r Area Dikes ar		<b>:</b>	SEVI LIM	ERE	Piping		•	:	tness	Easily	       Wetness		

1					
RECREATIONAL DEVELOPMENT	RATING	) RES	STRICTIVE FEAT	TURE(S)	i
Camp Areas	MODERATE	Wetness			١
Picnic Areas	MODERATE	Wetness		1	1
Playgrounds	MODERATE	Large Stones	Slope	Wetness	1
Paths and Trails	MODERATE	Large Stones	Wetness	1	١
i					1

1	crop yields	in this table	are average	Jes 101	mign leve	ı manayement wi	mere the drop is		me map unit.	1
	Corn Grain	Corn Silage	Soybeans bu/a	Wheat bu/a	Oats	Alfalfa Hay	Red Clover Hay	Improved Pasture	Permanent Pasture	
į								6.6	2 2	

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
3X	SLIGHT	MODERATE	SLIGHT	MODERATE	SEVERE					
							sugar maple	E	69	3
				-			yellow birch	E		
							paper birch	E		
							bigtooth aspen	E		
							quaking aspen	E		
							American basswood	E	68	3
							white spruce	. P		
							red pine	P		
							eastern white pine	Ρ.		

Sloping, moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.

Component Name: GOODMAN

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

						EST	IMATED SOII								
Dameth	ncus mo			Unifi		assifi	cation AASHTY	)			Pero No 4		in. pass		Clay %   <.002 m
Jepun   	USDA Te	 xrme									ļ				j
0- 3	SIL		ML	CL-ML			A-4		- 2	5-50	90-			00 55 <b>- 9</b> 0	5-12
3-23		•	ML	CL-ML			h-4			0-15	•		100 85-1		•
23-38)	FSL SL L		ML	CL-ML SM	SM-	SC	A-2 A-1 A	-4						90 13- 70	
38-60	SL GR-SL	LS	SM	SM-SC			A-2 A-1		-	0-15	65-	100 60-	- 95 30-	80 13- 35	2-12
	Liquid	Plas-	Moi	st	Per	me-	Avail	able	Soil	C	EC	CaCO3	Organic	Shrink	Erosio
	Limit	ticity		ensity	abi	lity	Water Ca	pacity	Reactio	n (	me/		Matter	Swell	Facto
(In)		Index	g/	cc -	In/	'hr	(In./	in)	(pH)	1	.00g)	Pct	Pct	Potentia	al K
 0- 3	<23	NP-6	1.4-	1.5	0.6	i-2.	0.11-	0.2	3.6-6.5	 ;	-	-	3 7.	LOW	0.37
3-23		NP-7		1.6		5-2.	0.17-		3.6-6.5	<b>,</b>	-	-	-	LOW	0.37
23-38		NP-6		-1.6			0.04-		3.6-6.5	<u>,                                    </u>	-	-	-	LOW	0.24
38-60		NP-6	1.5-		0.6		0.04-	0.12	5.1-6.5	5	-	-	-	LOW	0.24
												Wind	Risk of	Corrosion	Potenti
	Floo	ding		Wa	iter	Table ·	-(feet)	Bedroo	k-(in)	HYD	T	Erod.	•		Frost
Freque	ency Dura	tion	Months	Depth	K	Cind	Months	Depth	Hard.	GRP	Fact.	Index	Steel	Concrete	Action
NONE			-	1.5-3.0	PER	RCHED	NOV-MAY	>60	-	В	5	0	LOW	HIGH	MODERAT
	SANITA	RY FACI	LITIES			R	ATING )		Ri	ESTRI	CTIVE	FEATURE	 (S)	·  	
Septio	c Tank Al	sorption	n Fields			SEVE	RE	Wetness	s	1			1	1	
Daily	Cover fo	or Landf	ill			FAIR	١	Slope		We	tness		] 		
	BUILD	NG SITE	DEVELOP	MENT		R	ATING		R	ESTRI	CTIVE	FEATURE	(S)	i	
Shalle	ow Excava					SEVE	RE	Cutban	ks Cave	We	toess		1	1	
Dwell:	ings With	out Bas	ements			MODE	rate	Wetnes	s	) sl	ope		1	1	
Dwell:	ings With	Baseme	nts			SEVE	re	Wetnes	s	1			!	ļ	
Small	Commerci	ial Buil	dings			SEVE	RE	Slope		}			ļ	}	
•	Streets			٠.		MODE		Wetnes	-	Sl	ope		Frost A	ction	
Lawns	, Landsca	aping, a	nd Golf	Fairways		SEVE	RE	Large	Stones 	) 			 		
	CONST	RUCTION	MATERIAL			R	ATING		R	ESTRI	CTIVE	FEATURE	(s)	į	
	ill					FAIR		Wetnes	S	1			1	ļ	
Roadf:													j	1	
							OBABLE		Fines	1			i		
Roadf: Sand Grave:	1					IMPR	OBABLE	Excess	Fines	1			į		
Sand Grave	1						OBABLE	Excess		Ar	ea Re	claim	<u> </u>		
Sand Grave	l il	MANAGEM	 IENT			IMPR POOR	OBABLEATING	Excess Large	Fines Stones	·		claim  FEATURE	)  E(S)		
Sand Grave: Topso: 	l il  WATER Reservoi	r Area				POOR	OBABLE  ATING  RE	Excess Large Slope	Fines Stones	·			i         		
Sand Grave Topso  Pond	l il WATER Reservoir	r Area		<del></del>		POOR R SEVE	OBABLE  ATING RE RE	Excess Large Slope Piping	Fines Stones	·			;         		
Sand Grave Topso: Pond Emban	l il 	r Area		<del></del>		IMPR   POOR   R   SEVE   SEVE	OBABLE  ATING  RE  RE  TATION	Excess Large Slope Piping Slope	Fines Stones	ESTRI	CTIVE	FEATURE	i i E(S)		
Sand Grave Topso Pond Emban Drain	l il 	r Area Dikes an	d Levees	<del></del>		IMPR   POOR   SEVE   SEVE   LIMI	OBABLE  ATING  RE  RE	Excess Large Slope Piping	Fines Stones	ESTRI		FEATURE	E(S)	Facily	

RECREATIONAL DEVELOPMENT	RATING	] -	RESTRICTIVE FEAT	TURE(S)	j
Camp Areas	MODERATE	Slope	Wetness	1	1
Picnic Areas	MODERATE	Slope	Wetness	1	1
Playgrounds	SEVERE	Slope	}	1	)
Paths and Trails	MODERATE	Large Stones	Wetness	1	}
i					1

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn G	_	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
								6.4	3.3

## WOODLAND INTERPRETATIONS

WOODLAND   ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP   ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E) (P)	SITE INDEX	WOODLAND PRODUCT- IVITY
) 3x ) ) 	SLIGHT	MODERATE	SLIGHT	MODERATE	SEVERE		sugar maple yellow birch paper birch bigtooth aspen quaking aspen	E E E E	69	3
   					•		American basswood white spruce red pine eastern white pine	E P P	68	3

TO 25 PERCENT SHOPES, STORY

Moderately steep, well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is highly erodible. The land capability classification is 7S in stony areas.

Component Name: GOODMAN

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

]														
	)   USDA Te			Unifi	ed	Fication AASH	TO					3 in. pass 10 No.40		Clay %   <.002 m
0- 3	  SIL			CL-ML		λ-4			 25-5	,	-100 90	)-100 80-1	100 55- 9	-   )   5-12
3-23	•			CL-ML		h-4		_				)-100 85-1		
	FSL SL I	,		CL-ML SM	SM-SC	A-2 A-1	A-4	_				)- 95 30-		
	SL GR-SL			SM-SC		A-2 A-1		-				95 30-		
	Liquid	Plas-	Mo	 ist	Perme-	Avai	 lable	Soi	 l	CEC	 CaC03	Organio	Shrin	Erosi
Depth	Limit	ticity	Bulk 1	Density	ability	Water C	apacity	Reacti	on			Matter		
(In)		Index	g,	/cc	In/hr			(Hq)		100g)	Pct	Pct		
	<23	NP-6		 -1.5	0.6-2.	0.11	- 0.2	3.6-6.	.5			3 7.		0.37
3-23	<25	NP-7				0.17				-	_	J. ,.	LOW	0.37
23-38	<25	NP-7	1.5	-1.6	0.6-2.		-0.16			_	_	_	LOW	0.37
38-60				-1.8			-0.12			_	_	_	LOW	0.24
											- Wind	Risk of		Potentia
	Floo	ding		Wat	er Table	-(feet)	- Bedroo	k-(in)	1 ну	יד ס	Erod.	Uncoated		Frost
Freque	ncy Dura	tion	Months	Depth	Kind							Steel		•
NONE			-	>6.0	-	-	>60		В	5	0	LOW	HIGH	MODERATE
	Tank Abs	-			) SEVE		Slope Slope					) .   .	1	
	BUILDI	NG SITE	DEVELOPE	ENT	R	ATING	 		ESTR	CTIVE	FEATURE	 (s)		
Shallo	w Excavat	tions			SEVE		Cutbank				IMIONE	1	1	
Dwelli	ngs With	out Base	ments		SEVE	RE	Slope		1	p-		ĺ		
Dwelli	ngs With	Basemen	ts		SEVE	RE	Slope		i			i	ί .	
Small (	Commercia	al Build	ings		SEVE	RE	Slope		İ			İ	í	
Local :	Streets a	and Road	s		SEVE	RE	Slope		1		•	j	j	
Lawns,	Landscap	oing, an	d Golf F	airways	) SEVE	RE	Large S	tones	) s:	lope		1	j	
	CONSTRU	CTION M	ATERIAL		l R	ATING		R	ESTR	CTIVE	FEATURE	 (S)		
					•			• •					•	
	11				FAIR		Slope	•	1			)	)	
Roadfi Sand					FAIR		Excess	Fines				} 	}	
Sand Gravel					FAIR			Fines				)   	)   	
Sand Gravel					FAIR	OBABLE	Excess	Fines Fines	1	lope		}     	)      1	
Sand Gravel Topsoi	l Water M	 IANAGEME	 NT		FAIR IMPRO IMPRO POOR	OBABLE OBABLE	Excess Excess Large S	Fines Fines tones	)     s:		FEATURE	      (s)	     	
Sand Gravel Topsoi	l WATER M	Area			FAIR IMPRO IMPRO POOR R SEVE	OBABLE OBABLE ATING	Excess Excess Large S	Fines Fines tones	)     s:		FEATURE	        (S)	          	
Sand Gravel Topsoi Pond Re Embank	WATER Meservoir	Area			FAIR IMPR IMPR POOR R SEVE	DBABLE DBABLE ATING RE	Excess Excess Large S Slope Piping	Fines Fines tones R	)     s:		FEATURE	      (s)		
Sand Gravel Topsoi Pond Re Embank	WATER M eservoir ments, Di	Area			FAIR IMPR IMPR POOR R SEVE	OBABLE OBABLE ATING RE RE TATION	Excess Excess Large S Slope Piping Deep To	Fines Fines tones R	)     s:		FEATURE	           		
Sand Gravel Fopsoi Pond Re Embanko Orainac	WATER M eservoir ments, Di ge	Area kes and	Levees		FAIR IMPR IMPR POOR R SEVEI	OBABLE OBABLE ATING RE RE PATION PATION	Excess Excess Large S Slope Piping Deep To Slope	Fines Fines tones R	   S]   S]     ESTR] 	CTIVE		             	)            	
Sand Gravel Topsoi Pond Re Embanko Orainag Grrigat	WATER M eservoir ments, Di	Area kes and	Levees		FAIR IMPR IMPR POOR SEVEI SEVEI LIMI	OBABLE OBABLE ATING RE RE TATION	Excess Excess Large S Slope Piping Deep To	Fines Fines tones R	SI   SI   ESTRI		asily	             	)  ) ) )	

RECREATIONAL DEVELOPMENT	RATING	) · RE	STRICTIVE FEATUR	E(S)
Camp Areas	SEVERE	Slope		! !
Picnic Areas	SEVERE	Slope	•	
Playgrounds	SEVERE	Slope	1	1
Paths and Trails	MODERATE	Large Stones	Slope	1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

+ Dactura	١
t Pasture UM	
6	- -
	NUM 2.6

## WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
3R	SLIGHT	MODERATE	SLIGHT	SLIGHT	SEVERE	NORTH ·	sugar maple	E	69	3
							yellow birch	E		
							paper birch	E		š.
							bigtooth aspen	E		
							quaking aspen	E		
							American basswood	E	68	3
							white spruce	P		
							red pine	P		
•							eastern white pine	P		

Nearly level, very poorly drained soil formed in acid organic material more than 51 inches thick or underlain by sandy glacial outwash at depths of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.

Component Name: GREENWOOD

This map unit has 3 components and 3 interpretation sheets.

Classification: TYPIC BOROHEMISTS, DYSIC

) Depth	USDA Te	xture		Unif:		assifi	cation AASHT	0	>10 In.		-10 ches	•		•	sing sieve No.200	: -
j											0					-
0- 9)			PT				A-8 A-8		-		0	1 -			-	1 -
9-60	HM		PT				A-0		-							} 
}	Liquid	Plas-	Moi	st	Peru	ne-	Avail	able	So	il		EC	CaCO3	Organi	c Shrin	k Erosion
Depth	Limit	ticity	Bulk I	ensity	abi.	lity	Water Ca	pacity	Reac	tic	a (	me/		Matter		
(In)		Index	9/	/cc	In/l		(In./	in)	(p	H)	1	.00g)	Pct	Pct	Potent	ial K
ا 0- 91			n 3-	-0.4	6		0.55-	0.65	3.6-	 4.4	. <b></b>	-	-	5575		0.1
9-60		_		-0.3			0.45-					-	-	-		
													Wind	Risk of	Corrosion	Potentia
	Floo	ding		W	ater !	rable	-(feet)	Bedroo	k-(in	)	HYD	T	Erod.	Uncoate	d	Frost
Freque	ency Dura	tion	Months		K			: -					Index	Steel	Concrete	i
NONE			-	1			YEAR-ROUND	,			A/D	5		HIGH	HIGH	HIGH
															 }	
	SANIT	RY FACI	LITIES		1	R	ATING			RI	STRI	CTIVE	FEATURE	(S)	,	
Septio	SANITARY FACILITIES eptic Tank Absorption Fields			1	SEVE	RE )	Subside	es		Por	nding		)	1		
Daily	Cover fo	or Landf	ill '		}	POOR	)	Ponding	9		Exc	cess ł	iumus	}	]	
	BUILDI	ING SITE	DEVELOP	MENT	)	 R	ATING )			RI	ESTRI(	CTIVE	FEATURE	(S)		
Shallo	w Excava	ations			j	SEVE	RE	Excess	xcess Humus   Ponding				}	1		
Dwelli	ings With	out Bas	ements		1	SEVE	re	Subsid	sides		Ponding			Low Str	ength	
Dwelli	ings With	Baseme	nts		1	SEVE	re	Subsid	es		Po	nding		Low Str	- :	
Small	Commerci	al Buil	dings		1	SEVE	RE .	Subsid	es		Po	nding		Low Str	-	
	Streets				)	SEVE		Pondin	_			ost A		Subside	s I	
Lawns,	Landsca	aping, a	nd Golf !	Fairways	;	SEVE	RE	Pondin	g 		Ex	cess i	łumus 	\ 		
	CONST	RUCTION	MATERIAL		1	R	ATING			R			FEATURE	(S)	į	
Roadfi	111				]	POOR		Wetnes			Lo	w Str	ength	}	1	
Sand					}		OBABLE	Excess			1			}	}	
Grave]	l				}		OBABLE	Excess			1			1	1	
Topsoi	il 				ا 	POOR		Excess	Humus	s 	We	tness		1		
	WATER	MANAGEM	ENT		1	R	ATING			R	ESTRI	CTIVE	FEATURE	:(s)	1	
	Reservoi				!	SEVE		Seepag			1			}	. ]	
		Dikes an	d Levees		)	SEVE		Excess		s		nding		1 .	}	
Draina					]		TATION	Pondin	•		Fr	ost A	ction	1	1	
Irriga					}		TATION	Pondin			)			i	1	
	ces and l		ns		}		TATION	Pondin	_		1			1	}	
Grasse	ed Water	ways			1	LIM	TATION	Wetnes	S		l			1	)	

RECREATIONAL DEVELOPMENT	RATING	) R	ESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Ponding	Excess Humus
Picnic Areas	SEVERE	Ponding	Excess Humus
Playgrounds	SEVERE	Excess Humus	Ponding
Paths and Trails	SEVERE	Ponding	Excess Humus
i			

	Crop yields	in this table	are averag	es for	high leve	l management	where the crop is	commonly grown on t	the map unit.
	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0ats   bu/a	Alfalfa Hay	y Red Clover Hay tons/acre	Improved Pasture   AUM	Permanemt Pasture
i					1			1	

#### WOODLAND INTERPRETATIONS

1										
WOODLAND	EROSION	EQUIPMENT	SEEDLING	WIND TH.	PLANT	INTERP	COMMONLY EXISTING TREES	(E)		WOODLAND
ORD. SYB.	HAZARD	LIMITATION	MORTALITY	HAZARD	COMPETITION	ASPECT	and/or		SITE	PRODUCT-
1							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
2W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	NORTH ·				
1							balsam fir	E	39	5
1							tamarack	E		1
)							black spruce	E	15	2

05/28/92

Nearly level, very poorly drained soil formed in acid organic material more than 51 inches thick or underlain by sandy glacial outwash at depths of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.

Component Name: LOXLEY This map unit has 3 components and 3 interpretation sheets.

Classification: TYPIC BOROSAPRISTS, DYSIC

l					ES'	TIMATED SOI	L PROPER	TIES							
Depth	USDA Text	ure		Unifi	Classif ied	ication AASHT	0	>10 In.	3-10 Inches		cent < 3	3 in. pass 10 No.40			Clay % <.002 mm
0- 4 4-60			PT PT			A-8 A-8		-	0 0	-		· -	 - -	   	-
		las- icity ndex	Moi Bulk D g/	ensity	Perme- ability In/hr	Avail Water Ca (In./	pacity	Soi React (pH	ion	CEC (me/ 100g)	CaCO3	Organic Matter Pct	Swe	11	Erosion Factor K
0- 4 4-60		- - -	0.3-	0.4	620. 0.2-6.		0.65 0.45	3.6-4 3.6-4		- - -	-	70. <b>-</b> 90.			0.1
	Flooding		 Months		ter Table Kind	-(feet) Months	Bedroc					Risk of Uncoated Steel		į	Potential Frost Action
NONE	-		-	+1-1.0	APPARENT	YEAR-ROUND	>60		A/D	5	38	HIGH	HIGH	- ) -	IIGH
-	SANITARY Tank Absor Cover for I BUILDING	rption Landfil	Fields Ll	 ENT	SEVEL POOR	ATING   RE	Subside Ponding	s 	Por Exc	nding cess H	FEATURE ( iumus  FEATURE (	Percs Sl Too Acid	- :		
Dwelli Dwelli	w Excavationgs Without ngs With Ba Commercial	ons : Basen asement	ments :s	<b></b>	SEVE	RE RE	Excess : Subside Subside Subside	Humus s s -	Por Por	nding nding nding nding		Low Stre Low Stre Low Stre	ngth		
Local	Streets and Landscapin	Roads	3	airways	SEVE	RE	Subside Too Acid	s	Por	nding nding		Frost Ac	tion		
Roadfi Sand Gravel		TION ME	ATERIAL		POOR	ATING	Wetness Excess : Excess :	Humus Humus	Los	CTIVE Stre	FEATURE (	(S)	)       		
	WATER MAN eservoir Ar ments, Dike	ea			SEVER	:	Seepage Excess 1	Humus	Por	CTIVE nding	FEATURE (	(S)	       		
Irriga Terrac	~		;		LIMI	NOITAT NOITAT NOITAT	Ponding Ponding Wetness		- :	osides o Acid		riust AC	     		

RECREATIONAL DEVELOPMENT	RATING	) RI	ESTRICTIVE FEATUR	E(S)
Camp Areas	SEVERE	Ponding	Excess Humus	Too Acid
Picnic Areas	SEVERE	Ponding	Excess Humus	Too Acid
Playgrounds	SEVERE	Excess Humus	Ponding	Too Acid
Paths and Trails	SEVERE	Ponding	Excess Humus	j

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM

#### WOODLAND INTERPRETATIONS

1										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP   ASPECT	COMMONLY EXISTING TRE and/or TREES RECOMENDED TO P		SITE INDEX	WOODLAND PRODUCT- IVITY
) 2W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	NORTH -				
i	•						balsam fir	E		
i	·						tamarack	E		
1							black spruce	. <b>E</b>	15	2
1										

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

1								
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name		Height
common ninebark		eastern white pine Siberian crabapple		green ash silky dogwood	28 9	nannyberry	viburnum	8)

Irrigation

Terraces and Diversions

Grassed Waterways

Nearly level, very poorly drained soil formed in acid organic material more than 51 inches thick or underlain by sandy glacial outwash at depths of 16 to 50 inches. This map unit is not highly erodible unless drained. The land capability classification is 6W. This map unit is hydric.

Component Name: DAWSON This map unit has 3 components and 3 interpretation sheets.

Classification: TERRIC BOROSAPRISTS, SANDY OR SANDY-SKELETAL, MIXED, DYSIC

#### ESTIMATED SOIL PROPERTIES

Mo: y Bulk 1 g,  0.2 0.2	-SC SM SC S	Perme-ability (n/hr 620. 0.2-6. 620.	A-8 A-8 A-2 A-3 A Avail: Water Cap (In./: 0.55-0 0.35-0	-1 A-4 able pacity in) 0.65 0.45	Soil Reaction (pH) 3.6-4.4 4.5-6.5	C (in 1.	   -   45-1   45-1   60   60   60   70   70   70   70   70   70   70   7	 - -	100 15- Organi Matter Pct  6585	c Shr Sw Pote	           	Erosion Factor
PT PT SM Mo: Wood Bulk 1  9. 0.2 0.2 0.2 0.1.5	-SC SM SC S	Perme-ability (n/hr 620. 0.2-6. 620.	A-8 A-2 A-3 A Avail: Water Cap (In./: 0.55-0 0.35-0	able pacity in) 0.65 0.45	(pH) 3.6-4.4	0 0 C. m (1	EC me/ 00g)	CaC03	Organi Matter Pct	c Shr Sw Pote	ink ell	0- 0-10 Erosion Factor
Moi y Bulk 1 g, 0.2 0.2 0.2	-SC SM SC S	Perme-ability (n/hr 620. 0.2-6. 620.	A-2 A-3 A-3 A-2 A-3 A-3 A-3 A-3 A-3 A-3 A-3 A-3 A-3 A-3	able pacity in) 0.65 0.45	(pH) 3.6-4.4	0 Con (1	EC me/ 00g)	CaC03	Organi Matter Pct	c Shr Sw Pote	ink ell	0-10  Erosion Factor K
Mo: y Bulk 1 g, 0.2 0.2 0.2	Density a /cc I 8-0.3 -0.4 0 -1.8 Wate   Depth	Perme-ability (n/hr 620. 0.2-6. 620.	Avail: Water Cap (In./: 0.55-0 0.35-0	able pacity in) 0.65 0.45	(pH) 3.6-4.4	C (in 1.	EC me/ 00g)	CaC03	Organi Matter Pct	c Shr Sw Pote	ink ell	Erosion Factor
9, Bulk 1 9, 0.2 0.2 0.2 1.5 Months	Density a //cc I	n/hr 620. 0.2-6. 620.	Water Cap (In./: 0.55-0 0.35-0	pacity in)  0.65 0.45 0.1	(pH) 3.6-4.4	n (i	me/ 00g)  - -		Matter Pct	Pote	ell	Factor K
9, 0.2 0.2 0.2 0.1.5	/cc I -0.3 -0.4 0 -1.8 Wate	in/hr 620. 0.2-6. 620.	(In./: 0.55- 0.35- 0.03-	in) 0.65 0.45 0.1	(pH)  3.6-4.4 3.6-4.4	1	00g)  - -	Pct 	Pct	Pote		K
0.2 0.2 0.2 0.1.5 Months	2-0.3 2-0.4 0 3-1.8 3-1	620. 0.2-6. 620.	0.55- 0.35- 0.03-	0.65 0.45 0.1	3.6-4.4 3.6-4.4	 : : .	-	Pct  - -			ntial	
0.2 ) 1.5 Months	-0.4 0 -1.8 Wate	0.2-6. 620. er Table	0.35- 0.03-	0.45 0.1	3.6-4.4		- - -	- - -	6585 - -			0.1
1.5	-1.8   Wate	620. er Table	0.03-	0.1			-	-	-			
Months	Wate	er Table			4.5-6.5		-	-	-			
Months	Depth									LOW		
Months	Depth		-(feet)	1				Wind	Risk of	Corrosi	on	Potentia
•	: -	v: 3	,/	Bedroc	k-(in)	HYD	T	Erod.	Uncoate		1	Frost
-				: -	Hard.		Fact.	:	Steel	Concre	te	Action
	: .		YEAR-ROUND	:		A/D	4	:	HIGH	HIGH		HIGH
fill 		POOR		Ponding		Exc	ess Hu	mus )				
DEVELOP	MENT	) R	ATING		RI	STRIC	TIVE F	EATURE (	S)		İ	
		SEVE	RE )	Cutbank	s Cave	Exc	ess Hu		Ponding	•	1	
sements		SEVE	RE	Subside		Pon	-	j	Low Str	ength	1	
ents		SEVE	;	Subside			ding				!	
ldings		SEVE	:	Subside		Pon	_	}	Low Str	-	}	
ads	Pairman	SEVE	:	Subside		Pon	ess Hu	 	Frost 1	action	1	
and Golf	ram ways	SEVE	nb	Ponding		1 EXC		mus			1	
MATERIAL			ATING			ESTRIC	TIVE E	EATURE (	(S)		!	
				Wetness	;	1					1	
						1					1	
		:	;	Fuere	Unama	l Dod	DOE-		-		1	
		POOR		LXCESS	numus	y wet	mess		! 		.	
		) R	ATING		R	ESTRIC	TIVE I	EATURE (	(S)		İ	
		SEVE	RE	Seepage	•	]					1	
 ÆNT			:				_		_			
MENT	3	I LIMIT	TATION	Ponding	J	Sub	sides		Frost	Action	1	
	 ZNT		PROB PROB PROB PROB POOR POOR PROBE	SEVERE   SEVERE	PROBABLE PROBABLE PROBABLE POOR Excess  INT RATING SEVERE Seepage Levees SEVERE Excess	PROBABLE PROBABLE PROBABLE POOR Excess Humus  INT RATING SEVERE Seepage Levees SEVERE Excess Humus	PROBABLE PROBABLE PROBABLE POOR Excess Humus Wet  THE SEVERE Seepage Excess Humus Por	PROBABLE     PROBABLE     PROBABLE     POOR   Excess Humus   Wetness	PROBABLE   PROBABLE   PROBABLE   PROBABLE   POOR   Excess Humus   Wetness    INT   RATING   RESTRICTIVE FEATURE   Severe   Seepage   Ponding   P	PROBABLE	PROBABLE	PROBABLE

Ponding

Ponding

Wetness

LIMITATION

LIMITATION

LIMITATION

Rooting Depth

Rooting Depth

RE Camp Areas Picnic Are Playground Paths and	as ls	L DEVELOPMENT		RATING SEVERE SEVERE SEVERE SEVERE	Ponding Ponding Excess Ponding	) Humus	STRICTIVE   Excess H   Excess H   Ponding   Excess H	umus		       	
Crop yie	lds in thi	s table are	averages for	high lev	CROPS AND P	where th	e crop is	commonly grown or	the	map uni	it.
Corn Grai	in Corn S ton	ilage Soyb s/a bu 			Alfalfa Ha   tons/acre 	-		Improved Pastur	re Po		t Pasture UM
					WOODLAND INT	ERPRETAT	CONS				
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION		WIND TH.	COMPETITION	ASPECT	ĺ	EXISTING TREES and/or COMENDED TO PLANT		SITE	WOODLAND PRODUCT- IVITY
2W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	NORTH	tamarack black spr	uce	E E	15	2

KaB

Nearly level and gently sloping, somewhat excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 3S.

Component Name: KARLIN

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

					E	STIMATED SOI	L PROPER	TIES							
						fication	<b>n</b>	>10		Per				sieve	Clay %   <.0C2 m
- :	USDA Te			Uniti	led	AASHT				-					
0- 411			SM	SP-SM		A-2 A-4		-	0	•	·100 75-				
	LFS LS S	L	SP-	SM SM MI		A-2 A-4		-	0	•	-1 <b>0</b> 0 <b>7</b> 5-				
32-60			SP	SP-SM SI	•	A-2 A-3 1	1-1	-	0	80-	-100 75-	-100 35	- 70 	0- 15	0-10
 }	 Liquid	Plas-	Moi	.st	Perme-	Avai	able	Soi	.1	CEC	CaCO3	Organ	ic	Shrink	Erosio
	Limit		Bulk D	ensity	ability	Water C	apacity	React	ion	(me/		Matte		Swell	Factor
(In)		Index		cc/	In/hr	(In.,		(pH	1)	100g)	Pct	Pct		Potentia	1 K
:		NP-4	1 4-	-1.6	26.		-0.12	3.6-6	5.5	-		0.5-		OW	0.17
	• •	NP-4 NP-4		-1.6			-0.16			-	-	-	I	LOW	0.17
4-32   32-60		NP-4	1.4-		620			5.6-7		-	-	-	I	COM	0.15
											- Wind	Risk c	of Corr	rosion	Potentia
	Floo	ding		W	ater Tabl	e-(feet)	-  Bedroo	k-(in	)   HY	T O	Erod.	•			Frost
	ncy Dura						Depth	Hard.	. GF	P Fact	. Index	Steel	Cor	ncrete	Action
NONE			_	>6.0		-	>60		A		134	LOW	HIC	GH	LOW
														1	
	CANTURO	RY FACI	 TTTES			RATING	 		REST	RICTIVE	FEATURE	(S)			
Septio			n Fields		SE	/ERE	Poor F	ilter	1			1		1	
_	Cover fo				PO	OR	Seepage	е	1:	loo San	dy				
	BUTT.D	NG STTE	DEVELOP	MENT		RATING	1		REST	RICTIVE	FEATURE	(S)		i	
Shallo	w Excava				SE	VERE	Cutban	ks Cav	e			1		ļ	
Dwelli	ings With	out Bas	ements		SL	IGHT	}		1			]		Ì	
Dwelli	ings With	Baseme	ents		SL	IGHT	1		)			1		1	
Small	Commerci	ial Buil	dings		:	IGHT	1		ļ		•	1		!	
	Streets				:	IGHT	]	<b></b>	l 1			1		1	
Lawns,	, Landsca	aping, a	and Golf	rairways	MU	DERATE 	Drough					·			
Į	CONST	RUCTION	MATERIAL	ı	ļ	RATING	!		REST	RICTIV	EFEATURE	E(S)		1	
Roadfi	in				:	OD			1			1		i	
Sand						OBABLE	   Man Ca	-A-	1			1		í	
Grave						PROBABLE IR	Too Sa		1	Small :	Stones	i		í	
Topsoi						 TV								<u>j</u>	
		MANAGE	ENT		1	RATING			REST	RICTIV	E FEATUR	E(S)			
	Reservoi				:	VERE	Seepag		1	Dini		1		i 1	
	-	Dikes a	nd Levees	5	:	VERE	Seepag			Piping		1		1	
Drain	age					MITATION	Deep 1		1 T 1	Drough	+ w	Fact	Intak	e ¦	
Irrig	ation ces and				:	MITATION MITATION	Slope   Too Sa		1	_	lowing	1		i	

RECREATIONAL DEVELOPMENT	RATING	1.	RESTRICTIVE FEATURE(S)	- !
Camp Areas	SLIGHT			l
Picnic Areas	SLIGHT	1		1
Playgrounds	MODERATE	Slope	Small Stones	. !
Paths and Trails	SLIGHT	}	1	j

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1			 	 			
Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a		Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanent Pasture
			 55	3.	2.3	4.6	1.6

## WOODLAND INTERPRETATIONS

1										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E) (P)	SITE INDEX	WOODLAND   PRODUCT-   IVITY
3A	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE	NORTH ·				
) JA	DD10111	0010					sugar maple	E	61	3
ļ •							yellow birch	E	0	0
1							bigtooth aspen	E	0	0
!							northern red oak	E	0	0
ļ							American basswood	E	0	0
Į							red pine	EP	0	0
1							eastern white pine	EP	0	0
1										

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

1							
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
Amur maple  eastern white pine  Norway spruce	<b>2</b> 9	Amur privet imperial Carolina poplar red pine	r 70	arrowwood lilac Siberian crabapple	11	eastern redcedar manyflower cotoneaster Siberian peashrub	18  6  8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift. This map unit is not highly erodible. The land capability classification is 6S in stony areas.

Component Name: KEWEENAW

Classification: ALFIC HAPLORTHODS, SANDY, MIXED, FRIGID

					EST	'IMATED SOI	L PROPER	TIES				•		
Depth	USDA Te	xture				AASHT		In.					ing sieve No.200	Clay %   <.002 π
									25 - 1				75 15- 40	!
0- 5 5-23	SL LFS GR-L	s s				A-2 A-4 A A-2 A-1-B		-					75 15- 40 85 5- 45	!
J 201	. On 2	5 5	511	DC DII DC	DI DII	A-3				25   05 .	200 00	100 00	00 0 10	, 2 10
23-55	FSL S GR	-LS	SM	SC SP-SM	ML	A-2 A-3 A	-1-B	-	0-3	25   85-	100 60-	-100 30-	85 5- 55	0-15
						h-4								
55-60	LS GR-LS		SM	SC SM-SC	SP-SM	A-2 A-1-B		-	0-:	25   85-	100 60	-100 30-	75 10- 30	2-15
 	Liquid	Plas-	Moi	ist	Perme-	Avail	able	Soi	1	CEC	CaCO3	Organic	Shrink	Erosio
	-					Water Ca						Matter		Factor
(In)		Index		/cc		(In./		Hq)	)	100g)	Pct	Pct	Potentia	ı K
			_											
0- 5	<20	NP-10	1.4-	-1.7	0.6-2.		0.15				-	1 2.	LOW	0.24
5-23	<20	NP-10			26.	0.08-					-	-	LOW	0.17
23-55		NP-10			0.6-6.	0.06-				-	-	-	LOW	0.17
55-60)		NP-10			26.					-	-	-	LOW	0.17
												•	Corrosion	
		-		Depth		(feet) Months						:	:	Frost
-	_			_		HOUGHS	: -		- 1					
NONE	-		<b>-</b>	2.5-6.0	APPARENT	NOV-MAY	>60		A	5	0	TOM	MODERATE	
		RY FACII			•	ATIING			REST	RICTIVE	FEATURE	(S)	ļ	
-					) SEVE	•	Wetness Seepage		1.	C11 C+		} !	j	
Dally	Cover fo				) POOR	ا 	Seepage		· ·	Small St		} 		
	BUILDI	NG SITE	DEVELOP	TENT	l R	ATING			REST	RICTIVE	FEATURE	(S)	Í	
Shallo	w Excava	tions			SEVE		Cutbank					Ì	i	
Dwelli	ngs With	out Base	ements		MODE	LATE	Large S	tones	j			j	j	
Dwelli	ngs With	Basener	nts		MODE	ATE )	Wetness	3	1	Large St	ones	1	j	
Small	Commerci	al Build	lings		MODE	RATE	Large S	tones	1			}	1	
Local	Streets	and Road	is		MODE	EATE	Large S	tones	1			1		
Lawns,	Landsca	ping, ar	nd Golf H	airways	SEVE	E )	Large S	tones	)			)	}	
	CONSTR	UCTION N	ATERIAL		) Ri	ATING			REST	RICTIVE	FEATURE	 (S)	·;	
Roadfi	11				FAIR	j	Large S	Stones	1	Wetness		1	j	
Sand					PROB	BLE			. 1			1	• 1	
Gravel					:	BABLE	Too San	-	1			1	1	
Topsoi	1.				POOR	}	Small S	Stones	1	Area Rec	laim	j	}	
	WATER	MANAGEME	OVT		) Ri	ATING )			REST	RICTIVE	FEATURE	 (S)		
Pond R	eservoir				SEVE	:	Seepage	<u> </u>	1			1		
	ments, D		Levees		SEVE	:	Seepage		í	Piping		i	i	
Draina					i	MOITAT	Slope			Cutbanks	Cave	j	j	
Irriga	•				LDM	NOITAT	Slope		j	Large St	ones.	Wetness	j	
-	es and D	iversion	ns ·		LIMIT	MOITAT	Large S	Stones	:	Wetness		1	j	
_	d Waterw	200			LIMIT	NOITAT	Large S	Stones	)	Droughty	,	)	1	

RATING	R	ESTRICTIVE FE	ATURE(S)
SLIGHT	1	1	]
SLIGHT	1	}	
MODERATE	Large Stones	Slope	Small Stones
MODERATE	Large Stones	1	1
	SLIGHT   SLIGHT   MODERATE	SLIGHT	SLIGHT

Crop yields	in this table	are averag	es for	high leve	el management w	here the crop is (	commonly grown on t	he map unit.
Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0a⁺.s bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture   AUM	Permanemt Pasture

## WOODLAND INTERPRETATIONS

l										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP. ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLA		SITE INDEX	WOODLAND PRODUCT- IVITY
3X	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH	, 			
							balsam fir	E		
Ì							red maple	E		
) 							sugar maple	E	61	3
[ ]							yellow birch	E		
) }							paper birch	E		
j 							quaking aspen	E		
1							black cherry	E		
, 1							northern red oak	E		
i I							eastern hemlock	£		
<i>;</i> }							eastern white pine	EP		
! }							red pine	P	-	
1										

05/28/92

Sloping, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.

Component Name: KEWEENAW

Classification: ALFIC HAPLORTHODS, SANDY, MIXED, FRIGID

					L3	TIMATED SOI	T LYOPEL	/1TE/2						
Depth	USDA Te	exture		Unifi	ied	ication AASHT	0	In. I		No	4 No.	10 No.40	ing sieve	<.002 mm
0- 5					 :	A-2 A-4 A							70 15- 40	1
5-23	LFS GR-L	s s	SM	SC SM-SC	SP-SM	A-2 A-1-B	A-4	-	0-25	85-	100 60	-100 30-	85 5- 45	•
1						<b>A-3</b>								
23-55)	FSL S GR	-LS	SM	SC SP-SI	i ML	A-2 A-3 A	1-1-B	-	0-25	85-	100 60	-100 30-	85 5 <b>- 5</b> 5	0-15
55-60)	LS GR-LS	;	SM	SC SM-SC	SP-SM	A-4 A-2 A-1-B	3	_	0-25	85-	-100 60	-100 30-	75 10- 30	2-15
	Liquid	Dlac-		 ist	Dormo-			able Soil		 CEC	CaC03	Organic	Chuinh	
	Limit				ability					(me/				
(In)		Index		/cc	_	/hr (In./:				100g)		Pct		
0- 5	<20	NP-10			0.6-2.		0.15			-	-	1 2.	LOW	0.24
5-23		NP-10				0.08-					-	-	row	0.17
_								0.14 4.5-6.5			-	-	LOW	0.17
55-60]	<20	NP-10	1.5-	-1.7	26.	0.04-	0.1				-	-	row	0.17
	Floo	dina		U-	tor Moble	ble-(feet)   Bedro					Wind		Corrosion	
						(ind Months )						•		Frost
					·				1		TIMEX			ACCION
NONE	-		- , ,	>6.0			>60		A	5	0	LOW	MODERATE	!
Daily Shallor Dwellin Dwellin Dwellin Local S Lawns,	Tank Ab Cover fo  BUILDI W Excava ngs With ngs With Commercia Streets a Landscap  CONSTR	r Landf: NG SITE tions out Base Basemen al Build and Road ping, ar	n Fields ill DEVELOPM ements nts dings	ent	MODE POOR R SEVE MODE SEVE MODE SEVE	ATING   RE   RATE   RATE   RATE   RATE   RATE   RE   RATE   RE   RATING	Percs S Seepage Cutbank Slope Slope Slope Slope Large S	R S Cave	Slower   Smr	ope all St CTIVE rge St rge St	ones FEATURE ones cones	Large St 	ones	
Gravel					IMPR	OBABLE	Too San	_	1				)	
Popsoi.	l 				) POOR	<b></b>	Small S	tones	Ar	ea Rec	laim	]		
	WATER	Managemi	ent		) R	ating		R	ESTRI	CTIVE	FEATURE	(S)	 	
Pond Re	eservoir	Area			SEVE	re j	Seepage			оре		}	j	
Embankı	ments, D	ikes and	d Levees		SEVE	RE j	Seepage	:	Pi	ping		1	j	
Drainag	je				LIMI	TATION	Deep To	Water	1			1	j	
Irrigat	tion				LIMI	TATION	Slope		La	rge St	ones	Droughty	· j	
Terrace	es and D	iversion	ns		LIMI	TATION	Slope		La	rge St	ones	Too Sand	y	
3rasseg	Waterwa	ays			LIMI	TATION	Large S	tones	Sl	оре		Droughty	. 1	

			- 1
RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	ļ
Camp Areas	MODERATE	Slope	1
Picnic Areas	MODERATE	Slope	1
Playgrounds	SEVERE	Slope	1
Paths and Trails	MODERATE	Large Stones	-1
i			-1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1								
Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture   AUM
í					1.		4.4	2.
1								

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TR and/or TREES RECOMENDED TO	(E) (P)	SITE INDEX	WOODLAND PRODUCT- IVITY
3X	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH		 		
							balsam fir	 L		
							red maple	E		
							sugar maple	E	61	3
							yellow birch	E		
							paper birch	E		
							quaking aspen	E		
							black cherry	E		
		-					northern red oak	E		
							eastern hemlock	E		
							eastern white pine	EP		
							red pine	P		

05/28/92

Moderately steep, well drained soil formed in sandy and loamy deposits over gravelly, loamy sand glacial drift. This map unit is potentially highly erodible. The land capability classification is 7S in stony areas.

Component Name: KEWEENAW

Classification: ALFIC HAPLORTHODS, SANDY, MIXED, FRIGID

					ES	TIMATED SOI	L PROPER	TIES						
Depth	USDA Te	xture		Unifi	Classif ed		0			•		-	ing sieve No.200	•
0- 5):				SC SM-SC		A-2 A-4 A				•			70 15- 40	:
•		s s			SP-SM	A-2 A-1-B							85 5- 45	
23-55	FSL S GR	-LS	SM	SC SP-SM	ML	A-3 A-2 A-3 A	-1-B	-	0-25	85-	100 60-	-100 30- 8	85 5- 55	0-15
55-60):	LS GR-LS	<b>;</b>	SM	SC SM-SC	: SP-SM	A-4 A-2 A-1-B		-	0-25	85-	100 60-	-100 30- '	75 10- 30	2-15
				 ist	Perme-	 lievá	 able	Soil		CEC C		Organic	Shrink	Erosio
		ticity Index	Bulk I		ability		pacity		.on	(me/ 100g)	CaCO3 Pct	Matter	Swell	Factor
0- 5  5-23		NP-10			0.6-2.		0.15	4.5-6.5 4.5-6.5		-	-	1 2.	LOW	0.24 0.17
23-55						0.6-6. 0.06-0				-	-	-	LOW	0.17
55-60	<20	NP-10				6. 0.04-				-	-	<b>-</b> ·	LOW	0.17
												:	Corrosion	
		-				-(feet)	-						:	Frost
-	-		Months	_	Kind		: -					Steel 	Concrete	
NONE	_		-	>6.0		-	j >60		A			LOW	MODERATE	
	CANTE	DV PACE			I	ATING )					 FEATURE	 (g)		
Sentic		RY FACI	n Fields		SEVE	:	Slope	r	\LJ1K.	CIIVE	ILMIUND	1	1	
-	Cover fo	-			POOR	:	Seepage	<b>e</b>	Sr	mall St	ones	Slope	į	
	רת דדוות	NG STOF	DEVELOP	AFNITI	) F	ATING \	RF.		RESTR	CTTVE	FEATURE	(S)		
Shallo	w Excava		DD I III OI I		SEVE		Cutbanl	ks Cave		RESTRICTIVE F		1	i	
Dwelli	ngs With	out Bas	ements		SEVE	RE	Slope		j			1	Ì	
Dwelli	ngs With	Baseme	nts		SEVE	RE	Slope		١					
Small	Commerci	al Buil	dings		SEVE	RE	Slope		1					
Local	Streets	and Roa	ds		SEVE	RE	Slope		1			1		
Lawns,	Landsca	nping, a	nd Golf I	Fairways	SEVE	RE	Large :	Stones	) S	lope		<u> </u>	·	
	CONST	RUCTION	MATERIAL		} F	ATING					FEATURE	(s)	į	
Roadfi	.11				FAIR		Large :	Stones	S	lope		1	}	
Sand						BABLE		_	ļ			1	1	
Gravel						OBABLE	Too Sa	_	1	rea Red	.laim	l Clore	1	
Topsoi	.1				) POOI		Swall :	Stones	, A 	rea ke	:19TM	Slope		
	WATER MANAGEMENT			) 1	RATING	}	1	RESTR	ICTIVE	FEATURE	E(S)	į		
Pond R	eservoi	Area			) SEVI	ERE	Seepag	е	) s	lope			1	
Embank	ments, I	ikes an	d Levees		SEVI	RE	Seepag	e	) P	iping		!	!	•
Draina	ige				LIM	MOITATI	: -	o Water	:			1	}	
Irriga						MOLTATI	Slope		:	arge S		Droughty		
Terrac	es and I	Diversio	ns		:	TATION	Slope			arge S	tones	Too Sand	- :	
Grasse	d Water	<i>r</i> ays			LIM	MOITATI	Stones	S	lope		Drought	7		

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Slope
Picnic Areas	SEVERE	Slope
Playgrounds	SEVERE	Slope
Paths and Trails	MODERATE	Large Stones   Slope
i e		

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture   AUM
								1.6

## WOODLAND INTERPRETATIONS

•										
WOODLAND ORD. SYB.	EROSION HAZARD  MODERATE	EQUIPMENT LIMITATION  MODERATE	SEEDLING MORTALITY  SLIGHT	WIND TH. HAZARD SLIGHT	PLANT COMPETITION MODERATE	INTERP ASPECT  NORTH	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT balsam fir red maple sugar maple	E E E	SITE INDEX	WOODLAND PRODUCT- IVITY
   								E E E E E	61	3
) 			,				eastern white pine red pine	EP P		

Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and nearly level, and gently sloping, excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 6S in stony areas.

Component Name: KEWEENAW This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, SANDY, MIXED, FRIGID

l					ES.	rimated soi	IL PROPER	TIES							
Depth	USDA Te	exture			ied		ro	>10 In.						g sieve No.200	
0- 5	  st.				,	A-2 A-4 1			25-50	,				15- 40	
		s s				A-2 A-1-H				-				5- 45	•
						A-3									,
23-55	FSL S GF	R-LS	SM	SC SP-SI	ML		A-1-B	-	0-25	85-	-100 60	-100 3	0- 85	5- 55	0-15
55-60	LS GR-LS	}	. SM	SC SM-SC	SP-SM	A-4 A-2 A-1-E	3	_	0-25	1 85-	-100 60	-100 3	0- 75	10- 30	2-15
	_	Plas- ticity		ist Deneite	Perme-		lable	Soi		EC	CaCO3	-		Shrink	Erosio
(In)		Index		/cc /cc	ability In/hr						Dock		er	Swell	Factor
		Tudex			111/111	(.111.)	-	(pH		.00g)	Pct	PC	t 	Potentia	
0- 5	<20	NP-10	1.4	-1.7	0.6-2.			4.5-6	.5	_	-		2.		0.24
5-23	<20	NP-10	1,5	-1.8	26.	0.08-	-0.11	4.5-6	.5	-	-	-		LOW	0.17
23-55		NP-10			0.6-6.	0.06-	-0.14	4.5-6	.5	-		-		LOW	0.17
55-60	<20	NP-10	1.5	-1.7	26.	0.04-	0.1		.5	-	-	•		LOW	0.17
												Risk	of Co	rrosion	Potentia
	Floo	ding		) Wa	ter Table-	(feet)	Bedroc	k-(in)	HYD	T	Erod.	Uncoa	ted	}	Frost
Freque	ncy Dura	tion 1	Months	) Depth	Kind	Months	Depth	Hard.	GRP	Fact.	Index	Steel		oncrete	
NONE	-			•		NOV-MAY	1		) A			LOW		ODERATE	τοω
-	Tank Ab	RY FACIL sorption r Landfi	Fields		:	:	Wetness Seepage		1		FEATURE	(S) !		   	
												! 			
		NG SITE I	DEVELOP	MENT	RA	TING		1	RESTRIC	TIVE	FEATURE	(S)		1	
	w Excava				SEVER	-	Cutbank					)		]	
	_	out Baser			MODER	:	Large S					)		j.	
		Basement			MODER	i	Wetness		•	ge St	ones	1		!	
		al Build: and Road:	-		MODER	:	Large S		1			!		ļ	
		ping, and		airways	) MODER SEVER		Large S Large S		l l			) 		)	
Roadfi.		UCTION M	ATERIAL		) KA   FAIR	TING )	Tamma C				FEATURE	(S)		ļ	
Sand	11				PROBA	ן מיד ו	Large S	tones	) wet	ness		] 1		i	
Gravel						BABLE	Too San	A	1			} 1		1	
Topsoi:					POOR		Small S	-	Are	a Rec	:laim	<i>!</i> 		1	
		MANAGEMEN	T			TING )	_		RESTRIC	TIVE	FEATURE	(S)		ļ	
	eservoir				SEVER	:	Seepage							ļ	
	ments. D	uxes and	revees		SEVER	:	Seepage			ing	_	}		!	
Embanko	•				TIMIT.	ATION 1	Slope		Cut	banks	Cave	)		1	
Embanko Orainag	ge						C)		i -			1			
Embanko Orainag Irrigat	ge tion	ivoreies			LIMIT	ATION	Slope	<b>.</b>		ge St	ones	Wetne	SS	į	
Embanko Drainag Irrigat Terrace	ge tion	iversions	3		LIMIT		Slope Large S Large S		Wet	ge St ness ughty		Wetne	SS	į	

				,
RECREATIONAL DEVELOPMENT	RATING	) , RE	STRICTIVE FE	ATURE(S)
Camp Areas	SLIGHT	1	1	1
Picnic Areas	SLIGHT		1	l C11 Ctonos
Playgrounds	MODERATE	Large Stones	Slope	Small Stones
Paths and Trails	MODERATE	Large Stones	1	1
1				

Crop yields	in this table	are average	ges for	high leve.	management w	nere the crop is		
Corn Grain   bu/a	Corn Silage tons/a	Soybeans · bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture   AUM
							4.6	2.   1.5

CTAR TOWNS	ZMULLI RILI GOLDANICE	

Nearly level and gently sloping, moderately well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and nearly level, and gently sloping, excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 6S in stony areas.

Component Name: VILAS This map unit has 2 components, and 2 interpretation sheet.

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

					E:	STIMATED SOIL	PROPER'	TIES							
Depth	USDA Te	exture	Classification Unified AASHTO					>10 In. I	3-10 Inches	•			ing sieve No.200	<.00	2 m
									 0	   80-	100 75-	100 35-	90 12- 30	2-	
0- 3				SP-SM		A-1 A-2		_	-				90 12- 30	•	6
3-19				SM SM		A-1 A-2 A-1 A-2 A-		_				100 35-			3
19-30				SP-SM SP-SM SM		A-1 A-2 A-		_		•	-	100 35-		:	3
30-60			5r 											· 	
	Liquid	Plas-	Moi	st	Perme-	Availa	able	Soi]	l	CEC	CaCO3	-		Ero	
Depth	Limit	ticity	Bulk D	ensity	ability	Water Cap	pacity	Reacti	ion	(me/		Matter		Fac	
(In)		Index		cc	In/hr	(In./	in)	(pH)	)	100g)	Pct	Pct	Potentia		K 
0- 3		NP		1 6	620.	0.09-	0.12	4.5-6.	.5			0.5- 1.	LOW		17
3-19		NP			620.		0.12			-	-	-	LOW	0.	17
3-19 19-30		NP			620.		30.0				-	-	LOW	0.	17
30 <b>-6</b> 0		NP	1.5-		620.		0.07			-	-	-	LOW	0.	17
											Wind	Risk of	Corrosion	Poter	ntia
	Floo	oding		Wa	ter Tabl	e-(feet)	Bedroo	k-(in)	HY	T C	Erod.	Uncoated	ì	Fro	st
	ency Dura	_	Months				Depth	Hard.	GRI	P Fact.	Index	Steel	Concrete	Acti	con
											124	)	עדכט	LOW	
NONE	•	-	- }	>6.0	-	-	>60		A	5	134	LOW	HIGH	I TOM	
Daily Cover for Landfill      BUILDING SITE DEVELOPMENT     Shallow Excavations     Dwellings Without Basements     Dwellings With Basements     Small Commercial Buildings     Local Streets and Roads     Lawns, Landscaping, and Golf Fairways				   SEV   SLI   SLI	POOR     RATING     SEVERE     SLIGHT     SLIGHT     SLIGHT     SLIGHT     MODERATE				OO Sandy    ICTIVE FEATURE(         		(S)             	           			
CONSTRUCTION MATERIAL					1 000	RATING     GOOD		RESTRICTIVE F		r LATUKI	1	1			
Roadf	711				:		! }		1			1	1		
Sand			:	PROBABLE TIMPROBABLE T		Too Sandy				i	í				
Gravel  Topsoil			:	POOR Too S		-	j			i	j				
									· 						
Water management					1	RATING		RESTRICTIVE FEAT		FEATUR	ATURE(S)				
Pond Reservoir Area						Seepage   Pinin		Na a a		1	1				
Embankments, Dikes and Levees			:	· ·		page   Piping				1	1				
Drainage				:				To Water			   Fast In				
Irrigation						MITATION	Droughty  Soil Blowing			rast II	icake				
Terraces and Diversions						LIMITATION Too Sa			1 3	מ דדספ	омтид	1	1		
Grass	ed Water	ways			l rr	MITATION	Drough	ıcy	1			i	i		

RECREATIONAL DEVELOPMENT	RATING		RESTRICTIVE FEATURE	E(S)	j
Camp Areas	MODERATE	Too Sandy	· 1 .	1	1
Picnic Areas	MODERATE	Too Sandy	1	}	}
Playgrounds	MODERATE	Slope	Small Stones	Too Sandy	}
Paths and Trails	MODERATE	Too Sandy	1		j
i		-	•	-	i

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture AUM	Permanemt Pasture AUM
							4.6 4.	2. 1.5

#### WOODLAND INTERPRETATIONS

1										
WOODLAND ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
. 6S	SLIGHT	SLIGHT	MODERATE	SLIGHT	SLIGHT	NORTH				
							balsam fir	E		
							red maple	E		
1					•		paper birch	E		
							quaking aspen	E		
							northern pin oak	E		
							northern red oak	E		
							jack pine	EP	65	7
							red pine	EP	57	6
							eastern white pine	EP	56	8
							·			

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height)
American cranberrybush  gray dogwood  Norway spruce	8	Amur maple jack pine red pine		eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30) 6) 8)

Sloping, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and sloping, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.

This map unit has 2 components, and 2 interpretation sheet. Component Name: KEWEENAW

Classification: ALFIC HAPLORTHODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

						EST	IMATED SOIL	PROPERT	TES								
) Depth	USDA Te	xture		Unifi			cation AASHTO			Inc	bes	Perc				No.200	Clay % <.002 m
0- 5			SM S	SC SM-SC			A-2 A-4 A- A-2 A-1-B	1-B	- - -	25				100 40- 100 30-		15- 40 \ 5- 45	2-15
23-55	FSL S GR	-LS	SM	SC SP-SM	ML		A-3 A-2 A-3 A- A-4	1-B	-			•				5- 55	
55 <b>-</b> 60	LS GR-LS	3	SM	SC SM-SC	SP-	SM	A-2 A-1-B		-	(	)- <b>2</b> 5	) 85-1 	.00 60-	100 30-	· 75	10- 30	2-15
	Liquid   Limit	Plas- ticity Index		st ensity cc	In/	lity hr	Availa Water Cap (In./i	acity in)	Read	oil ction pH)	a (	EC me/ 00g)	CaCO3	Organi Matter Pct	:	Shrink Swell Potentia	Erosio Factor
 0- 5	   <20	NP-10	1.4-	1.7		-2.	0.13-0	0.15	_			-	-	1	2.	LOW	0.24
5-23	:	NP-10	1.5-	1.8	2.	-6.	0.08-0	0.11	4.5	-6.5		<b>-</b> .	-	-		LOW	0.17
23-55	•	NP-10		1.8		-6.	0.06-0	0.14	4.5	-6.5		-	-	-		LOW	0.17
	20	NP-10	1.5-	1.7	2.	-6.	0.04-	0.1		-6.5		-	-			LOW 1	0.17
														•		rrosion	Frost
	Flo	oding		W	ater	Table	(feet)	Bedro	ck-(i	n)	HYD	T	Erod.	•		) 	
Prequ	ency Dur	ation	Months	Depth	ķ	Kind	Months	Depth	Har	d.	GRP	ract.	Index	Steel		Concrete	ACCIO:
 NONE			-	>6.0		-		>60			A			!		oderate	rom
	SANIT c Tank A Cover f		n Fields			MODE POOF		Percs Seepag			) s1	ope	FEATURE	Large	Sto	nes	
			DEVELOP			 l 1	RATING I			R	ESTRI	CTIVE	FEATURE	E(S)		j	
   al 1 1			, DEVELOR	rien i		SEV		Cutban	iks C	ave	1			1		1	
	low Excav Lings Wit		coment s			:	ERATE	Slope			La	rge St	cones	1		]	
	lings Wit lings Wit					:	ERATE	Slope			ا ا	rge S	cones	1		)	
•	l Commerc					SEV	ERE	Slope			1			ļ		1	
•	l Streets					MOD	ERATE	Slope			L	arge S	tones	1		1	
	s, Landso			Fairways	5	SEV	ERE	Large	Ston	es 	 			 		·\	
 	CONS	TRUCTION	MATERIAL	,		}	RATING	}			ESTR.	ICTIVE	FEATUR	E(S)			
Road	fill					FAI		Large	Ston	es	1			}		) 1	
Sand				•		•	BABLE		3		i			1		1	
Grav	el •					: -	PROBABLE	Too S			1 2	rea Re	claim	1		i	
Tops	oil					) POC	)K 		3001								
		r manage	MENT			•	RATING	1		I			FEATUR	E(S)		) 1	
	Pond Reservoir Area			!	/ERE	Seepa	-		:	lope iping		1		Í			
•	imbankments, Dikes and Levees			•	VERE	Seepa	_	a+	1 1	הייולד		i		j			
Drai						LIMITATION   Deep				a LEL	1	arge 9	Stones	Drou	ghtv	j	
	Irrigation			LIMITATION   Slop		Slope			•	-	Stones	Too					
•	erraces and Diversions		1			: Sto	nes	:	Slope		Drou						
IGras	sed Wate	rwavs				I PT	17 12 17 014										

B-54

Grassed Waterways

			1
RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	١
Camp Areas	MODERATE	Slope	1
Picnic Areas	MODERATE	Slope	}
Playgrounds	SEVERE	Slope	1
Paths and Trails	MODERATE	Large Stones	1
1			-1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grai	n Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
							4 4	1.7

#### WOODLAND INTERPRETATIONS

1										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES	(E)	SITE	WOODLAND PRODUCT-
		*********					TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
, 1 3x	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH				
1							balsam fir	E		
İ							red maple	E		
ĺ							sugar maple	E	61	· 3
ĺ							yellow birch	E		
j							paper birch	E		
j							quaking aspen	E		
İ		`					black cherry	E		
j							northern red oak	E	•	•
j .							eastern hemlock	E		
j							eastern white pine.	· EP		
j .							red pine	P		
i										

Sloping, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and sloping, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas.

Component Name: VILAS

This map unit has 2 components, and 2 interpretation sheet.

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

	]				Classi	fication										
Depth	USDA T	exture		Unif		fication.	SHTO	>10 In.	3-10 Inches	Pe No		< 3 in No.10			sieve No.200	
0- 3	   I.S									· j						)
3-19	2			M SP-SM		A-1 A-2			0	80	-100	75-100	35-	90	12- 3	
19-30				P-SM SM		A-1 A-2		-	0	80	-100	75-100	35-	90	12- 3	0 2
30-60				M SP-SM			2 A-3	-	0	80	-100	75-100	35-	90	5- 2	•
				P SP-SM SM	! 	A-1 A-2	2 A-3	<b>-</b>	0	80	-100	75-100	35-	<b>9</b> 0	1- 2	
	Liquid		Mo	oist ·	Perme-	Ava	ilable	Soi	 ()	CEC	CaC					
	Limit	ticity	Bulk	Density	ability	Water	Capacity			(me/	Cac		rganic atter		Shrin	
(In)   		Index	7	/cc	In/hr		./in)			100g)	Pc		Pct		Swel Potent	
0- 3		NP		-1.6	620.											
3-19	-	NP		-1.6	620.		9-0.12	4.5-6		-	-	0.	5- 1.	]	LOW	0.
19-30	_	NP					7-0.12			-	-		-	1	LOW	0.
30-60	-	NP		-1.7	620.		5-0.08			-	-		-	1	LOW	0.
				-1./	020.	0.0	4-0.07	5.1-6	.5	-	-		-	1	LOW WOL	0.
	Floor	ding		Wat	or Table	-(feet) -	1				Wind				rosion	Poten
Frequer	cy Durat	tion	Months	Depth	Kirs er rante	-(reet) Months	Bedroo	ж-(in)	HYD	T	Erod.	Unc	oated			Fro
						months	Depth	Hard.		Fact.		Ste	el	Cor	crete	Acti
NONE	-		-	>6.0	-	-	>60		A			LOW		HIG		l LOW
		corption	Fields		SEVE	ATING RE	Poor Fi	] ]ter	RESTRIC	TIVE	FEATUR	E(S)			į	
	over for	Landfi	11 			RE	Poor Fi   Seepage	lter	1	TIVE I		E(S)			j   	
	over for  BUILDIN	Landfi G SITE I	11 	 Ent	SEVER POOR	RE	•	lter	   T∞	Sandy	7	1				
Shallow	over for BUILDIN Excavat	Landfi G SITE I	11 DEVELOPM	 ENT	SEVER POOR	RE ATING	•	lter  R	1	Sandy	7	1		•	;   	
hallow welling	over for BUILDIN Excavat. gs Witho	Landfi G SITE I ions ut Basen	11 DEVELOPM ments	ENT	SEVER POOR	RE NTING RE	Seepage	lter  R	   T∞	Sandy	7	1		•	;        	
shallow welling	over for BUILDIN Excavat gs Withous Sign With 1	G SITE I ions ut Basem Basement	ll  DEVELOPM ments Ls	ent	SEVER   POOR   RA   SEVER   MODER   MODER	RE ATING RE LATE	Seepage	lter  R	   T∞	Sandy	7	1		•	;          	
Shallow Welling Welling	over for BUILDIN Excavat. gs Without gs With 1 commercial	G SITE I ions ut Basement Basement Buildi	ll DEVELOPM ments ts ings	ENT	SEVER   POOR   RA   SEVER   MODER   MODER   SEVER	ATING RE RATE RATE E	Seepage     Cutbank:   Slope   Slope   Slope	lter  R	   T∞	Sandy	7	1			       	
Shallow Welling Welling Mall Co	BUILDIN Excavat gs Without With 1	G SITE I ions ut Basement Buildi nd Roads	DEVELOPM ments ts ings		SEVER POOR  RAISEVER MODER  MODER SEVER MODER MODER MODER	ATING RE LATE LATE E ATE	Seepage   Cutbank:   Slope   Slope   Slope	lter  R s Cave	Too	Sandy	7	1		• • • • •	        	
challow welling welling mall Co	over for BUILDIN Excavat. gs Without gs With 1 commercial	G SITE I ions ut Basement Buildi nd Roads	DEVELOPM ments ts ings		SEVER   POOR   RA   SEVER   MODER   MODER   SEVER	ATING RE LATE LATE E ATE	Seepage     Cutbank:   Slope   Slope   Slope	lter  R s Cave	   T∞	Sandy	7	1				
hallow welling welling mall Co ocal St awns, L	BUILDIN Excavat. gs Without the commercial reets ar andscapi	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM ments ts ings il Golf Fa		SEVER POOR  RM SEVER MODER MODER MODER MODER MODER	ATING RE LATE LATE E ATE	Seepage   Cutbank:   Slope   Slope   Slope	lter R s Cave	ESTRICE	Sandy	Y  PEATUR	E(S)			           	
welling welling mall Co ocal St awns, L	BUILDIN Excavat. gs Without the commercial reets ar andscapi	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM ments ts ings il Golf Fa		SEVER POOR  RM SEVER MODER MODER MODER MODER MODER	ATING ATE ATE ATE ATE ATE	Seepage   Cutbank:   Slope   Slope   Slope	lter R s Cave	Too	Sandy	Y  PEATUR	E(S)			           	
welling welling mall Co ocal St awns, L	BUILDIN Excavat. gs Without the commercial reets are and scape CONSTRUCTORS	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM ments ts ings il Golf Fa		SEVER POOR  RP SEVER MODER MODER MODER MODER MODER RA	ATING LE LATE LATE LATE ATE ATE ATE	Seepage   Cutbank:   Slope   Slope   Slope	lter R s Cave	ESTRICE	Sandy	Y  PEATUR	E(S)				
Shallow Welling Welling Mall Co ocal St awns, L ocadfill and cavel	BUILDIN Excavat. gs Without the commercial reets are and scape CONSTRUCTORS	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM ments ts ings il Golf Fa		SEVER POOR  RM SEVER MODER  MODER  MODER  MODER  MODER  RA'  GOOD	ATING RE LATE LATE E ATE ATE ATE TING	Seepage   Cutbank:   Slope   Slope   Slope	Rs Cave	ESTRICE	Sandy	Y  PEATUR	E(S)				
Shallow Welling Welling Mall Co ocal St awns, L ocadfill and cavel	BUILDIN Excavat. gs Without the commercial reets are and scape CONSTRUCTORS	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM ments ts ings il Golf Fa		SEVER   POOR   RA   SEVER   MODER   MODER   MODER   MODER   MODER   MODER   GOOD   PROBAL	ATING RE LATE LATE E ATE ATE ATE TING	Seepage   Cutbank:   Slope   Slope   Slope   Slope   Droughty	Rs Cave	ESTRICE	Sandy	Y  PEATUR	E(S)				
challow welling welling mall Co ocal Stawns, Loadfill and cavel opsoil	BUILDIN Excavat. SWithout SWith Intercial Excavat. CONSTRUCT WATER MA	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM Dents ts ings the Golf Fa		SEVER POOR  RA SEVER MODER MODER MODER MODER RA GOOD PROBAL IMPROI	ATING RE LATE LATE ATE ATE ATE TING BLE BABLE	Seepage   Cutbank:   Slope   Slope   Slope   Slope   Droughty	lter R s Cave	Too	Sandy	PEATUR	E(S)				
challow welling welling mall Coocal Stawns, Loadfill and ravel possil	BUILDIN Excavat.  gs Without gs With 1 commercial creets an andscapi CONSTRUC	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM Dents Ls Ls Ls LS LS LS LS LS LS LS LS LS LS LS LS LS		SEVER POOR  RA SEVER MODER MODER MODER MODER RA GOOD PROBAL IMPROI	ATING ATE ATE ATE ATE ATE ATE ATE TING	Seepage   Cutbanks   Slope   Slope   Slope   Droughty   Too Sand	lter R s Cave	Too	Sandy	PEATUR	E(S)				
hallow welling welling mall Co ocal St awns, L oadfill und ravel psoil pad Rese	BUILDIN Excavat. SWithout SWith Intercial Excavat. CONSTRUCT WATER MA	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM Dents Ls Ls Ls LS LS LS LS LS LS LS LS LS LS LS LS LS		SEVER POOR  RA SEVER MOD	ATING ATE ATE ATE ATE ATE ATE BLE BABLE  FING	Seepage   Cutbanks   Slope   Slope   Slope   Slope   Droughty   Too Sand   Too Sand	lter R s Cave	Too	Sandy	PEATUR	E(S)				
challow welling welling mall Co ocal St awns, L  padfill and ravel opsoil  nd Rese bankmen ainage	BUILDIN Excavat. SWithout Swith Intercial CONSTRUCT WATER MA	G SITE I ions ut Basement l Buildi nd Roads ing, and	DEVELOPM Dents Ls Ls Ls LS LS LS LS LS LS LS LS LS LS LS LS LS		SEVER POOR  RP SEVER MODER  MODER  MODER  MODER  RA'  GOOD  PROBAL  IMPROI  POOR  RA'  SEVERE	ATING LE LATE LATE ATE ATE TING BLE BABLE FING C	Seepage   Cutbank:   Slope   Slope   Slope   Droughty   Too Sand   Too Sand	R Cave	Too	Sandy	PEATUR	E(S)				
Shallow welling welling mall Co ocal St awns, L coadfill and ravel opsoil coal and ravel	BUILDIN Excavat. SWithout Swith Intercial CONSTRUCT WATER MA	G SITE I ions ut Basement l Buildi nd Roads ing, and TION MA	DEVELOPM Dents Ls Ls Ls LS LS LS LS LS LS LS LS LS LS LS LS LS		SEVER POOR  RP SEVER MODER  MODER  MODER  MODER  MODER  MODER  MODER  MODER  MODER  MODER  MODER  MODER  MODER  RAT  SEVERE  SEVERE	ATING LE LATE LATE LATE ATE ATE TING BLE BABLE  FING  TING  TING	Seepage   Cutbanks   Slope   Slope   Slope   Slope   Droughty   Too Sand   Too Sand	R Cave	Too	Sandy	PEATUR	E(S)				
Shallow Welling Welling Welling Mall Co Occal St awns, L Deadfill And Tavel Opsoil One Welling	BUILDIN Excavat. SWithout Swith Intercial CONSTRUCT WATER MA	G SITE I ions ut Basement l Buildi nd Roads ing, and CTION MA	DEVELOPM Dents Ls Ls Ls LS LS LS LS LS LS LS LS LS LS LS LS LS		SEVER   POOR   SEVER   MODER   SEVER   MODER   MODER   POOR   PROBAL   IMPROI   POOR   SEVERE   SEVERE   LIMITA	TING  BLE BABLE  TING  ITING  ITING  ITING	Seepage   Cutbank:   Slope   Slope   Slope   Droughty   Too Sand   Too Sand   Seepage   Seepage	R Cave	ESTRICE    Slop  ESTRICE   Slop    Slop  Droug	Sandy	PEATUR	E(S)	Intak Blowi			

· · · · · · · · · · · · · · · · · · ·					
RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE FEATU	RE(S)	)
Camp Areas	MODERATE	Slope	Too Sandy	)	)
Picnic Areas	MODERATE	Slope	Too Sandy	1	1
Playgrounds	SEVERE	Slope		1	1
Paths and Trails	MODERATE	Too Sandy	)	1	]
1					1

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1								
Corn Grain	Corn Silage	Soybeans	Wheat	Oats	Alfalfa Hay	Red Clover Hay	Improved Pasture	Permanemt Pasture
bu/a	tons/a	bu/a	bu/a	bu/a	tons/acre	tons/acre	· AUM	AUM
}				1			4.4	1.7
)				j			3.8	1.2
1				•				

#### WOODLAND INTERPRETATIONS

WOODLAND	EROSION	EQUIPMENT	SEEDLING	WIND TH.	PLANT	INTERP	COMMONLY EXISTING TRE	ES (E)		WOODLAND
ORD. SYB.	HAZARD	LIMITATION	MORTALITY	HAZARD	COMPETITION	ASPECT	and/or		SITE	PRODUCT-
							TREES RECOMENDED TO P	LANT (P)	INDEX	IVITY
6S	SLIGHT	SLIGHT	MODERATE	SLIGHT	SLIGHT	NORTH				
].							balsam fir	E		
1							red maple	E		
}							paper birch	E		
l							quaking aspen	E		
1							northern pin oak	E		
							northern red oak	E		
1							jack pine	EP	65	7
)							red pine	EP	57	6
							eastern white pine	EP	56	8
l										

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name Height	Plant Name	Unicht				,
		neight	Plant Name	Height	Plant Name H	leight
American cranberrybush 10 gray dogwood 8 Norway spruce 20		30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30] 6] 8]

Moderately steep and steep, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and moderately steep and steep, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel. This map unit is highly erodible. The land capability classification is 7S in stony areas.

Component Name: KEWEENAW This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, SANDY, MIXED, FRIGID

								TIES						
Denth!	USDA Te	vtnre		Unifi		ication AASHTY				-			sing sieve	
- :		xrare				nnon1				:				:
0- 5)	SL		SM	SC SM-SC	!	A-2 A-4 A	-1-B	-	25-50	90-	100 <b>7</b> 5	-100 40-	70 15- 40	2-15
5-23	LFS GR-L	s s	SM	SC SM-SC	SP-SM	A-2 A-1-B	A-4	-	0-25	85-	1 <b>0</b> 0 60	-100 30-	85 5- 45	2-15
						<b>A-3</b>								
23-55	FSL S GR	-LS	SM	SC SP-SM	ML	A-2 A-3 A	-1-B	-	0-25	85-	100 60	-100 30-	85 5- 55	0-15
						A-4								
55-60)	LS GR-LS		SM	SC SM-SC	SP-SM	A-2 A-1-B		-	0-25	85-	100 60	-100 30- 	75 10- 30	) 2-15 
1	Liquid	Plas-	Moi	st	Perme-	Avail	able	Soil	. (	CEC	CaCO3	Organio	c Shrink	Erosio
Depth	Limit	ticity	Bulk I	Density	ability	Water Ca	pacity	Reacti	on (	me/		Matter		Factor
(In)		Index	9/	/cc	In/hr	(.aI)	in)	(Hq)	1	100g)	Pct	Pct	Potenti	al K
0- 5		NP-10		-1.7				4.5-6.		-	-	1 2		0.24
5-23		NP-10				0.08-				-	-	-	rom	0.17
23-55		NP-10			0.6-6.		0.14			-	-	•	LOW	0.17
55-60	<20	NP-10	1.5-			0.04-		5.1-6.	-	-	<b>-</b>	- 1 - · · · -	TOM	0.17
		3:				/F \						•	Corrosion	
						-(feet)						_		Frost
-	-			Depth		Months	: -		:			•	Concrete	:
NONE	-			>6.0	-	-	>60		A	5	0	LOW .		row
		RY FACII			:	ATING		R	ESTRIC	CTIVE	FEATURE	(S)		
		_	Fields		SEVE		Slope		}			]		
Daily (	Cover fo	r Landfi	.11		) POOR	!	Seepage	:	) Sma	all St	ones	Slope		
	BUILDI	NG SITE	DEVELOPA	ŒNT	j ri	ATING							!	
Shallo	w Excava	tions			:			R	ESTRI	TIVE	FLATURE	(S)	1	
D 114.					SEVE	:	Cutbank				FEATURE	(S) }	}	
DMGTTTT	ngs With	out Base	ements		) SEVE	RE I	Cutbank Slope				FEATURE	(s)   	) }	
					:	RE J					FEATURE	(s)     	) } }	
Dwellir	ngs With	out Base	nts		SEVE	RE   RE   RE	Slope				FEATURE	(s)       	) ) )	
Dwellin Small ( Local S	ngs With Commerci Streets	out Base Basemer al Build and Road	nts lings ls		SEVEI SEVEI SEVEI	RE RE RE RE RE	Slope Slope Slope Slope	s Cave			FEATURE	(s)         	} } }	
Dwellin Small ( Local S	ngs With Commerci Streets	out Base Basemer al Build and Road	nts Lings	Pairways	SEVEI SEVEI	RE RE RE RE RE	Slope Slope Slope	s Cave		ope	FEATURE	(s)           	       	
Dwellin Small ( Local S	ngs With Commerci Streets Landsca	out Base Basemer al Build and Road	nts lings ls nd Golf F	airways	SEVEI SEVEI SEVEI SEVEI	RE RE RE RE RE	Slope Slope Slope Slope	tones	Slo	ope ope	FEATURE	)           	         	
Dwellin Small ( Local S Lawns,	ngs With Commerci Streets Landsca CONSTR	Basemer Basemer al Build and Road ping, ar	nts lings ls nd Golf F	Pairways	SEVEI SEVEI SEVEI SEVEI	RE   RE   RE   RE   RE   RE   RE   RE	Slope Slope Slope Slope	tones	Slo	ope ope		)           	       	
Dwellin Small ( Local S Lawns,	ngs With Commerci Streets Landsca CONSTR	Basemer Basemer al Build and Road ping, ar	nts lings ls nd Golf F	airways	SEVEI SEVEI SEVEI SEVEI	RE   RE   RE   RE   RE   RE   RE   RE	Slope Slope Slope Slope Large S	s Cave	Slo	ope Ope CTIVE		)           	            	
Dwellin Small ( Local S Lawns,  Roadfil Sand Gravel	ngs With Commerci Streets Landsca CONSTR	Basemer Basemer al Build and Road ping, ar	nts lings ls nd Golf F	Pairways	SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI FAIR PROBI	RE   RE   RE   RE   RE   RE   ATING   ABLE   DBABLE	Slope Slope Slope Slope Large S	tones  tones	Slo	ope  CTIVE ope	FEATURE	(s)		
Dwellin Small ( Local S Lawns,  Roadfil Sand Gravel	ngs With Commerci Streets Landsca CONSTR	Basemer Basemer al Build and Road ping, ar	nts lings ls nd Golf F	airways	SEVEI   SEVEI   SEVEI   SEVEI   SEVEI   RIR   FAIR	RE   RE   RE   RE   RE   RE   ATING   ABLE   DBABLE	Slope Slope Slope Slope Large S	tones  tones	Slo	ope Ope CTIVE	FEATURE	)           		
Dwellin Small ( Local S Lawns,  Roadfil Sand Gravel	ngs With Commerci Streets Landsca CONSTR	Basemer Basemer al Build and Road ping, ar	nts lings ls ad Golf I	airways	SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI PROBI PROBI POOR	RE   RE   RE   RE   RE   RE   ATING   ABLE   DBABLE	Slope Slope Slope Slope Large S	itones  Stones  dy  stones	Slo	ope CTIVE ope	FEATURE	(S)                           		
Dwellir Small ( Local S Lawns,  Roadfil Sand Gravel	ngs With Commerci Streets Landsca CONSTR	Basemer al Build and Road ping, ar UCTION N	nts lings ls ad Golf I	airways	SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI PROBI PROBI POOR	RE   RE   RE   RE   RE   RE   ATING   DBABLE   ATING	Slope Slope Slope Slope Large S	stones Etones ady Etones	Slo	ope CTIVE ope	FEATURE	(S)                           		
Dwellin Small (Local Stants,	ngs With Commerci Streets Landsca CONSTR	Basemer al Build and Road ping, ar UCTION N	nts lings ls ld Golf I	Pairways	SEVEI SEVEI	RE   RE   RE   RE   RE   RE   RE   ATING   DBABLE   ATING   RE   RE   ATING   RE   RE   ATING   RE   RE   RE   RE   RE   RE   RE   RE	Slope Slope Slope Slope Large S Large S Too Sar Small S	stones stones stones	Slo	ope CTIVE ppe ea Rec	FEATURE	(S)                           		
Dwellir Small ( Local S Lawns, Roadfil Sand Gravel Topsoil Pond Re Embankon	ngs With Commerci Streets Landsca CONSTR	Out Base Basemer al Build and Road ping, ar UCTION M	nts lings ls ld Golf I	airways	SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI	RE   RE   RE   RE   RE   RE   RE   ATING   DBABLE   ATING   RE   RE   ATING   RE   RE   ATING   RE   RE   RE   RE   RE   RE   RE   RE	Slope Slope Slope Slope Large S  Too Sar Small S	stones dy stones	Slo	ope  CTIVE  care	FEATURE	(S)                           		
Dwellir Small ( Local S Lawns, Roadfil Sand Gravel Topsoil Pond Re Embankm	ngs With Commerci Streets Landsca CONSTR	Out Base Basemer al Build and Road ping, ar UCTION M	nts lings ls ld Golf I	Pairways	SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI LIMIT	RE   RE   RE   RE   RE   RE   RE   RE	Slope Slope Slope Slope Large S  Too Sar Small S  Seepage Seepage	stones dy stones	Slo	ope  CTIVE  care	FEATURE	(S)                           		
Dwellir Small ( Local S Lawns, Roadfil Sand Gravel Topsoil Pond Re Embanka Drainac Irrigat	ngs With Commerci Streets Landsca CONSTR	Out Base Basemer al Build and Road ping, ar UCTION M	its lings ls ld Golf I	airways	SEVEI SEVEI SEVEI SEVEI SEVEI SEVEI RI FAIR PROBI IMPRO POOR RI SEVEI SEVEI LIMIT	RE   RE   RE   RE   RE   RE   RE   RE	Slope Slope Slope Slope Large S Too Sar Small S Seepage Seepage Deep To	stones dy stones	Slo	ope CTIVE ope CTIVE ope coping	FEATURE Claim FEATURE	(S)	- :	

			•
RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	1
Camp Areas	SEVERE	Slope	1
Picnic Areas	SEVERE	Slope	1
Playgrounds	SEVERE	Slope	!
Paths and Trails	MODERATE	Large Stones   Slope	  -

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
				j		1		1.4
!				;		j		1.
1				1				

### WOODLAND INTERPRETATIONS

WOODLAND   EROSION   EQUIPMENT   SEEDLING   WIND TH.   PLANT   INTERP   COMMONLY EXISTING TREES (E)   WOODLAND     ORD. SYB.   HAZARD   LIMITATION   MORTALITY   HAZARD   COMPETITION   ASPECT   and/or   SITE   PRODUCT	•										
balsam fir E red maple E sugar maple E 61 3 yellow birch E paper birch E quaking aspen E black cherry E northern red oak E eastern hemlock E eastern white pine EP			_					and/or			PRODUCT-
quaking aspen E black cherry E northern red oak E eastern hemlock E eastern white pine EP	3R     	MODERATE	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH	red maple sugar maple yellow birch	E E E	61	3
	 							quaking aspen black cherry northern red oak eastern hemlock	_		

Moderately steep and steep, well drained soil formed in sandy and loamy deposits over gravelly loamy sand glacial drift and moderately steep and steep, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel. This map unit is highly erodible. The land capability classification is 7S in stony areas.

Component Name: SAYNER This map unit has 2 components, and 2 interpretation sheet.

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

)					E:	STIMATE	D <b>S</b> O	IL PROPE	RTIES								
	USDA Te			Unifi	led	1	aash		In.	3-10 Inche	s   No	4 No	.10	No.4	0	No.200	Clay %   <.002 m
0-4	LS			SP-SM					-	0-1						10- 30	1-5
4-22	LS S GR-	-S	SP	SM GP GM	1	A-1 A	A-3 i	A-2		0-15						0- 30	
22-60)	SR-SG		SP	SP-SM GP	GP-GM	A-1 A	A-3 1	A-2	-							0- 10	
	Liquid			ist	Perme-	1	Avai	lable	Soil		CEC	CaCO:	3 Or	ganio	 C	Shrink	Erosio
Depth	Limit			Density		Wate	er Ca	apacity	Reacti	.on	(me/			tter			
(In)   		Index	-	/cc 	In/hr			/in)	(Hq)		100g)	Pct		Pct		Potentia	
0-4		NP		-1.4				-0.12			-			 5- 1.		Low	0.17
4-22		NP	1.4	-1.5	26.	0	.03-	-0.12	4.5-6.	5	-	-	•	-		LOW	0.17
22-60		NP	1.5	-1.8	620.	0	.02-	-0.04	5.1-6.	5	-	-		_		LOW	0.17
												Wind	Ris	k of	C		Potentia
	F100	ding		Wa	ter Table	-(feet)		Bedroc	k-(in)	HYD	T	Erod.	Unce	oated	l	į	Frost
redner	icy Dura	tion	months	Depth	Kind	Month	.s	Depth	Hard.	GRP	Fact.	Index	Stee	el		crete	
IONE	-		-	>6.0		-		>60		A		134	LOW		MOI	DERATE	LOW
Challow Wellin Wellin mall Co	BUILDIN Excavat gs Witho mmercia	G SITE Lions out Basemen Build Roadsing, and	DEVELOPM ments ts ings s d Golf F	ENT	SEVER SEVER SEVER SEVER	ATING RE RE RE	j  1 1	Poor Fi. Seepage  Cutbanks Slope Slope Slope Slope Droughty	RI S Cave	To	o Sand	y FEATURE	(s)           	ll St	ones	; ]	
oadfil:					FAIR		j	Slope	KL		TIAE E	CATURE	(S) 				
and					PROBA		)			ĺ			j			i	
ravel					PROBA	BLE	1						1			j	
opsoil					POOR			Too Sand	y 	Sma	ll Sto	nes	Area	Rec]	laim	į	
	WATER M		T		RA	TING	1		RE	STRIC	TIVE F	'EATURE	(S)			)	
	ervoir l		_		SEVER		ļ	Seepage		Slo						j	
	nts, Dil	es and	Levees		SEVER			Seepage		1						j	
ainage					LIMIT		- :	Deep To	Water	1						j	
rigati		•			LIMIT			Slope		Dro	ughty		Fast	Inta	ke	j	
	and Div		1		LIMIT			Slope		Too	Sandy	.	Soil	Blow	ing	j	•
assea	Waterway	S			LIMIT	MOITA	1	Slope		Dro	ughty					1	

RECREATIONAL DEVELOPMENT	RATING	1 .	' RESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Slope	1
Picnic Areas	SEVERE	Slope	
Playgrounds	SEVERE	Slope	1
Paths and Trails	MODERATE	Slope	Too Sandy
i .			

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanent Pasture
				j				1.4
				j				1.

#### WOODLAND INTERPRETATIONS

1										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or Trees recomended to plant		SITE INDEX	WOODLAND   PRODUCT-   IVITY
7R	MODERATE	MODERATE	MODERATE	SLIGHT	SLIGHT	NORTH				
i							red maple	E		1
İ							paper birch	E		
j							quaking aspen	E		. 1
İ							northern red oak	E		
İ							jack pine	EP		}
j							red pine	EP	59	7
j							eastern white pine	EP	57	8
i										

## RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	leight
American cranberrybush gray dogwood Norway spruce		Amur maple jack pine red pine		eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30) 6) 8)

Nearly level, poorly drained soil formed in thin organic material overlying sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 6W. This map unit is hydric.

Component Name: KINROSS

Classification: TYPIC HAPLAQUODS, SANDY, MIXED, FRIGID

						TIMATED SOI								
- :	USDA Te			Unif		ication AASHT	o		3-10 Inches				sing sieve 0 No.200	
0- 5	SP		PT			A-8			0	·     -				
	S FS LS		SP	-SM SM		A-3 A-2-4		-	0	100-	100 100	-100 50-	80 5- 30	
29-60	s fs		SP	-SM SM		A-3 A-2-4		-	0			-100 50-		•
Depth (In)			Bulk 1	ist Density /cc	Perme- ability In/hr			Soil Reacti (pH)	.on	CEC (me/ 100g)	CaCO3 Pct	Organi Matter Pct	Swell	Factor
0- 5l		NP	0.1	-0.3	26.	0.35-	n. 45	3.6- 5				 5099		
5-29		NP			620 <i>.</i>	0.04-		3.6- 6		-	_	JU. )) -	LOW	0.15
29-60	-	NP	1.4			0.04-		4.5-6.		-	-	-	LOW	0.15
				 !							Wind		Corrosion	Potential
Freque	ency Dura	tion	Months	Depth	Kind		Depth	Hard.				Uncoate Steel		Frost   Action
NONE	-		-	<b>!</b>		YEAR-ROUND	•		]   A/D	5		HIGH	MODERATE	
	SANITA Tank Ab Cover fo	_	Fields	•	SEVE	:	Ponding Seepage		Po	CTIVE or Fil o Sand		(S) Ponding	1	
	BUILDI	NG SITE	DEVELOP	ENT	l R	ATING		 R	ESTRI	CTIVE	FEATURE (	's)	}	
Shallo	w Excava	tions			SEVE	e j	Cutbanks			nding		,-,	i	
	ngs With				SEVE	Æ	Ponding		j		1		ĺ	
	ngs With				SEVE	:	Ponding		1		ļ		1	
	Commercia Commercia		_		SEVE	:	Ponding		ļ		1			
	Streets a Landscaj			airways	SEVE	:	Ponding Ponding		Ex	cess H	umus			
	CONSTRI	OCTION M	 ATERIAL		1 R/	ATING		 R	ESTRT	CTIVE	 FEATURE (	· 'S )	j	
Roadfi]					POOR		Wetness		]		2		í	
Sand					PROBE	BLE			j		ĺ		i	
Gravel					IMPRO	BABLE	Too Sand	Эy	1		j		j	
[opsoi]	1 				POOR		Too Sand	ly 	We	tness	( 	·	) 1	
		anageme	NT		:	ATING		R	ESTRI	CTIVE	FEATURE (	(S)		
	acomioi =	Area			SEVER	:	Seepage		]				1	
Pond Re			-				0		I Da	ping				
Embanka	ments, Di	ikes and	Levees		SEVER		Seepage				_ !	Ponding	!	
Embanko Orainag	ments, Di ge	ikes and	Levees		LDIII	NOITA	Ponding			tbanks	Cave	Ponding		
Embanko Orainag Errigat	ments, Di ge				rmi				Cu		j	Ponding Soil Blo	ļ	

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	
Camp Areas	SEVERE	Ponding	1
Picnic Areas	SEVERE	Ponding	j
Playgrounds  Paths and Trails	SEVERE	Ponding	 
			•

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

- 1	crop Aleros	in this table							
	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture AUM	Permanent Pasture   AUM
1									

## WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT NORTH	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLAN	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
2W	SLIGHT	SEVERE	SEVERE	SEVERE	SEVERE	MOKIN	balsam fir	E	0	0
1		•					red maple	E	0	0
1							tamarack	E	0	0
]							black spruce	E	0	0
j							quaking aspen	E	45	2
1							northern whitecedar	E	0	0
]										

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, somewhat poorly drained soil formed in silty deposits underlain by sandy loam glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: MAGNOR

Classification: AQUIC GLOSSOBORALFS, COARSE-LOAMY, MIXED

					Classi	fication		>10	3-	10   Pe	rcent <	3 in. pass	sing sieve	Clay %
	USDA Te			Unif	ied	AASH	TO	In.	Inc	hes   No	4 No.	10 No.40	No.200	\ <.002 m
0- 4			CL	CL-ML M	 L	A-4		-	15	-25   95	-100 90	-100 85-1	100 65-100	5-18
4-29	SIL SI		CL	CL-ML M	Ĺ.	A-4		-		-15   95			00 65-100	•
29-35	L SL GR-	SL	ML	CL-ML SI	M SM-SC	A-2 A-4	A-1	-	0	-15   75	-100 70	- 95 40-	90 20- 70	3-12
35-60	SL L GR-	SL	ML	CL-ML SI	M SM-SC	A-2 A-4	A-1	-	0	-15   75	-100 70	- 95 40-	90 20- 70	3-12
,	Liquid	Plas-	Moj	ist	Perme-	Avai	lable	Soi	1	CEC	CaCO3	Organio	Shrink	Erosio
Depth	Limit	ticity	Bulk I	Density	ability	Water C	apacity	React	ion	(me/		Matter		
(In)		Index	g/	/cc	In/hr	(In.	/in)	(pH	1)	100g)	Pct	Pct	Potenti	
0- 4	15-28	2-10	1.4-	1.5	0.6-2.	0 12	-0.21	4.5-				3 7.		0.37
4-29		NP-10			0.6-2.	0.17		4.5-		_	_	J /.	LOW	0.37
29-35		NP-7			0.2-2.			4.5-		_	_	-	LOW	0.37
35-60		NP-6	1.8-		<0.06		- 0.	4.5-6		_	_	_	LOW	0.24
											- Wind	Risk of	Corrosion	Potentia
	Floo	ding		Wa	ater Table	e-(feet)	- Bedroo	:k-(in)				Uncoated		Frost
	ncy Dura				Kind		1		- 7			•	Concrete	•
			:											
NONE	-		- 1	0.5-3.0	) · PERCHED	NOV-JUN	>60		1 (	C 4	0	LOW	MODERATE	HIGH
	Tank Abs	-			SEVE POOR		Wetness   Wetness		} }	Percs Sl	lowly	]   		
	BUILDI	NG SITE	DEVELOPM	ENT	) R	ATING	]		RES!	TRICTIVE	FEATURE	 (S)		
Shallo	w Excavat	tions			SEVE	RE	Wetness	;	١			Ì	j	
	ngs Withd				SEVE	RE	Wetness	;	1			}	Ì	
	ngs With				SEVE	RE	Wetness	1	)			}	1	
	Commercia		-		SEVE	RE	Wetness	1	1			}	1	
	Streets a				SEVE	RE	Wetness	:	- !	Frost Ac	ction	1	1	
Lawns,	Landscap	oing, an	d Golf F	airways	SEVE	RE	Wetness		}			) 	1	
	CONSTRU	CTION M	IATERIAL		) R	ATING	1		RES.	TRICTIVE	FEATURE	(S)		
Roadfi.	n				POOR	. !	Wetness		1			1	1	
Sand						OBABLE	Excess		1			1	1	
Gravel	_					OBABLE	Excess		1			!	- }	
Topsoi					POOR		Small S	tones	<u> </u>	Wetness		] 	1	
	WATER N	IANAGEME	NT		) R	ATING	,		RES.	TRICTIVE	FEATURE	(S)	}	
	eservoir				MODE	RATE	Seepage	:	1	Slope		}	Ì	
	ments, Di	kes and	Levees		SEVE	RE 1	Piping		١	Wetness		1	١	
Oraina					rmu	TATION	Percs S	lowly	1	Frost Ac	ction	Slope		
Irrigation				:	TATION	Slope		)	Wetness		Droughty			
Terraces and Diversions					TATION	Large S		1	Erodes I	Casily	Wetness	1		
irassed	rassed Waterways				LIMI	TATION	Large S	tones		Wetness		Erodes E	asily	

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	
Camp Areas	SEVERE	Wetness	
Picnic Areas	SEVERE	Wetness	
Playgrounds	SEVERE	Wetness	
Paths and Trails	SEVERE	Wetness	
i			

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
							6.6	3.5

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
3X	SLIGHT	SEVERE	MODERATE	SEVERE	SEVERE	NORTH				
<i>5</i> <u>n</u>	<b>DD1</b> 01						red maple	E	65	3 .
							sugar maple	E	61	3
							yellow birch	E	65	3
	•						white ash	E	68	4
							bigtooth aspen	E		
							quaking aspen	E		
							northern red oak	E	67	4
							American basswood	E	67	4
							white spruce	P		
				-			red pine	P		
							eastern white pine	P		

Nearly level, poorly drained and very poorly drained soil formed in silty and loamy deposits underlain by gravelly coarse sand glacial outwash. This map unit is not highly erodible. The land capability classification is 6W. This map unit is hydric.

Component Name: MINOCQUA

Classification: TYPIC HAPLAQUEPTS, COARSE-LOAMY OVER SANDY OR SANDY-SKELETAL, MIXED, NONACID, FRIGID

					ES	TIMATED SOI	L PROPER	TIES						
Depth	USDA Te	xture		Unifi		ication AASHT	20		3-10 nches			3 in. pas 10 No.4	sing sieve	Clay %   <.002 mm
0- 8	STI.		ст.	ML SC SM	·	A-4			 0-7	1 80-	100 75	-100 60-	 100 45- 90	8-12
:	SIL L SL	•		SM CL MI		A-2 A-4 A	-6	_	0-7	:		-100 45-		
	LCOS GR-			GM GP SF		A-2 A-1 A		_	0-7		100 75		70 2-40	
-	GR-COS S			SM GP GM		A-1 A-3 A		-	0-7	:	100 30		70 0- 30	
I	Liquid	Plas-	Mo:	 ist	Perme-	Avail	able	Soil		 CEC	 CaC03	Organi	Shrink	Erosion
	Limit	ticity		Density						(me/	<b>CG</b> C05	Matter		
(In)		Index		/cc	In/hr	(In./		(pH)		100g)	Pct	Pct		
  8 -0		NP-10	1.2-	-1.5	0.6-2.	0.19-	0.24	4.5-7.	· 8			410	 . LOW	0.37
8-21	<b>&lt;3</b> 5	NP-13	1.5-		0.6-2.	0.11-	0.19	4.5-7.	8	-	_	-	LOW	0.37
21-24	<20	NP-4	1.6-	-1.8	26.	0.06-	0.13	4.5-7.	8	-	_	-	LOW	0.1
24-60	-	NP	1.8-	-1.9	620.	0.02-	0.04	4.5-7.	8	-	-	-	LOW	0.1
											Wind	Risk of	Corrosion	Potential
	Floo	ding		Wa	ter Table	-(feet)	Bedroo	k-(in)	'HYD	T	Erod.	Uncoated	1	Frost
reque	ncy Dura	tion	Months	Depth	Kind					Fact.	Index	Steel	Concrete	Action
IONE				+1-1.0	APPARENT	YEAR-ROUND	1		B/D	4	_	   нісн	HIGH	   HIGH
	SANTTA	RY FACIL	TTTES		i p	ATING		 Di	 FC11DT/	 ~#TUE	FEATURE	 /c\		
Septic	Tank Ab				SEVE		Ponding			or Fil		(S) 	. 1	
	Cover for				POOR	:	Seepage			Sand		Small St	ones	
			DEVELOPM			AMTIVO I		·						
hallo	Excava		DEVELOPE	TENT	SEVE	ATING	Cutbank				FEATURE (	(S)	1	
	ngs With		monts		SEVE	:	Ponding	s Cave	i Por	nding			1	
	ngs With				SEVE	:	Ponding		1				j	
	Commercia				SEVE	:	Ponding		1		i		1	
	Streets a		-		SEVE		Ponding		Fre	ost Ac	tion	! }	1	
			d Golf F	airways	SEVE		Ponding		1	110				
	CONSTRU	OCTION M	ATERIAL		R	ATING		RI	ESTRIC	TIVE	FEATURE (	(S)		
koadfi]	u				POOR	i	Wetness					<b>,</b>	j	
and					PROB				İ				j	
Gravel					PROB	ABLE			}		į		j	
[opsoi]	l 				POOR	1	Small S	tones	Are	ea Rec	laim		İ	
	COMPD A	IANAGEME	<b></b> TX		R	ATING		RI	ESTRIC	TIVE	FEATURE (	(S)		
	MUITU L				1	i i	Seepage		1				i	
ond Re	eservoir	Area			SEVE	KE	p-g-		,					
			Levees		SEVE	:	Seepage		Pip	oing		Ponding	į	
mbankn	eservoir ments, Di		Levees		SEVE	:				oing Ost Ac	tion	Ponding Cutbanks	Cave	
mbankm rainag rrigat	eservoir ments, Di ge Lion	kes and			SEVE	RE j	Seepage		Fro	-			Cave	
imbankm Frainag Frrigat Gerrace	eservoir ments, Di ge	kes and			SEVEL LIMIT	RE	Seepage Ponding		Fro	ost Ac			į	

				1
RECREATIONAL DEVELOPMENT	RATING	1.	RESTRICTIVE FEATURE(S)	ļ
Camp Areas	SEVERE	Ponding		ļ
Picnic Areas	SEVERE	Ponding		
Playgrounds	SEVERE	Ponding	!	ļ
Paths and Trails	SEVERE	Ponding	1	1

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1										
	Corn Grain	Corn Silage	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture   AUM	
į						1				

### WOODLAND INTERPRETATIONS

WOODLAND   ORD. SYB.     7W	EROSION HAZARD SLIGHT	EQUIPMENT LIMITATION SEVERE	SEEDLING MORTALITY 	WIND TH. HAZARD SEVERE	PLANT COMPETITION SEVERE	INTERP ASPECT NORTH	commonly existing TREES and/or TREES RECOMENDED TO PLANT balsam fir black ash tamarack quaking aspen northern whitecedar red maple white ash white spruce	(E) (P) E E E E E E P		WOODLAND PRODUCT- IVITY 7 0 4 0 0 2 0 0
}							black spruce	P	0	0

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, somewhat poorly drained soil formed in silty and loamy deposits underlain by sandy loam glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: MONICO

Classification: ENTIC HAPLAQUODS, COARSE-LOAMY, MIXED, FRIGID

: .																
  Depth	USDA Te	exture		Unifi		ication AAS	HTO	>10 In.	3-10 Inches	Per	4 No	(3 in. )	0.40	No.2		Clay %   <.002 m
0-3	L		ML	CL-ML SM	SM-SC	A-4		_	25-50	-   )   75.		0-100				8-15
3-23	FSL GR-L	SIL		SC ML CL		A-3 A-4			0-25			0-100			- 85	
	SL GR-SL			SP-SM GM		A-2 A-1		_	0-25			0-100				
29-60	GR-LS LS	GR-SL		SP-SM GM		A-2 A-1		-				0-100				
   ·	Liquid	Plas-	Mo:	 ist	Perme-	Avai	lable	 [Soi	 1	CEC	CaC0	3 Oras	anic		ink	 
Depth	Limit	ticity	Bulk	Density			Capacity			(me/	0000	Matt			ell	Erosio Factor
(In)		Index		/cc	In/hr		/in)	(Hq)		100g)	Pct		ot.			
0-3		NP-7	1.1		0.6-2.	0.09	)- 0 2	4.5-6.	 5							
3-23		NP-10		-1.8	0.6-2.	0.06		4.5-6.		_	-	3	- 7.	LOW		0.32
23-29		NP-4		-1.8		0.04		5.1-7.		-	-	_	_	LOW		0.24
29-60		NP-4		-1.8	0.6-2.		-0.12	5.1-7.		_	_	_	_	LOW		0.17 0.1
											Wind	l Rick	of Co	orrosi	on 1	Potentia
	Floo	ding		Wa	ter Table	-(feet)	-  Bedroo	:k-(in)							П	Frost
Frequer	ncy Dura	tion	Months	Depth	Kind	Months	Depth	Hard.	GRE	Fact.	Index	•		Concre	te	
NONE						NOV-MAY	,		!						]	
						NOV-IMI	•		) C	5	0	MODER	CATE H	11GH	. 1	HIGH
		SOTUTOR	Fields		SEVE	RE	Wetness		ESTRI 	CTIVE	FEATURE	E(S) I			] 1	
	Cover for		Fields ll		SEVE		Wetness   Seepage	;	1	CTIVE		E(S)	ss		] ] }	
	BUILDIN	Landfi	11 		SEVE	ATING	:		j Sm	all St		Wetne	:SS			
Shallow	BUILDIN Excavat	Landfi G SITE I	11 DEVELOPM		SEVE	ATING	:	R	Sm  ESTRI	all St	ones	Wetne	:SS			
Shallow	BUILDIN Excavat	Landfi G SITE I Lions out Baser	11  DEVELOPM ments		SEVE	ATING RE	Seepage     Cutbank   Wetness	R s Cave	Sm  ESTRI	all St	ones	Wetne	:ss			
Shallow Dwellin	BUILDIN Excavatings Withougs With	Landfi G SITE I Lions out Baser Basement	DEVELOPM ments		SEVEL   SEVEL   SEVEL   SEVEL   SEVEL	ATING RE RE	Seepage     Cutbank   Wetness   Wetness	R s Cave	Sm  ESTRI	all St	ones	Wetne	ess 			
Shallow Dwellin Dwellin	BUILDING Excavatings Withough With Commercia	G SITE I ions out Baser Basement	ll DEVELOPM ments ts ings		SEVEL   SEVEL	ATING RE RE RE	Seepage     Cutbank   Wetness   Wetness	R s Cave	Sm  ESTRI	all St	ones	Wetne	ess			
Shallow Dwellin Dwellin Small Co	BUILDIN Excavatings Withougs With	G SITE I	ll DEVELOPM ments ts ings	 ient	SEVEL   SEVEL   SEVEL   SEVEL   SEVEL	ATING RE RE RE RE	Seepage     Cutbank   Wetness   Wetness	R s Cave	Sm  ESTRI	all St	ones	Wetne	ess 			
Shallow Dwellin Dwellin Small Co	BUILDIN FEXCAVAT FOR SETTING FOR STATE FOR STA	G SITE I Lions out Baser Basement I Buildi and Roads ing, and	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL SEVEL SEVEL SEVEL SEVEL SEVEL	ATING RE RE RE RE	Seepage 	Rs Cave	Sm  ESTRI   We   	all St	Ones FEATURE	Wetne	ess			
Shallow Dwellin Dwellin Small C Local S	BUILDIN FEXCAVAT FOR WITH COMMERCIA STREET CONSTRU	G SITE I	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   RI   SEVEL	ATING RE RE RE RE	Seepage   Cutbank   Wetness   Wetness   Wetness   Frost A   Large S	R S Cave	Sm   Sm   ESTRI   We                   	crive	ones	Wetne	ess			
Shallow Dwellin Dwellin Small Co Local S Lawns, I	BUILDIN FEXCAVAT FOR WITH COMMERCIA STREET CONSTRU	G SITE I Lions out Baser Basement I Buildi and Roads ing, and	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   RI   SEVEL	ATING RE RE RE RE RE RE	Seepage 	R S Cave	Sm   Sm   ESTRI   We                   	all St	Ones FEATURE	Wetne	ess			
Shallow Dwellin Dwellin Small Co Local S Lawns, I	BUILDIN FEXCAVAT FOR WITH COMMERCIA STREET CONSTRU	G SITE I Lions out Baser Basement I Buildi and Roads ing, and	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   RI   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   FAIR   PROBA	ATING RE RE RE RE RE RE RE	Seepage   Cutbank   Wetness   Wetness   Wetness   Frost A   Large S	R S Cave	Sm   Sm   ESTRI   We                   	crive	Ones FEATURE	Wetne				
Shallow Dwellin Dwellin Small Co Local S Lawns, I	BUILDIN  Excavat  gs With  commercia  treets a  Landscap  CONSTRU	G SITE I Lions out Baser Basement I Buildi and Roads ing, and	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   RI   SEVEL	ATING RE RE RE RE RE RE RE	Seepage   Cutbank   Wetness   Wetness   Wetness   Frost A   Large S	R s Cave	Sm   Sm   ESTRI   We                 We	crive	Ones FEATURE FEATURE	Wetne	.ss			
Shallow Dwellin Dwellin Small Co Local S Lawns, Roadfill Sand Gravel	BUILDING Excavatings Withougs With Commercia Streets a Landscap CONSTRU	G SITE I Lions out Baser Basement I Buildi and Roads ing, and	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   RI   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   PROBA   PROBA   POOR	ATING RE RE RE RE RE ATING	Seepage   Cutbank   Wetness   Wetness   Frost A   Large S	R Cave	Sm   Sm   We   We         We	cTIVE tness	Ones FEATURE FEATURE	Wetne	.ss			
Shallow Dwellin Dwellin Small Co Local S Lawns, I Coadfill Gand Gravel Copsoil	BUILDING Excavatings Withougs With Commercia Streets a Landscap CONSTRU	E Landfillions IG SITE Incidence of Basement Building Roads Incidence of Basement Building Roads Incidence of Buil	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   RI   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   PROBA   PROBA   POOR	ATING RE RE RE RE RE LE LE LE LE LE LE LE LE LE LE LE LE LE	Seepage   Cutbank   Wetness   Wetness   Frost A   Large S   Large S	R S Cave	Sm   Sm   We   We         We   Ard	cTIVE tness	Ones FEATURE FEATURE	Wetne	.ss			
Shallow Dwellin Dwellin Small Co Local S Lawns, I Coadfill Gand Gravel Copsoil Cond Res	BUILDIN  Excavatings Without the commercial treets a Landscap  CONSTRUIT	E Landfillions IG SITE Intions Out Basement I Buildi Ind Roads Ing, and CTION MA	DEVELOPM ments ts ings s d Golf F	 ient	SEVEL   POOR   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   PROBA   PROBA   POOR   RA	ATING RE RE RE RE RE RE LTING LELE LTING LATING	Seepage   Cutbank   Wetness   Wetness   Wetness   Frost A   Large S   Large S   Small S	R s Cave  ction tones  Ritones	Sm   Sm   We   We         ESTRI   We   Arc	CTIVE tness ea Rec	Ones FEATURE FEATURE	Wetne				
Shallow Dwellin Dwellin Small Co Local S Lawns, I Coadfill Sand Gravel Copsoil Cond Res Embankmen	BUILDING Excavatings Without treets a Landscap CONSTRUIL WATER M. servoir , ents, Dil	E Landfillions IG SITE Intions Out Basement I Buildi Ind Roads Ing, and CTION MA	DEVELOPM ments ts ings s d Golf F	 ient	SEVEI   POOR   SEVEI   SEVEI   SEVEI   SEVEI   SEVEI   PROBA   PROBA   POOR   RA   MODER   SEVER   SEVER   SEVER   SEVER   POOR   RA   MODER   SEVER	ATING RE RE RE RE RE RE LTING LELE LTING LATING	Seepage   Cutbank   Wetness   Wetness   Frost A   Large S   Large S	R S Cave	Sm   Sm   We   We         We   Arcestric	cTIVE tness	Ones FEATURE FEATURE	Wetne		ave		
Shallow Dwellin Dwellin Small Co Local S Lawns, I Coadfill Sand Gravel Copsoil Cond Res Cmbankme Orainage Crrigati	BUILDING FEXCAVAT FOR SERVICE FOR SERVICE  BUILDING FEXCAVAT FOR SERVICE  BUILDING FOR SERVICE FOR SERVICE  BUILDING FOR SERVICE FOR SERVICE  BUILDING FOR SERVICE	E Landfillions Out Baser Basement I Buildi and Roads Sing, and CTION MA	DEVELOPMENTS ts ings s d Golf F ATERIAL	 ient	SEVEI   POOR   RI   SEVEI   SEVEI   SEVEI   SEVEI   SEVEI   PROBA   PROBA   PROBA   POOR   RA   MODER   SEVER   LIMIT	ATING RE RE RE RE RE ATING ABLE ABLE ATING	Seepage   Cutbank   Wetness   Wetness   Wetness   Frost A   Large S   Large S   Small S	R S Cave	Sm   Sm   We   We         We   Arc	CTIVE tness ea Rec	ODES FEATURE	Wetne	nks C	ave		
Shallow Dwellin Dwellin Small Co Local S Lawns, I Coadfill Sand Gravel Copsoil Cond Res Cmbankme Orainage Crrigati	BUILDING FEXCAVAT FOR SET OF S	E Landfillions Out Baser Basement I Buildi and Roads Sing, and CTION MA	DEVELOPMENTS ts ings s d Golf F ATERIAL	 ient	SEVEL   POOR   RI   SEVEL   SEVEL   SEVEL   SEVEL   SEVEL   PROBA   PROBA   PROBA   POOR   RA   MODER   SEVER   LIMIT   LIMIT   LIMIT	ATING RE RE RE RE RE ATING ABLE BLE ATING ATENE	Seepage   Cutbank   Wetness   Wetness   Wetness   Frost A   Large S   Large S   Small S   Seepage   Seepage   Frost A	Rs Cave  ction tones  Ri tones	Sm ESTRI   We           Ar- ESTRI   Ar- ESTRI   Slo	CTIVE tness  call St	ODES FEATURE	Wetne	nks C	ave		

RECREATIONAL DEVELOPMENT	RATING	) , RI	ESTRICTIVE FEATURE(S)	
Camp Areas	SEVERE	Wetness		]
Picnic Areas	MODERATE	Wetness	Small Stones	į
Playgrounds	SEVERE	Small Stones	Wetness	1
Paths and Trails	MODERATE	Large Stones	Wetness	1
1.0000				

Crop wields in this table are aver	ages for high level management	where the crop is commo	nly grown on the map unit.
------------------------------------	--------------------------------	-------------------------	----------------------------

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay   tons/acre	Improved Pasture	Permanemt Pasture AUM
				}			5.	3.3

#### WOODLAND INTERPRETATIONS

WOODLAND EROSION											
sugar maple E 63 3  yellow birch E  American basswood E  red maple EP  white ash EP  white spruce P  black spruce P	•		_	MORTALITY	HAZARD	COMPETITION	ASPECT	and/or			PRODUCT-
· ·	) 3x } } !	SLIGHT	MODERATE	SLIGHT	MODERATE	MODERATE		yellow birch American basswood red maple white ash white spruce black spruce	E E EP	63	3

PaB

Nearly level and gently sloping, moderately well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 2E. This map unit is prime farmland.

Component Name: PADUS

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

Depth	USDA Te	exture		Unif		ication AASH	TO		3-10 nches			3 in. pa 10 No.		-	Clay %
0- 5	L		ML	CL-ML C	 L	A-4		-	0-7	80-	·100 75	-100 65	-100	50- 90	6-15
5-33	FSL SL I		SM	SC ML C	ւ	A-2 A-4	A-1-B	-	0-7			-100 45			:
33-35	GR-LS S	GR-SL	SM	SP GP G	M	A-2 A-4	A-1 A-3	-	0-7			-100 25		2- 40	:
35-60	SR- S G		SP	SP-SM G	P GP-GM	A-1 A-2	<b>A-3</b>	-	0-7	:		-100 10			
1	Liquid	Plas-	Mo:	ist	Perme-	Avai	lable	Soil		CEC	CaC03	Organ	 ic	Shrink	Erosio
Depth	Limit	ticity	Bulk 1	Density	ability	Water C	apacity	Reacti	on	(me/		Matte		Swell	Factor
(In)		Index	g,	/cc	In/hr	(In.,	/in)	(pH)	;	100g)	Pct			Potentia	ı K
0- 5		NP-10	1.4	-1.5	0.6-6.	0.17	-0.24	4.5-6.	<b></b> . 5			2		LOW	0.32
5-33	<30	NP-10	1.4	-1.6	0.6-6.	0.09	-0.22	4.5-6.	5	_	-	-		LOW	0.24
33-35	<b>&lt;2</b> 5	NP-4	1.4	-1.6	0.6-6.	0.05	-0.14	4.5-6.	5	-	-	-		LOW	0.1
35-60	-	NP	1.5	-1.8	620.	0.02	-0.06	5.1-6.	5	-	-	-		LOW	0.1
											Wind	Risk o	f Cor	rosion	Potentia
				Wa	ater Table	-(feet)	- Bedroo	k-(in)	HYD	T	Erod.	Uncoate	ed	i	Frost
Freque	ncy Dura	tion	Months	Depth	Kind	Months	Depth	Hard.	GRP	Fact.	Index	Steel	Co	oncrete	Action
NONE	_		-	2.5-4.0	PERCHED	NOV-MAY	!		В	4	56	LOW		ј (ĠH 1	MODERATE
 Septic		RY FACIL			R	ATING		 R	ESTRIC	TIVE	FEATURE			 	
	SANITA Tank Ab Cover fo	sorption	Fields			ATING	Wetness	  R	ESTRIC		FEATURE				
Daily (	Tank Ab Cover for BUILDI	sorption r Landfi NG SITE	Fields		R SEVE	ATING	Wetness	R	ESTRIC   Poc	CTIVE or File	FEATURE	(S)     Small :			
Daily (	Tank Ab Cover for BUILDI W Excava	sorption r Landfi  NG SITE tions	Fields		R SEVE	ATING RE ATING	Wetness	R	ESTRIC   Poc	CTIVE or File	FEATURE ter y	(S)     Small :			
Daily (	Tank Ab Cover for BUILDI W Excava ngs With	sorption r Landfi NG SITE tions out Base	Fields ill DEVELOPM		R SEVE	ATING RE ATING RE HT	Wetness   Seepage	R R S S S S Cave	ESTRIC   Poc	CTIVE or File	FEATURE ter y	(S)     Small :			
Daily ( Shallowelling)	Tank Ab Cover for BUILDI W Excava ngs With	sorption r Landfi NG SITE tions out Base Basemen	Pields  DEVELOPMENTS  The state of the state		R POOR	ATING RE ATING RE HT RATE	   Wetness   Seepage	R R S S S S Cave	ESTRIC   Poc	CTIVE or File	FEATURE ter y	(S)     Small :			
Daily ( Shallow Dwellin Dwellin Small (	Tank Ab Cover for BUILDI W Excava ngs With ngs With	sorption r Landfi NG SITE tions out Base Basemen al Build	Prields  Ill  DEVELOPM  Ements  its  lings		R SEVE POOR R SEVE SLIG	ATING RE ATING RE HT RATE	Wetness   Seepage   Cutbank   Wetness	R R R R S Cave	ESTRIC   Poc	CTIVE or File	FEATURE ter y	(S)     Small :			
Shallow Owelling Small (	Tank Ab Cover for BUILDI W Excava ngs With ngs With Commercia Streets	sorption r Landfi NG SITE tions out Base Basemen al Build and Road	Prields  Ill  DEVELOPM  Ements  its  lings	GENT	R POOR	ATING RE ATING RE HT RATE HT RATE	Wetness   Seepage	R R R S Cave	ESTRIC	CTIVE or File	FEATURE ter y FEATURE	(S)			
Shallow Owelling Small (	Tank Ab Cover for BUILDI W Excavangs With ngs With Commercial Streets a	sorption r Landfi NG SITE tions out Base Basemen al Build and Road	DEVELOPMENT  The second of the	GENT	R SEVE POOR  R SEVE SLIG	ATING RE ATING RE HT RATE HT RATE	Wetness   Seepage   Cutbank   Wetness	R. R. S. Cave	ESTRIC	TIVE or File or Sand	FEATURE ter y FEATURE	(S)   Small : (S) 			
Daily ( Shallow Dwellin Dwellin Chocal Stawns,	Tank Ab Cover for BUILDI W Excavangs With ngs With Commercial Streets a Landscap	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an	DEVELOPMENT  The second of the	GENT	R SEVE POOR  R SEVE SLIG	ATING RE ATING RE HT RATE HT RATE	Wetness   Seepage   Cutbank   Wetness	R. R. S. Cave	ESTRIC	TIVE or File or Sand	FEATURE ter y FEATURE	(S)   Small : (S) 			
Shallow Dwellin Small (Cocal Scawns, Cocadfil	Tank Ab Cover for BUILDI W Excavangs With Gommercia Streets a Landscap CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an	DEVELOPMENT  The second of the	GENT	R SEVE POOR SLIGI	ATING RE ATING RE HT RATE HT RATE RATE ATING	Wetness   Seepage   Cutbank   Wetness   Frost A   Large S	R. R. S. Cave	ESTRIC	TIVE or File or Sand	FEATURE ter y FEATURE	(S)   Small : (S) 			NOCEMIL
Shallow Dwellin Small ( Local S Lawns, Roadfil Sand Gravel	Tank Ab Cover for BUILDI W Excava ngs With Commercia Streets a Landscap CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an	DEVELOPMENT  The second of the	GENT	R R POOR SEVER SLIGIT MODEL MODEL RIFAIR	ATING RE ATING RE HT RATE HT RATE RATE ATING	Wetness   Seepage   Cutbank   Wetness   Frost A   Large S	R. R. S. Cave	ESTRIC	TIVE or File or Sand	FEATURE ter y FEATURE	(S)   Small :			
Shallow Dwellin Small (Cocal Scawns, Cocadfil	Tank Ab Cover for BUILDI W Excava ngs With Commercia Streets a Landscap CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an	DEVELOPMENT  The second of the	GENT	R SEVE SEVEL SLIGI MODEL MODEL RAIR PROBLE	ATING RE ATING RE HT RATE HT RATE RATE ATING	Wetness   Seepage   Cutbank   Wetness   Frost A   Large S	R. R. Cave	ESTRICE  Drocestrice  Drocestrice  ESTRICE  Drocestrice	TIVE or File or Sand	FEATURE (	(S)   Small :			NOCEMIL
Shallow Dwellin Small ( Local S Lowns, Roadfil Sand Gravel	BUILDI W Excava ngs With ngs With Commercia Streets Landscap  CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an UCTION M	DEVELOPMENTS  Sits	GENT	R SEVE POOR  SEVE SLIGI SLIGI MODEL SLIGI MODEL FAIR PROBI POOR	ATING RE ATING RE HT RATE HT RATE ATING ATING	Wetness   Seepage   Cutbank   Wetness   Frost A   Large S	R R R R R R R R R R R R R R R R R R R	ESTRICE    Pool   Too   Too	TIVE or File or Sand	FEATURE (	(S)   Small (S)   (S) 			NODEMIE
Shallow Owelling Owelling Small (Cocal S Cawns, Cocal Standard Cocal Standar	Tank Ab Cover for BUILDI W Excavangs With Commercial Streets a Landscap CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an UCTION M	DEVELOPMENTS  STATEMENTS  AND GOOD FOR THE PROPERTY OF THE PRO	GENT	R SEVE POOR SLIGI	ATING RE ATING RE HT RATE HT RATE ATING ABLE ABLE ATING RE	Wetness   Seepage   Cutbank   Wetness   Frost A   Large S   Wetness   Small S	R. R. S. Cave	ESTRICE  Dro  ESTRICE  Are	oughty  TIVE	FEATURE ( FEATURE (	(S)   Small (S)   (S) 			NORMIE
Shallow Dwellin Dwellin Small (Cocal Scawns, Cocadfil Sand Gravel Gropsoil Cond Re	Tank Ab Cover for BUILDI W Excavangs With Manage With Commercial Streets and Constrain CONSTRAIN WATER Managements, Di	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an UCTION M	DEVELOPMENTS  STATEMENTS  AND GOOD FOR THE PROPERTY OF THE PRO	GENT	R SEVE SEVEL SLIGI MODEL MODEL PROBLE PROBLE PROBLE SEVEL SEVEL SEVEL SEVEL	ATING RE ATING RE HT RATE HT RATE ATING ABLE ABLE ATING	Wetness   Seepage   Cutbank   Wetness   Frost A Large S   Wetness   Small S   Seepage   Seepage   Seepage	R. R. S. Cave	ESTRICE  Are  ESTRICE  Por  Are  ESTRICE  Pip	TIVE DOUGHTY	FEATURE (	(S)   Small (S)   (S) 			NOURMIL
Shallow Dwellin Dwellin Small (Cocal Scawns, Coadfil Gravel Popsoil Cond Recombankm Orainag	Tank Ab Cover for BUILDI W Excavarings With Commercia Streets a Landscap CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an UCTION M	DEVELOPMENTS  STATEMENTS  AND GOOD FOR THE PROPERTY OF THE PRO	GENT	R SEVE POOR R SEVEI PROBE POOR R SEVEI SEVEI LIMIT	ATING RE ATING RE HT RATE HT RATE ATING ABLE ABLE ATING RE RE RE RE	Wetness   Seepage   Cutbank   Wetness   Frost A   Large S   Wetness   Small S   Seepage   Seepage   Slope	R. R. S. Cave	ESTRICE    Poc   Toc   Corrections of the correction of the correc	TIVE Sand	FEATURE (	(S)   Small (S)	Stone		·
Shallow Dwellin Dwellin Small (Cocal Scawns, Coadfil Gravel Pond Re Combankm Orainag	Tank Ab Cover for BUILDI W Excavarings With Commercia Streets a Landscap CONSTRI	sorption r Landfi NG SITE tions out Base Basemen al Build and Road ping, an UCTION M	DEVELOPMENTS  Ats  Ats  Ats  Ats  Ats  Ats  Ats  At	GENT	R SEVE POOR SLIGH MODEL MODEL PROBLE POOR RISEVEL LIMIT	ATING RE ATING RE HT RATE HT RATE ATING ABLE ABLE ATING	Wetness   Seepage   Cutbank   Wetness   Frost A Large S   Wetness   Small S   Seepage   Seepage   Seepage	R. R. R. R. R. R. R. R. R. R. R. R. R. R	ESTRICE    Pocestrice   Drocestrice   Arecestrice   Line	TIVE DOUGHTY	FEATURE (	(S)   Small (S)   (S) 	Stone		·

RECREATIONAL DEVELOPMENT	RATING	1.	RESTRICTIVE FEATURE(S)	1
Camp Areas	SLIGHT	1		1
Picnic Areas	SLIGHT	1		1
Playgrounds	MODERATE	Slope	Small Stones	i
Paths and Trails	SLIGHT	1	}	1
1				-1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a		Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
			  75	4.	3.	6.	3.

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION MODERATE	INTERP ASPECT NORTH	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E) (P)	SITE INDEX	WOODLAND   PRODUCT-   IVITY
] 3L	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH	sugar maple white ash bigtooth aspen	E E	67 0 78	3 0 6
							northern red oak American basswood red pine white spruce	E E EP P	70 0 0 0	4 0 0 0
1							eastern white pine	P	0	0

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

•							
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name 1	Height  
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine	30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30) 6) 8)

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Sloping, well drained soil formed in loway deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 3E.

Component Name: PADUS

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

					E	STIMATED SOI	L PROPER	TIES						
  Depth	USDA Te	exture		Unifi		fication AASHI	0		3-10 nches				sing sieve	Clay %
 0- 5			 MT	CL-ML CI		 λ-4			 0-7	   80-	100 75	 -100 65-1	.00 50- 90	6-15
	FSL SL I			SC ML CI		A-2 A-4 A-1-B			0-7			-100 05-1 -100 45-		:
-	GR-LS S			SP GP GP		h-2 h-4 h		_	0-7			-100 45-		
•	SR-SG	OK DE		SP-SM GF				-	0-7			-100 10-		
	Liquid	Plas-	 Moi	 ist	Perme-	Avail	able	Soil		CEC	CaC03	Organic	: Shrink	Erosio
	Limit	ticity		Density	ability	Water Ca	pacity	Reacti		(me/		Matter	Swell	
(In)		Index	g/	/cc	In/hr	(In./		(pH)		100g)	Pct	Pct	Potenti	
0- 5		NP-10	1.4-	-1.5	0.6-6.	0.17-	0.24	4.5-6.	5	-		2 4.	LOW	0.32
5-33	<30	NP-10	1.4-	-1.6	0.6-6.	0.09-	0.22	4.5-6.	5	-	-	-	LOW	0.24
33-35	<25	NP-4	1.4-	-1.6	0.6-6.	0.05-	0.14	4.5-6.	5	-	-	-	LOW LOW f Corrosion	0.1
35-60	-	NP	1.5-	-1.8	620.	0.02-	0.06	5.1-6.	5	-		-		0.1
											Wind	Risk of		Potentia
	Floo	ding		Wa	ter Tabl	.e-(feet)	Bedroo	k-(in)	HYI	T	Erod.	Uncoated	l	Frost
Freque	ncy Dura	ntion	Months	Depth	Kind	Months	Depth	Hard.	GRI	Fact.	Index	Steel	Concrete	Action
 NONE				>6.0		-	   >60		   B	4	56	LOW	HIGH	MODERAT
	SANITA	RY FACIL	ITIES			RATING		 R	ESTR	CTIVE	FEATURE	(S)		
Septic	Tank Ab	sorption	Fields		SE	ERE	Poor Fi		j			ì	į	
_		or Landfi			P00	: :				Too Sandy		Small St	ones	
	BUILDI	NG SITE	DEVELOP	ŒNT		RATING		R	ESTR	CTIVE	FEATURE	(S)		•
Shallo	w Excava	tions			SEV	ERE	Cutbank	s Cave	ı			Ì	j	
Dwelli	ngs With	out Base	ments		MOI	ERATE	Slope		Ì			Ì	j	
Dwelli	ngs With	Basemen	its		MOI	ERATE	Slope		j			Ì	j	
Small	Commerci	al Build	lings		SEV	ERE	Slope		1			1	j	
Local	Streets	and Road	ls		MOI	ERATE	Slope		F	ost Ac	tion	1		
Lawns,	Landsca	ping, an	d Golf F	airways	I MOI	ERATE	Large S	tones	Dı	oughty	,	Slope	1	
	CONSTR	UCTION M	MATERIAL			RATING		F	ESTR	CTIVE	FEATURE	(S)		
Roadfi	11				GOO	ן מכ			1			1	1	
Sand					PRO	BABLE			1			j	}	
Gravel					PRO	BABLE			1			1		
Topsoi	1				PO	OR	Small S	Stones	l Aı	rea Rec	laim	1	 1	
<b></b>	WATER	MANAGEME	ont			RATING		F	ESTR	CTIVE	FEATURE	(S)		
Pond R	esérvoir	Area			SEV	'ERE	Seepage	<b>:</b>	S	lope		1	1	
Embank	ments, D	ikes and	Levees		SEV	ERE	Seepage	•	P:	iping		1	1	
Draina	-				LD	HOITATION	Deep To	Water	1			!		
Irriga						MOITATE	Slope			ought			1	
Terraces and Diversions		:	LIMITATION   Slope			:	oo Sand	-	1	ļ				
irasse	rassed Waterways			LD	ITATION	Slope		D	roughty	7	Rooting	Depth		

RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE	E FEATURE(S)	j
Camp Areas	MODERATE	Slope	1	1	1
Picnic Areas	MODERATE	Slope	1	1	1
Playgrounds	SEVERE	Slope	1	1	1
Paths and Trails	SLIGHT	1	1	1	1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a		Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
				70	3.5	2.5	5.8	2.5

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP	COMMONLY EXISTING TREES and/or	(E)	SITE	WOODLAND PRODUCT-
		DIMITATION	HOWINDIII		CONFERENCE	DI DC1	TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
3L	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH				
							sugar maple	E	67	3
							white ash	E	0	0
							bigtooth aspen	E	78	6
							northern red oak	E	70	4
							American basswood	E	0	0
							red pine	EP	0	0
							white spruce	P	0	0
							eastern white pine	P	0	0

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name   Height   Plant Name   Height								
gray dogwood 8 jack pine 30 lilac 10 manyflower cotoneaster 6	Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name I	Height
	gray dogwood	8	jack pine		lilac	10	manyflower cotoneaster	

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
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Moderately steep, well drained soil formed in loamy depostis underlain by stratified sand and gravel glacial outwash. This map unit is highly erodible. The land capabiltiy classification is 6E.

Component Name: PADUS

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

•						STIMATED SO	TT LKOLF	 vitro								
  Depth	USDA T	exture		Unifi	Classi ied	fication AASH	łīvo	>10 In.	3-10			< 3 in 10.10			sieve	
													NO.4		No.200	<.002
0- 5		•	ML	CL-ML CI		<b>A-4</b>		-	0-7	80	-100	<b>75-10</b> 0	65-	1 <b>0</b> 0	50- 90	6-1
	5-33 FSL SL L SM SC ML ( 33-35 GR-LS S GR-SL SM SP GP (					A-1-B -				-100	75-100	45-	95	20- 90		
				SP GP GA		A-2 A-4	A-1 A-3	-	0-7	50	-100	<b>45-10</b> 0	25-	75	2- 40	:
35-60	SR- S G		SP	SP-SM GE	GP-GM	A-1 A-2	<b>A-</b> 3	-	0-7	30	<b>-10</b> 0	<b>25-10</b> 0	10-	70	1- 12	j o- :
	Liquid	Plas-	Мо	ist	Perme-	Avai	lable	Soil		CEC	CaC	03 0	 rgani	 C	Shrink	Eros
Depth		ticity	Bulk 1	Density	ability	Water C	apacity	Reacti	.on	(me/			atter		Swell	
(In)		Index		/cc	In/hr	(In.	/in) `	(pH)		100g)	Pc	t	Pct	1	Potenti	
0- 5		NP-10		-1.5	0.6-6.	0 17	-0.24	4.5-6.	·					-		
5-33		NP-10		-1.6	0.6-6.		-0.22		-	_	-		2 4.		LOW	0.3
33-35		NP-4		-1.6	0.6-6.		-0.22 -0.14	4.5-6.		-	-		-		LOW	0.24
35-60	_	NP			620.		-0.14 -0.06	4.5-6. 5.1-6.		-	-		-		LOW	0.:
						0.02		J.1-U.		-	- Wind	54	- -	_	LOW rosion	0.1 
	Floo	ding		Wa	ter Table	-(feet)	- Bedroo	k-(in)	תעון	T	Erod	i	sk or coated		rosion	Potenti
Frequer	ncy Dura	tion	Months	Depth	Kind	Months		Hard.					coated eel	-	crete	Frost
												.   su	<del>2</del> 67		crete	Action
NONE	-		- i	>6.0	-	-	<b>1</b> >60		В	4	56	LO	,	HIG		MODERAT
	Tank Ab	RY FACIL: sorption	Fields		R	ATING RE	Poor Fi				FEATUR	RE(S)			   	
	Tank Ab		Fields			RE	Poor Fi	lter	Slo			İ	all St	ones		
	Tank Abs	sorption r Landfil	Fields ll	 ENT	SEVE POOR	RE		lter 	Slo	pe Sand	y 	Sma	all St	ones		
Caily C	Tank Abs	sorption r Landfil 	Fields ll	 ENT	SEVE POOR	RE ATING	Seepage	lter Ri	Slo	pe Sand		Sma	all St	ones		
Daily C  Shallow	Tank Abs Cover for BUILDIN Excavat	sorption r Landfil 	Fields 11  DEVELOPM	 Ent	POOR	RE ATING	Seepage Cutbank	lter Ri	Slo	pe Sand	y 	Sma	all St	ones		
Oaily C  Shallow Owellin	Tank Abs Cover for BUILDING Excavatings Withou	sorption r Landfil NG SITE I	Fields  11  DEVELOPM  ments	ENT	SEVE POOR	RE ATING	Seepage Cutbank Slope	lter Ri	Slo	pe Sand	y 	Sma	all St	ones		
Shallow Swelling	Tank Absolver for BUILDING Excavatings Without Grant Commercia	sorption r Landfil NG SITE I tions out Basem Basement al Buildi	Fields  CEVELOPM  ments  s  ings	ENT	SEVE	ATING   RE	Seepage Cutbank Slope Slope	lter Ri	Slo	pe Sand	y 	Sma	all St	ones		
Shallow Swelling Swelling Small Co	Tank Abs Cover for BUILDIN Excavatings Withougs With Commerciativeets a	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads	Fields  11  DEVELOPM  ments  is  ings		SEVE	RE ATING   RE   RE   RE   RE	Seepage Cutbank Slope	lter Ri	Slo	pe Sand	y 	Sma	all St	ones		
Shallow Swelling Swelling Small Co	Tank Abs Cover for BUILDIN Excavatings Withougs With Commerciativeets a	sorption r Landfil NG SITE I tions out Basem Basement al Buildi	Fields  11  DEVELOPM  ments  is  ings		SEVE   POOR   R   SEVE   SEVE   SEVE	RE ATING   RE   RE   RE   RE   RE   RE	Seepage Cutbank Slope Slope Slope	lter Ri	Slo	pe Sand	y 	Sma	all St	ones		
Challow Challo	Tank Abs Cover for BUILDI Excavat ags With commercia treets a Landscap CONSTRU	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads	Fields  11  DEVELOPM  ments  is  ings  if Golf Fi		SEVE   SEVE	RE ATING   RE   RE   RE   RE   RE   RE	Cutbank Slope Slope Slope Slope	lter Ri s Cave	Slo	pe Sand TIVE	y  FEATUR	Sma	all St	ones		
Challow Wellin Wellin Cocal Stawns, I	Tank Abs Cover for BUILDI Excavat ags With commercia treets a Landscap CONSTRU	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and	Fields  11  DEVELOPM  ments  is  ings  if Golf Fi		SEVE   SEVE	RE ATING RE RE RE RE RE RE	Cutbank Slope Slope Slope Slope	lter Ri s Cave	Slo	pe Sand TIVE	y 	Sma	all St	ones		
Challow Challo	Tank Abs Cover for BUILDI Excavat ags With commercia treets a Landscap CONSTRU	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and	Fields  11  DEVELOPM  ments  is  ings  if Golf Fi		SEVE   SE	ATING   RE   RE   RE   RE   RE   RE   ATING	Cutbank Slope Slope Slope Slope Slope	lter Ri s Cave	Slo	pe Sand TIVE	y  FEATUR	Sma	all St	ones		
Challow Owelling Coocal Stawns, I coocal Stawns, I coocal fill and ravel	Tank Abs Cover for BUILDIN Excavatings With Commercia treets a Landscap CONSTRU	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and	Fields  11  DEVELOPM  ments  is  ings  if Golf Fi		SEVE   SE	RE ATING   RE   RE   RE   RE   RE   RE   RE   R	Cutbank Slope Slope Slope Slope Slope	lter Ri s Cave	Slo	pe Sand TIVE	y  FEATUR	Sma	all St	ones		
challow welling mall Cocal Stawns, I cocadfill and	Tank Abs Cover for BUILDIN Excavatings With Commercia treets a Landscap CONSTRU	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and	Fields  11  DEVELOPM  ments  is  ings  if Golf Fi		SEVE POOR R SEVE SEVE SEVE SEVE SEVE FAIR PROB	RE ATING   RE   RE   RE   RE   RE   RE   RE   R	Cutbank Slope Slope Slope Slope Slope	lter RI s Cave	Slo	pe Sand TIVE	y FEATUR	Sma		ones		
Shallow Welling Wellin	Tank Abs Cover for BUILDIN Excavatings With Commercia treets a Landscap CONSTRUI	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and	Fields  Il  DEVELOPM  ments  is  ings  I Golf Fields  TERIAL		SEVE POOR SEVEL SEVEL SEVEL SEVEL PROBL PROBL POOR	RE ATING   RE   RE   RE   RE   RE   RE   RE   R	Cutbank Slope Slope Slope Slope Slope	RECONDES	Slo	ope Sand TIVE	y FEATUR FEATUR	E(S)		ones		
challow welling mall Cocal Stawns, I coadfill and ravel copsoil	Tank Abs Cover for BUILDIN Excavatings Without treets a Landscap CONSTRUIT	sorption r Landfil r Landfil RG SITE I tions but Basement al Buildi and Roads bing, and CTION MA	Fields  Il  DEVELOPM  ments  is  ings  if Golf Fields  TERIAL		SEVE POOR SEVEL SEVEL SEVEL SEVEL PROBL PROBL POOR	RE ATING RE RE RE RE RE ATING ATING ATING ATING	Cutbank Slope Slope Slope Slope Slope	RECONDES	Slo	ope Sand TIVE TIVE TIVE TIVE TIVE TIVE	y FEATUR	E(S)		ones		
Challow Wellin Wellin Wellin Cocal S'awns, I and ravel opsoil	Tank Abs Cover for BUILDIN Excavatings Without Excavatings With Commercial Excavatings With Commercial Excavatings With Commercial Excavatings With Excavatings	sorption r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and	Fields  Il  DEVELOPM  ments  is  ings  if Golf Fields  TERIAL		SEVE POOR SEVE SEVE SEVE SEVE SEVE PROBLE PROBLE POOR	RE ATING RE RE RE RE ATING ATING ATING ATING ATING ATING ATING ATING ATING	Cutbank Slope Slope Slope Slope Slope Slope	RECONDES	Slo	PPE  Sand  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE	y FEATUR FEATUR	E(S)		ones		
Challow Wellin Wellin Cocal Stawns, I coadfill and ravel oppoil	Tank Abs Cover for BUILDIN Excavatings With Commercia treets a Landscap CONSTRUIT	sorption r Landfil r Landfil RG SITE I tions but Basement al Buildi and Roads bing, and CTION MA	Fields  Il  DEVELOPM  ments  is  ings  if Golf Fields  TERIAL		SEVE   SE	RE ATING RE RE RE RE ATING ATING ATING ATING ATING ATING ATING ATING ATING	Cutbank Slope Slope Slope Slope Slope Slope	RE	Slo	PPE  Sand  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE	y FEATUR FEATUR	E(S)		ones		
Shallow Wellin Wellin Small Co. ocal Stawns, I condfill and ravel oppoil	Tank Abs Cover for BUILDIN Excavatings With Commercia treets a Landscap CONSTRUI  WATER M Servoir ents, Did ents	sorption r Landfil r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and CTION MA	Fields  Il  DEVELOPM  ments  s  Ings  TERIAL		SEVE   SE	RE ATING RE RE RE ATING ATING ATING ABLE ABLE ATING ATING ABLE ABLE ABLE ABLE ABLE ABLE ABLE ABLE	Seepage Cutbank Slope Slope Slope Slope Slope Slope Slope Slope Seepage	RE	Slo	PPE  Sand  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE  TIVE	y FEATUR FEATUR	E(S)		ones		
Shallow Welling Wellin	Tank Abs Cover for BUILDIN Excavatings With Commercia treets a Landscap CONSTRUI  WATER M Servoir ents, Did ents	sorption r Landfil r Landfil NG SITE I tions but Basement al Buildi and Roads bing, and CTION MA ANAGEMEN Area kes and i	Fields  Il  DEVELOPM  ments  s  Ings  TERIAL		SEVE	ATING RE RE RE RE RE ATING   A	Seepage Cutbank Slope Slope Slope Slope Slope Slope Slope Slope Small St Seepage Seepage Deep To	RE	Slo	PPE PSAND TIVE I TIVE I TIVE I	y FEATUR FEATUR	E(S)		ones		

RECREATIONAL DEVELOPMENT	RATING	1,	RESTRICTIVE FE	ATURE(S)	1
Camp Areas	SEVERE	Slope	1		1
Picnic Areas	SEVERE	Slope	1		- [
Playgrounds	SEVERE	Slope	1	ļ	ļ
Paths and Trails	MODERATE	Slope	1	1	!
Tracins and Trains					1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1 0105 1101								
Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0ats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanent Pasture   AUM
							5.4	2.

## WOODLAND INTERPRETATIONS

•										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT	(E)	SITE	PRODUCT-   IVITY
3R     	MODERATE	MODERATE	SLIGHT	SLIGHT	MODERATE		sugar maple white ash bigtooth aspen northern red oak American basswood	E E E E	67 0 78 70	3   0   6   4
							red pine white spruce eastern white pine	EP P P		0 0 0
:										

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

•							
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine	30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30  6  8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, moderately well drained soil formed in loamy deposits underlain by stratified sand and gravel glacialoutwash, and nearly level and gently sloping moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: PADUS This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

					23	STIMATED S	OIL PROPE	RTIES						
Depth	USDA Te	exture		Unif		ication AAS	ł <b>T</b> O		3-10 inches		4 No.	10 No.		00   <.002 mm
0- 3	L		ML	CL-ML C	 L	A-4			0-7	1 80-			 -100 50-	90   6-15
3-28	FSL SL L SM SC ML CI				L	A-2 A-4	A-1-B	_	0-7	-		-100 45·		90   5-18
	3 GR-LS S GR-SL SM SP GP GM					A-2 A-4		-	0-7   50-10			-100 25		40   2-10
	SR-SG SP SP-SM GP				P GP-GM			-	0-7	•		-100 10·		12   0-3
Depth (In)	Liquid Limit	Plas- ticity Index			Perme- ability In/hr	Water (	ilable Capacity (/in)	Soil Reacti (pH)	ao.	CEC (me/	CaCO3	Organ Matte Pct	r Swe	ell Factor
) 0- 31	<30	NP-10	1.4-	-1.5	0.6-6.	0.17	7-0.24	4.5-6.	 5			2 4	 4. LOW	0 32
3-28		NP-10			0.6-6.			4.5-6.		_		2	LOW	0.32 0.24
28-33		NP-4	1.4-	-1.6	0.6-6.	0.09	5-0.14			-	_	_	LOW	0.1
33-60)		NP	1.5-		620.		2-0.06	5.1-6.		-	-	-	LOW	0.1
											Wind	Risk of	Corrosio	
	Floo	ding		Wa	ater Table	-(feet)	- Bedroo	k-(in)	HYD	T	Erod.			Frost
	ncy Dura		Months		Kind		Depth							te Action
NONE			 	2 5-4 (	) DEDCAED	NOV-MAY	1		) ) B	4	<b></b> 56	LOW	 НІGН	MODERATE
							•		•			DON	111011	PODERATE
-		sorption r Landfi			SEVE		Wetness   Seepage	:	Poc	or Fil		Small S	Stones	
	w Excava			ENT	) R   SEVE	ATING RE	Cutbank		ESTRIC	TIVE	FEATURE	(s) 		
	-	out Baser Basemen			SLIG		   Wetness		1			] 		
		al Build			SLIG	•	i		Í			Í	j	
		and Road:			MODE	RATE	Frost A	ction	1			]	j	
awns,	Landsca	ping, and	d Golf F	airways	MODE	RATE	Large S	tones	Dro	oughty		) 	1	
		OCTION M	ATERIAL		•	ATING	1		ESTRIC	TIVE	FEATURE	(S)	<b></b>	
Roadfil	11				FAIR		Wetness		!			1	1	
Sand					PROB		}		1					
Gravel Mopsoil					PROB.		   Small S	tones	Are	a Rec	laim		) 1	
	UNTED 1	MANAGEMEI	 NTT		1 5	AMTNC	  1					 (a)		
ond Re	walek eservoir		11.1		SEVE	ATING RF	Seepage		FOIKIC	TIVE	FEATURE	(S) I	į	
		ikes and	Levees		SEVE		Seepage		   Pir	ing		) 	j	
rainag			30.000			TATION	Slope			banks	Cave	! 	1	
_					i	TATION	Slope		:	ness		Drought	.v !	
rrigat												,		
rrigat Yerrace		iversions	S		:	TATION	Wetness			Sand	У		- i	

				1
RECREATIONAL DEVELOPMENT	RATING	1 .	· RESTRICTIVE FEATURE(S)	1
Camp Areas	SLIGHT	1		į.
Picnic Areas	SLIGHT	1	1	1
Playgrounds	MODERATE	Slope	Small Stones	1
Paths and Trails	SLIGHT	. 1	1	
				;

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1										•
Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	1	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM	1
								6. 6.6	3. 3.3	1
1					1		•			i.

#### WOODLAND INTERPRETATIONS

WOODLAND   ORD. SYB.	EROSION HAZARDSLIGHT	EQUIPMENT LIMITATION MODERATE	SEEDLING MORTALITYSLIGHT	WIND TH. HAZARD	PLANT COMPETITION MODERATE	INTERP ASPECT	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT		SITE INDEX	WOODLAND   PRODUCT-   IVITY
} 3L }	SLIGHT	MODERATE	SLIGHT	5510111	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		sugar maple white ash bigtooth aspen northern red oak	E E E	67 78 70	3   6   4
							American basswood red pine white spruce eastern white pine	E EP P P		

## RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

  Plant Name	 Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush   gray dogwood   Norway spruce	8	Amur maple jack pine red pine	. 30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30) 6) 8)

Nearly level and gently sloping, moderately well drained soil formed in loamy deposits underlain by stratified sand and gravel glacialoutwash, and nearly level and gently sloping moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: GOODMAN This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

						EST	LMATED	SOIT	PRUPER.	ILD							
) Depth	USDA Te	xture		Unifi		essifi	cation		ı	In.		No 4				ng sieve No.200	Clay %   <.002 mm
													00 90-	100	80-10	0 55- 90	!
0-3				CL-ML			A-4			_						0 55- 90	
3-23				CL-ML	CM-C	20	A-4 A-2 A-	-1 <b>λ</b> -	.Δ	_						0 13- 70	
	FSL SL I			CL-ML SM	5m-2	<b>SC</b>			7	_						0 13- 35	
38-60	SL GR-SI	, LS	SM :	SM-SC		A-2 A-1											
	niquid 12d2			Perr	me-	A.	vaila	ble	Soi	1	CEC	CaCO3	Or	ganic	Shrink	Erosio	
	Limit ticity Bulk Density		abi.	lity	Wate:	r Cap	acity	React	ion	(me/		Ma	tter	Swell	Factor		
(In)	Index g/cc I			hr _		In./i	in)	(pH	)	100g)	Pct		Pct	Potentia			
													7.	LOW	0.37		
0- 3	1 22 11 0			-2.			0.2	3.6-6		_	_	3	- /.	LOW	0.37		
3-23	38 <23 NP-6 1.5-1.6					.17-0			.5	-	_		_	LOW	0.24		
23-38				6-2. 0.04-0				5.1-6		_	_	-		LOW	0.24		
38-60			0.6	-2.	U	.04-0	J.12 	5.1-0			Wind	Risk of					
				Moble:	-/foot\		Redmo	k-(in)				:	coated		Frost		
				ind	Month	s	Depth	Hard.	GRI	P Fact.	Index	Ste	el	Concrete	Action		
rreque	ency bur		noncus											j			
NONE		_		1.5-3.0					•		B	5	0	LOV	V	HIGH	MODERATE
•		or Landf:	n Fields ill		j 	FAIR		<u> </u>	Wetnes		<u> </u>			} 		)	
	BUILD	ING SITE	DEVELOP	MENT		R	ATING	١			RESTR	ICTIVE	FEATURE	(S)		ĺ	
Shall	ow Excav				į	SEVE	RE	1	Cutban	ks Cav	e   W	letness		ļ		1	
		hout Bas	ements			MODE	RATE	1	Wetnes	S	)			!		ļ	
Dwell	ings Wit	h Baseme	nts			SEVE	RE	1	Wetnes	s	ļ			1		1	
Small	Commerc	ial Buil	dings			MODE	RATE		Wetnes		1		. •	1		1	
,		and Roa				MODE			Wetnes			Frost A	ction	1		1	
Lawns	, Landso	aping, a	nd Golf	Fairways		SEVE	RE		Large	Stones 				 			
 	CONST	RUCTION	MATERIAL			) P	ATING				RESTI	RICTIVE	FEATUR	E(S)		į	
Roadf	ill					FAIR	t		Wetnes		ļ					1	
Sand						:	ROBABLE			Fines				1		1	
Grave	:1					:	ROBABLE			Fines	:	D.	-3-4	ì		1	
Topso	oil -					POOF	₹		Large	Stones	5 } /	Area Re	craim	 			
 	WATER MANAGEMENT			) 1	RATING		)		REST	RICTIVE	FEATUR	E(S)		į			
Pond	Reservo	ir Area				MODI	ERATE		Seepag		] :	Slope		1		1	
Embar	dements,	Dikes ar	d Levees	;		SEVI	ERE		Piping	7	ļ			1		1	
Drain	nage					:	ITATION		Slope		1	M-Ac:		1		1	
	gation					:	ITATION		Slope	<b>01</b>		Wetness	Easily	l m	etness	1	
						1 7 730	ている ヤエヘル	Y	1 1 2 2 4 4	T ODG	- 1	r.rooes	r.2451 1V	1 W	ະເມເວລິ		
•	aces and sed Water		ons			•	NOITATI NOITATI			Stone: Easi		Large :		i		i	

RECREATIONAL DEVELOPMENT	RATING	. RESTRICTIVE	FEATURE(S)
Camp Areas	MODERATE	Wetness	)
Picnic Areas	MODERATE	Wetness	1
Playgrounds	MODERATE	Large Stones   Slope	Wetness
Paths and Trails	MODERATE	Large Stones   Wetness	l j
,			

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture	1
							6. 6.6	3. 3.3	1

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
3X	SLIGHT	MODERATE	SLIGHT	MODERATE	SEVERE	NORTH				
							sugar maple	E	69	3
							yellow birch	E		
							paper birch	E		
							bigtooth aspen	· <b>E</b>		
							quaking aspen	E		
							American basswood	E	68	3
							white spruce	P		
					•		red pine	P		
							eastern white pine	P		

PbC

Sloping, well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash and moderately well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: PADUS This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

					E	STIMATED SOI	L PROPER	TIES						
1					Classi	fication				:			ing sieve	
Depth	USDA Te	xture		Unifi	ed	AASHT	0	In. Ir	ches	No 4	4 No.1	10 No.40	No.200	<.002 m
0- 31	 T.		мт.	CL-ML CL		 A-4		-	0-7	80-	100 75	-100 .65-1	.00 50- 90	6-15
	FSL SL I			SC ML CL		A-2 A-4 A	-1-B	-	0-7	80-	100 75	-100 45-	95 20- 90	5-18
•	GR-LS S				i			-	0-7	50-	100 45	-100 25-	75 2- 40	2-10
	SR- S G		SP	SP-SM GP	GP-GM	A-1 A-2 A	-3	-	0-7	30-	100 25	-100 10-	70 1- 12	0-3
ا	Liquid	Plas-	Moi	st	Perme-	Avail	able	Soil	(	CEC	CaCO3	Organio	: Shrink	Erosi
:	Limit	ticity		ensity	ability	Water Ca	pacity	Reactio	n (	(me/		Matter	Swell	Facto
(In)		Index		cc -	In/hr	(In./	in)	(Hq)	1	100g)	Pct	Pct	Potentia	ej K
  0- 3		NP-10	1.4-	1.5	0.6-6.	0.17-	0.24	4.5-6.	 5			2 4.	LOW	0.32
3-28		NP-10	1.4-		0.6-6.	0.09-		4.5-6.		-	-	-	LOW	0.24
28-33		.NP-4	1.4-		0.6-6.		0.14	4.5-6.	5	-	-	-	LOW	0.1
33-60		NP	1.5-		620.		0.06	5.1-6.		-	-	-	LOW	0.1
::											Wind	Risk of	Corrosion	Potenti
	Floo	ding		Wa	ter Tabl	e-(feet)					Erod.	Uncoated		Frost
Freque	ncy Dura	ation	Months	Depth	Kind	Months	Depth		GRP	Fact.	Index		Concrete	:
 NONE				>6.0	-		>60		   B	4	56	LOW	HIGH	MODERAT
												· 		
-	Tank Al	ARY FACII osorption or Landfi	Fields			RATING ERE	Poor Fi	ilter	}	CTIVE o Sand	FEATURE	(S)     Small S	tones	
		ING SITE	DEVELOP	MENT	:	RATING			ESTRI	CTIVE	FEATURE	E(S)	ļ	
	w Excava				:	ERE		ks Cave	1	,		1	1	
	•	out Base				DERATE	Slope		ì			1	1	
	_	n Basemer			:	DERATE VERE	Slope Slope		1			1	i	
		ial Build and Road	_			DERATE	Slope		Fr	ost Ac	rtion	i	ì	
		and Road aping, an		Fairways		DERATE	Large	Stones	•	oughty		Slope	į	
	тгиор	RUCTION !	MATERTAI.		 	RATING	 	 R	ESTRI	CTIVE	FEATURE	 E(S)		
Roadfi					GOX		j		}			j	j	
Sand						DBABLE	j		Ì			1	1	
Gravel	l				PRO	DBABLE	1		1			}	1	
Topsoi					PO	OR	Small	Stones	) Ar	rea Re	claim	1	) 	
	WATER	MANAGEM	ent			RATING	1	I	RESTRI	CTIVE	FEATUR	E(S)		
n 2 F	Reservoi	r Area			SE	VERE	Seepag	е	) s:	lope		)	ļ	
Pond P		Dikes and	d Levees		SE	VERE	Seepag		Pi	iping		]	!	
	oments,											1		
Embank					LI	MITATION		o Water	1			ļ	}	
	age					MOITATION MOITATIM	Slope	o Water	:	rought			)	
Embank Draina Irriga	age ation	Diversio			LI			o Water	To	rought oo San rought	дy		} } Depth	

RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE	FEATURE(S)	Ì
Camp Areas	MODERATE	Slope	1	1	
Picnic Areas	MODERATE	Slope	1	1	}
Playgrounds	SEVERE	Slope		1	1
Paths and Trails	SLIGHT	}		}	}
i					

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture AUM	Permanemt Pasture
					1		5.8	3.
					j		6.4	3.3

### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
27	or Tolm	MODED AME	Ct TCIM	SLIGHT	MODERATE	NORTH ·	TREES RECOMMENDED TO THAN			
3L	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH	sugar maple	E	67	3
			•				white ash	E	•	·
							bigtooth aspen	E	78	6
							northern red oak	E	70	4
							American basswood	E		
							red pine	EP		
							white spruce	P		
		·					eastern white pine	P		

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine	30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30  6  8

loping, well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash and moderately ell drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is potentially highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: GOODMAN This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

Don't	l none m			n_1£1	Classif		<b>1</b> 00			:			passi No.40	-		Clay %   <.002 mm
•	USDA Te	exture		Unifi		THRAA		in.	Inches	NO	4 NO.	.10	NO.40	NO.2		\
0- 3	SIL		ML	CL-ML		A-4		-	25-50	90-	100 90	-100	80-10	0 55-	90	5-12
3-23	SIL		ML	CL-ML		A-4		-	0-15	95-	100 <b>9</b> 0	-100	85-10	0 55-	90	8-14
23-38	FSL SL I		ML	CL-ML SI	M SM-SC	A-2 A-1 A	4-4	-	25-50	65-	100 60	)- 95	30- 9	0 13-	70	2-12
38-60	SL GR-SI	LS	SM	SM-SC		A-2 A-1		-	0-15	65-	100 60	)- 95	30- 8	0 13-	35	2-12
	Liquid	Plas-	Moi	.st	Perme-	Avail	lable	Soi	.1	CEC	CaCO:	3 O1	ganic	Shr	ink	Erosio
Depth	Limit	ticity	Bulk D	ensity	ability	Water Ca	pacity	React	ion	(me/		Ma	atter	Sw	æll	Factor
(In)	i	Index	g/	'cc	In/hr	(In./	'in)	Hq)	1)	100g)	Pct		Pct		ntia	
0- 3	!	NP-6	1.4-	1.5	0.6-2.	0.11-	- 0.2	3.6-6	5.5			:	3 7.	LOW		0.37
3-23		NP-7	1.5-		0.6-2.	0.17-		3.6-6		_	_		_	LOW		0.37
23-38	<23	NP-6	1.5-	1.6	0.6-2.		-0.16	3.6-6	5.5	-	-		-	LOW		0.24
38-60	<b>C23</b>	NP-6	1.5-	1.8	0.6-2.	0.04-		5.1 <b>-</b> 6	5.5	-	-		-	LOW		0.24
											Wind	Ris	sk of C	orrosi	on }	Potentia
r	Floo	ding		Wa	ater Table	-(feet)	Bedro	ck-(in)	HYD	T	Erod.	Und	coated		١	Frost
Freque	ency Dura	tion 1	ï	-		Months	: -					Ste	el	Concre	te	Action
NONE			 -			NOV-MAY	,		·     B	5	0	LO	١	HIGH	J	MODERATE
	SANITA	RY FACIL	ITIES		l R	ATING			RESTRI	CTIVE	FEATUR	 E(S)			· ]	
-	c Tank Ab	RY FACIL: esorption or Landfi	Fields		R   SEVE   FAIR		Wetness Slope		RESTRI	CTIVE tness	FEATUR	E(S)   			-	
-	Cover fo	sorption	Fields 11		SEVE   FAIR	RE	Wetnes:	5	j We	tness		1			-	
Daily	Cover fo	osorption or Landfi	Fields 11	ENT	SEVE   FAIR	RE         ATING	Wetnes:	s 	) We	tness		1				
Daily	C Tank Ab Cover for BUILDI	osorption or Landfi	Fields 11  DEVELOPM	ENT	SEVE   FAIR   R	RE ATING RE	Wetnes: Slope	s  ks Cave	We RESTRI	tness  CTIVE		1			·   -   -   -   -   -   -   -   -   -	
Daily  Shallo	C Tank Ab Cover for BUILDI OW Excava	osorption or Landfi ONG SITE I	Fields  11  DEVELOPMENTS	ENT	SEVE   FAIR   R   SEVE	RE ATING RE RATE	Wetness Slope Cutban	s  ks Cave	We RESTRI	tness  CTIVE tness		1			·	
Daily Shallo Dwelli Dwelli	C Tank Ab Cover for BUILDI OW Excava ings With	osorption or Landfi ING SITE I ations nout Bases	Fields  11  DEVELOPM ments ts	ENT	SEVE   FAIR   R   SEVE   MODE	RE ATING RE RATE RE	Wetness Slope Cutbanl	s  ks Cave	We RESTRI	tness  CTIVE tness		1			-	
Daily Shallo Dwelli Dwelli Small Local	C Tank Ab Cover for BUILDI DW Excava- sings With lings With Commerci Streets	osorption or Landfi NG SITE I ations nout Basement a Basement al Build and Roads	Fields  ll  DEVELOPM  ments  ts  ings s		SEVE   FAIR   R   SEVE   MODE   SEVE	RE ATING RE RATE RE RE	Wetness Slope Cutbanl Wetness Wetness Slope Wetness	s  ks Cave s s	RESTRI	tness  CTIVE tness		E(S)	ost Act	ion		
Daily Shallo Dwelli Dwelli Small Local	C Tank Ab Cover for BUILDI DW Excava- sings With lings With Commerci Streets	osorption or Landfi NG SITE I ations nout Basement a Basement	Fields  ll  DEVELOPM  ments  ts  ings s		SEVE   FAIR   R   SEVE   MODE   SEVE   SEVE	RE ATING RE RATE RE RE RE RE RE	Wetness Slope Cutban Wetness Slope	s  ks Cave s s	RESTRI	tness  CTIVE tness ope		E(S)	ost Act	ion		
Daily Shallo Dwelli Dwelli Small Local	C Tank Ab Cover for BUILDI ow Excava- ings With ings With Commerci Streets , Landsca	osorption or Landfi NG SITE I ations nout Basement a Basement al Build and Roads	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE RAIR RSEVE MODE SEVE MODE SEVE	RE ATING RE RATE RE RE RE RE RE	Wetness Slope Cutbanl Wetness Wetness Slope Wetness	ks Cave s s s Stones	We   We   RESTRI	tness CTIVE tness ope		E(S)	ost Act	ion	-	
Shallo Dwelli Dwelli Small Local Lawns,	C Tank Ab Cover for BUILDI OW Excave ings With ings With Commerci Streets , Landsca	ONG SITE Intions  A Basement all Building and Roads	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE	ATING RE RATE RE RE RATE RATE RATE RATE RATE	Wetness Slope  Cutbani Wetness Wetness Slope Wetness Large	ks Cave s s s Stones	We   We   RESTRI	tness CTIVE tness ope	FEATUR	E(S)	ost Act	ion		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand	C Tank Ab Cover fo  BUILDI DW Excava ings With ings With Cómmerci Streets , Landsca  CONSTR	ONG SITE Intions  A Basement all Building and Roads	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   R   FAIR	RE ATING RE RATE RE RATE RATE RATE RATE RE OBABLE	Wetness Slope  Cutbani Wetness Slope Wetness Large Wetness Large	ks Cave s s s Stones Fines	We   We   RESTRI	tness CTIVE tness ope	FEATUR	E(S)	ost Act	ion		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Gravel	C Tank Ah Cover fo  BUILDI OW Excava ings With ings With Commerci Streets , Landsca  CONSTR	ONG SITE Intions  A Basement all Building, and	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   R   FAIR   IMPR	RE ATING RE RATE RE RATE RATE RATE RE OBABLE OBABLE	Wetness Slope Cutbanl Wetness Slope Wetness Large Wetness Large	ks Cave s s Stones Fines Fines	We   We   RESTRI	tness CTIVE tness ope ope	FEATUR	E(S)	ost Act	ion		
Daily Shallo Dwelli Dwelli Small Local Lawns, Roadfi Sand Grave	C Tank Ah Cover fo  BUILDI OW Excava ings With ings With Commerci Streets , Landsca  CONSTR	ONG SITE Intions  A Basement all Building, and	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   R   FAIR	RE ATING RE RATE RE RATE RATE RATE RE OBABLE OBABLE	Wetness Slope  Cutbani Wetness Slope Wetness Large Wetness Large	ks Cave s s Stones Fines Fines	We   We   RESTRI	tness CTIVE tness ope	FEATUR	E(S)	ost Act	ion		
Daily Shallo Dwelli Dwelli Small Local Lawns Roadfi Sand Gravel	C Tank Ab Cover for BUILDI OW Excava ings With ings With Commerci Streets , Landsca  CONSTR ill il	NG SITE Intions about Basement all Builds and Roads aping, and	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   R   FAIR   IMPR   IMPR   POOR	RE ATING RE RATE RE RATE RATE RATE OBABLE OBABLE	Wetness Slope Cutbanl Wetness Slope Wetness Large Excess Excess Large	ks Cave s s Stones Fines Fines Stones	We   We   RESTRI	tness CTIVE tness ope Ope CTIVE	FEATUR	                         	ost Act	ion		
Daily Shallo Dwelli Small Local Lawns Roadfi Sand Grave Topsoi	C Tank Ab Cover for BUILDI OW Excava ings With ings With Commerci Streets , Landsca  CONSTR ill il WATER Reservoir	NG SITE Intions about Basement all Builds and Roads ping, and CUCTION ME	Fields  11  DEVELOPM  ments ts ings s d Golf F		SEVE RAIR SEVE ROOM RAIR POOR RESEVE	RE ATING RE RATE RE RATE RATE ROBABLE OBABLE ATING RE ATING	Wetness Slope  Cutbanl Wetness Slope Wetness Large  Excess Excess Large  Slope	ks Cave s s Stones Fines Fines Stones	We   We   RESTRI	tness CTIVE tness ope Ope CTIVE	FEATUR FEATUR	                         	ost Act	ion		
Shallo Dwelli Small Local Local Lawns, Roadfi Sand Gravel Topsoi	C Tank Ab Cover for BUILDI OW Excava ings With ings With Cómmerci Streets , Landsca  CONSTR ill il il WATER Reservoir Kments, D	NG SITE Intions about Basement all Builds and Roads aping, and	Fields  11  DEVELOPM  ments ts ings s d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   MODE   SEVE   R   FAIR   IMPR   IMPR   POOR   R   SEVE   SEVE   SEVE   SEVE   SEVE   SEVE	RE ATING RE RATE RE RATE RATE RATE ATING OBABLE OBABLE ATING RE RE	Wetness Slope  Cutbanl Wetness Slope Wetness Large  Wetness Excess Excess Large	ks Cave s s Stones Fines Fines Stones	We   We   RESTRI	tness CTIVE tness ope Ope CTIVE	FEATUR FEATUR	                         	ost Act	ion		
Shallo Dwelli Swall Local Lawns, Roadfi Sand Gravel Topsoi	C Tank Ab Cover for BUILDI OW Excava ings With ings With Cómmerci Streets , Landsca CONSTR ill il WATER Reservoir kments, Dage	NG SITE Intions about Basement all Builds and Roads ping, and CUCTION ME	Fields  11  DEVELOPM  ments ts ings s d Golf F		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   MODE   SEVE   R   FAIR   IMPR   IMPR   POOR   R   SEVE   SEVE   SEVE   SEVE   LIMI	RE ATING RE RATE RE RATE RE ATING OBABLE OBABLE ATING RE RE RE ATING	Wetness Slope  Cutbanl Wetness Slope Wetness Large  Excess Excess Large  Slope Piping Slope	ks Cave s s Stones Fines Fines Stones	We   RESTRI   We   Sl   Sl   Ar   RESTRI	tness CTIVE tness ope Ope CTIVE	FEATUR FEATUR	                         	ost Act	ion		
Shallo Dwelli Swall Local Local Lawns, Roadfi Sand Gravel Topsoi Pond I Embanl Draina	C Tank Ab Cover for BUILDI OW Excava ings With ings With Cómmerci Streets , Landsca  CONSTR ill il il WATER Reservoir Koments, D age ation	NG SITE Intions about Basement all Builds and Roads ping, and CUCTION ME	Fields  11  DEVELOPM  ments ts ings s d Golf F  ATERIAL		SEVE   FAIR   R   SEVE   MODE   SEVE   MODE   SEVE   IMPR   IMPR   POOR	RE ATING RE RATE RE RATE RATE RATE ATING OBABLE OBABLE ATING RE RE	Wetness Slope  Cutbanl Wetness Slope Wetness Large  Wetness Excess Excess Large	ks Cave s s Stones Fines Fines Stones	RESTRI  We SI SI SI AT RESTRI  AT RESTRI  We RESTRI  We RESTRI  We RESTRI	tness CTIVE tness ope Ope CTIVE	FEATUR FEATUR FEATUR		ost Act			

) RATING	) 'R	ESTRICTIVE FEAT	TURE(S)
MODERATE	Slope	Wetness	*
MODERATE	Slope	Wetness	1
SEVERE	Slope	1	1
MODERATE	Large Stones	Wetness	1
	MODERATE MODERATE SEVERE	MODERATE   Slope   MODERATE   Slope   SEVERE   Slope	MODERATE   Slope   Wetness   MODERATE   Slope   Wetness   SEVERE   Slope

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0ats bu/a	Alfalfa Hay tons/acre	Red Clover Hay	Improved Pasture	Permanemt Pasture
							5.8 6.4	3. 3.3

#### WOODLAND INTERPRETATIONS

3X   SLIGHT   MODERATE   SLIGHT   MODERATE   SEVERE   NORTH	69	3
paper birch E bigtooth aspen E		
bigtooth aspen E		
· · · · · · · · · · · · · · · · · · ·		
quaking aspen E		
American basswood E	68	3
white spruce P		
red pine P		
eastern white pine P		

Moderately steep, well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash and moderately steep, well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is highly erodible. The land capability classification is 7S in stony areas. This map unit may have hydric inclusions.

Component Name: PADUS This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

						EST	IMATED SOII										
Denth!	USDA Te	xture		Unifi			cation AASHTY	)								ng sieve No.200	
																	•
0- 3	L		ML	CL-ML CL		A-4			-		0-7					0 50-9	
3-28	FSL SL L	1		SC ML CL		A-2 A-4 A-1-B			-			•				5 20-9	
	GR-LS S	GR-SL		SP GP GM		A-2 A-4 A-1 A-3			-				100 45 <b>-</b> 100 25-				
33-60	SR- S G		SP	SP-SM GP	GP-G	-GM A-1 A-2 A-		-3 	3		0-7 	30-		.100	10- /		
	Liquid	Plas-	Moi	st	Perm	ne-	Avail	able Soil		c	EC	CaCO3	Oı	rganic	Shrin	k Erosi	
•	•	ticity	Bulk D	ensity	abi]	lity	Water Ca	pacity	Read	tio	n (	me/		Ma	atter	Swe]	l Facto
(In)		Index	g/			ır		in)	(1	H)	1	.00g)	Pct		Pct	Potent	ial K
				1.4-1.5 0.6-				0.24	4.5	 -6 5		-		-	2 4.	LOW	0.32
	<30	NP-10					0.09-					_	_		_	LOW	0.24
3-28		NP-10		1.6								_	-		-	LOW	0.3
28-33		NP-4	1.5-				0.02-					-	-		-	LOW	0.3
33-60	-	NP	1.5-	.1.0	٠.٠	-20.	. 0.02						Wind	Ri	sk of (	Corrosio	Potent
	F1		1	Us	tor '	Tahlo	-(feet)							Un	coated		Fros
F	1100	otion	Months	Denth	· Y	ind	Months	Depth	Har	a. I	GRP	Fact.	Index	St	eel	Concrete	e   Action
	ency Dure									]				!			- }
NONE		-	-	>6.0		-	-	>60			В	4	56	LO	W	HIGH	MODERA
-		bsorption or Landfi			:	POOF		,			•	Slope Too Sandy		Str	Small Stones		
	''' TTIIG	ING SITE	DENEI UDI	AENTI	 ۱		ATING			RI	ESTRI	CTIVE	FEATURE	(S)		. }	
  Chall	ow Excav		DB T BBOT .		i	SEVE		Cutban	ks Ca	ve	S1	оре		١		1	
		hout Base	ements		i	SEVE	RE	Slope			}					1	
	-	h Basemer			i	SEVE	RE	Slope			1			1		1	
	-	ial Build			j	SEVE	RE	Slope			١			1		1	
•		and Road			}	SEVI	RE	Slope			1			]		}	
Lawns	, Landsc	aping, a	nd Golf	Fairways	)	SEV	RE	Slope			) 						
	CONST	RUCTION I	MATERIAL			]	ATING	]		R	ESTR]	CTIVE	FEATURE	E(S)			
,  Roadf					j	FAI	}	Slope			1			1			
Sand						PRO	BABLE	1			1			1			
Grave	1					PRO	BABLE	)			1			1			
Topso					1	P00	?	Small	Stone	es 	) Aı	rea Re	claim 	S	lope		) 1
	WATER	MANAGEM	ENT			 }	RATING	  `		P	ESTR	ICTIVE	FEATUR	E(S)			
Pond	Pond Reservoir Area					SEV	ERE	Seepa	ge		S	lope		1			}
,	Embankments, Dikes and Levees					SEV	ERE	Seepage		P	iping		1			1	
	Orainage ·					LIMITATION De			ro Wa	ter	!			ļ			}
•	Irrigation					LIMITATION   Slope					•	rought	-	1			1
	erraces and Diversions					LIMITATION   Slope		Slope			:	oo Sar	_	1			1
	assed Waterways						ITATION	Slope			1 10	rought	-	I D	ootina	Depth	1

RECREATIONAL DEVELOPMENT	RATING	1 .	RESTRICTIVE	FEATURE(S)	
Camp Areas	SEVERE	Slope	1	}	}
Picnic Areas	SEVERE	Slope	}	1	)
Playgrounds	SEVERE	Slope	1		1
Paths and Trails	MODERATE	Slope	}		1
i					1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

- 1										1
	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM	
					}			5.4	2.2	! 
1					}			6.	2.6	
i					•					١

### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
3R	MODERATE	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH ·				
							sugar maple	E	67	3
			•				white ash	E		
							bigtooth aspen	E	78	6
							northern red oak	E	70	4
							American basswood	E		
							red pine	EP		
							white spruce	P		
							eastern white pine	P		

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush	10	Amur maple	10	eastern redcedar	15	eastern white pine	30
gray dogwood	8	jack pine	30	lilac	10	manyflower cotoneaster	6)
Norway spruce	20	red pine	30	Siberian peashrub	8	silky dogwood	8

Moderately steep, well drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash and moderately steep, well drained soil formed in silty deposits underlain by gravelly loamy sand glacial till. This map unit is highly erodible. The land capabiltiy classification is 7S in stony areas. This map unit may have hydric inclusions.

This map unit has 2 components, and 2 interpretation sheet. Component Name: GOODMAN

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

						ES.	TIMATED SOIL	PROPER'	TIES						
Depth	USDA Te	exture		Unifi		assif:	ication AASHTC	)			Per			sing sieve No.200	Clay %
												100 00	100 90-1	100 55- 90	5-12
0- 3				CL-ML			A-4		-				100 85-1		
3-23				CL-ML		A-4			-					90 13- 70	•
	FSL SL I			CL-ML SM	SM-				_					80 13- 35	
38-60	SL GR-SI	. LS	SM	SM-SC			A-2 A-1		-		1 63-				
	Liquid	Plas-	Moi	.st	Per	rme- Available		Soil		CEC	CaCO3	Organi	c Shrink	Erosio	
	Limit	ticity	Bulk D	ensity	abi	lity	Water Cap	pacity	Reacti	on.	(me/		Matter	Swell	Factor
(In)		Index	g/	'cc	In/hr		(In./	in)	(pH)		100g)	Pct	Pct		
						·	0.11-	0.2	3.6-6.	<b></b>			3 7		0.37
0- 3		NP-6	1.4-			5-2.	0.11-		3.6 <b>-</b> 6.		_	_	J. ,	LOW	0.37
3-23		NP-7	1.5-			5-2.	0.17-0		3.6-6.		_	_	_	LOW	0.24
23-38		NP-7		1.6					5.1 <b>-</b> 6.		_	_	_	LOW	0.24
38-60	<23	<b>NP-6</b>	1.5-	1.8	υ.	5-2.	0.04-	0.12	5.1-0.			Wind	Risk of	Corrosion	1
		·				m-L1-	-(feet)	l Bodros	-k-(in)			Erod.	Uncoate		Frost
		_				Table		l Donth	Hard VIII)	GPE	Fact			Concrete	
Freque	ency Dura	ation	Months	Depth		ona.	months	Depth	naru.						
NONE		•	_	>6.0		_	-	>60.		ÌВ	5	0	LOW	HIGH	MODERATE
SANITARY FACILITIES Septic Tank Absorption Fields Daily Cover for Landfill BUILDING SITE DEVELOPMENT Shallow Excavations					SEVERE			pe   RESTRICTIVE			FEATURE	   (S) 			
	ings Wit					SEVE	i	Slope		1			1	1	
	ings Witi					SEVE	i	Slope Slope		1			1	i	
	Commerc					SEVI SEVI		Slope		í			í	i	
	Streets Landsc		nd Golf 1	Fairways		SEVI		Large	Stones	s	lope		j	j	
													······································		
		RUCTION	MATERIAL			•	RATING	Slope		restr 	TCITAF	FEATURE	(3)	1	
Roadf	ill					FAI		Slope	Fines	1			1	í	
Sand	•						ROBABLE ROBABLE		Fines	1			1	.	
Grave						POO			Stones		lope		i	i	
Topso						FOO!	n .						' 		
	WATER MANAGEMENT					1	RATING		RESTRICTIVE F			FEATUR	E(S)	ļ	
Pond	Pond Reservoir Area				SEV	ERE	Slope		ļ			1	!		
Embankments, Dikes and Levees							Piping				}	1			
Drain	Drainage ·					LIMITATION Deep			o Water	.			1	}	
:	Irrigation					LIMITATION   Slope				1			1	ļ	
Terra	erraces and Diversions				LIM	LIMITATION   Slope			•		Easily	1	ļ		
Grace	rassed Waterways					LIMITATION   Slope				} I	rodes	Easily	l	l	

RECREATIONAL DEVELOPMENT	RATING		RESTRICTIVE	FEATURE(S)	
Camp Areas	SEVERE	Slope			
Picnic Areas	SEVERE	Slope	j	j	
Playgrounds	SEVERE	Slope	j	j	
Paths and Trails	MODERATE	Large Stones	Slope	j	

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM	
1							j	5.4	2.2	
) 					)		1	6.	2.6	

#### WOODLAND INTERPRETATIONS

							***************************************			
WOODLAND ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
3R	SLIGHT	MODERATE	SLIGHT	SLIGHT	SEVERE	NORTH				
							sugar maple	E	69	3
							yellow birch	E		
							paper birch	E		
					•		bigtooth aspen	E		
							quaking aspen	E		
							American basswood	E	68	3
							white spruce	P		
							red pine	P		i
							eastern white pine	P		j
										i

PeB

Nearly level and gently sloping, well drained soils formed in loamydeposits underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is potentially highly erodible. The land capability classification is

Component Name: PADUS This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

						ESTIMATED SOII	PROPER'	rtes 						
Depth	USDA Te	exture		Unifi		ification AASHT	0 .		3-10 inches	Perc			ing sieve	Clay %   <.002 m
  0- 5			SM			A-2 A-4 A	 -1-B		0-7	80-1	00 75-	100 45-	85 20- 50	!
	FSL SL I			SC ML CI		A-2 A-4 A		_	0-7	80-1	.00 75-	100 45-	95 20- 90	5-18
	GR-LS S			SP GP GP		A-2 A-4 A		_	0-7	50-1	.00 45-	100 25-	75 2- 40	2-10
	SR- S G	OK DE		SP-SM GF				-	0-7	30-1	.00 25-	100 10-	70 1- 12	0-3
	Liquid	Plas-	 <b>M</b> oi	 ist	Perme-	 Avail	able	Soil	L (	EC	CaCO3	Organio	Shrink	Erosio
	Limit	ticity		Density	abilit		pacity	Reacti	ion (	me/		Matter	Swell	Factor
(In)		Index		/cc	In/hr	(In./		(Hq)	) 1	.00g)	Pct	Pct	Potentia	al K
 0- 5	!	NP-4	1.4	<del>-</del> - -1.7	0.6-6.	0.1-	0.15	4.5-6.	.5	-	-	0.5- 2.	LOW	0.24
5-33		NP-10		-1.6	0.6-6.	0.09-	0.22	4.5-6.	.5	-	-	-	LOW	0.24
33-35		NP-4		-1.6	0.6-6.	0.05-	0.14	4.5-6.	.5	-	-	-	LOW	0.1
35 <b>-</b> 60		NP		-1.8	620		0.06	5.1-6.	.5	-	-	-	TOM	0.1
											Wind	Risk of	Corrosion	Potenti
	Flo	oding		Wa	ater Tab	le-(feet)	Bedroo	k-(in)	HYD	T	Erod.	Uncoated	3	Frost
	ency Dura			Depth				Hard.		Fact.	Index	Steel	Concrete	Action
				>6.0			) l >60			4	86	LOW	HIGH	   MODERAT
NONE 													1	
	SANTT	ARY FACI	LITIES			RATING		1	RESTRI	CTIVE	FEATURE	(S)		
Septio	c Tank A	bsorption	n Fields		) SI	VERE	Poor Fi							
Daily	Cover fo	or Landf:	ill		PC	OOR J	Seepage	:	To	o Sand	y 	Small S	tones	
	BUILD	ING SITE	DEVELOP	MENT		RATING			RESTRI	CTIVE	FEATURE	(S)	į	
Shalle	ow Excav	ations			) SI	EVERE	Cutban	cs Cave	.			]	ļ	
Dwell:	ings Wit	bout Bas	ements		) si	LIGHT			-			]	ļ	
Dwell:	ings Wit	h Baseme	nts		S	LIGHT			1			!	Į	
Small	Commerc	ial Buil	dings		S	LIGHT			ļ			! .	}	
Local	Streets	and Roa	дs		M	ODERATE	Frost	Action	1				ļ	
Lawns	, Landsc	aping, a	nd Golf	Fairways	) Mi	ODERATE	Large :	Stones 	Dr	oughty		l 		
	CONST	RUCTION	MATERIAL	1	!	RATING	ļ		RESTRI	CTIVE	FEATURE	(S)		
Roadf	ill					OOD			ļ			1	] 1	
Sand					:	ROBABLE	1		}			1	) 1	
Grave					- :	ROBABLE		<b>0</b> 1		n	Jai-	1	. 1	
Topsoil				P	00R 	Small	Stones 	IA	ea Rec		! 			
WATER MANAGEMENT					1	RATING		_	RESTRI	CTIVE	FEATURE	:(S)	1	
Pond Reservoir Area					:	SEVERE   Seepag			1 -			1	1	
Embankments, Dikes and Levees					:				Seepage   Piping			1	1	
Drainage					:			eep To Water   Decuments		1 0047 10	lorring l			
Irrig						LIMITATION   Slo		2	:	roughty		Soil B	l fortent	
Terra	erraces and Diversions					IMITATION	Too Sa	-	Soil Blowing     Rooting Depth				) 1	
	2 12 4				1 .7	TMTTN FTON	1 Drough	TT	1 R	חמו דחר	DEDID			

LIMITATION

Grassed Waterways

Droughty

| Rooting Depth |

				. !
RECREATIONAL DEVELOPMENT	RATING	1 .	RESTRICTIVE FEATURE(S)	- 1
Camp Areas	SLIGHT			ļ
Picnic Areas	SLIGHT	1	!	ļ
Playgrounds	MODERATE	Slope	Small Stones	1
Paths and Trails	SLIGHT	1	1	1
•				

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	0ats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture	
				65 55	3.5 3.5	2.8 2.5	6. 5.	2.5 2.5	

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
21	CT TCIM	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH -	TREES RECORDINGED TO THESE			
3L	SLIGHT	MODERATE	2010011	Shioni	HODELLID	2.02.2	sugar maple	E	67	3
							white ash	E	0	0
							bigtooth aspen	E	<b>7</b> 8	6
							northern red oak	E	<b>7</b> 0	4
							American basswood	E	0	0
							red pine	EP	0	0
							white spruce	P	0	0
							eastern white pine	P	. 0	0
	•	•								

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

1							
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine	30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30 6 8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

PeB

Nearly level and gently sloping, well drained soils formed in loamydeposits underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is potentially highly erodible. The land capability classification is

This map unit has 2 components, and 2 interpretation sheet. Component Name: PENCE

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

						ESI	TMATED SOI		T1ES 								
Depth	USDA Te	xture		Unifi			cation AASHT	0	>10 In.		-10 :hes					ing sieve No.200	Clay %   <.002 mm
() 18 -0			 SM	 мт.			A-4 A-2 A				)-7	85-	 100 75-	100	45- 8	35 20- 55	3-11
•	SL L GR-	.er		ML CL-ML	SM-S	:C	A-4 A-2 A		_		)-7	:				95 15- 75	
:	GR-COS L			SP-SM GM			A-2 A-1 A		_		)-8	55-		100			i
•	GR-COS S			SP-SM GP			A-1 A-3 A	_	-	(	<b>)-1</b> 5	30-	1 <b>0</b> 0 <b>2</b> 5-	100	10-	70 1- 12	0-4
 1	Liquid	D) 20-	 Moi	 et	Perm		Avail	able	Sc	oil		EC	CaC03	Oro	ganic	Shrink	Erosio
	Limit			ensity			Water Ca		Read			me/		-	tter		Factor
(In)		Index		cc.	In/h		(In./			oH)	•	00g)	Pct		Pct	Potentia	
  8 -0		NP-4	1.2-	1.6	2			0.18	4.5	·					3.	LOW	0.24
8-15		NP-7		1.5		-6.		0.15	4.5-	- 6.		_	-		-	LOW	0.24
15-21		NTP	1.6-			-20.		0.08		-6.5		-	-		-	LOW	0.1
21-60		NP	1.4-			-20.		0.05	5.1	-6.5		-	-		-	LOW	0.1
													Wind	Ris	k of	Corrosion	Potentia
	Floo	ding		Wa	ater !	[able	-(feet)	Bedroo	:k-(iı	1 (a	HYD	T	Erod.	Unc	oated		Frost
	ency Dura	_		Depth		ind		Depth					Index	Ste	el	Concrete	Action
								>60			 В	3	86	LOW		MODERATE	
NONE	· 		-	>6.0		-		1 200		) 							
																}	
	SANITA	RY FACIL	ITIES		j	R	ATING			RE	STRI	TIVE	FEATURE	(S)	•	1	
Septio	Tank Al	sorption	Fields		1	SEVE	re	Poor F	ilter		1			1			
Daily	Cover fo	or Landfi	11		}	POOR		Seepage	2		To	Sand	y	Sma	11 St	ones	
	יח ודוום	ING SITE	DEVELODA	Æእጥ 	1	 D	ATING		 ,	RF.	STRI	TTVE	FEATURE	 (S)			
Ch-11-			DEAFTOLI	ши	1	SEVE		Cutban	rs Ca		1			1		i	
	ow Excava	out Base	monte			SLIG		Cucioni	<b>₩ ₩</b>	••	1			ĺ		i	
		Basemer			i	SLIG					í			i		i	
	-	ial Build			i	SLIG					i			i .		j	
		and Road	-		í	SLIG					i			j		j	
		aping, ar		Fairways	i	MODE		Large	Stone	s	Dr	oughty	7	İ		Ì	
	CONST	RUCTION N	ATERIAL		 I	 R	ATING			RE	STRI	CTIVE	FEATURE	 (S)			
Roadf					i	GOOD					1			1		1	
Sand					i	PROB					j			İ		1	
Grave:	1				i	PROB	ABLE				j			}		1	
Topso					i	POOR		Small	Stone	s	Ar	ea Re	claim	1		1	
	WATER	MANAGEMI	ent		 	R	ATING	 		RI	STRI	CTIVE	FEATURE	(S)			
Pond I	Reservoi	r Area			į	SEVE	RE	Seepag	e		1			1		1	
		Dikes and	d Levees		j	SEVE	RE	Seepag	e		)			1		1	
Draina	•				i	LIMI	TATION	Deep T	o Wat	er	1			)		)	
Irrig	-				i	LIMI	TATION	Drough	ty		Sc	il Bl	owing	\$10	ope	1	
		Diversion	ns		j	LIMITATION TOO			ndy		Sc	il Bl	owing	l		1	
	ed Water				i	LIMITATION   Too Sa			ıt <del>v</del>		1			1		}	

1
i i
TE   Slope   Small Stones
Г

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture AUM	Permanemt Pasture   AUM	
1					65	3.5	2.8	6.	2.5	
]					55	3.5	2.5	5.	2.5	1

## WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARDSLIGHT	EQUIPMENT LIMITATION MODERATE	SEEDLING MORTALITY SLIGHT	WIND TH. HAZARDSLIGHT	PLANT COMPETITIONSLIGHT	INTERP ASPECT NORTH	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
							balsam fir	E	0	0
							sugar maple	E	59	3
							yellow birch	E	0	0
		-					paper birch	E	0	0
							quaking aspen	Ξ	0	0
							American basswood	E	0	0
							red pine	EP	59	7
							eastern white pine	EP	57	8
							jack pine	P	0	Ω

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

							1
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name…	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine		eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30 6 8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

PeC

Sloping, well drained soils formed in loamy deposits underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is potentially highly erodible. The land capability classification is 4E.

Component Name: PADOS This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

					ES	TIMATED SO	LL PROPE	TIES						
Depth	USDA Te	exture		Unif		ication AASH	ro		3-10 inches			3 in. pas: 10 No.40	sing sieve No.200	Clay %
0- 5	SL		SM			A-2 A-4 I	A-1-B		0-7	l 80-	100 75	 -100 45-	85 20- 50	3-10
•	FSL SL I	,	SM	SC ML CI	i.	A-2 A-4 A-1-B			0-7	:		-100 45-		
	GR-LS S			SP GP G		A-2 A-4 I		-	0-7			-100 25-		
	SR- S G		SP	SP-SM GI	P GP-GM	A-1 A-2 I	4-3	-	0-7	30-		-100 10-		
	Liquid Limit	Plas- ticity Index		ist Density /cc	Perme- ability In/hr	Avail Water Ca	apacity	Soil Reacti (pH)	.on	CEC (me/ 100g)	CaCO3	Organio Matter Pct		Erosion Factor
0- 5	<25	NP-4	1.4-	-1.7	0.6-6.	0.1-	-0.15	4.5-6.	5	_	_	0.5- 2	LOW	0.24
5-33	<30	NP-10	1.4-	-1.6	0.6-6.	0.09-		4.5-6.	5	-	-	-	LOW	0.24
33-35	<25	NP-4	1.4-	-1.6	0.6-6.	0.05	-0.14	4.5-6.	5	-	-	-	LOW	0.1
35-60	-	NP	1.5-	-1.8	620.	0.02	-0.06	5.1-6.	5	-	-	-	LOW	0.1
											Wind	Risk of	Corrosion	Potentia]
	Floo	ding		Wa	ater Table	-(feet)	Bedroo	k-(in)	HYD	T	Erod.	Uncoated	1	Frost
reque	ncy Dura	tion	Months	Depth	Kind	Months	Depth	Hard.	GRE	Fact.	Index	Steel	Concrete	Action
ONE				>6.0	_	_			)   B	4	86		) HIGH	MODERATE
	SANITA	RY FACIL	ITIES		) R	ATING		 R	ESTRI	CTIVE	FEATURE	 (S)		
Septic	Tank Ab	sorption	fields		SEVE	RE	Poor Fi		]			ì	j	
Daily (	Cover fo	r Landfi	11		POOR		Seepage		To	o Sand	ly	Small St	ones	
	BUILDI	NG SITE	DEVELOPM	ENT	l R	ATING		 R	ESTRI	CTIVE	FEATURE	 (S)		
Shallo	w Excava	tions			SEVE	RE	Cutbank		1			Ì	ĺ	
welli	ngs With	out Base	ments		MODE	RATE	Slope		i			Í	i	
Welli	ngs With	Basemen	ts		MODE	RATE	Slope		j			j	i	
mall (	Commerci	al Build	ings		SEVE	RE ]	Slope		j			j	i	
ocal S	Streets	and Road	s		MODE	RATE	Slope		Fr	ost Ac	tion	1	İ	
awns,	Landsca	ping, an	d Golf F	airways	MODE	RATE	Large S	tones	Dr	oughty	•	Slope		
	CONSTR	UCTION M	ATERIAL		l R	ATING		R	ESTRI	CTIVE	FEATURE	(S)		
coadfil	n i				GOOD				1			1	1	
Sand					PROB	ABLE			1			1	}	
Gravel					PROB	ABLE			1			1	1	
[opsoi]	l 				POOR		Small S	tones	Ar	ea Rec	laim	1	.	
	WATER MANAGEMENT			l R	ATING		R	ESTRI	CTIVE	FEATURE	(S)			
	eservoir				SEVE	re	Seepage		S1	ope		1	1	
		ikes and	Levees		SEVE	RE )	Seepage		Pi	ping		]	}	
rainag					:	ration	Deep To	Water	1			1	1	
rrigat	tion				LIM	ration	Slope		Dr	oughty	•	Soil Blo	owing	•
	rraces and Diversions		LIMITATION		Slope									
	es and Di Naterwa		s		:	ration	Slope Slope		To	o Sand	l <b>y</b>	Soil Blo	owing	

					1
RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE FEAT	TURE(S)	)
Camp Areas	MODERATE	Slope	1	j	1
Picnic Areas	MODERATE	Slope	1		
Playgrounds	SEVERE	Slope	1	1	1
Paths and Trails	SLIGHT		1	1	1
•					1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain bu/a	Corn Silage tons, a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanent Pasture	]
			••••	55 50	3. 3.	2.3 2.3	5.8	2. 2.	

#### WOODLAND INTERPRETATIONS

1										
WOODLAND	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
J 3L	SLIGHT	MODERATE	SLIGHT	SLIGHT	MODERATE	NORTH -				
j							sugar maple	E	67	3
Ì							white ash	E	0	0
1							bigtooth aspen	E	78	, 6
1							northern red oak	E	70	4
}							American basswood	E	0	0
1							red pine	EP	0	0
1							white spruce	P	0	0
1	•						eastern white pine	P	0	0
1										

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush  gray dogwood  Norway spruce	10 8 20	Amur maple jack pine red pine		eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30 6 8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Sloping, well drained soils formed in loamy deposits underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is potentially highly erodible. The land capability classification is 4E.

Component Name: PENCE This map unit has 2 components, and 2 interpretation sheet.

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

					E:	STIMATED SOI	L PROPER	TIES								
  Depth	USDA Te	exture		Unifi		fication AASHT	0	>10 In.		·10 :hes	:		-	ssing sie 40 No.20		y % ∣02 mm
							1			 )-7	05-		-100 45	- 85 <b>2</b> 0-		 -11
0- 8			SM		m. 00	A-4 A-2 A		-		)- <i>1</i> )-7	:			- 05 20- - 95 15-		-12
	SL L GR-			ML CL-ML		A-4 A-2 A		<u>-</u>		)-/ )-8	55-		-100 30 -100 25			2-10
	GR-COS I			SP-SM GM		A-2 A-1 A A-1 A-3 A		_			•		-100 10			)- 4
21-60	GR-COS S	S SG	SP 	SP-SM GP			-2 									
	Liquid	Plas-	Moi	.st	Perme-	Avail	able	Soi	il	С	EC	CaCO3	Organ	ic Shr	ink Er	osio
Depth	Limit	ticity	Bulk I	ensity	ability	Water Ca	pacity	React	tio	) c	me/		Matte	r Sw	ell Fa	ctor
(In)		Index	g/	'cc	In/hr	(In./	in)	(pł	H)	1	00g)	Pct	Pct	Pote	ntial	K
  8 -0	<21	NP-4	1.2	1.6	26.	0.1-	0.18	4.5-6	5.5			-	1	3. LOW		.24
8-15		NP-7		.1.5			0.15	4.5-	6.		-	-	-	LOW	C	.24
15-21		NP		1.8			0.08	4.5-6	5.5		-	-	-	LOW		0.1
21-60		NP	1.4-		620.			5.1-6			-	-	-	LOW		0.1
												Wind	Risk o	f Corrosi	on   Pote	entia
	Floo	oding		Wa	ter Tabl	e-(feet)	Bedroo	k-(in)	)	HYD	T	Erod.	Uncoat	ed	Fr	ost
	ency Dura			Depth			Depth						Steel	Concre	te   Act	ion
 NONE				>6.0		_	   >60		-	 В	 3	<b>86</b>	LOW	MODERA	 TE   LOW	
													 /6\		1	
		ARY FACI			:	RATING	Poor F	11+0-	KE	I SIKIC	TIVE	FEATURE	(5)		1	
_			n Fields		: "	ERE )				l Too	Sand	v	Small	Stones	i	
Dally	Cover fo	or Landi	 TTT		POC	·	Seepage	: 							.}	
	BUILD	ING SITE	DEVELOP	ENT	1	RATING		-	RE	STRIC	TIVE	FEATURE	(S)		!	
Shallo	w Excava	ations			SEV	ERE	Cutbanl	ks Cave	е	]			!		1	
	ings With				MOD	ERATE	Slope			ļ			!		!	
Dwell:	ings With	n Baseme	nts		MOD	ERATE	Slope			1			1		ļ	
Small	Commerc	ial Buil	dings.		:	ERE	Slope			!			1		1	
	Streets					ERATE	Slope			!			1		1	
Lawns	, Landsc	aping, a	und Golf 1	fairways	I MOI	ERATE	Large	Stones		) Dro	oughty 		Slope		.  .	
	CONST	RUCTION	MATERIAL	•	1	RATING			RE	STRI	TIVE	FEATURE	(S)		j	
Roadf	ill				GOC	Œ				1			1		ļ	
Sand					PRO	BABLE				]			!		ļ	
Grave:	1					DBABLE				į.			!		!	
Topso	il				POC	OR	Small	Stones 		Are	ea Rec	laim	 		-1	
	WATER	MANAGEM	IENT			RATING			RE	STRI	CTIVE	FEATURE	E(S)		İ	
Pond 1	Reservoi	r Area			SE	/ERE	Seepag	е		Sle	ope		1		1	
Embani	kments,	Dikes ar	d Levees		SE	/ERE	Seepag	e					1		!	
Drain	age				LI	TITATION	Deep T	o Wate	r				]		1	
Irrig	ation				LI	ITATION	Drough	ty		So	il Blo	wing	Slope		1	
Terra	ces and	Diversio	ns		LD	CITATION	Slope			To	o San	ì <b>y</b>	Soil	Blowing	1	
	ed Water	UAVS			l LII	CITATION	Slope			Dr	ought	7	)		}	

			1
RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	1
Camp Areas	MODERATE	Slope	1
Picnic Areas	MODERATE	Slope	
Playgrounds	SEVERE	Slope	1
Paths and Trails	SLIGHT		1
i			1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

- 1										i .
	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM	1
1					55	3.	2.3	5.8	2.	
					50	] 3.	2.3	4.8	Z.	 

#### WOODLAND INTERPRETATIONS

WOODLAND	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP	COMMONLY EXISTING TREES   and/or	(E)	SITE	WOODLAND PRODUCT-
j							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
38	SLIGHT	MODERATE	SLIGHT	SLIGHT	SLIGHT	NORTH -				
i							balsam fir	E	0	0
j							sugar maple	E	59	3
i							yellow birch	E	0	0
i							paper birch	E	0	0
İ							quaking aspen	E	0	0
j							American basswood	E	0	0
İ							red pine	EP	59	7
j							eastern white pine	EP	57	8
İ							jack pine	P	0	0 .
i										

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name H	leight
American cranberrybush	10	Amur maple	10	eastern redcedar	15	eastern white pine	30
gray dogwood	8	jack pine	30	lilac	10	manyflower cotoneaster	6
Norway spruce	20	red pine	30	Siberian peashrub	8	silky dogwood	8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Moderately steep and steep, well drained loamy soils underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is highly erodible. The land capability classification is 7E.

Component Name: PADUS This map unit has 2 components, and 2 interpretation sheet.

Classification: ALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

1					£5	TIMATED SO.	IT LKOLFI	CTIES						
  Depth	USDA Te	xture		Unifi	Classif led	ication AASH	ro		3-10 nches			3 in. pass 10 No.40	sing sieve No.200	Clay %   <.002 mm
33-35	SL FSL SL L GR-LS S SR- S G		SM	SC ML CI SP GP GP SP-SM GI	1	A-2 A-4 I A-2 A-4 I A-2 A-4 I A-1 A-2 I	A-1-B A-1 A-3	- - - -	0-7 0-7 0-7 0-7	80-   50-	·100 75 ·100 45	-100 45- -100 45- -100 25- -100 10-	95 20- 90 75 2- 40	2-10
	Liquid Limit	Plas- ticity Index			Perme- ability In/hr		lable apacity /in)	Soil Reacti (pH)	on	CEC (me/ 100g)	CaCO3	Organic Matter Pct	Swell Potentia	Erosion Factor
0- 5 5-33 33-35 35-60	<30 <25	NP-4 NP-10 NP-4 NP	1.4- 1.4- 1.4-	1.6	0.6-6. 0.6-6. 0.6-6. 620.	0.09- 0.05-	-0.15 -0.22 -0.14 -0.06	4.5-6. 4.5-6. 4.5-6. 5.1-6.	5 5	- - -	-	0.5- 2.		0.24 0.24 0.1 0.1
 Freque	Floo	ding	}	Wa		(feet) Months	Bedroo		HYD		Wind Erod. Index	Uncoated	Corrosion	Potential Frost Action
NONE	-		- Í	>6.0	-	-	>60		В	4	86	LOW	HIGH	MODERATE
	Tank Ab	RY FACILI sorption r Landfil	Fields		RI   SEVEI   POOR	ATING RE	Poor Fi Seepage	lter	s1	CTIVE ope o Sand	FEATURE Y	(S)     Small St	ones	
Dwellin Dwellin Small ( Local :	w Excavatings Withough With Commercia Streets	NG SITE I tions but Basement Basement al Buildi and Roads bing, and	ments ts ings		RI   SEVEI   SEVEI   SEVEI   SEVEI   SEVEI	re Re Re	Cutbank Slope Slope Slope Slope Slope			CTIVE ope	FEATURE	(s)           		
Roadfi Sand Gravel Topsoi	11	OCTION ME	ATERIAL		POOR PROBA	:	Slope Small S		1	CTIVE	FEATURE	(S)         Slope		
Embanko Orainag	eservoir ments, Di ge	MANAGEMEN Area Likes and			SEVER SEVER	E )	Seepage Seepage Deep To		Sl	ope ping	FEATURE			
		versions ys	;		LIMIT	'ATION   'ATION   'ATION	Slope Slope Slope		To	oughty o Sand oughty	У	Soil Blo   Soil Blo   Rooting	wing	

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEAT	URE(S)
Camp Areas	SEVERE	Slope	
Picnic Areas	SEVERE	Slope	1
Playgrounds	SEVERE	Slope	
Paths and Trails	SEVERE	Slope   .	1
1.00.00			

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

	   Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture AUM	Permanemt Pasture AUM	
					)   			5.4 4.4	1.5	
-	ł				•					1

#### WOODLAND INTERPRETATIONS

ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION MODERATE	INTERP   ASPECT    NORTH -	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT		SITE INDEX	WOODLAND PRODUCT- IVITY
3R   	SEVERE	SEVERE	SLIGHT	SLIGHT	MODERATE		sugar maple white ash	E E E	67 0 <b>78</b>	3 0 6
1							horthern red oak American basswood	E E	70 0	4
1							red pine white spruce eastern white pine	EP P P	0 0 0	0 0 0

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine	30	eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30  6  8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

PeD

Moderately steep and steep, well drained loamy soils underlain by stratified sand and gravel and gravelly coarse sand glacial outwash. This map unit is highly erodible. The land capability classification is 7E.

Component Name: PENCE This map unit has 2 components, and 2 interpretation sheet.

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

					ES	TIMATE	D SOI	L PROPER	TIES						
Depth	USDA Te	exture		Unifi	Classif ed		n AASHT	10		3-10 nches	:		_	sing sieve	Clay %   <.002 mm
											-	100 75	100 45	or 20 EC	3.11
0- 8			SM		<b></b>		A-2 I		-	0-7				85 20- 55	i
	SL L GR			ML CL-MI			A-2 I		-	0-7				95 15- 75	:
:	GR-COS I			SP-SM GM				1-3	-	0-8	•		-100 25-		:
21 <b>-6</b> 0	GR-COS S	S SG	SP	SP-SM GF	GP-GM	A-1 	A-3 <i>1</i>	1-2 		0-1:		100 25	-100 10-	70 1- 12 	) 0- 4 
1	Liquid	Plas-	Moi	st	Perme-		Avai]	lable	Soil		CEC	CaCO3	Organi	c Shrink	Erosio
Depth	Limit	ticity	Bulk D	ensity	ability	Wat	er Ca	apacity	Reacti	ao.	(me/		Matter	Swell	Factor
(In)		Index	g/	cc	In/hr		(In./	'in)	(pH)		100g)	Pct	Pct	Potenti	al K
  8 -0		NP-4	1.2-	1.6	26.		0.1-	0.18	4.5-6.	5	-		1 3	. LOW	0.24
8-15	<25	NP-7	1.4-		26.		0.1-	-0.15	4.5- 6		-	-	-	LOW	0.24
15-21	-	NP	1.6-		220.		0.05-	-0.08	4.5-6.	5	-	-	-	LOW	0.1
21-60		NP	1.4-		620.			0.05	5.1-6.		-	-	-	LOW	0.1
												Wind	Risk of	Corrosion	Potentia
	Flo	oding		Wa	ter Table	-(feet	)	Bedroo	k-(in)	HYI	T	Erod.	Uncoate	d	Frost
Freque	ncy Dura	ation	Months	Depth	Kind	Mont	hs	Depth	Hard.	GRI	Pact.	Index	Steel	Concrete	Action
ONE				>6.0							3	86	LOW	MODERATE	LOW
														1	
	SANIT	ARY FACI	LITIES		R	ating			R	ESTR:	CTIVE	FEATURE	(S)	j	
Septic	Tank Al	sorption	n Fields		SEVE	RE		Poor Fi	lter	S	lope		1	1	
Daily	Cover fo	or Landf:	ill		POOR			Seepage	!	To	oo Sand	<b>y</b>	Small S	tones	
	BUILD	ING SITE	DEVELOPM	ENT	l R	ating			R	ESTR	CTIVE	FEATURE	(S)		
Shallo	w Excava	ations			SEVE	RE		Cutbank	s Cave	] s:	lope		1	İ	
Dwelli	ngs With	out Base	ements		SEVE	RE		Slope		j			İ	Ì	
Dwelli	ngs With	Basemen	nts		SEVE	RE		Slope		1			1	j	
Small	Commerci	al Buile	dings		SEVE	RE		Slope		1			1	1	
Local	Streets	and Road	ds		SEVE	RE		Slope					1	1	
Lawns,	Landsca	nping, a	nd Golf F	airways	SEVE	RE	1	Slope					<b> </b>	<u>1</u>	
	CONST	RUCTION I	MATERIAL		R	ATING		 	R	ESTR	ICTIVE	FEATURE	(S)		
Roadfi	11				POOR			Slope		1			}	}	
Sand					PROB	ABLE				1			1		
Gravel					PROB	ABLE				1				1	
Topsoi	1				POOR			Small S	Stones	) Ai	rea Rec	laim	Slope		
	WATER	MANAGEM	ENT		l R	ATING		1	F	ESTR	ICTIVE	FEATURE	(S)	1	
Pond R	eservoii	Area			SEVE	RE		Seepage	)	S	lope		]	1	
Embank	ments, I	ikes and	d Levees		SEVE	RE		Seepage	•	1				1	
Draina	ge				LIMI	TATION	1	Deep To		ļ			!	!	
Irriga					:	TATION		Drought	<b>y</b>		oil Blo	_	Slope	ļ	•
		)iversion	ល		:	TATION		Slope		:	oo Sand	-	Soil Bl	owing	
Grasse	d Water	rays			LIMI	TATION		Slope		D:	roughty	7	1	j	

,			
RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)	
Camp Areas	SEVERE	Slope	
Picnic Areas	SEVERE	Slope	
Playgrounds	SEVERE	Slope	l
Paths and Trails	SEVERE	Slope	ĺ
i			ı

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1								
Corn Grain   bu/a	Corn Silage tons/z	Soybeans bu/a	Wheat bu/a	Oats   bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	improved Pasture	Permanemt Pasture
							5.4 4.4	1.5 1.5
!				•				

#### WOODLAND INTERPRETATIONS

1										
WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	commonly existing trees and/or	(E)	SITE	WOODLAND PRODUCT- IVITY
					or rolm	NODMI	TREES RECOMENDED TO PLANT	(P)	INDEX	14111
3R	SEVERE	SEVERE	SLIGHT	SLIGHT	SLIGHT	NORTH ·			•	•
1							balsam fir	E	0	0
i							sugar maple	E	59	3
ĺ							yellow birch	E	0	0
ί							paper birch	E	0	0
1							quaking aspen	E	0	0
·							American basswood	E	0	0
í							red pine	EP	59	7
1							eastern white pine	EP	57	8
i							jack pine	P	0	0
•										

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine	10 30 30	eastern redcedar lilac . Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30  - 6  8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, somewhat poorly drained soil formed mainly in sandy deposits over sandy and loamy glacial drift. This map unit is not highly erodible. The land capability classification is 6S in stony areas. This map unit may have hydric inclusions.

Component Name: PEQUAMING

Classification: ALFIC HAPLAQUODS, SANDY, MIXED, FRIGID

<u> </u>			,	n	Classifi	.cation	`						ing sieve No.200	
	USDA Te			Unifie	a 	ANDITAL COLUMN								
0- 3			SM S	SC SM-SC	SP-SM	A-2-4 A-1-	-В	- 25	5-50	95-1	.00 90-	100 40- 7	70 10- 30	0-12
	LS S			SM-SC SC		A-2-4 A-3	A-1-B					100 40- 3		•
	LS SL			SC SM-SC		A-2 A-1 A-	-4 A-6						75 15- 40	
	LS S GR-	-SL		SM-SC SC		A-1-B A-3	A-2	- (	0-25	80-1	LOO 60-	100 30-	75 5- 30	0-12
													a	
	Liquid	Plas-			Perme-	Availa		Soil		EC	CaCO3	-		Erosio Factor
Depth	Limit	ticity	Bulk D	ensity		Water Cap			- '	me/	n_+	Matter		
(In)		Index			In/hr			(pH)		.00g)	Pct	Pct	rocencia	
				· 1	220.	0.09-		4.5- 6.			-	1 4.	LOW	0.17
0- 3	:	NP-10		1.5 1.7				4.5- 6.		-	-	-	LOW	0.17
3-24	•	NP-10		1.8				4.5- 6.		_	-	-	LOW	0.17
24-32		NP-25				0.04-		5.1-6.5		-	-	-	LOW	0.17
32-60	<25	NP-10	1.5-	1.8	2 <u>2</u> 0.						Wind	Risk of	Corrosion	Potentia
		. 1 /		Un:	מולכים יים	-(feet)								Frost
		oding ation				Months	Depth	Hard.	GRP	Fact.	Index	Steel	Concrete	Action
NONE					APPARENT	NOV-MAY	>60	j	A	5	0	LOW	HIGH	MODERATE
		bsorption or Landfi			SEVE POOF	i	Wetnes Seepag			or Fil o Sand		   Small St	cones	
		ING SITE	DEVEL OD	erer		RATING		RI	ESTRI	CTIVE	FEATURE	(S)	i	. *
	ow Excav		DEVENOE		SEVI									
		hout Base	ements				Cutban	ks Cave	We	tness		)	1	
		h Basemer			SEVI		Cutban   Wetnes	ks Cave	We	tness		1	1	
	Commerc				SEVI	ERE	:	uks Cave ss	We	tness		   	]   	
•		וווא וגרי			:	ere ere	Wetnes	ks Cave s s	We	tness		] ] ]	   	
	Streets		dings		SEVI	ere ere ere	Wetnes	ks Cave s s s	We	tness		       	)     	
Lawns		and Road	dings ds	Fairways	SEVI	ere ere ere	Wetnes Wetnes Wetnes Wetnes	ks Cave s s s		tness etness		       	       	
Lawns	, Landso	and Road	dings ds nd Golf 1		SEVI SEVI SEVI	ere Ere Ere Ere	Wetnes Wetnes Wetnes Wetnes	eks Cave es es es es es es es es es es es es es	       We	etness		       	         	
 	const	and Road	dings ds nd Golf 1		SEVI SEVI SEVI	ERE ERE ERE ERE ERE	Wetnes   Wetnes   Wetnes   Wetnes   Large	uks Cave us us us us us us us us us us us us us	       We	etness		       	          	
    Roadi	const	and Road	dings ds nd Golf 1		SEVI SEVI SEVI SEVI	ERE ERE ERE ERE ERE ERE ERE RATING	Wetnes Wetnes Wetnes Wetnes	uks Cave us us us us us us us us us us us us us	       We	etness		       	           	
Roadi	const	and Road	dings ds nd Golf 1		SEVI SEVI SEVI POO	ERE ERE ERE ERE ERE ERE ERE RATING R BABLE	Wetnes   Wetnes   Wetnes   Wetnes   Large	eks Cave ss ss ss ss Stones R	       We	etness		       	           	
Roadi Sand Grave	const	and Road	dings ds nd Golf 1		SEVI SEVI SEVI POO	ERE ERE ERE ERE ERE RATING R BABLE ROBABLE	Wetness   Wetness   Wetness   Large   Large   Wetness   Too Sa	eks Cave ss ss ss ss Stones R	               	etness  LCTIVE		       		
Roadi Sand	const	and Road	dings ds nd Golf :		SEVI SEVI SEVI SEVI POO PRO PRO	ERE ERE ERE ERE RATING R BABLE ROBABLE	Wetness   Wetness   Wetness   Large   Large   Wetness   Too Sa	eks Cave es es es es es es es es es es es es es	ESTRI	etness CTIVE	 FEATURE	                                   		
Roadf Sand Grave	constill  cl  cil  water	and Road	dings ds nd Golf :		SEVI SEVI SEVI POO PRO PRO	ERE ERE ERE ERE ERATING R BABLE ROBABLE R	Wetnes   Wetnes   Wetnes   Wetnes   Large   Wetnes   Too Si   Large	eks Cave es es es es es es es es es es es es es	ESTRI	etness CTIVE	FEATURE	                                   		
Roadi  Sand  Grave  Topso 	CONST	and Road caping, and TRUCTION	dings ds nd Golf 1 MATERIAL		SEVI SEVI SEVI SEVI POO PRO PRO	ERE ERE ERE ERE ERATING R BABLE ROBABLE R RATING R RATING	Wetnes   Wetnes   Wetnes   Wetnes   Large   Wetnes   Too Si   Large	eks Cave ss ss ss Stones R ss andy Stones R	ESTRI	etness CTIVE	FEATURE	                                   		
Roadf  Sand  Grave  Topso 	CONST	and Road	dings ds nd Golf 1 MATERIAL		SEVI SEVI SEVI SEVI POO PRO PRO POO	ERE ERE ERE ERE ERATING R BABLE ROBABLE R RATING R RATING	Wetness   Wetness   Wetness   Large   Wetness   Too Si   Large   Seepa	eks Cave ss ss ss Stones R ss andy Stones R	ESTRI	etness  ICTIVE rea Re	FEATURE			
Roadi  Sand  Grave  Topso      Pond  Embai	CONST	and Road caping, and TRUCTION	dings ds nd Golf 1 MATERIAL		SEVI SEVI SEVI SEVI POO PRO PRO POO SEV	ERE ERE ERE ERE ERATING R BABLE ROBABLE R RATING R RATING	Wetnes   Wetnes   Wetnes   Large   Wetnes   Too Si   Large   Seepa   Seepa	eks Cave ss ss ss Stones R ss andy Stones R	ESTRI   A	etness  ICTIVE rea Re	FEATURE claim			
Roadi Sand Grave Topso  Pond Embai	CONST	and Road caping, and TRUCTION	dings ds nd Golf : MATERIAL ENT		SEVI SEVI SEVI SEVI POO PRO PRO POO SEVI SEVI LIP	ERE ERE ERE ERE ERE ERATING R BABLE ROBABLE R RATING ERE ERE	Wetnes   Wetnes   Wetnes   Large   Wetnes   Too S:   Large   Seepa   Seepa   Cutba	eks Cave ess ess ess Stones R ess andy Stones R ge ge ge nks Cave	ESTRI	etness  [CTIVE rea Re  ICTIVE	FEATURE claim : FEATUR		5	•

RECREATIONAL DEVELOPMENT	RATING	•	<ul> <li>RESTRICTIVE</li> </ul>	FEATURE(S)	ì
Camp Areas	SEVERE	Wetness	1		}
Picnic Areas	SEVERE	Wetness	1		1
Playgrounds	SEVERE	Wetness	1	1	j
Paths and Trails	SEVERE	Wetness	}	}	j
					i

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain	Corn Silage	Soybeans	Wheat	Oats	Alfalfa Hay	Red Clover Hay	Improved Pasture	Permaneut Pasture
bu/a	tons/a	bu/a	bu/a	bu/a	tons/acre	tons/acre		AUM
					]		4.6	1.6

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.		EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
4X	SLIGHT	SEVERE	MODERATE	SEVERE	SEVERE	NORTH				
							balsam fir	E	53	7
							red maple	E	56	2
					•		sugar maple	E	53	2
							quaking aspen	Ε	60	4
					•		white spruce	EP	53	7
							northern whitecedar	EP	33	3
•							Norway spruce	P		
							black spruce	P		
					•		eastern white pine	P		

For more information contact: Area Resource Soil Scientist, Soil Conservation Service, Hwy 70 E. and Timberland Road, Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Pt PITS, GRAVEL Pits, sand or gravel Component Name: PITS Classification: |------ Flooding-----| ---- Water Table-(feet) --- | Bedrock-(in) | HYD T Erod. | Uncoated | Frost | |Frequency Duration | Months | Depth | Kind | Months | Depth | Hard. | GRP Fact. Index | Steel | Concrete | Action | |-----| - | NA CROPS AND PASTURE YIELDS Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit. Corn Grain Corn Silage Soybeans Wheat Oats | Alfalfa Hay Red Clover Hay | Improved Pasture Permanent Pasture | bu/a bu/a tons/acre tons/acre AUM AUM bu/a tons/a bu/a

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, somewhat poorly drained soil formed in sandy, loamy, and silty lacustrine deposits. This map unit is not highly erodible. The land capability classification is 2W. This map unit is prime farmland where drained.

Component Name: PLOVER

Classification: AQUIC GLOSSOBORALFS, COARSE-LOAMY, MIXED

					E	STIMATED SOI	L PROPER	TIES						
Depth	USDA Te	exture		Unifi		fication AASHT	NO	>10 In.	3-10 Inche	:		-	ing sieve No.200	Clay %
								,		- j				j
0- 5	FSL		ML	SM		A-2 A-4		-	0				95 30- 55	:
5-23	FSL VFSI	L	SM	ML SM-SC	CL-ML	A-4		-	0				00 40- 75	:
23-29	FSL SL		SM	ML CL-ML	SM-SC	A-4		-	0	•			00 40- 70	:
29-60	SR- SI H	rs	SM	ML CL-ML	SM-SC	A-4		-	0	100-	100 100-	-100 65-1	00 40- 75	1-12
	Liquid	Plas-	Moi	ist	Perme-	Avail	lable	Soi	1	CEC	CaCO3	Organic	Shrink	Erosion
Depth	Limit	ticity	Bulk I	Density	ability	Water Ca	apacity	React	ion	(me/		Matter	Swell	Factor
(In)		Index	g/	/cc	In/hr	(In./	/in)	Hq)	)	100g)	Pct	Pct	Potentia	
  0- 5		NP-4	1.4-	-1.6	0.6-2.	0.13-	-0.18	4.5-7	.3			2 3.	LOW	0.24
5-23		NP-5		-1.7	0.6-2.		-0.19	4.5-7		_	_	_	LOW	0.24
23-29		NP-7		-1.7			-0.17			-	_	_	LOW	0.24
29-60		NP-7	1.5-		0.6-2.			5.6-7		-	-	-	LOW	0.24
											Wind	Risk of	Corrosion	Potential
	Floo	oding		Wa	ter Tabl	e-(feet)	- Bedroo	k-(in)	НУ	D T	Erod.	Uncoated	l	Frost
			Months		Kind	Months					Index	Steel	Concrete	Action
RARE	-	•	-	1.0-3.0	APPAREN	T NOV-MAY	>60		l c	5	86	MODERATE	HIGH	HIGH
-		osorption or Landfi	n Fields ill		SEV POC	ERE DR	Wetness Too Sar		)   W	etness		 	1	
	BUILD	ING SITE	DEVELOP	œnt		RATING	 		RESTR	ICTIVE	FEATURE	(S)		
Shallo	w Excava	ations			SEV	ERE	Cutbank	s Cave	W	etness		ĺ	j	
		out Base	ements		SEV	ERE	Floodir	ng	j w	etness		İ	j	
Dwelli	ngs With	Basemen	nts		SEV	ERE	Floodin	ng	) W	etness		1	1	
Small	Commerci	ial Build	dings		SEV	ERE	Floodin	ng	W	etness		1	1	
Local	Streets	and Road	ds		SEV	ERE	Frost	action	1			1	1	
Lawns,	Landsca	aping, a	nd Golf 1	airways	IOM (	ERATE	Wetness	<b>.</b>				}	I	
	CONST	RUCTION I	MATERIAL		1	RATING	1		RESTR	ICTIVE	FEATURE	(S)	j	
Roadfi	11				FA]	LR .	Wetness	3	)			)		
Sand					IM	ROBABLE	Excess	Fines	1					
Gravel					DI	ROBABLE	Excess	Fines	- [			ļ		
Topsoi	1				FA]	IR	Thin L	ayer 				 	l	
	WATER	MANAGEM	ENT		1	RATING	1		RESTR	ICTIVE	FEATURE	(S)	i	
Pond R	eśervoi:	Area			MOI	ERATE	Seepage	9	j			}		
Embank	ments, I	ikes and	d Levees		SEV	/ERE	Piping		1 6	<i>l</i> etness		1		
Draina	ge				LD	CITATION	Frost	Action		utbank		!		
Irriga					LD	CITATION	Wetnes			Soil Blo		1	ļ	
		Diversion	ns			CITATION	Wetnes		1 2	oo San	dy	ļ	ļ	
Grasse	d Water	vays			LD	NOITATI	Wetnes	S	- 1			1	1	

RECREATIONAL DEVELOPMENT	RATING	RESTRICT	TIVE FEATURE(S)	1
Camp Areas	SEVERE	Flooding   Wetr	ess	1
Picnic Areas	MODERATE	Wetness	)	1
Playgrounds	SEVERE	Wetness		1
Paths and Trails	MODERATE	Wetness	1	1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

0	Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
					<b>7</b> 0	3.5	3.	5.8	2.

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES   and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
3W	SLIGHT	SEVERE	SLIGHT	MODERATE	SEVERE	NORTH -				
							red maple	E	65	3
							yellow birch	E	0	0
							American basswood	E	0	0
							American elm	E	0	0
							white spruce	P	0	0
							black spruce	P	0	0
							eastern white pine	P	0	0

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

1	Plant Name	Heiaht	Plant Name	Height	Plant Name	 Height	Plant Name	Height
j								
].	American cranberrybush	10	eastern white pine	30	lilac	10	nannyberry viburnum	8
- 1:	northern whitecedar	15	red maple	- 30	red pine	30	redosier dogwood	8
].	silky dogwood	10	silver maple	30	white ash	30	white spruce	20

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

RsB

Nearly level and gently sloping, well drained soil formed in sandy, glacial outwash and lacustrine deposits. This map unit is not highly erodible. The land capability classification is 3S.

Component Name: ROUSSEAU

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

						SITURIED SO	TL PROPE	(1152							
-	USDA Te			Unifi		fication AASH									Clay %
0- 6	  LFS		SM			A-2-4 A-	Δ		0					25 45	
6-21						A-2-4	_	_	0					25- 45 20- 35	
	FS S			-SM SM		A-2-4 A-		-	_					20- 35 5- 35	
	   T::3	D3		 ·											
	Liquid			ist Donaita	Perme- ability		lable		.1		CaCO3	9	anic		
(In)		Index			In/hr		apacity /in)				<b>5</b> .4		ter	Swell	
` ' !					111/III	•	/1n)	•-		100g)	Pct	P	ct	Potentia	
0- 6		NP				0.1						1	- 2.		
6-21	-	NP				0.06					_		- 2. -	LOW	0.17
21-60		NP				0.05					_		-	LOW	0.15 0.15
											Wind				Potentia
	Floo	ding		Wa	ter Table	-(feet)	- Bedroo	k-(in)	1 ну	т о	Erod.			1103101	Frost
Freque	ency Dura	tion	Months	Depth	Kind	Months	Depth	Hard.	GR	P Fact.	Index			oncrete	Action
									1						
NONE	-		-	>6.0	-	-	>60		A	5	134	LOW	M	ODERATE	LOW
Shallowellin Swellin Swall (	BUILDIN W Excavangs Withougs With Commercia Streets a	NG SITE tions but Base Basemer al Build	DEVELOPM ements ots lings ls		SEVE POOR R SEVEIS SLIGI SLIGI SLIGI SLIGI SLIGI	ATING RE HT HT	Poor Fi   Seepage     Cutbank     Drought	s Cave	RESTR	oo Sand	y   FEATURE (	(S)			
oadfil		CTION M	TATERIAL		J RI GOOD	ATING		I	RESTRI	ICTIVE	FEATURE (	S)			
and					PROBI	ABLE !			i		1			) 1	
ravel					IMPRO	BABLE	Too Sand	Эy	i		i			i	
opsoil	l				POOR	j	Too San	Эy	j		i			j	
	WATER N	ANAGEME	nt		RI	ATING )				 CTTVE	 FEATURE(				
ond Re	eservoir				SEVER		Seepage			LUIITE .	ן  מאטגמה ו	رد		i	
mbanku	ments, Di	kes and	Levees		SEVER	:	Seepage		Pi	iping	; 1			1	
rainag	•				:	TATION	Deep To	Water	1	y	} }			1	
						•			1 -		!				
rrigat	ion				LIMIT	I NOITA'	Slope		Dr	cought v	1	Fact	Intake	· 1	
-	ion s and Di	version	s			ATION	Slope Too Sand	lv		coughty oil Blo	yina	Fast	Intake	<b>!</b>	

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)
Camp Areas	MODERATE	Too Sandy
Picnic Areas	MODERATE	Too Sandy
Playgrounds	MODERATE	Slope   Too Sandy
Paths and Trails	MODERATE	Too Sandy

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

	Corn Grain	Corn Silage tons/a	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
1					<b>5</b> 5	2.5	2.	4.6	1.6

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or	(E)	SITE	WOODLAND PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
5 <u>A</u>	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE	NORTH -				
							balsam fir	E	0	0
							red maple	E	0	0
							sugar maple	E	60	3
							yellow birch	E	0	0
							paper birch	E	65	5
							quaking aspen	E	65	5
							northern red oak	<b>E</b> .	0	0
							eastern hemlock	E	0	0
					•		jack pine	EP	62	6
							red pine .	ΕP	0	0
•										

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name He	ight  
Amur privet  jack pine  Siberian crabapple	26	eastern redcedar manyflower cotoneaster silky dogwood	6	eastern white pine Norway spruce Vanboutte spirea	28	imperial Carolina poplar red pine white spruce	70 26 22

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Sloping, well drained soil formed in sandy glacial outwash and lacustine deposits. This map unit is potentially highly erodible. The land capability classification is 3E.

Component Name: ROUSSEAU

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

١							cation		>10	3-10					ng sieve No.200	Clay %   <.002 mm
	USDA Te			Unifi	.ed		AASHTO		In. :	Inche	s   No -	4 No.1	·	10.40 	NO.200	
0- 61	LFS		SM				A-2-4 A-4		-	0	•				5 25- 45	
6-21			SM				A-2-4		-	0	•				0 20- 35	0-10
21-60				SM SM			A-2-4 A-3		-	0	100-	100 100-	100	50-10	0 5- 35	0-10
 I	Liquid	Dlace	 Moi	 et	Per	 me-	Availa	able	Soi	 1	CEC	CaCO3	Org	ganic	Shrink	Erosio
		ticity		ensity		lity	Water Car		React	ion	(me/		Ma	tter	Swell	Factor
(In)		Index		CC		hr	(In./i	in)	Hq)	)	100g)	Pct	]	Pct	Potentia	л к 
 0- 6		NP	1.3-	1.5	2.	 -6.	0.1-0	0.12	4.5-	 6.	-	-	1	2.	LOW	0.17
6-21		NP		1.6		-20.			4.5-6	.5	-	-		-	LOW	0.15
21-60		NTP	1.5-		6.		0.05-0	0.07	5.1-6	.5	-	-		-	LOW	0.15
												Wind	Ris	k of C	orrosion	Potentia
	Floo	ding		Wa	ater	Table	-(feet)	Bedro	k-(in)	НУ	T d	Erod.	Unc	oated		Frost
	ency Dura		Months			ind	Months	Depth	Hard.	GR	P Fact.	Index	Ste	el	Concrete	Action
										   A	 5	134	LOW		MODERATE	LOW
NONE	-	•	-	>6.0		-	-	>60		) h		134	1 500			
	SANTT	ARY FACII	TITIES		1	F	ATING			RESTE	ICTIVE	FEATURE	(S)		. 1	
Sentic	Tank Al					SEVE	RE	Poor F	ilter	}			1		1	
-	Cover fo					POOF		Seepag	е	1 7	oo San	ly	1			
	BUILD	ING SITE	DEVELOP	ENT			ATING			•	KICTIVE	FEATURE	1		1	
	ow Excava					SEVE	;	Cutban	ks cave	≥   			1		1	
	ings With						RATE	Slope Slope		1			1		i	
	ings With					SEVI	ERATE	Slope		i			i		i	
•	Commerc						ERATE	Slope		i			i		i	
	Streets , Landsc		nd Golf !	Fairways	;	MODI	;	Drough	ty	j	Slope		İ		j	
						 l 1	RATING 1			REST	RTCTTVE	FEATURE	 E(S)			
  Roadf		RUCTION	MATERIAL			G001							1		j	
Sand						PRO	BABLE			1					ļ	
Grave	1					IMP	ROBABLE	Too Sa	ındy	1			!		!	
Topso						P00	R	Too Sa	undy							
 	WATER	MANAGEM	ENT				RATING	- <i></i>		REST	RICTIVE	FEATUR	E(S)		į	
Pond	Reservoi	r Area				SEV	ERE	Seepag	je	:	Slope		1		!	
•			d Levees			SEV	ERE	Seepag	•	:	Piping		!		!	
Drain						LIM	ITATION	: -	lo Wate				1	. =	. !	
Irrig	ation					LIM	ITATION	Slope		•	Drough	_		st Int	i	
Terra	ces and	Diversio	ns				HOITATION	Slope			Too Sa	_	So	oil Blo	אנאכן partwo	
Grass	ed Water	wavs				LIM	ITATION	Slope		- 1	Drough	СĀ	i		ì	

				1
RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE FEATURE(S)	İ
Camp Areas	MODERATE	Slope	Too Sandy	1
Picnic Areas	MODERATE	Slope	Too Sandy	1
Playgrounds	SEVERE	Slope	1	
Paths and Trails	MODERATE	Too Sandy	1	1
l				1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain bu/a	Corn Silage tons/a	Soybeans bu/a		Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
			 45	2.3	1.8	4.4	1.3

#### WOODLAND INTERPRETATIONS

1										
WOODLAND	EROSION	EQUIPMENT	SEEDLING	WIND TH.	PLANT	INTERP	COMMONLY EXISTING TREES	(E)		WOODLAND
ORD. SYB.	HAZARD	LIMITATION	MORTALITY	HAZARD	COMPETITION	ASPECT	and/or		SITE	PRODUCT-
							TREES RECOMENDED TO PLANT	(P)	INDEX	IVITY
5A	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE	NORTH ·				
1							balsam fir	E	0	0
1							red maple	E	0	0
1							sugar maple	E	<b>6</b> 0	3
]							yellow birch	E	0	0
1							paper birch	E	65	5
1	•						quaking aspen	E	65	5
1							northern red oak	E	0	0
1							eastern hemlock	. E	0	0
1	-						jack pine	EP	62	6
]							red pine	EP	0	0
ł										

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name He	 ight  
Amur privet  jack pine  Siberian crabapple		eastern redcedar manyflower cotoneaster silky dogwood		eastern white pine Norway spruce Vanhoutte spirea	28	imperial Carolina poplar red pine white spruce	70 26 22

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Nearly level and gently sloping, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 4S.

Component Name: SAYNER

Grassed Waterways

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

					ES	ESTIMATED SOIL PROPERTIES								
  Depth 	USDA Te	exture		Unif		ication AAS	нто		3-10 nches	s No	ercent < 3 in. passing sie			0   <.002 mm
0- 4 4-22	LS LS S GR- SR- S G		SP	SP-SM SM GP GR SP-SM GR	M P GP-GM	A-1 A-2 A-1 A-3 A-1 A-3	<b>A-2</b>	-	0-15 0-15 0-15	5   80- 5   50-	-100 75 -1 <b>0</b> 0 <b>5</b> 0		- 75 10- 1 - 75 0- 1	30   1-5
	Liquid Limit		Bulk I	ist Density /cc	Perme- ability In/hr	Water ( (In:	ilable Capacity ./in)	Soil Reacti (pH)	on	CEC (me/ 100g)	CaCO3	Organi Matter Pct	Swe.	ll Factor tial K
0- 4 4-22 22-60	-	np np np	1.4	-1.5	26. 26. 620.	0.03	8-0.12 3-0.12 2-0.04	4.5-6. 4.5-6. 5.1-6.	5 5 5	- - -	-	0.5- 1 - -	LOW LOW	0.17 0.17 0.1
Freque		tion	Months	Depth	ter Table Kind	Months	Bedroo	Hard.	HYD GRP	T Fact.	Erod. Index	Uncoate	ed.	Potential Frost Action
NONE 			- !	>6.0		- ·	>60 		A 	4	134	rom	MODERATI	LOW
		-	Fields		RI   SEVEI   POOR		Poor Fi	lter	!	CTIVE o Sand	FEATURE	(S)     Small S	tones	
Wellin Wellin Small ( Jocal S	W Excava ags With ags With Commercia Streets a	tions out Base Basemen al Build and Road	its lings ls		SEVER	1T 1T 1T 1T	Cutbank	s Cave	ESTRI       	CTIVE	FEATURE (	(S)		
awns,		ping, an  UCTION M	d Golf F	airways 	SEVER	RE  ATING	Drought		STRI		  FEATURE (	(S)		
Roadfil Sand Sravel Copsoil	-				GOOD PROBA		       Too San		1	all St	)   	Area Rec	      claim	
ond Re	WATER MANAGEMENT and Reservoir Area			RA SEVER	TING E	Seepage	RE	STRI(	CTIVE 1	FEATURE (	s)			
rainag	abankments, Dikes and Levees rainage rigation			SEVER	SEVERE Se		Water	Dro	oughty	; ; ;	Fast In	      take		
				:	TATION	Too San	łу		il Blo					

Droughty

LIMITATION

RECREATIONAL DEVELOPMENT	RATING	1.	RESTRICTIVE FEATURE	E(S)	-
Camp Areas	MODERATE	Too Sandy	1		-
Picnic Areas	MODERATE	Too Sandy	}	S	ļ
Playgrounds	MODERATE	Slope	Small Stones	Too Sandy	]
Paths and Trails	MODERATE	Too Sandy	1		ļ
					- 1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a		Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
			 40	2.3	1.8	3.3	1.4

# WOODLAND INTERPRETATIONS

WOODLAND   ORD. SYB. 	EROSION HAZARD	EQUIPMENT LIMITATION MODERATE	SEEDLING MORTALITY  MODERATE	WIND TH. HAZARD	PLANT COMPETITIONSLIGHT	INTERP ASPECT  NORTH	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT		SITE INDEX	WOODLAND   PRODUCT-   IVITY
1 /5	Spigni	HODERALL	nobbidiza	2220			red maple	E	0	0
1							paper birch	E	0	0 }
1							quaking aspen	E	0	0
1							northern red oak	E	0	0
1							jack pine	EP	0	0
1							red pine	EP	59	7
1							eastern white pine	EP	57	8

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

1							
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
							201
American cranberrybush	10	Amur maple	10	eastern redcedar		eastern white pine	30
gray dogwood		jack pine	30	lilac	10	manyflower cotoneaster	6
Norway spruce		red pine	30	Siberian peashrub	8	silky dogwood	8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

SaC

Sloping, excessively drained soil formed in sandy deposits underlain by stratified sand and gravel glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S.

Component : Name: SAYNER

Grassed Waterways

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

						EST	TAME	ED SOI	IL PROPER	TIES								
Depth	USDA Te	exture		Unifi									rcent < 3 in. passing siev 4 No.10 No.40 No.20				<.002 m	
0- 4			CM	SP-SM			A-1	 Л-2			n-1	-   5   80	-100 75	 -100	35-	 75	10- 30	   1- 5
	LS S GR-	-S		SM GP GM	(					_			-100 75					:
	SR- S G					-GM A				-			- 90 40				-	
	Liquid	Plas-	Moi	ist	Peri	me-		Avail	lable	Soil		CEC	CaCO3	Org	anic	:	Shrink	Erosio
Depth	Limit	ticity	Bulk I	ensity	abi.	lity	Wat	ter Ca	apacity	Reacti	.on	(me/		Mat	ter		Swell	Factor
(In)		Index	g/	cc/	In/l	hr		(In./	'in)	(pH)	ı	100g)	Pct	F	ct	P	otentia	l Ķ
0- 4	-	NP	1.3-	1.4	2.	 -6.		0.08-	-0.12	4.5-6.	5	-	-	0.5	 - 1.	L	 OW	0.17
4-22	-	NP	1.4-	1.5	2.	-6.		0.03-	-0.12	4.5-6.	5	-	-		-	L	OW	0.17
22-60	-	NP	1.5-	1.8	6	-20.		0.02-	-0.04	5.1-6.	5	-	-		-	L	OW	0.1
														Risk	of	Corr	osion	Potentia:
				Wa										:	ated		1	Frost
Freque	ncy Dura	tion	Months	Depth	K:	ind	Mont	ths	Depth	Hard.	J GRI	P Fact	. Index	Stee	:1	Con	crete	Action
none	-		-	>6.0		-		-	>60		] A	4	134	LOW		MOD	ERATE	LOW
•	Tank Ab	RY FACIL sorption or Landfi	Fields			SEVER POOR		   	Poor Fi	lter	1	o San	FEATURE	(S)     Smal	1 St	ones	   	
	BUILDI	NG SITE	DEVELOP	ENT	]		TING	١		R	ESTR	CTIVE	FEATURE	(S)			j	
	w .Excava				ļ	SEVER		į	Cutbank	s Cave	ļ			ļ			ļ	
	-	out Base			1	MODER		1	Slope		1			1			į	
	_	Basemen al Build			1	MODER		- 1	Slope Slope		j 1			} !			l l	
		and Road				MODER		1	Slope		-			i I			1	
		ping, an		airways	i	SEVE		í	Drought	. <b>y</b>	i			,				
	CONSTR	UCTION M	ATERIAL			R2	TING	 	<del></del>	R	ESTR	CTIVE	FEATURE	 (S)			<u> </u>	
Roadfi	11				.]	GOOD		Ì			1			1			j	
Sand					1	PROB	BLE				1			1			1	
Gravel					!	PROBI	BLE	ļ			!			]			ļ	
Topsoi	1 				 	POOR		l	Too Sar	ıd <del>y</del> 	St	mall S	tones	Area	Rec	laim	1	
	WATER MANAGEMENT				!		TING	ļ				ESTRICTIVE FEA		(S)			į	
	eservoir				ļ	SEVER			Seepage		) S.	lope		1			ļ	
	mbankments, Dikes and Levees					SEVERE Seepage		:			1							
Draina Irriga	-				1	LIMITATION   Deep To		water	10		<del></del>	   Fa	. 7-4		1			
_		iversion			1		IOITA'	:	Slope Slope		- :	Droughty Too Sandy		Fast Intake     Soil Blowing		. I		
IST LGC	es and h	TACTRION	ia .		!	ודעדו	MILLO	١ !	эторе		1 10	w san	a y	9017	r DTC	)WIIIG	ı İ	

Droughty

LIMITATION

				1
RECREATIONAL DEVELOPMENT	RATING	1 - 1	RESTRICTIVE FEATURE(S)	Ì
Camp Areas	MODERATE	Slope	Too Sandy	- 1
Picnic Areas	MODERATE	Slope	Too Sandy	
Playgrounds	SEVERE	Slope	1	1
Paths and Trails	MODERATE	Too Sandy	1	1

| Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

Corn Grain   bu/a	Corn Silage tons/a	Soybeans pu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay   tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
							3.	1.

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP ASPECT	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT	(E)	SITE INDEX	WOODLAND PRODUCT- IVITY
7S	SLIGHT	MODERATE	MODERATE	SLIGHT	SLIGHT	NORTH ·				
							red maple	E	0	0
							paper birch	E	0	0
							quaking aspen	E	0	0
							northern red oak	E	0	0
							jack pine	EP	0	0
							red pine	EP	59	7
							eastern white pine	EP	57	8

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Noight	Plant Name	Height	Plant Name	 Height	Plant Name	Height
	neight	ridut name					
American cranberrybush	10	Amur maple	10	eastern redcedar	15	eastern white pine	30)
gray dogwood	8	jack pine	30	lilac	10	manyflower cotoneaster	6
Norway spruce	20	red pine	30	Siberian peashrub	8	silky dogwood	8
1							

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

SaD

Moderately steep and steep, excessively drained soil formed in sandy depostis underlain by stratified sand and gravel glacial outwash. This map unit is highly erodible. The land capability classification is 7S.

Component Name: SAYNER

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

						ication			>10 3-10   Percent < In. Inches   No 4 No.										
- :	USDA Te			Unifi	ied		AASHTO		In. I	nches						Na.200 	•		
0-4			SM	SP-SM		A-1 A	A-2			0-15	•					10- 30	1		
4-22	LS S GR-	·S	SP	SM GP GM	!	A-1 A	A-3 A-2		-	0-15	50-	-100	50-100	20-	<b>7</b> 5	0- 30	1-5		
22-60	SR-SG		SP	SP-SM GP	GP-GM	A-1 A-3 A-		A-1 A-3 A-2			-	0-15	50-	- 90	40- 85	0-	<b>5</b> 5	0- 10	•
1	Liquid	Plas-	Mod	ist	Perme-	A	vailabl	е	Soil		CEC	Ca	03 O	gani	 c	Shrink	Erosio		
	Limit	-			ability		er Capac	ity 1	Reacti	on	(me/		M	atter		Swell	Factor		
(In)		Index	g/	/cc	In/hr		(In./in)		(pH)	:	100g)	Po	7 <b>t</b>	Pct		Potenti			
0-4	-	NP		-1.4	26.	0	0.08-0.1	2 4	4.5-6.	5	-	-	- 0.	5- 1.		LOW	0.17		
4-22	-	NP			26.	0	0.03-0.1	2 4	4.5-6.	5	-	-	•	-		LOW	0.17		
22-60	-	NP	1.5-	-1.8	620.	0	0.02-0.0	4 5	5.1-6.	5	-	-	•	-		LOW	0.1		
													l   Ris	sk of	Cor	rosion	Potentia		
-					ter Table									coated	_		Frost		
rreque	ncy Dura			Depth		Month	ıs ID	epth 1	Hard.	GRP	Fact.	Inde	x   Ste				Action		
NONE	-		-	>6.0	-	-		>60		] A	4	134	:			DERATE	l com		
										, 							, DON		
-	Tank Ab	RY FACIL sorption r Landfi	Fields		SEVE		: -	or Filt epage		Slo	CTIVE ope o Sand		Ì	ıll St	cone	s			
Daily (	Tank Abs	sorption r Landfi NG SITE 1 tions	Fields 11  DEVELOPM	<u>-</u> Ent	SEVE	RE  ATING RE	Se	epage tbanks	ter  Ri	Slo	ope o Sand CTIVE	у 	Sma	ill St	one	s   			
Daily (	Tank Abs	sorption r Landfi NG SITE	Fields  11  DEVELOPMENTS	ENT	SEVE	RE  ATING RE RE	Se	epage	ter  Ri	Slo	ope o Sand CTIVE	у 	Sma	ill St	cone	s   			
Daily ( Shallowelling Dwelling	Tank Abs Cover for BUILDII V Excavatings Withougs With	sorption r Landfi NG SITE I tions out Base	Fields  11  DEVELOPMENTS  ts	<u>-</u> -	SEVE   POOR   R   SEVE   SEVE	RE ATING RE RE RE	Se	epage tbanks	ter  Ri	Slo	ope o Sand CTIVE	у 	Sma	all St	cone	s   			
Daily (  Shallowelling Dwelling Small (  Local 5	Tank Absolver for BUILDII W Excavatings Withougs With Commercia Streets a	sorption r Landfi NG SITE I tions out Base Basemen al Build and Roads	Fields  11  DEVELOPM  ments  ts  ings		SEVE   POOR   SEVE   SEVE   SEVE   SEVE	RE ATING RE RE RE RE RE RE	Se	epage tbanks ope ope	ter  Ri	Slo	ope Sand  CTIVE ope	у 	Sma	ill St	cone.	s			
Daily (  Shallowelling Dwelling Small (  Local 5	Tank Absolver for BUILDII W Excavatings Withougs With Commercia Streets a	sorption r Landfi NG SITE 1 tions out Base Basemen	Fields  11  DEVELOPM  ments  ts  ings		POOR SEVE SEVE SEVE	RE ATING RE RE RE RE RE RE	Second   Cur   Slo   S	epage tbanks ope ope ope	ter R Cave	Slo	ope Sand  CTIVE ope	у 	Sma	all St	cone.	5			
Daily ( Shallon Dwellin Small ( Local S Lawns,	Tank Abs Cover for BUILDII Excavatings With Commercia Streets a Landscap	sorption r Landfi NG SITE I tions out Base Basemen al Build and Roads	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   SEVE	ATING RE RE RE RE RE RE RE RE RE RE RE	See	epage tbanks ope ope ope ope ope oughty	R: Cave	Slo	ope Sand  CTIVE ope	y  FEATU	Sma	ill St	Cone.	s			
Daily ( Shallon Dwellin Small ( Local S Lawns,	Tank Abs Cover for BUILDII Excavatings With Commercia Streets a Landscap	sorption r Landfi NG SITE I tions out Basemen al Build and Road	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE POOR SEVE SEVE SEVE SEVE REVER	ATING RE RE RE RE RE RE RE RE RE	See	epage tbanks ope ope ope ope	R: Cave	Slo	ope Sand CTIVE Ope	y  FEATU	Sma	all St	Cone	5			
Daily ( Shallon Dwellin Dwellin Small ( Local ! Lawns,  Roadfil Sand	Tank Abs Cover for BUILDII Excavatings With Commercia Streets a Landscap	sorption r Landfi NG SITE I tions out Basemen al Build and Road	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   SEVE   R   POOR   PROB	ATING RE RE RE RE RE RE RE ATING	See	epage tbanks ope ope ope ope ope oughty	R: Cave	Slo	ope Sand CTIVE Ope	y  FEATU	Sma	ill st	cone.	s			
Daily ( Shallon Dwellin Dwellin Small ( Local S Lawns, Roadfil Sand Gravel	Tank Abs Cover for BUILDII W Excavaings With Commercia Streets a Landscap CONSTRU	sorption r Landfi NG SITE I tions out Basemen al Build and Road	Fields  11  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   SEVE   POOR   POOR	ATING RE RE RE RE RE ATING ATING	See	epage tbanks ope ope ope oughty	R:	Slo	ope Sand CTIVE Ope Ope CTIVE	Y FEATU	RE(S)						
Daily ( Shallon Dwellin Dwellin Small ( Local ! Lawns,  Roadfil Sand	Tank Abs Cover for BUILDII Facavai ags With Commercia Streets a Landscap CONSTRU	Sorption r Landfi NG SITE I tions out Base Basemen al Build and Road ping, and	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   SEVE   POOR   PROB   POOR	ATING RE RE RE RE RE ATING ATING	See	epage tbanks ope ope ope ope ope oughty	Cave	Slo	ope o Sand cTIVE ope ope cTIVE	FEATU	Sma	all St					
Daily ( Shallon Dwellin Dwellin Small ( Local S Lawns, Roadfil Sand Gravel	BUILDII  Excavatings Without Excavation Streets at Landscap  CONSTRU	SORPTION MA	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE POOR SEVE SEVE SEVE SEVE POOR PROB POOR	ATING RE RE RE RE RE ATING ABLE ATING	See	epage tbanks ope ope ope oughty ope	Cave	Slo	ope o Sand cTIVE ope ope cTIVE	FEATU	Sma						
Shallon Dwellin Dwellin Small (Local Stand Gravel Fopsoil Fond Re	BUILDII  Excavatings Without Excavatings Without Excavatings Without Excavatings Without Excavatings Without Excavatings Without Excavatings Water Market Ma	SORPTION MA	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   POOR   PROB   POOR	ATING RE RE RE RE RE ATING ABLE ATING	See	epage  thanks  ope  ope  ope  oughty  ope  o Sandy	Cave	Slo	ope o Sand cTIVE ope ope cTIVE	FEATU	Sma						
Shallon Dwellin Dwellin Small ( Local S Lawns,  Roadfil Sand Gravel Topsoil Pond Re	BUILDIN  Excavatings Without Streets at Landscap  CONSTRUIT	SORPTION MA	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   POOR   PROB   POOR   PROB   POOR	ATING RE RE RE RE RE ATING ABLE ABLE ATING RE RE	See   See   See   See   See   See	epage  thanks  ope  ope  ope  oughty  ope  sandy	R:	Slo	ope o Sand cTIVE ope ope cTIVE	FEATU	Sma						
Daily (  Shallon Dwellin Dwellin Small (  Local (  Lawns,  Roadfil Sand Gravel Topsoil  Pond Re Embankm Drainag	BUILDIN  Excavatings Without Streets at Landscap  CONSTRUIT	SORPTION MA	Fields  Il  DEVELOPM  ments  ts  ings  s  d Golf F		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   POOR   PROB   POOR   PROB   POOR   PEOR 	ATING RE RE RE RE RE ATING ABLE ATING RE RE RE ATING RE RE	See   Dece   D	epage  thanks  ope  ope  ope  oughty  ope  epage  epage  epage  epage  epage	R:	Slo	ope o Sand corrective ope corrective all St	FEATU	Smz	a Rec					
Daily (  Shallon Dwellin Dwellin Small (  Local (  Lawns,  Roadfil Sand Gravel Topsoil  Pond Re Embankm Drainag Irrigat	BUILDING Excavatings With Commercia Streets a Landscap  CONSTRUIT	SORPTION MA	Fields  Il  DEVELOPM  ments ts ings s d Golf F  ATERIAL		SEVE   POOR   SEVE   SEVE   SEVE   SEVE   POOR   PROB   POOR   POOR   POOR   SEVE   SEVE	ATING RE RE RE RE RE ATING ABLE ABLE ATING RE RE	See   Dece   D	epage  thanks  ope  ope  ope  oughty  ope  epage  epage  epage  ep To Woope	R:	Slo	ope o Sand cTIVE ope ope cTIVE	FEATU	Smz		:lair	                 			

RECREATIONAL DEVELOPMENT	RATING	RESTRICTI	VE FEATURE(S)	1
Camp Areas	SEVERE	Slope		!
Picnic Areas	SEVERE	Slope	l l	1
Playgrounds	SEVERE	Slope	1	ļ
Paths and Trails	SEVERE	Slope	I	-
				-1

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

1								
Corn Grain   bu/a	Corn Silage	Soybeans bu/a	Wheat bu/a	Oats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture AUM
								0.8

## WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD SEVERE	EQUIPMENT LIMITATIONSEVERE	SEEDLING MORTALITY SEVERE	WIND TH. HAZARD	PLANT COMPETITIONSLIGHT	INTERP   COMMONLY EXISTING TREES ASPECT   and/or   TREES RECOMENDED TO PLANT NORTH		SITE INDEX	WOODLAND   PRODUCT-   IVITY
7R	SEVERE	SEVERE	DUTING	2220		red maple	E	0	0
]						paper birch	E	ð	0
1						quaking aspen	E	0	0
1						northern red oak	E	0	0
1						jack pine	EP	0	0
1						red pine	EP	59	7
1						eastern white pine	EP	57	8
Į									

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

1							
Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name 1	Height
American cranberrybush gray dogwood Norway spruce	8	Amur maple jack pine red pine		eastern redcedar lilac Siberian peashrub	10	eastern white pine manyflower cotoneaster silky dogwood	30) 6) 8)

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Corn Grai bu/a	n Corn Sil tons/					alfa Hay s/acre		lover s/acre		Improv	ed Pastur	e Permane	mt Pastur AUM
Crop yiel	ds in this	table are	averages	for high		S AND PAS agement w			is o	commonly	grown on	the map u	nit.
:	-	- j	NA 	-	-	AN .				,		1	İ
requency	Duration	Months	Depth	Kind	Months	Depth	Hard.	GRP I	act.	Index	Steel	Concrete	Action
	Flooding		Wa	ter Table		Bedrock	(in)	HYD	T		Uncoated	Corrosion	Potentia

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, excessively drained soil formed in sandy glacial outwash. This map unit is not highly erodible. The land capability classification is 4S.

Component Name: VILAS

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

					E3	TIMATED	SOIL PROPI	ERTIES								
Depth	USDA TO	exture		Unifi	Classif .ed	ication	ASHTO	>10 In.	3-10 Inches		cent <					Clay %   <.002 m
0- 2										•						
0- 3 3 <b>-</b> 19				SP-SM		A-1 A-		-	0						12- 30	
19-30				-SM SM SP-SM		A-1 A-		-	0 0	-					12- 30	
30-60				SP-SM SM	I	A-1 A-	2 A-3 2 A-3	-	0		·100 7:				5- 20 1- 20	
	Liquid		Mod		Perme-		ailable	Soi		CEC	CaCO:	3 Or	ganic	:	${\tt Shrink}$	Erosio
- :	Limit	ticity		Density	•		Capacity			(me/			tter		Swell	Factor
(In)		Index	g/ 	/cc	In/hr	(1	n./in)	(pH	) 1	100g)	Pct		Pct	1	Potentia	al K
0- 3		NP	1.4-	-1.6	620.	0.	09-0.12	4.5-6	- <b></b> -	-			5- 1.	•	~	0 17
3-19		NP		1.6	620.		07-0.12			_		0.	J- 1. -		LOW	0.17
19-30	-	NP		1.7			05-0.08			_	-		_		LOW LOW	0.17
30-60	-	NP	1.5-		620.		04-0.07	5.1-6.		_	-		_		OW .	0.17 0.17
											Wind	Ris			osion	Potentia
					ter Table	(feet)	Bedro	ck-(in)	HYD	T	Erod.		oated			Frost
	ncy Dura		Months		Kind	Months		Hard.			Index	Ste	el	Cor	crete	Action
NONE			}	>6.0												
· · · · · · ·	_		- 1	26.0	-	-	>60		A	5	134	LOW		HIG	SH	LOW
	Tank Ab	RY FACIL sorption r Landfi	Fields		SEVE	ATING RE	Poor F	ilter	!	TIVE	FEATURE Y	(S)   			]	
	BUILDI	NG SITE	DEVELOPM	ENT	) RJ	TING		- R	ESTRIC	TIVE I	FEATURE	(S)				
hallo	Excava	tions			SEVER	Œ.	Cutban	cs Cave	1			Ì			í	
wellir	ngs With	out Base	ments		SLIGH	T	1		İ			i			j	
		Basemen			SLIGH	T	1		1			j			j	
		al Build	-		SLIGH		!		1			1			Ì	
		and Road	-		SLIGH		!		1			1			j	
awns,	Landscap	oing, and	d Golf Fa	alrways 	MODER	ATE	Drough	t <b>y</b>	<u> </u>			] 			]	
		CTION M	ATERIAL		l RA	TING	1	R	ESTRIC	TIVE I	EATURE	(S)				
oadfil	.1				GOOD		1		1			}			j	
and					PROBA		1					1			1	
ravel						BABLE	Too Sar	•	!			1	•		1	
opsoil 					POOR		Too Sar	ody 	 			 			1	
	WATER M	IANAGEMEI	T		RA	TING	1	R	ESTRIC	TIVE F	EATURE	(S)				
	servoir				SEVER		Seepage	•	1			1			j	
		kes and	Levees		SEVER	E	Seepage	<b>!</b>	Pipi	ing		1			Ì	
rainag					LIMIT		Deep To	Water	1			1				
rrigat					LDIII	ATION	Slope		Drou	ughty		Fast	Inta	ke	j	
errace	s and Di Waterwa		3		LIMIT		Too Sar	_	Soil	l Blow	ring	!			j	

RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE FEATURE	(S)
Camp Areas	MODERATE	Too Sandy	1	
Picnic Areas	MODERATE	Too Sandy	   Small Stones	Too Sandy
Playgrounds	MODERATE	Slope	Small Stones	100 banaj
Paths and Trails	MODERATE	Too Sandy		

Crop yields in this table are averages for high level management where the crop is commonly grown on the map unit.

•	C1 OP 1101—									i
1.	Corn Grain	Corn Silage tons/a	2012	Wheat bu/a		I	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture	-
1					45	2.3	1.8	4.	1.5	1

# WOODLAND INTERPRETATIONS

OODLAND	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH.	PLANT COMPETITION	INTERP   ASPECT     NORTH -	COMMONLY EXISTING TREES and/or TREES RECOMENDED TO PLANT		SITE INDEX	PRODUCT- IVITY
6S	SLIGHT	MODERATE	MODERATE	SLIGHT	SLIGHT	NORTH	balsam fir	E	0	0
							red maple	E	0	0
							paper birch	E	0	0
							quaking aspen	E	0	0
							northern pin oak	Ε	0	0
							northern red oak	E	0	0
							jack pine	EP	65	7
							red pine	EP	57	. 6
							eastern white pine	EP	56	8

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

American cranberrybush 10 Amur maple 10 eastern redcedar 15 eastern white plants and a section with the plants and a section w			KECOLEE					
American cranberrybush 10 Amur maple 10 eastern redecar 15 eastern white product of the control	  Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
	gray dogwood	8	jack pine	30	lilac	10	manyflower cotoneaster	30  6  8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service

Sloping, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 6S.

Component Name: VILAS

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

	·				E:	STIMATED SO	IL PROPER	RTIES							
Depth	USDA Te	exture		Unifi	Classi: ed	fication AASH	<b>r</b> o	>10 In. I			cent < . 4 No.	-	-		Clay %   <.002 mm
0- 3	LS		SM	SP-SM		A-1 A-2		-	0	80-	100 75	-100 3	 5- 90	12- 30	2- 6
3-19	LS		SP-	-SM SM		A-1 A-2		-	0	80-	100 75	-100 3	5 <b>- 9</b> 0	12- 30	2-6
19-30	S		SM	SP-SM		A-1 A-2	<b>1-</b> 3	-	0	80-	100 75	<b>-10</b> 0 3	5- 90	5- 20	1-3
30-60	S		SP	SP-SM SM		A-1 A-2 1	A-3	-	0	80-	100 <b>7</b> 5	-100 3	5- 90	1- 20	0-3
	Liquid Limit		Bulk I	ist Density /cc	Perme- ability In/hr	Water Ca	· •	Soil Reacti (pH)	on (	CEC (me/ 100g)	CaCO3	Matte	er	Shrink Swell Potentia	Erosion Factor
0- 3	-	NP	1.4	-1.6	620.	0.09	-0.12	4.5-6.	 5	-		0.5-	1. I	.OW	0.17
3-19		NP	1.5-		620.		-0.12	4.5-6.		-	-	-		.OW	0.17
19-30	-	NP		-1.7	620.		-0.08	4.5-6.		-	_	-		.OW	0.17
30-60	-	NP	1.5-	-1.7	620.	0.04	-0.07	5.1-6.	5	-	-	-	I	.OW	0.17
											Wind	Risk o	of Corr	cosion	Potential
	Floo	ding		Wa	ter Table	e-(feet)	Bedroc	k-(in)	HYD	T	Erod.	Uncoat	ed .	j	Frost
Freque	ncy Dura	tion	Months	Depth	Kind	Months	Depth	Hard.	GRP	Fact.	Index	Steel	Cor	crete	Action
 NONE				>6.0	_	_				 5	134		 HIG	:	
-		-	n Fields		SEVI		Poor Fi	lter	1	TIVE	FEATURE	(S) 		}	
			DEVELOP	ENT	:	RATING			ESTRIC	TIVE	FEATURE	(S)		1	
	w Excava				SEVI		Cutbank	s Cave	!			]		!	
	ngs With				:	ERATE	Slope		!					!	
	ngs With Co				:	ERATE	Slope					] 1			
	Commerci Streets		-		SEVI	ERATE	Slope		1			} 1		1	
			nd Golf F	airways			Slope Drought	y	Slo	ре		) 			
	CONSTR	UCTION N	MATERIAL		I	RATING		 R	 ESTRIC	TIVE	FEATURE	 (S)			
Roadfi	11				GOOI	)			1			Ì		ĺ	
Sand					PROF	BABLE			İ			Ì		j	
Gravel					IMPE	ROBABLE	Too San	dу	j			l		j	
l'opsoi	1				POOF	₹	Too San	дy	1					.	
	WATER	MANAGEME	ent		) i	RATING		R	ESTRIC	TIVE	FEATURE	(S)			
	eservoir				SEVE	ere	Seepage		Slo	pe					
	ments, D	ikes and	l Levees		SEVE	ERE	Seepage		Pip	ing				1	
Oraina					:	TATION	Deep To	Water	]					1	
[rriga <sup>.</sup>					:	TATION	Slope		:	oughty			Intake		
	es and D		os		i	TATION	Slope			Sand	-	Soil H	Blowing	,	
rasse	d Waterwa	ays			LIM	MOTTATI	Slope		Dro	oughty		)		}	

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)					
Camp Areas	MODERATE	Slope ~	Too Sandy				
Picnic Areas	MODERATE	Slope	Too Sandy				
Playgrounds	SEVERE	Slope					
Paths and Trails	MODERATE	Too Sandy					
•		· · · · · · · · · · · · · · · · · · ·					

Crop yields in this table are averages for high level	management where the cro	p is commonly	y grown on the map unit.
---	--------------------------	---------------	--------------------------

Corn Grain   bu/a	Corn Silage tons/a	Soybeans bu/a	0ats bu/a	Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permaneut Pasture
			 			3.8	1.2

#### WOODLAND INTERPRETATIONS

ORD. SYB.	EROSION HAZARD SLIGHT	EQUIPMENT LIMITATION	SEEDLING MORTALITY MODERATE	WIND TH. HAZARD	PLANT COMPETITIONSLIGHT	INTERP ASPECT	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT		SITE INDEX	WOODLAND PRODUCT- IVITY
1 05	2010111	HODERALD	HODEMENTS	2220112			balsam fir	E	0	0
j							red maple	E	0	0
i							paper birch	E	0	0
i							quaking aspen	E	0	. 0
j							northern pin oak	E	0	0
İ							northern red oak	E	0	0
i							jack pine	EP	65	7
i .							red pine	EP	57	6
į							eastern white pine	EP	56	8

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Height	Plant Name	Height	Plant Name	Height	Plant Name	Height
10 8	Amur maple jack pine				•	30 - 6
20	red pine	30	Siberian peashrub	8	silky dogwood	8
	10	Height Plant Name  10 Amur maple 8 jack pine 20 red pine	10 Amur maple 10 8 jack pine 30	10 Amur maple 10 eastern redcedar 8 jack pine 30 lilac	10 Amur maple 10 eastern redcedar 15 8 jack pine 30 lilac 10	10 Amur maple 10 eastern redcedar 15 eastern white pine 8 jack pine 30 lilac 10 manyflower cotoneaster

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Moderately steep, excessively drained soil formed in sandy glacial outwash. This map unit is potentially highly erodible. The land capability classification is 7S.

Component Name: VILAS

Grassed Waterways

Classification: ENTIC HAPLORTHODS, SANDY, MIXED, FRIGID

#### ESTIMATED SOIL PROPERTIES

					ES	TIMATED SOI	L PROPER	RTIES						
    Depth	USDA Te	exture		Unif		ication	0		3-10 nches	:	4 No.1	10 No.40		<.002 m
  0- 3			 SM	SP-SM		A-1 A-2		-	0	80-		-100 35- 9	90 12- 30	2- 6
3-19				SM SM		A-1 A-2		-	0	80-	100 75-	-100 35- 9	90 12- 30	2- 6
19-30				SP-SM		A-1 A-2 A	-3	-	0	80-	100 75-	-100 <b>35-</b> 9	90 5- 20	1-3
30-60				SP-SM SI	¥	A-1 A-2 A		-	0	80-	100 75-	-100 35- 9	90 1- 20	0-3
	Liquid			ist	Perme-	Avail		Soil Reacti		EC me/	CaCO3	Organic Matter		Erosio Factor
Depth; (In)		ticity Index		ensity cc	ability In/hr	Water Car (In./		(pH)	•	00g)	Pct	Pct		
0- 3	-	NP	1.4-	-1.6	620.	0.09-	0.12	4.5-6.	5	-	-	0.5- 1.	LOW	0.17
3-19	-	NP	1.5-	-1.6	620.	0.07-	0.12	4.5-6.	5	-	-	-	LOW	0.17
19-30	-	NP	1.5-	-1.7	620.	0.05-	0.08	4.5-6.	5	-	-	-	LOW	0.17
30-60	-	NP	1.5-	-1.7	620.	0.04-	0.07	5.1-6.	5	-	-	<b>-</b>	LOW	0.17
												:	Corrosion	
		-				e-(feet)					Erod.	Uncoated	•	Frost
Freque	ency Dura	tion	Months	· -		Months	Depth	Hard.	GRP	Fact.	Lndex	Steel	Concrete	Action
none			_	>6.0		-	>60		A	5	134	LOW	HIGH \	LOW
	SANITA	RY FACI	LITIES		}	RATING		F	ESTRIC	TIVE	FEATURE	(S)		
Septio			n Fields		SEV	ERE	Poor F	ilter	Slo	pe		ĺ	ĺ	
-	Cover fo	_			P001	R J	Seepag	e	Too	Sand	У	Slope	}	
	BUILDI	ING SITE	DEVELOP	ient	1	RATING		F	ESTRIC	TIVE	FEATURE	(S)		
Shallo	w Excava	ations			SEV	ERE	Cutban	ks Cave	Slo	pe		}	1	
Dwelli	ngs With	out Bas	ements		SEV	ERE	Slope		1			1	1	
Dwelli	ngs With	Baseme	nts		SEV	ERE	Slope		!			]	ļ	
	Commerci		-		SEV	:	Slope		ļ			}	ļ	
	Streets			_	SEV	:	Slope		1			1	!	
Lawns,	Landsca	aping, a	nd Golf 1	fairways 	SEV	ERE	Slope					 		
		RUCTION	MATERIAL			RATING		I	RESTRI	CTIVE	FEATURE	(S)	į	
Roadfi	111				FAI	:	Slope		1			1	ļ	
Sand						BABLE			ļ			j	!	
Grave]					:	ROBABLE	Too Sa	-	1 62			 	1	
Topsoi					P00	r	Too Sa	 may	1 270	ope 		! 		
		MANAGEM	ENT		:	RATING					FEATURE	.(S)	1	
	Reservoi				SEV		Seepag		:	ope		1	1	
	•	Dikes an	d Levees		SEV		Seepag		Pi	ping		1		
Draina	-				:	ITATION	-	o Water			_	l Part T		
Irriga					:	ITATION	Slope		•	ought		Fast Int	:	•
Terra	rraces and Diversions					ITATION ]	Slope		TO	o San	ıy	Soil Blo	wing	

Slope

Droughty

LIMITATION

RECREATIONAL DEVELOPMENT	RATING	RESTRICTIVE FEATURE(S)
Camp Areas	SEVERE	Slope ?
Picnic Areas	SEVERE	Slope
Playgrounds	SEVERE	Slope
Paths and Trails	MODERATE	Slope   Too Sandy

Crop wields in this table are averages	for high 1	tremenenem fava	where the	crop is	commonly grown	on the map unit.
I Crop vields in this table are averages	ior nigh i	evel management	Affects cite	crob ra	commonly grown	on the map unit.

- 1										1
1	Corn Grain	Corn Silage	Soybeans			•		•	Permanent Pasture	Ì
١	bu./a	tons/a	bu/a	bu/a	bu/a	tons/acre	tons/acre	AUM	MUA	1
i										١
!						1		i	1	i
- 1						<b>†</b>		1	1.	1
										١

#### WOODLAND INTERPRETATIONS

  WOODLAND  ORD. SYB. 	EROSION HAZARD MODERATE	EQUIPMENT LIMITATION	SEEDLING MORTALITY MODERATE	WIND TH. HAZARD	PLANT COMPETITIONSLIGHT	INTERP ASPECT 	COMMONLY EXISTING TREES   and/or   TREES RECOMENDED TO PLANT		SITE INDEX	WOODLAND   PRODUCT-   IVITY
			••••				balsam fir	E	0	0
i							red maple	E	0	0
i							paper birch	E	0	0
į							quaking aspen	. <b>E</b>	0	0
į							northern pin oak	E	0	0
İ							northern red oak	E	0	0
i							jack pine	EP	65	7
i							red pine	EP	57	6
į							eastern white pine	EP	56	8

#### RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Plant Name	 Height  
American cranberrybush	10	Amur maple	10	eastern redcedar	15	eastern white pine	30
gray dogwood	8	jack pine	30	lilac	10	manyflower cotoneaster	6
Norway spruce	20	red pine	30	Siberian peashrub	8	silky dogwood	8

For more information contact: Area Resource Soil Scientist, Soil Conservation Service
Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

Nearly level and gently sloping, somewhat poorly drained soil formed in loamy deposits underlain by stratified sand and gravel glacial outwash. This map unit is not highly erodible. The land capability classification is 2W. This map unit is prime farmland where drained. This map unit may have hydric inclusions.

Component Name: WORCESTER

Classification: AQUALFIC HAPLORTHODS, COARSE-LOAMY, MIXED, FRIGID

						EST	IMATED SOIT	, PROPER	TIES							
Depth	USDA Te	exture		Unifi			cation AASHT	)	>10 In.			•			ing sieve No.200	_
j												•			or or so	•
0- 3				SM-SC		A-2 A-4			-		0-7	•			85 25- 50 05 13 80	
	L SL SII			SM-SC ML					-			•			95 12- 80 95 10- 80	:
	L SL GR		SM	SC ML CL		A-2 A-4 A-1			-			•			70 1- 12	•
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1	Liquid	Plas-	Moi	st	Perm	e-	Avail	able	So	il	C	EC	CaCO3	Organic	Shrink	Erosio
Depth	Limit	ticity	Bulk D	)ensity	abil	ity	Water Ca	pacity	Reac	tio	n (	me/		Matter	Swell	Factor
(In)		Index		/cc	In/h		•	in)	(p	H)		.00g)	Pct	Pct		al K
	15-20	2-7		-1.5	0.6-			0.18	4.5-			-	-	1 3.		0.24
	15-20	2-7		-1.7			0.09-	0.22	4.5-	6.5	,	-	-	-	LOW	0.32
	15-25			-1.7				0.19	4.5-	6.5	,	-	-	-	LOW	0.32
		NP	1.3-		6			0.07	5.1-			-	-	-	LOW	0.15
													Wind	Risk of	Corrosion	Potentia
	Flo	odina		Wa	ter T	able-	(feet)	Bedroo	k-(in	) ]	HYD	T	Erod.	Uncoated	l	Frost
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Drain					TATION	Frost	Actio	n	Cu	tbank	s Cave	1	1			
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		Diversio	ns		1	LIMI	TATION	Wetnes	s		To	o San	dy	Soil Bl	owing	
		Waterways			TTMT	TATION	Wetnes			Dr	ought	V	Rooting	Depth		

RECREATIONAL DEVELOPMENT	RATING	1	RESTRICTIVE FEAT	URE(S)	•	1
Camp Areas	SEVERE	Flooding	Wetness	ļ		1
Picnic Areas	MODERATE	Wetness	1	ļ	4	
Playgrounds	SEVERE	Wetness	1	!		!
Paths and Trails	MODERATE	Wetness	}	]		]
				, ~*		- i

Crop yields in this table are aver	rages for high level management	where the crop is commonly	grown on the map unit.
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Corn Grain bu/a	Corn Silage tons/a	_		Alfalfa Hay tons/acre	Red Clover Hay tons/acre	Improved Pasture	Permanemt Pasture
			 75	4.	3.	6.3	3.3

#### WOODLAND INTERPRETATIONS

WOODLAND ORD. SYB.	EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WIND TH. HAZARD	PLANT COMPETITION	INTERP   COMMONLY EXISTING TREES ASPECT   and/or   TREES RECOMENDED TO PLA	. ,	SITE INDEX	WOODLAND PRODUCT- IVITY
2W	SLIGHT	SEVERE	SLIGHT	MODERATE	MODERATE	NORTH			
						balsam fir	E		
						sugar maple	E		
						yellow birch	E		
						red maple	EP	55	2
						white spruce	EP		
						eastern white pine	P		

# RECOMMENDED WINDBREAK SPECIES AND EXPECTED HEIGHT AT 20 YEARS

Plant Name	Height	Plant Name	Height	Plant Name	Height	Flant Name	Height
American cranberrybush nannyberry viburnum silky dogwood	8	common ninebark northern whitecedar silver maple	8 15 30	eastern white pine red maple white ash	30	lilac redosier dogwood white spruce	10) 8) 20)

For more information contact: Area Resource Soil Scientist, Soil Conservation Service, Hwy 70 E. and Timberland Road, Route 2, Box 2355, Spooner, WI 54801-1403, Phone: 715-635-3505

# Appendix C

# Forest County and Oneida County Soil Association Maps

(For Forest County Soil Series Properties see Appendix 3.5-30, Volume V of the Crandon Project's EIR. For Oneida County Soil Series Properties see Appendix B of the EIR Supplement: Wisconsin River Discharge Pipeline.)



Foth & Van Dyke
REVISED DATE BY DESCRIPTION

CHECKED BY: JKS1 DATE: AUG.'95

APPROVED BY: RFS DATE: AUG.'95 Scale: APPL

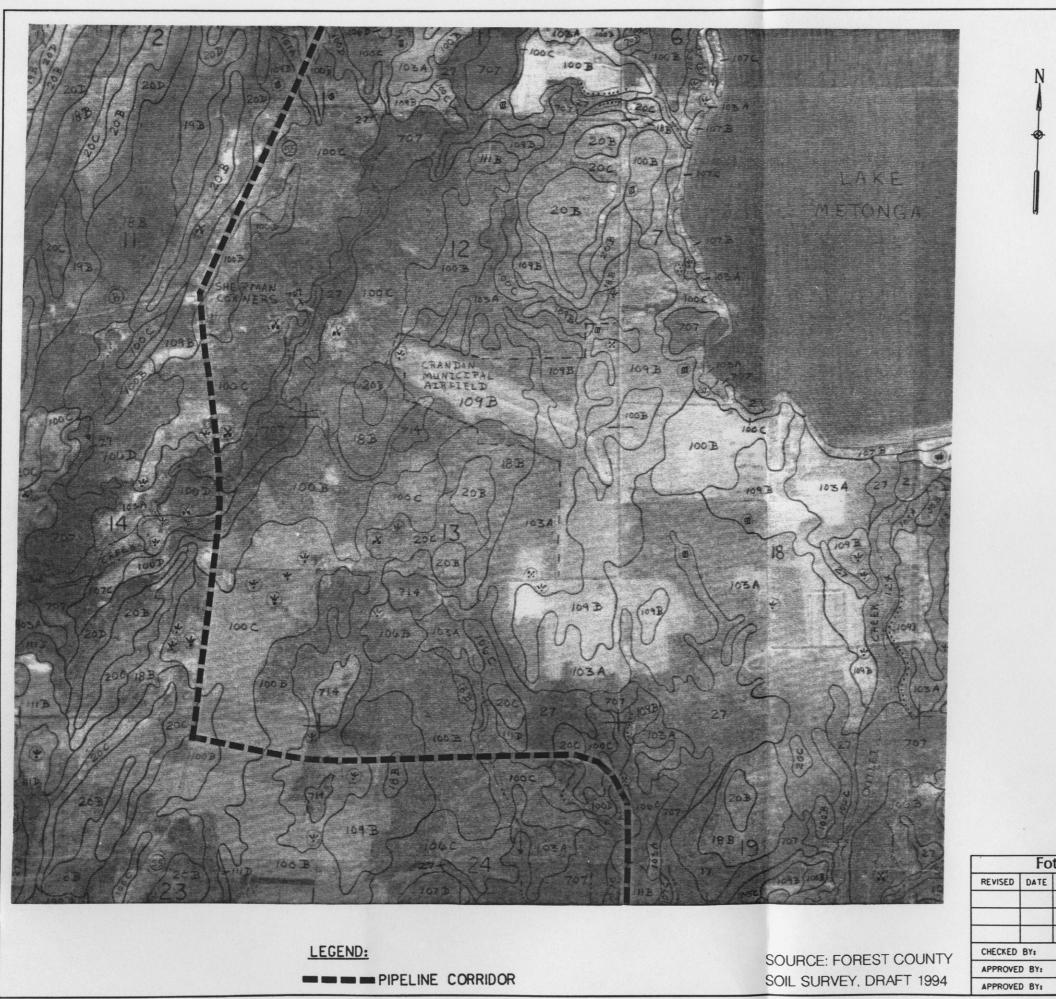
APPROVED BY: GWS DATE: AUG.'95 Prepared By:

FIGURE C-1
FOREST COUNTY
SOIL MAP SHEET

APPROX. 1"=1667 | Date: AUGUST, 1995 |
red By: Foth & Van Dyke | By: KMP

LEGEND:

SOURCE: FOREST COUNTY SOIL SURVEY, DRAFT 1994



Foth & Van Dyke

REVISED DATE BY DESCRIPTION

CHECKED BY: JKSI DATE: AUG. '95

APPROVED BY: RFS DATE: AUG. '95

APPROVED BY: GWS DATE: AUG. '95 Prepared By:

FIGURE C-2
FOREST COUNTY
SOIL MAP SHEET

Scale: APPROX. 1"=1667 Date: AUGUST, 1995
Prepared By: Foth & Van Dyke By: KMP

93C049

/d3/d1/users/jow/4c65f5.dgn





SOURCE: FOREST COUNTY SOIL SURVEY, DRAFT 1994

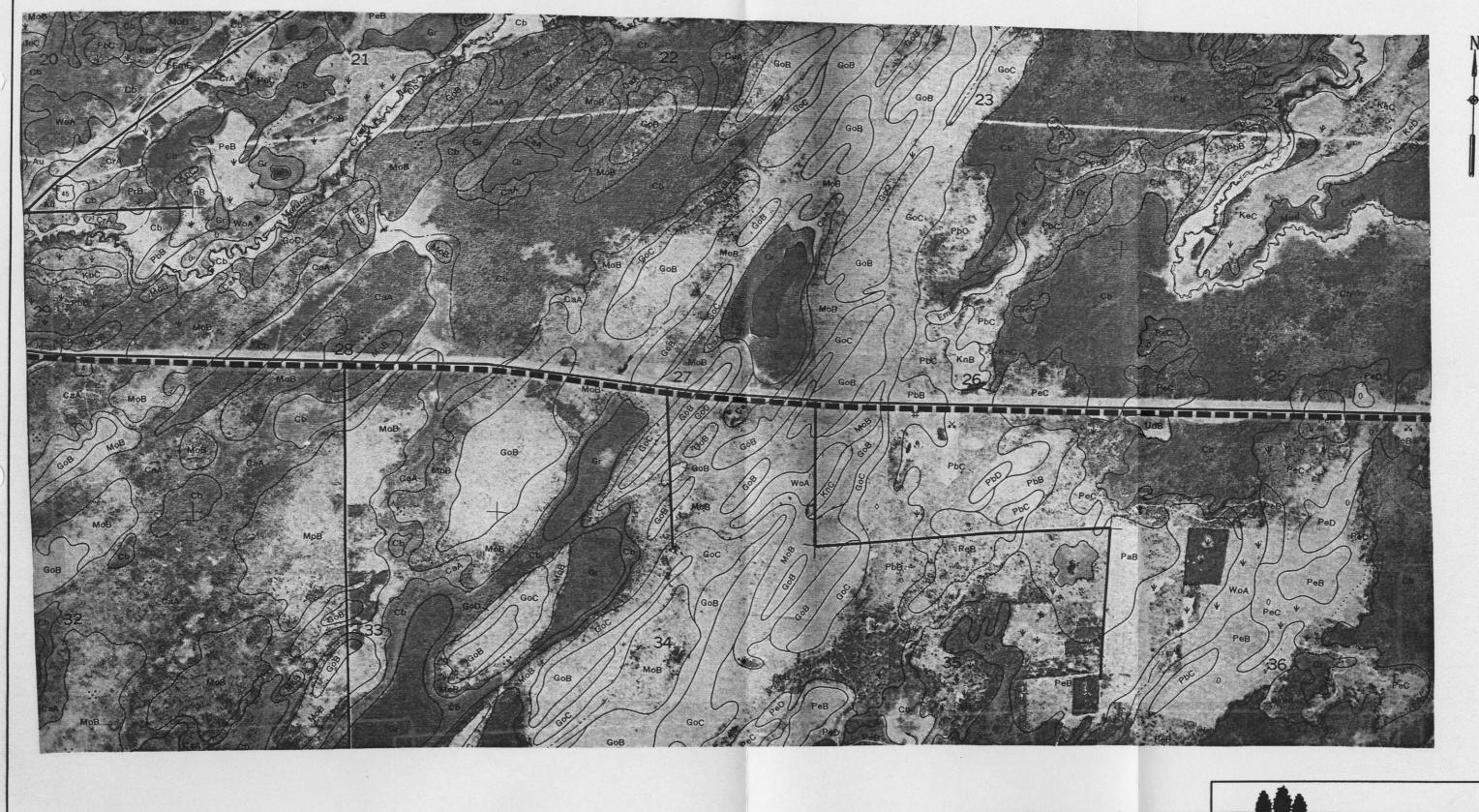
Foth & Van Dyke DESCRIPTION REVISED DATE BY DATE: AUG. 95 JKS1 CHECKED BY: DATE: AUG.'95 Scale: RFS APPROVED BY: DATE: AUG.'95 Prepared By: APPROVED BY:

Crandon Mining Company FIGURE C-4 FOREST COUNTY SOIL MAP SHEET APPROX. 1"=1667 Date: AUGUST, 1995

Foth & Van Dyke By: KMP

/d3/d1/users/jow/4c65f5.dgn

93C049



LEGEND:

SOURCE: ONEIDA COUNTY SOIL SURVEY 1993

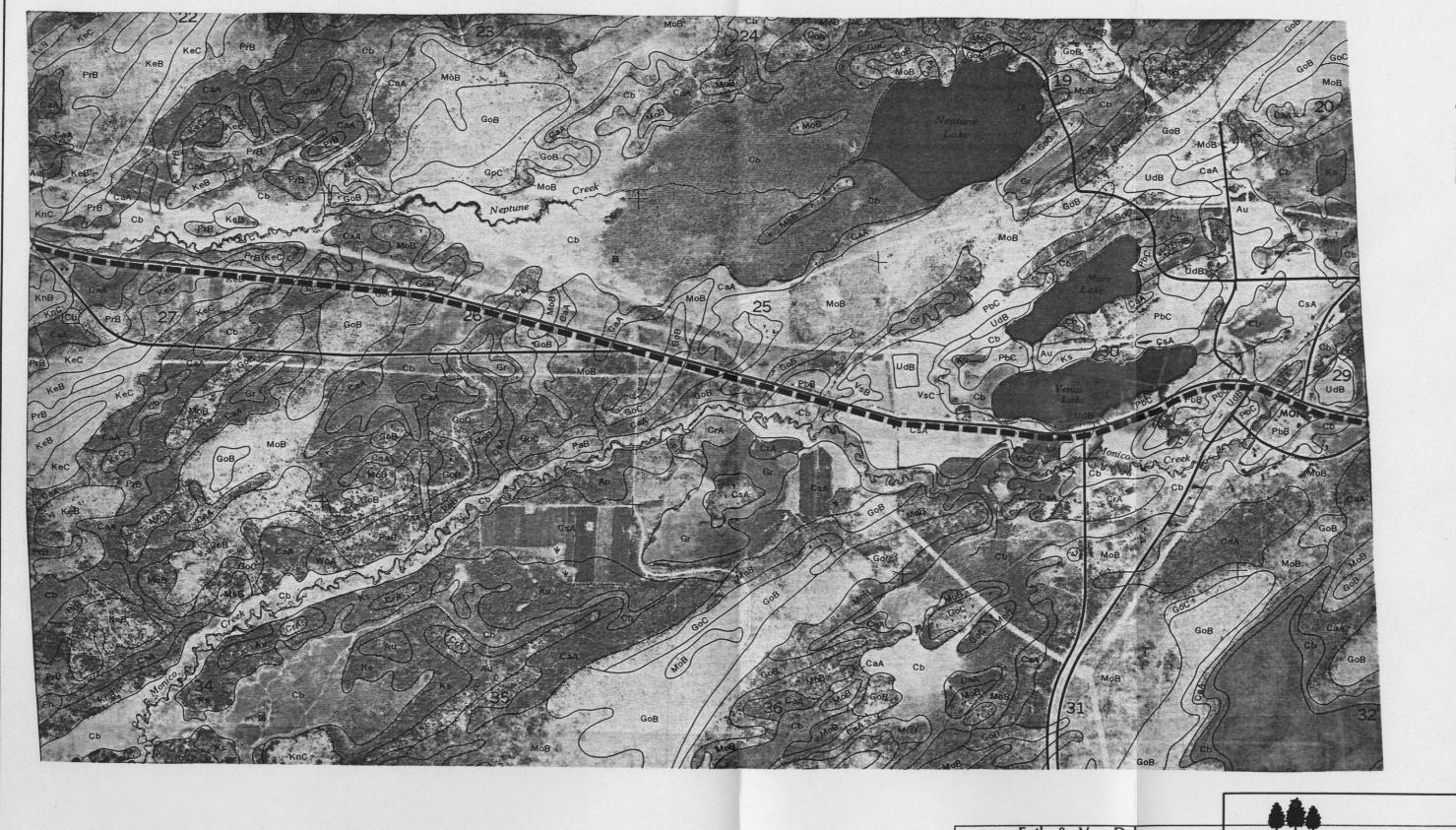
			Dyke	th &	Fo		
Ста		PTION	DESCRI		BY	DATE	REVISED
	AUG. '95	DATEs		JKS1		DV.	CHECKED
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Prepared	AUG.'95	DATEs		GWS		BY:	APPROVE

FIGURE C-5

ONEIDA COUNTY SOIL MAP SHEET

Prepared By: Foth & Van Dyke By: KMP

93C049



LEGEND:

SOURCE: ONEIDA COUNTY SOIL SURVEY 1993

		ke	k Van Dy	th 8	Fo	
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	AUG. '95	DATEs	we)			
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Prepare		A STATE OF THE PARTY OF THE PAR	GWS			APPROVE

andon Mining Company

FIGURE C-6 ONEIDA COUNTY SOIL MAP SHEET

APPROX. 1"=1667 Date: AUGUST, 1995

Foth & Van Dyke



LEGEND:

SOURCE: ONEIDA COUNTY SOIL SURVEY 1993

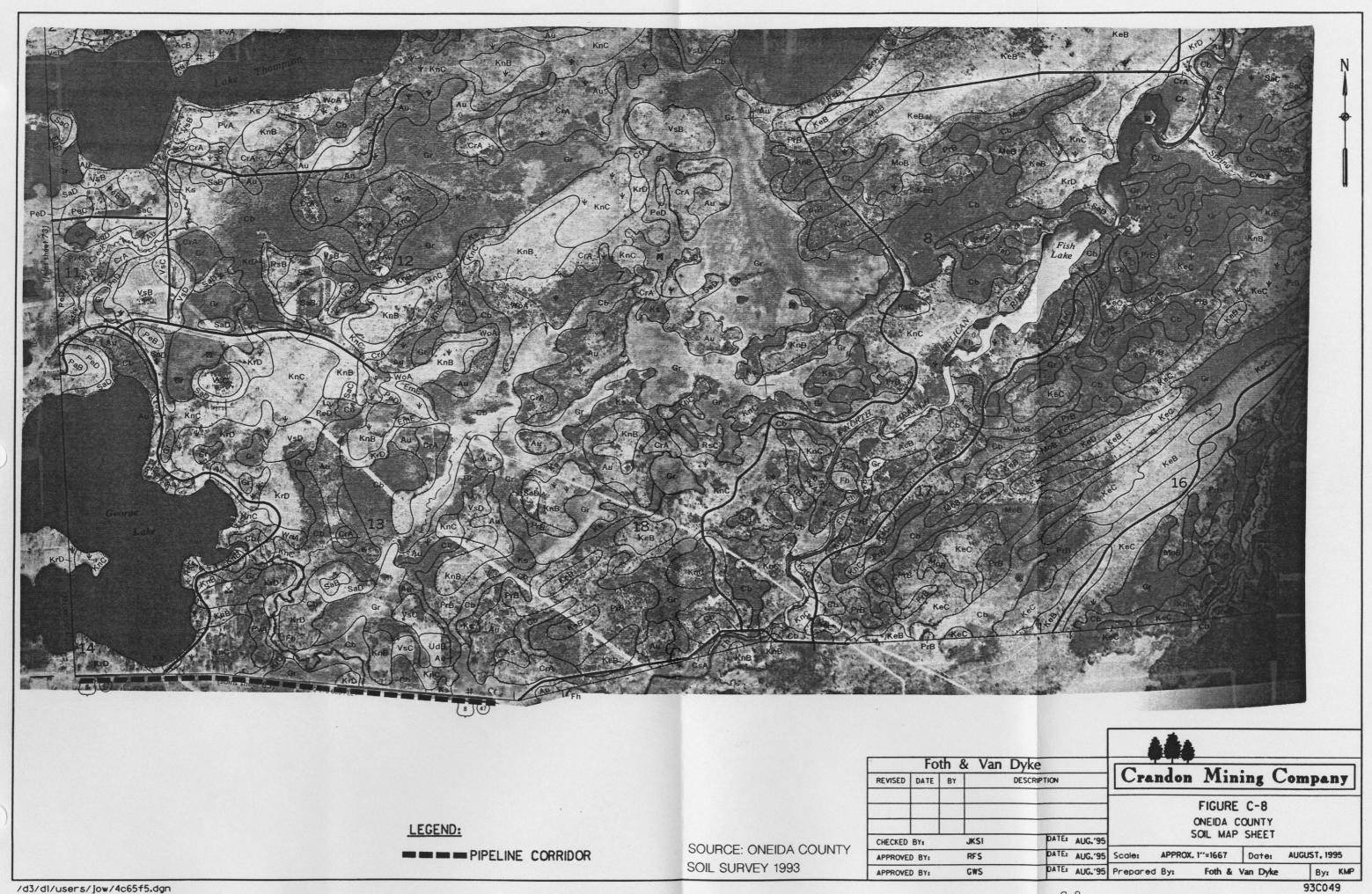
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Prepai	AUG. '95	DATE:	GWS		BY:	APPROVE

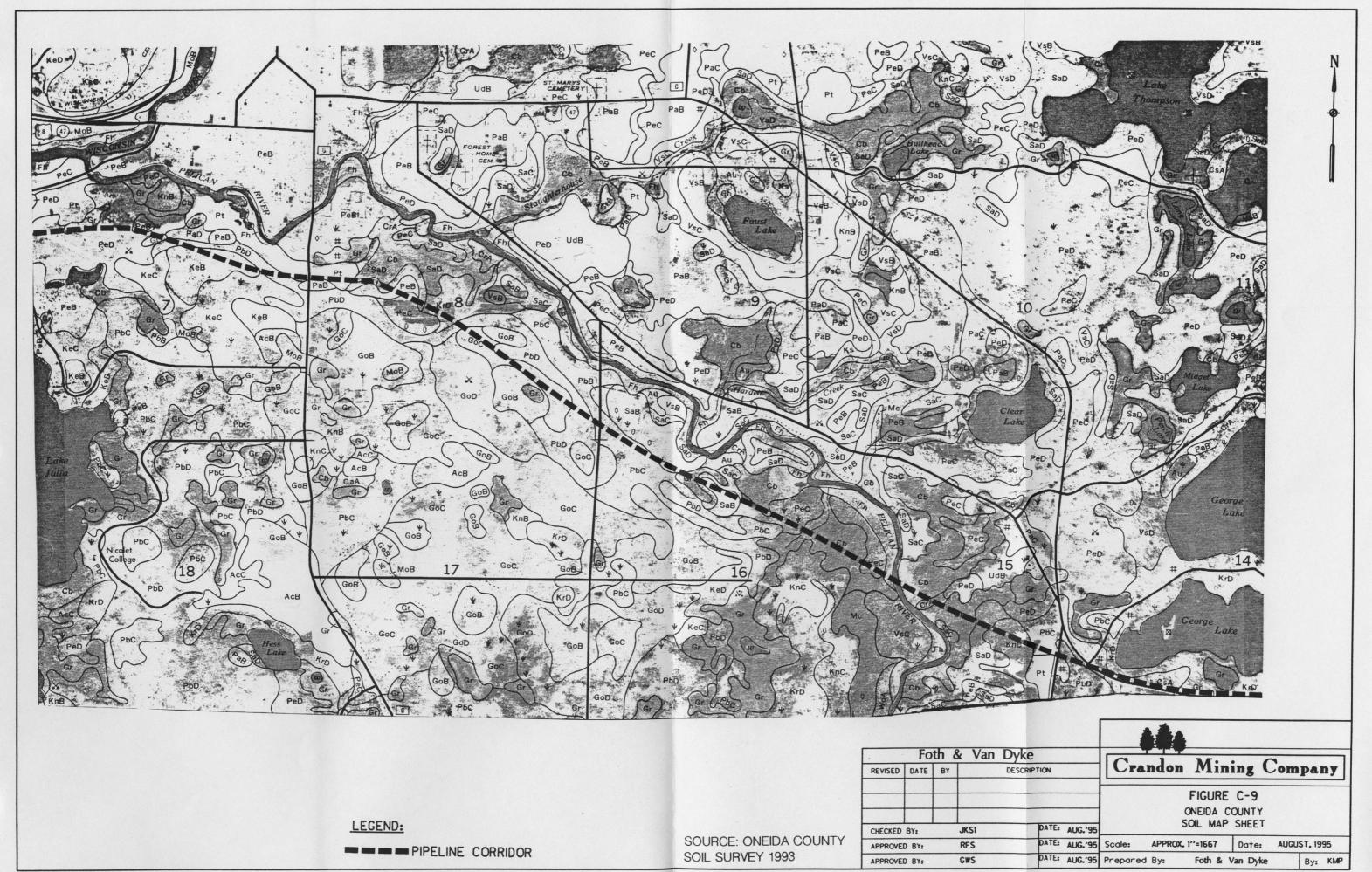
Crandon	Mining	Company
	FIGURE 6 7	

FIGURE C-7 ONEIDA COUNTY SOIL MAP SHEET

APPROX. 1"=1667 Date: AUGUST, 1995

Foth & Van Dyke

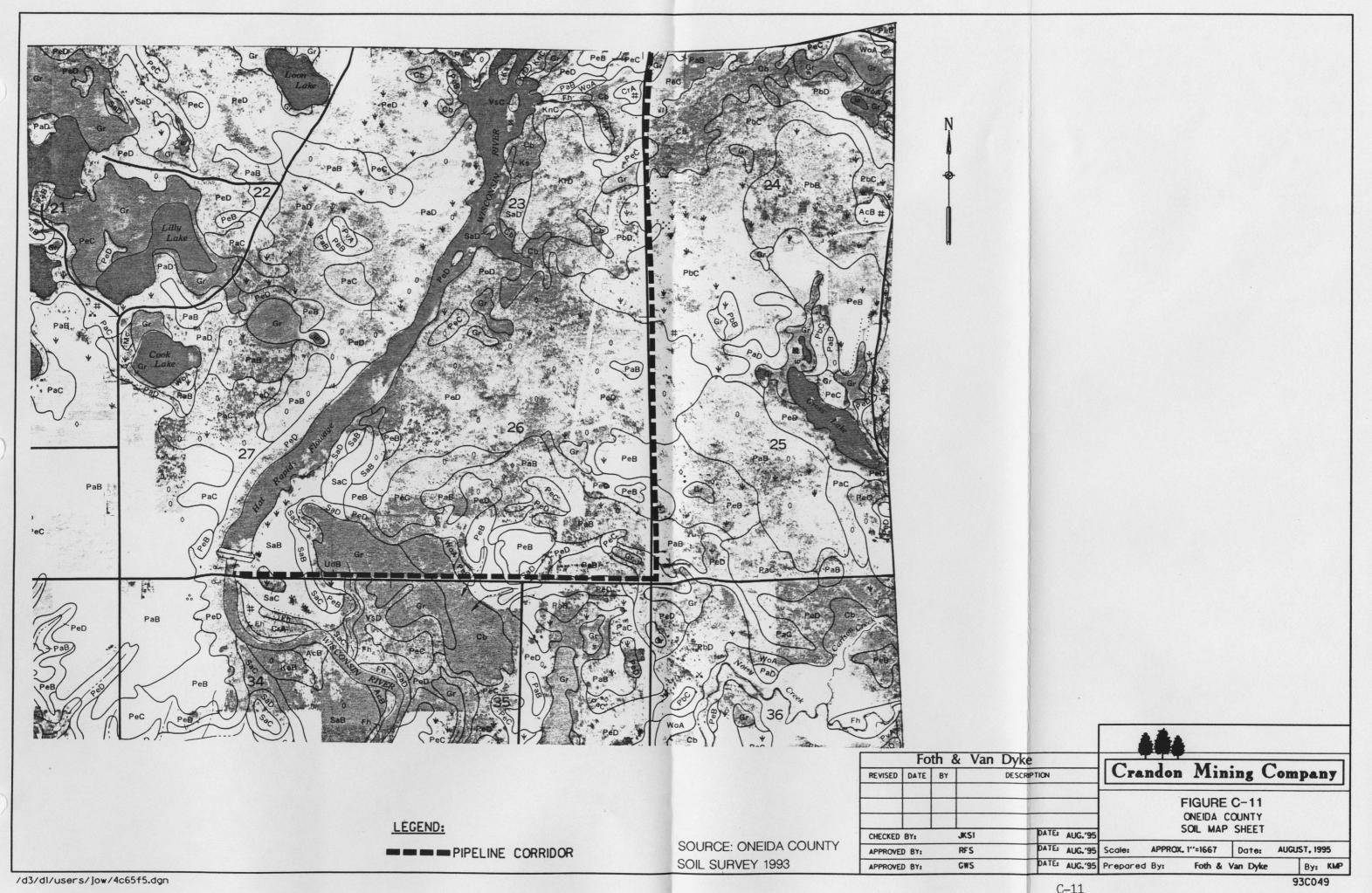




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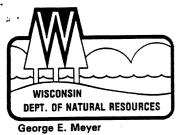
93C049





# Appendix D

Wisconsin Department of Natural Resources Correspondence



### State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

RECEIVED A RESTORME

North Central District Headquarters Box 818 Rhinelander, Wisconsin 54501 **TELEPHONE 715-365-8900** TELEFAX 715-365-8932

Secretary

June 13, 1995

Mr. Ronald F. Steg Foth & Van Dyke P. O. Box 19012 Green Bay, Wisconsin 54307-9012

Dear Mr. Steg:

The Department has reviewed Crandon Mining Company's (CMC) proposed wastewater discharge pipeline corridor from the mine site to the Wisconsin River. review is for the pipeline corridor itself and does  $\underline{\mathtt{not}}$  include evaluating the environmental impact of the wastewater discharge to the Wisconsin River. That analysis will come after specific wastewater quality and quantity characteristics are provided to the Department. Therefore, conclusions on the acceptability of discharging the wastewater to the Wisconsin River should not be based solely on this report.

At your suggestion, we did not evaluate a northern alternative route considered by CMC which would have proceeded northerly from the mine mill site along the Soo Line Railroad then westerly from the Argonne area through the Starks area. According to your telephone information, this alternative is not considered feasible.

Based on your telephone conversation, the CMC proposal is for a buried pipe between 8 and 14 inches in diameter, probably thermal plastic, averaging 4½ feet deep, and 7 feet under roads.

#### Department Statutory Authorities and Approvals 1.

- Section 30.20, Wisconsin Statutes. If the proposed directional а. boring under the bed of any waterway proves infeasible, a Chapter 30.20, Wis. Stat., permit will be required to trench across. This is applicable to both navigable and non-navigable streams. Even the small and/or intermittent streams with discernable beds and banks would require the permits. If such permits are required, delays could be expected for processing. Chapter 30 permits would be needed to directional bore several feet below the beds of the streams.
- Dredging across wetlands would require a Section 404 permit Ъ. (Federal Clean Water Act) from the U.S. Army Corps of Engineers. The Section 401 Water Quality Certification portion of this permit would come from Wisconsin DNR. CMC should contact the Corps.

MR 216, Wis. Administrative Code - I understand that Mr. Bob Chiesa of Foth & Van Dyke has contacted Mr. Paul Luebcke of our Central Office Bureau of Wastewater Management regarding the NR 216 permit needed for "land disturbing construction activities including clearing, grading and excavation activities which will result in the disturbance of five or more acres." Mr. Jim Bertolacini, Storm Water Specialist with DNR's Bureau of Wastewater Management (phone 608-266-7078), will provide further guidance to Foth & Van Dyke regarding the specific party(ies) responsible for obtaining this permit. It appears there would be at least four jurisdictions involved: the Town of Crescent, Wisconsin Department of Transporation, Forest County and CMC. As part of this permit, an erosion control plan, and practices consistent with the "Wisconsin Construction Site Best Management Practice Handbook" will be necessary.

Construction times of year should be considered from both environmental and construction advantages and disavantages. There can be some advantages to constructing through wetlands during the frozen winter months, to reduce damage to the wetland itself. However, erosion control can be a problem at spring breakup. If winter construction occurs, erosion control measures need to be implemented in the fall to minimize or prevent such problems in the spring.

I am providing some recommendations on erosion control to Mr. Bertolacini, and he will be your primary contact person for this aspect.

- d. NR 812, Wis. Administrative Code The well construction and pump installation administrative code requires a well not be placed within 50 feet of a wastewater treatment plant effluent pipe or a pressurized sewer, or within 100 feet of a lift station [NR 812.08(4)(c), and NR 812.08(4)(d)]. The CMC pipeline proposal does not identify the location of any well which may be within these distances. The identification of any well within 50 feet of the pipeline and 100 feet of any lift station will be necessary, and description of the well construction, depth, drilled/driven, etc. Since many wells are not recorded, field surveys by CMC will be necessary.
- e. <u>Chapter 130, Wisconsin Statutes, and associated NR 140, Wisconsin Administrative Code</u> The importance of leaks and/or spills in the pipeline will depend on the wastewater quality, not only in regard to the wastewater quality standards, but also for health advisory levels specified under Chapter 160 of the Wisconsin Statutes and the associated NR 140 groundwater standards, and the maximum contaminant levels (mcl's) specified under the Federal Safe Drinking Water Act. The wastewater should be characterized and regularly monitored for these parameters to assist in the evaluation of potential releases from the pipeline.
- f. NR 718, Wisconsin Administrative Code This code deals with the handling of excavated, contaminated soils. More information on the possibility of encountering contaminated soils along the proposed pipeline route is provided under #3 "Site Specific Comments and Recommendations" later in this report.

#### 2. General Comments and Recommendations

There are numerous wetlands along the proposed pipeline route that would be crossed. Trenching through these areas should have minimal long term impacts if erosion control measures are effective. We would expect such areas to return to their existing wetland functions in a relatively short time. CMC should summarize the amount and locations of wetland intrusion.

We have examined DNR and Department of Industry, Labor and Human Relations (DIHLR) lists of existing underground storage tanks and suggest you seek an update of this information before final engineering plans are completed. We have also examined the <u>Leaking</u> Underground Storage Tanks (LUST) and Spill Sites information and address this issue under #3, later in this report.

According to your telephone call, the alternative of discharging to the Pelican River was eliminated because of its low flow characteristics.

Because the pipeline is proposed on or directly adjacent to previously disturbed highway right-of-ways, the overall adverse impact to wildlife is expected to be minimal.

Several bald eagle and osprey nests are located within ½ to 1 mile of the route. However, we do not believe the installation of a pipe in the road right-of-way will impact these species.

Several rare species of mussels and fish, including some listed on the state "special concern" list are mentioned in Section #3 of this report ("Site Specific Comments and Recommendations"). For discretionary seasons, the exact locations and species are not included in this letter. Should directional boring prove infeasible under any of the waters with such species, or if you choose to conduct biological surveys (for these species) in advance of the contingency of possibly needing a Section 30.20, Wis. Stats., dredging permit, you may contact Mr. John Pohlman of DNR's Bureau of Endangered Resources, phone number (608)264-6263, for more details.

CMC should find out where all buried and overhead utilities along the corridor before completing final engineering plans.

There are several snowmobile trails in the area. Some of these are publicly funded. CMC should contact both the Forest County and Oneida County Snowmobile Trail Coordinators to investigate potential conflicts.

There are several spill sites (primarily of petroleum products from accidental truck overturns, etc.) on both Highway 8 and Highway 55 that have been cleaned up and are, therefore, not listed here.

It would be useful to provide a joint review of detailed engineering construction and erosion control plans with DNR, DOT and the Forest County Highway Department.

#### 3. Site Specific Comments and Recommendations

- Hat Rapids Road In the NE% NW%, Section 34, T36N, R8E, there is a. a former solid waste disposal facility. It was used some years ago to dispose of paper fiber and sludge from the St. Regis Mill that was skimmed and dredged from the Hat Rapids Flowage. The site has been abandoned for a number of years but DNR's Solid Waste program should be consulted if the pipeline would be more than 600 feet south of Hat Rapids Road in this location. There is an unnamed stream channel next to the north side of Hat Rapids Road about one-half mile east of the Wisconsin River in SE SE, Section 27, T36N, R8E. There are also two small ponds north of the road in the SW SW of Section 26, T36N, R8E. These small ponds are shown on the current USGS quadrangle topographic map. pipeline should avoid the shorelines of these ponds and the unnamed stream channel, unless directionally bored beneath. boring is not feasible in this area, consideration should be given to routing the pipeline along the south side of Hat Rapids Road, or at least as close as possible to the north shoulder of the road.
- b. <u>Highway 17</u> There are several small streams and some wetlands along this route. Care should be taken in crossing all of these.
- c. Lassig Road The shoreline areas of Lassig Lake and Cuenin Lake should be avoided. These lakes have wildlife and recreational values. Cuenin Lake has wild rice and its east shore touches Lassig Road, leaving no room on the west side of Lassig Road for pipeline installation. Lassig Road also crosses Carlson Creek and Cuenin Creek (the outlet of Cuenin Lake). If this route were chosen, it would be preferable to locate the pipeline east of Lassig Road in the area near Cuenin Lake and south of Lassig Road in the area near Lassig Lake.
- d. <u>County Highway G (Route 2)</u> There are some wetlands along CTH "G".

There are two leaking underground storage tank sites west of County "G" near Pine Crest Road. If further information is needed on these LUST sites, please contact Connie Antonuk of the Rhinelander DNR Office. Her phone number is (715)365-8986.

e. <u>River Bend Road (Route 1)</u> - There is a leaking underground storage tank site north of River Bend Road, east of Germond Road. For further information on this site, you may contact Connie Antonuk.

Cuenin Creek's channel is a steep rapids close to the north side of River Bend Road in the S½, Section 21, T36N, R9E, between Winquist Road and the Pelican River. If Route 1 were selected, the pipeline should go on the south side of River Bend Road to avoid this part of Cuenin Creek.

This route crosses the Pelican River which has a warm water gamefish population and is used for recreational canoeing, etc. The Pelican River also has two relatively uncommon fish species not on the "Special Concern" list. Any trenching in the Pelican River should avoid the May/June spawning times of these fish. The

Pelican River also likely contains the same five state "special concern" fresh water mussel species that the North Branch of the Pelican River (a tributary to the Pelican River) has. If directional boring beneath the Pelican River is <u>not</u> possible, we recommend surveys in the crossing area to ascertain the presence and locations of such mussels.

f. Highway 8 - The small unnamed natural lake and its shoreline area, in the NW4 NW4, Section 7, T36N, R9E, south of Highway 8 should be avoided by pipeline construction. Also, across Highway 8 to the north of this unnamed natural lake, a small artificially created wetland in a former gravel pit area should also be avoided. There should be room enough for the pipeline on either side of the existing highway; however, consideration should be given to future addition of two more Highway 8 lanes southward. The Holmboe Forest Natural Area is north of the artificial wetland; it is not expected to be affected.

The Highway 8 Rhinelander bypass corridor also crosses the Pelican River (same fish and mussel concerns as previously mentioned).

Extreme care should be taken in crossing the Lake George outlet and the floodplain wetlands that are attached to its confluence with the Pelican River. This area is prone to floods, which could present construction problems during high water.

The North Branch of the Pelican River has five state special concern mussels. It will be extremely important to prevent sedimentation to the North Branch of the Pelican River. If directional boring is not possible, we recommend local mussel surveys to determine if seasonal or locational restrictions are needed to protect these mussels. This is also a flood-prone area and the channels and backwaters of the North Branch of the Pelican River are close to both sides of the highway. Construction other than directional boring would need to stay very close to the toe of the highway's slope intercept, whether on the north or south side of the highway.

There also are numerous small drainages and intermittent streams that cross Highway 8.

Neptune Creek is a warm water forage fish stream. Several hundred feet east of Highway 8's crossing of Neptune Creek, the stream's channel is very close to the north slope intercept of Highway 8. If the pipeline is installed on the north side of Highway 8 in this location, directional boring may be needed to pass beneath the channel in this area. Staying on the south side of Highway 8 in this area would avoid this.

At Venus Lake, the southwest shore is immediately adjacent to the north slope intercept of Highway 8. The area north of the Highway 45/47 intersection with Highway 8 has rock gabions along the north slope intercept of Highway 8, immediately adjacent to

the south shoreline of Venus Lake. There is not room for construction of a pipeline between Highway 8 and Venus Lake; therefore, the pipeline would need to be located south of Highway 8 in these areas. There are some bedrock outcroppings in this vicinity which may present some construction problems.

Highway 8 crosses the outlet of Venus Lake and also Monico Creek. Extreme care should be taken to prevent disruption of these streams.

There are contamination sites located on the north and south sides of Highway 8 in the Monico area. These sites are from leaking underground storage tanks-petroleum products that are not yet cleaned up. CMC would need to handle soils in those areas in compliance with NR 718, Wis. Adm. Code. For further information on these sites, you may contact Connie Antonuk.

The Wisconsin Department of Transportation is considering rebuilding the intersection of Highway 45/47 and Highway 8 in the future. It will be important to coordinate pipeline installation plans in that area with them.

The Wolf River and Mud Creek, a tributary to the Wolf River, should be treated with extreme care. The Mud Creek is a warm water forage fish stream with wildlife values. The Wolf River has high fish, wildlife, ecological, aesthetic and recreational canoeing values. There is a small spring pond several hundred feet east of the Wolf River on the south side of Highway 8, which drains into the Wolf River. Care should be taken to avoid intrusion into this spring pond or its wetland fringe at the toe of the south slope of Highway 8, unless directional boring can pass beneath the wetland fringe or toe of the highway fill slope. Construction on the north side of Highway 8 in this vicinity appears preferable from environmental and construction aspects.

- g. <u>Forest County Highway "S"</u> If the pipeline is constructed in the right-of-way of Highway "S", we anticipate no problems with streams or wetlands. If the pipeline were constructed east of the Highway "S" right-of-way, wetland crossings and a possible old landfill site could be involved.
- Highway 55 from "S" to Mine Access Road The most environmentally h. sensitive area along this segment is Gliske Creek, a Class I brook trout stream. There are also some wetlands along the route, mainly adjacent to Gliske Creek. Extreme care should be taken to minimize any disruption or siltation to Gliske Creek. Downstream from Highway 55 it has a brook trout spawning area. A short distance downstream from its Highway 55 culverts, Gliske Creek turns southward and parallels Highway 55. It appears there may be room between the stream channel and Highway 55 to construct the pipeline, if this can be done without disrupting the creek banks. Although there are more wetlands on the east side of Highway 55 in the vicinity of Gliske Creek, the east side can also be considered. If directional boring is not possible under Gliske Creek, active construction in and near the creek must be avoided from September 15 to May 1 of any year to avoid the fall spawning and winter incubation periods for trout eggs.

i. Mine Access Road from Highway 55 to Mine/Mill Site - Depending on specific locations, this segment would cross three or four intermittent unnamed streams that become trout waters further downstream. Each of these should be directionally bored if possible.

Swamp Creek, a brook trout stream, is crossed by this route and extreme care should be taken. If directional boring is not feasible at Swamp Creek, the alternative of attaching the pipe to the proposed bridge should be carefully considered versus dredging the stream bottom in the rocky riffles area. Swamp Creek is also a tributary to Rice Lake, which has exceptional ecological, wild rice and wildlife values. Two state "special concern" mussel species, and five species of "special concern" dragonflies and one species of (state) endangered dragonfly occur in Swamp Creek. If directional boring is not possible, we would need surveys of the mussel and dragonfly populations before a decision on any proposed Section 30.20 dredging permit for burial of the pipeline in the bed of Swamp Creek.

If directional boring is not feasible under Swamp Creek or any of its tributaries along the access road, no instream construction will be permitted from September 15 to May 1 of any year to protect trout eggs.

Until we receive more detailed information on the placement of piping from the proposed treatment plant site to the access road, and all pertinent environmental CMC surveys (particularly vegetation) of that area, our analysis of the southern-most end of the pipeline is considered incomplete.

#### 4. <u>Summary</u>

Of Routes #1, #2 and #3, #3 is preferable from an environmental standpoint.

Although there are no records in our National Heritage Inventory database of endangered resources occurring within highway rights-of-way along the proposed route, comprehensive endangered resource surveys have not been completed for these rights-of-way. As a result, our data files may be incomplete. With the possible exception of rivers or streams where directional boring may prove infeasible, we do not believe that further surveys are warranted, given the site's specific impacts associated with installing a pipe, the disturbed nature of these rights-of-way and the low probability of rare species utilizing these rights-of-way. We have not yet reviewed CMC's Environmental Impact Report. If there are more rare species of plants and animals found by CMC's consultants along the southerly pipeline corridor, we may need to update or revise this letter.

As further consideration of this proposal evolves, please keep us informed. If you should deviate from the locations for pipeline installation proposed in your letter and maps of April 24, 1995, please contact us for further investigation and input.

# 5. Additional Information Needed from CMC

It would be helpful if you documented the following details when they become available:

- a. The specific location(s) and size(s) of pump/lift stations.
- b. If the pipeline is pressure tested with water, the proposed source and discharge points of the water. Discharge water from such a test <u>may</u> need a Wisconsin Pollution Discharge Elimination System (WPDES) permit.
- c. A description of the proposed monitoring and alarm system for leaks, and shut-down process, and a spill plan.
- d. The desirability of using double walled, insulated pipes attached to bridges over the Pelican River, Wolf River, and Swamp Creek.
- e. Proposed intentions for the pipeline after mine closure. (Where pipe would be left in the ground, and if some is removed, repairs of disturbed areas.)

Thanks for the opportunity to review this proposal.

Sincerely,

lery McKnight
Terrence C. McKnight

Environmental Impact Coordinator

#### TCM: da

cc: M. Stokstad/D. Urso, Rhinelander

- A. Wilson, Rhinelander
- C. Antonuk, Rhinelander
- B. Tans, EA/6
- J. Bertolacini, WW/2
- P. Luebcke, WW/2

District Staff

Area Staff

C. Pils, ER/4

Mike Hess, Dept. of Transportation, 777 Hanson Lake Rd., Rhinelander, WI 54501 Crandon Mining Company, 7 N. Brown St., 3rd Floor, Rhinelander, WI 54501-3161

# Appendix E Habitat Characterization Field Data Forms

# Dominant Habitat Types Along West Side of STH 55 from CTH S to Access Road

Corridor Segme	ent: WEST side	of STH 55			Beginning at: CTH S to Access Road								
	Average Width of			D	ominant Habitat	Туре А	djacent to Ma	intained RO	W				
Subsegment <sup>1</sup> (miles)	Maintained ROW <sup>2</sup>	Northern Hardwoods	Shrub Swamp Conifer Swamp Bog Sedge Shallow Marsh Residential Commercial										
0.0 - 0.4	30	V									Agri.		
0.4 - 0.5	30									V	V		
0.5 - 1.2	30	V							V				
1.2 - 1.5	30	~											
1.5 - 1.7	20			V									
1.8 - 1.9	30	~								V			
1.9 - 2.2	30	V								_			

<sup>&</sup>lt;sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

<sup>&</sup>lt;sup>2</sup> Maintained right-of-way contains little native vegetation and is routinely mowed or otherwise maintained by the WisDOT.

Table E-2

Dominant Habitat Types Along West Side of CTH S from USR 8 to STH 55

Corridor Segmen	nt: WEST side of	CTH S	-		Beginning at: 1	JSR 8 to	STH 55							
	Average				Dominant Habit	at Type A	djacent to Mai	ntained ROW						
Subsegment <sup>1</sup> (miles)	Width of Maintained ROW <sup>2</sup>	Northern Hardwoods	Shrub Conifer Swamp Bog Sedge Shallow Marsh Residential Commercial Agr											
0.0 - 0.4	20	<b>~</b>												
0.4 - 0.7	20										~			
0.7 - 0.8	20	V							<b>V</b>		<u> </u>			
0.8 - 1.0	20										1			
1.0 - 1.9	20	~												

A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

<sup>2</sup> Maintained right-of-way contains little native vegetation and is routinely mowed or otherwise maintained by the County.

rable E

# Dominant Habitat Types Along North Side of the Snowmobile Trail from CTH S to Whiteye Lane

Corridor Segn	nent: NORTH	Side of Snowmo	bile Trail			Beginning at	: СТН	S to Whitey	e Lane			
Subsegment <sup>1</sup>	Approx. Width of Snowmobile	Average Width of Maintained	Northern	Shrub	Conifer	Deciduous			1			т
(miles)	Trail	Area <sup>2</sup>	Hardwood	Swamp	Swamp	Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Ag.
0.0 - 0.1	6'	20'									Construction	"
0.1 - 0.4	6'	30'	V		_							<del> </del>
0.4	6'	30'								V		<del>                                     </del>
$0.5 - 0.6^3$	6'	30'	V									<del>                                     </del>
0.6	6'	30'								V		<del>                                     </del>
0.6 - 0.8	6'	30'	V									-
0.8 - 0.9	6'	30'				V						-
0.9 - 1.0	6'	30'		~								
1.0 - 1.1	6'	30'	~									<b></b>
1.1	6'	30'								~		
1.2 - 1.4	6'	30'	~									
1.4	6'	30'								~		
1.4 - 1.7	6'	30'	~									
1.7	6'	30'								~		
1.7 - 1.8	6'	30'	~									
1.8 - 2.1	6'	30'				V						
2.1 - 2.4	6'	30'	~									
2.4 - 2.6	6'	30'								V		

Table E-3 (Continued)

Corridor Segn	Corridor Segment: NORTH Side of Snowmobile Trail							S to Whiteye	Lane			
	Approx.	Average Width of										
Subsegment <sup>1</sup> (miles)	Width of Snowmobile Trail	Maintained Area <sup>2</sup>	Northern Hardwood	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Ag.
2.6 - 2.9	6'	30'	~									

<sup>&</sup>lt;sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

<sup>2</sup> Maintained power line corridor contains little native vegetation and is routinely maintained by the Wisconsin Public Service Corporation.

<sup>&</sup>lt;sup>3</sup> Salix spp. in North Ditch.

# Dominant Habitat Types Along North Side of the Snowmobile Trail from Whiteye Lane to CTH V

Corridor Segn	nent: NORTH S	Side of Snowmo	bile Trail			Beginning at	: White	eye Lane to	СТН V			
	Approx. Width of	Average Width of		·								
Subsegment <sup>1</sup> (miles)	Snowmobile Trail	Maintained Area <sup>2</sup>	Northern Hardwood	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Ag.
0.0	6'	30'	V									
0.1 - 0.5	10'	30'								~		
0.5 - 0.7	6'	15'				>						
0.7 - 1.1	10'	15'								V	V	
1.1 - 1.2	6'	10'		~								
1.2	6'	10'			>							
1.4 - 1.7	6'	10'								V		
1.7 - 2.0	6'	10'		~	>							
2.0 - 2.1	6'	30'		,	>							
2.1 - 2.2	6'	10'	<b>V</b>									
2.2 - 2.3	6'	30'			>							
2.3 - 2.7	6'	30'	>									
2.7 - 2.8	6'	10'				>						
2.8 - 3.0	6'	10'			>							
3.0 - 3.1	6'	10'	>									
3.1	6'	10'								<b>V</b>		
3.1 - 3.4	6'	10'			~							
3.4 - 3.7	6'	30'	~									

Table E-4 (Continued)

Corridor Segm	nent: NORTH S	Side of Snowmo	bile Trail			Beginning at	: White	eye Lane to (	CTH V			
	Approx.	Average										
Subsegment <sup>1</sup> (miles)	Width of Snowmobile Trail	Width of Maintained Area <sup>2</sup>	Northern Hardwood	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Ag.
3.5	6'	30'								V		
3.7 - 3.8	6'	30'								V		
3.8 - 4.3	6'	30'	~							V		
4.3	6'	30'								V		
4.4	6'	30'	~									
4.5	6'	30'			~							
4.6 - 5.2	6'	30'								~	V	
5.2 - 5.4	6'	30'	~									
5.4 - 5.8	6'	5'			~							
5.8 - 6.2	6'	15'	~		·							
6.2 - 6.4	6'	15'		V								
6.4 - 6.83	6'	15'	✓ recent cut	~								
6.8 - 7.0 <sup>3</sup>	6'	6'	V	~								
End at V												

<sup>&</sup>lt;sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

<sup>2</sup> Maintained power line corridor contains little native vegetation and is routinely maintained by the Wisconsin Public Service Corporation.

<sup>3</sup> Trail is in disturbed wetland - ground is wet salix spp. & alnus spp. present.

# Dominant Habitat Types Along South Side of the Snowmobile Trail from CTH S to Whiteye Lane

Corridor Segme	ent: SOUTH Sid	de of Snowmob	ile Trail			Beginning at	: СТН	S to Whitey	e Lane			
	Approx. Width of	Average Width of										-
Subsegment <sup>1</sup> (miles)	Snowmobile Trail	Maintained Area <sup>2</sup>	Northern Hardwood	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Ag.
0.0 - 0.4	6'	40' <sup>3</sup>										1 -8
0.4 - 0.7	6'	40'	V									
0.7 - 0.8	6'	10'	V									
0.8 - 0.9	6'	10'				V						
0.9 - 1.0	6'	10'		V								
1.0 - 1.4	6'	10'	V									
1.4 - 2.9	6'	40'3										

<sup>&</sup>lt;sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

<sup>2</sup> Maintained power line corridor contains little native vegetation and is routinely moved or otherwise maintained by the WisDOT.

<sup>3</sup> Maintained right-of-way consisting of mowed grass between the snowmobile trail and USR 8.

Table E-6 Dominant Habitat Types Along South Side of the Snowmobile Trail from Whiteye Lane to CTH V

Corridor Segm	nent: SOUTH S	ide of Snowmol	oile Trail			Beginning at:	: White	eye Lane to (	CTH V			
	Approx.	Average Width of										
Subsegment <sup>1</sup> (miles)	Width of Snowmobile Trail	Maintained Area <sup>2</sup>	Northern Hardwood	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Ag.
0.0 - 0.5	6'	50'	<b>✓</b> <sup>4</sup>							·		
0.5 - 0.7	6'	50′	<b>√</b> 6									
0.7 - 1.0	6'	10'	V									
1.0 - 1.1	6'	50'3										
1.1 - 1.2	6'	05		V								<u> </u>
1.2 - 1.9	6'	50'	•	close to USR 8								
1.9 - 2.7	6'	50'	<b>√</b> 6									
2.7 - 3.2	6'	05	,	~						·		
3.2 - 3.8	6'	10'	~									
3.8 - 4.0	6'	50'	<b>✓</b> <sup>6</sup>									
4.0 - 4.4	6'	50 <sup>13</sup>	~									
4.4 - 5.4	6'	50'	<b>✓</b> <sup>6</sup>									ــــــــ
5.4 - 5.8	6'	0		~								<u> </u>
5.8 - 6.4	6'	50'	<b>✓</b> <sup>6</sup>									
6.4 - 6.8	6'	05		~								
6.8 - 7.0	6'	0		<b>✓</b> 5					ļ			
End at V												

#### Table E-6 (Continued)

- <sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

  <sup>2</sup> Maintained power line corridor contains little native vegetation and is routinely mowed or otherwise maintained by the WisDOT.
- <sup>3</sup> Maintained right-of-way consisting of mowed grass between the snowmobile trail and USR 8.
- <sup>4</sup> Trees planted for barrier.
- Vegetation to edge of trail.
   Sparse woody vegetation.

 $\label{thm:continuous} \mbox{Table E-7}$  Dominant Habitat Types Along South Side of USR 8 from River Bend Road to CTH V

Corridor Segm	ent: SOUTH si	de of USR 8			Beginning at: River Bend Road to CTH V									
	Average Width of	Dominant Habitat Type Adjacent to Maintained ROW												
Subsegment <sup>1</sup> (miles)	Maintained ROW <sup>2</sup>	Northern Hardwoods	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Agri.			
0.0 - 0.1	25							~						
0.1 - 0.2	25			V										
0.2 - 0.4	90	V												
0.4 - 0.5	25					V								
0.5 - 0.7	25	V												
0.7 - 1.3	25			V										
1.3 - 1.6	25	V												
1.4	25		~											
1.6 - 1.8	25			V										
1.8 - 2.1	25		~											
2.1 - 2.6	25			V										
2.6 - 2.8	25		~		V									
2.8 - 3.2	25	V												
2.9	25		V											
3.2 - 3.3	25 .		V											
3.3 - 4.0	25			V										
4.0 - 4.2	25	V												
4.2 - 4.5	25			~										

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Corridor Segm	nent: SOUTH si	de of USR 8			Beginning at: River Bend Road to CTH V								
·	Average Width of	Dominant Habitat Type Adjacent to Maintained ROW											
Subsegment <sup>1</sup> (miles)	Maintained ROW <sup>2</sup>	Northern Hardwoods	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Assi		
4.5 - 5.1	25	~						TVILLIBII	Residential	Commercial	Agri		
5.0	25						V						
5.1 - 5.5	25			V							<del> </del>		
5.5 - 5.6	25	<b>&gt;</b>											
5.6 - 6.1	25			V									
6.1 - 6.5	25	~											
6.5 - 6.8	25			~									
6.8 - 7.1	25	~											
7.1 - 7.4	25		~	~									
7.4 - 7.5	25	~											
7.5 - 7.7	25			~									
7.7 - 8.2	25	V											
8.2 - 8.4	20								~				
8.4 - 8.5	20		~										
8.5 - 8.7	20	V							~				
8.7 - 9.3	20	V							•	V			
9.3 - 9.5	8		~					v	V	V			
9.5 - 9.9	8	V						-	~	•			
9.9 - 10.0	8		~						-				

A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle

<sup>2</sup> Maintained right-of-way contains little native vegetation and is routinely mowed or otherwise maintained by the WisDOT.

Table E-8

# Dominant Habitat Types Along North Side of the USR 8 Bypass from River Bend Road to STH 17

Corrido	Corridor Segment: NORTH Side of USR 8 Bypass						Beginning at: River Bend Road to STH 17									
Subsegment <sup>1</sup> (miles)	Average Width of Maintained ROW <sup>2</sup>		Dominant Habitat Type Adjacent to Maintained ROW													
		Northern Hardwoods	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Communicati						
0.0 - 0.3	3	100	V						Warsh	Residential	Commercial	Agri				
0.3 - 0.5	5	10			V	V										
0.5 - 1.4	4	30	~													
1.4 - 1.5	5	100	~									<u> </u>				
1.5 - 1.5	55	30	~													
1.55 - 1.	.65	100														
1.65 - 3.	.0	50	~							<b>V</b>		<u> </u>				
3.0 - 3.2	2	20	V							_						
3.2 - 3.5		40	~							<b>✓</b>						
3.5 - 3.6		20				~										
3.6 - 3.8		30	V													
3.8 - 3.9		40														
3.9 - 4.1		40	~													
4.1 - 4.2		40						~								
4.2 - 4.3		50	~													
4.3 - 4.4		100														
4.4 - 4.5		100	~								~					

<sup>&</sup>lt;sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

# Table E-8 (Continued)

<sup>2</sup> Maintained right-of-way contains little native vegetation and is routinely mowed or otherwise maintained by the WisDOT.

# Dominant Habitat Types Along West Side of STH 17 from USR 8 to Hat Rapids Road

Corridor Segment: WEST side of STH 17					Beginning at: USR 8 to Hat Rapids Road								
	Average Width of		Dominant Habitat Type Adjacent to Maintained ROW										
Subsegment <sup>1</sup> Maintain	Maintained ROW <sup>2</sup>	Northern Hardwoods	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Δ ~==:		
0.0 - 0.1	10			~	-				residential	_	Agri.		
0.1 - 2.2	10	V					•			<i>V</i>			
0.9	15		~										
2.2 - 2.7	15		~										
2.7 - 3.6	15	~											
3.6 - 3.8	15												
3.8 - 4.1	15	<b>v</b>									V		

<sup>&</sup>lt;sup>1</sup> A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle

<sup>&</sup>lt;sup>2</sup> Maintained right-of-way contains little native vegetation and is routinely mowed or otherwise maintained by the WisDOT.

Table E-10

Dominant Habitat Types Along South Side of Hat Rapids Road

Corridor Segment: SOUTH side of Hat Rapids Road			Beginning at: STH 17 to Wisconsin River								
	Average			D	ominant Habita	t Type A	djacent to Ma	intained RO	w		
Subsegment <sup>1</sup> Width of Maintained (miles) ROW <sup>2</sup>		Northern Hardwoods	Shrub Swamp	Conifer Swamp	Deciduous Swamp	Bog	Sedge Meadow	Shallow Marsh	Residential	Commercial	Agri.
0.0 - 0.3	5	<b>V</b>							~		
0.3 - 0.6	5										~
0.6 - 1.2	5			V							
1.2 - 1.3	5										~
1.3 - 1.4	5			V							
1.4 - 1.45	5		~								
1.45 - 1.5	5										~

A linear portion of the corridor beginning and ending at the indicated distance from the beginning point of the segment. Distances are approximate as measured by vehicle odometer.

<sup>2</sup> Maintained right-of-way contains little native vegetation and is routinely moved or otherwise maintained by the WisDOT.

Prepared by: AWZ Checked by: BDH



# Appendix F

# Addendum 1 - Supplement: Wisconsin River Discharge Pipeline for the Crandon Project

# Addendum 1 - Supplement: Wisconsin River Discharge Pipeline for the Crandon Project

93C049

Prepared for **Crandon Mining Company**7 North Brown Street, 3rd Floor Rhinelander, Wisconsin 54501-3161

Prepared by Foth & Van Dyke and Associates Inc.

October 1996

# Crandon Mining Company Addendum 1 - EIR Supplement: Wisconsin River Discharge Pipeline for the Crandon Project

#### **Contents**

1 Introduction       1         2 Fauna       2         2.1 Field Methods       2         2.1.1 Sampling Locations       2         2.1.2 General Benthic Macroinvertebrates       8         2.1.3 Odonata       8         2.1.4 Mussels       9         2.1.5 Fish       10         2.1.6 Quality Control       10         2.2. Results       10         2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.4 Fish       26         2.3 Ecological Significance and Diversity       17         2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Field Methods       33         3.1 Field Methods       33         3.1 Field Methods       33         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of					Page
2.1       Field Methods       2         2.1.1       Sampling Locations       2         2.1.2       General Benthic Macroinvertebrates       8         2.1.3       Odonata       8         2.1.4       Mussels       9         2.1.5       Fish       10         2.1.6       Quality Control       10         2.2       Results       10         2.2.1       General Benthic Macroinvertebrates       10         2.2.2       Odonata       17         2.2.3       Mussels       17         2.2.3       Species Composition       17         2.2.4       Fish       26         2.3       Ecological Significance of Findings       30         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.4       Fish       32         3.3       Flora       33         3.1       Quality Control       33         3.2       Results       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         4	1	Intro	duction	•••••	. 1
2.1       Field Methods       2         2.1.1       Sampling Locations       2         2.1.2       General Benthic Macroinvertebrates       8         2.1.3       Odonata       8         2.1.4       Mussels       9         2.1.5       Fish       10         2.1.6       Quality Control       10         2.2       Results       10         2.2.1       General Benthic Macroinvertebrates       10         2.2.2       Odonata       17         2.2.3       Mussels       17         2.2.3       Abundance and Diversity       17         2.2.4       Fish       26         2.3       Ecological Significance of Findings       30         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       33         2.3.3       Hodonata       3	2	Fauna	ı		. 2
2.1.1 Sampling Locations       2         2.1.2 General Benthic Macroinvertebrates       8         2.1.3 Odonata       8         2.1.4 Mussels       9         2.1.5 Fish       10         2.1.6 Quality Control       10         2.2 Results       10         2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.3.1 Abundance and Diversity       17         2.2.3.2 Species Composition       17         2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3 Flora       33         3.1 Field Methods       33         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wi					
2.1.2 General Benthic Macroinvertebrates       8         2.1.3 Odonata       8         2.1.4 Mussels       9         2.1.5 Fish       10         2.1.6 Quality Control       10         2.2 Results       10         2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.3 Habundance and Diversity       17         2.2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Jodonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3 Flora       33         3.1 Field Methods       33         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables         Tables         Tables					
2.1.3   Odonata   8   2.1.4   Mussels   9   2.1.5   Fish   10   2.1.5   Fish   10   2.1.6   Ouality Control   10   2.2   Results   10   2.2.1   General Benthic Macroinvertebrates   10   2.2.2   Odonata   17   2.2.3   Mussels   17   2.2.3.1   Abundance and Diversity   17   2.2.3.2   Species Composition   17   2.2.4   Fish   26   2.3   Ecological Significance of Findings   30   2.3.1   General Benthic Macroinvertebrates   30   2.3.2   Odonata   30   2.3.3   Mussels   31   2.3.4   Fish   32   31   31   Field Methods   33   3.1.1   Quality Control   33   3.1.1   Quality Control   33   3.2.1   Aquatic Macrophytes   34   3.2.2   Shoreline Vegetation   42   3.3   Ecological Significance of Findings   42   4   References   44   Table 2-1   Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   5   1996 Aquatic Species Sampling Effort   7   10   10   10   10   10   10   10					
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2.1.5 Fish       10         2.1.6 Quality Control       10         2.2 Results       10         2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.3.1 Abundance and Diversity       17         2.2.3.2 Species Composition       17         2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3 Flora       33         3.1 Quality Control       33         3.2 Results       34         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables     Table 2-1 Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       5					
2.1.6 Quality Control       10         2.2 Results       10         2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.3.1 Abundance and Diversity       17         2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3 Flora       33         3.1 Field Methods       33         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7					
2.2 Results       10         2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.3.1 Abundance and Diversity       17         2.2.3.2 Species Composition       17         2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3 Flora       33         3.1 Field Methods       33         3.1.1 Quality Control       33         3.2 Results       34         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7					
2.2.1 General Benthic Macroinvertebrates       10         2.2.2 Odonata       17         2.2.3 Mussels       17         2.2.3.1 Abundance and Diversity       17         2.2.3.2 Species Composition       17         2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3       3.1 Field Methods       33         3.1.1 Quality Control       33         3.2 Results       34         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7		2.2		•	
2.2.2       Odonata       17         2.2.3       Mussels       17         2.2.3.1       Abundance and Diversity       17         2.2.3.2       Species Composition       17         2.2.4       Fish       26         2.3       Ecological Significance of Findings       30         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.4       Fish       32         3       Flora       33         3.1       Field Methods       33         3.1.1       Quality Control       33         3.2.1       Aquatic Macrophytes       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         3.3       Ecological Significance of Findings       42         4       References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7		2.2			
2.2.3       Mussels       17         2.2.3.1       Abundance and Diversity       17         2.2.3.2       Species Composition       17         2.2.4       Fish       26         2.3       Ecological Significance of Findings       30         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.4       Fish       32         3       Flora       33         3.1       Field Methods       33         3.1.1       Quality Control       33         3.2.1       Aquatic Macrophytes       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         3.3       Ecological Significance of Findings       42         4       References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7					10
2.2.3.1   Abundance and Diversity   17   2.2.3.2   Species Composition   17   2.2.3.2   Species Composition   17   2.2.4   Fish   26   2.3   Ecological Significance of Findings   30   2.3.1   General Benthic Macroinvertebrates   30   2.3.2   Odonata   30   2.3.3   Mussels   31   2.3.4   Fish   32   35   31   31   32   31   32   31   32   31   32   33   33					17
2.2.3.2       Species Composition       17         2.2.4       Fish       26         2.3       Ecological Significance of Findings       30         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.4       Fish       32         3       Flora       33         3.1       Field Methods       33         3.1.1       Quality Control       33         3.2.2       Results       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         3.3       Ecological Significance of Findings       42         4       References       44         Tables         Tables         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7			2.2.3	Mussels	17
2.2.3.2   Species Composition   17   2.2.4   Fish   26   2.3   Ecological Significance of Findings   30   2.3.1   General Benthic Macroinvertebrates   30   2.3.2   Odonata   30   2.3.3   Mussels   31   2.3.4   Fish   32   35   31   31   31   Field Methods   33   3.1.1   Quality Control   33   3.2   Results   34   3.2.1   Aquatic Macrophytes   34   3.2.2   Shoreline Vegetation   42   3.3   Ecological Significance of Findings   42   4   References   44   References   44   References   45   Findings   45   45   45   45   45   45   45   4				2.2.3.1 Abundance and Diversity	17
2.2.4 Fish       26         2.3 Ecological Significance of Findings       30         2.3.1 General Benthic Macroinvertebrates       30         2.3.2 Odonata       30         2.3.3 Mussels       31         2.3.4 Fish       32         3 Flora       33         3.1 Field Methods       33         3.1.1 Quality Control       33         3.2 Results       34         3.2.1 Aquatic Macrophytes       34         3.2.2 Shoreline Vegetation       42         3.3 Ecological Significance of Findings       42         4 References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7					
2.3       Ecological Significance of Findings       30         2.3.1       General Benthic Macroinvertebrates       30         2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.4       Fish       32         3       Flora       33         3.1       Field Methods       33         3.1.1       Quality Control       33         3.2       Results       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         3.3       Ecological Significance of Findings       42         4       References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7			2.2.4		
2.3.1   General Benthic Macroinvertebrates   30   2.3.2   Odonata   30   2.3.3   Mussels   31   2.3.4   Fish   32   32   33   3.1   Field Methods   33   3.1.1   Quality Control   33   3.2   Results   34   3.2.1   Aquatic Macrophytes   34   3.2.2   Shoreline Vegetation   42   3.3   Ecological Significance of Findings   42   4   References   44   References   44   Table 2-1   Sampling Site Locations and Descriptions, Wisconsin River Below   Rhinelander, Wisconsin   5   Table 2-2   1996 Aquatic Species Sampling Effort   7		2.3	Ecologi		
2.3.2       Odonata       30         2.3.3       Mussels       31         2.3.4       Fish       32         3       Flora       33         3.1       Field Methods       33         3.1.1       Quality Control       33         3.2       Results       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         3.3       Ecological Significance of Findings       42         4       References       44         Tables         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7			2.3.1	General Benthic Macroinvertebrates	30
2.3.3       Mussels       31         2.3.4       Fish       32         3       Flora       33         3.1       Field Methods       33         3.1.1       Quality Control       33         3.2       Results       34         3.2.1       Aquatic Macrophytes       34         3.2.2       Shoreline Vegetation       42         3.3       Ecological Significance of Findings       42         4       References       44         Tables         Table 2-1       Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin       5         Table 2-2       1996 Aquatic Species Sampling Effort       7					
2.3.4 Fish   32   32   32   33   3.1   Field Methods   33   3.1.1   Quality Control   33   3.2   Results   3.2.1   Aquatic Macrophytes   34   3.2.2   Shoreline Vegetation   42   3.3   Ecological Significance of Findings   42   4   References   44   44   45   Table 2-1   Sampling Site Locations and Descriptions, Wisconsin River Below   Rhinelander, Wisconsin   5   Table 2-2   1996   Aquatic Species Sampling Effort   7   7   7   7   7   7   7   7   7					
3   Flora   33					
3.1 Field Methods			2.3.7	11511	32
3.1 Field Methods	3	Flora			22
3.1.1 Quality Control	,				
3.2 Results		3.1			
3.2.1 Aquatic Macrophytes 34 3.2.2 Shoreline Vegetation 42 3.3 Ecological Significance of Findings 42  4 References 44  Tables  Table 2-1 Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin 5 1996 Aquatic Species Sampling Effort 7		2.2			
3.2.2 Shoreline Vegetation		3.2			
3.3 Ecological Significance of Findings				Aquatic Macrophytes	34
Tables  Table 2-1  Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin				Shoreline Vegetation	
Tables  Table 2-1 Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin		3.3	Ecologi	ical Significance of Findings	42
Table 2-1 Sampling Site Locations and Descriptions, Wisconsin River Below Rhinelander, Wisconsin	4	Refer	ences .	•••••••••••••••••••••••••••••••••••••••	44
Rhinelander, Wisconsin				Tables	
Rhinelander, Wisconsin	Tal	ble 2-1		Sampling Site Locations and Descriptions, Wisconsin River Below	
Table 2-2 1996 Aquatic Species Sampling Effort					5
Table 2-3 Benthic Aquatic Macroinvertebrates Collected June 1996	Tal	ble 2-2		1996 Aquatic Species Sampling Effort	7
				Benthic Aquatic Macroinvertebrates Collected June 1996	11

## Contents (continued)

	F	Page
Table 2-4	Tricoptera Captured During Light Trapping, Wisconsin River,	15
T-1-1- 0 #	June 12 and 19, 1996	
Table 2-5 Table 2-6	Mussels Collected July 31 - August 2, 1996	
Table 2-7	Summary of CMC 1996 and Historical Mussel Collection Data,	20
Table 2-7	Wisconsin River Between Hat Rapids Dam and Kings Dam	27
Table 2-8	Fish Species Recorded in the Wisconsin River Downstream of Hat	
	Rapids Dam	29
Table 3-1	Aquatic Macrophytes and Shoreland Vegetation Noted During June and August 1996	35
	Figures	
Figure 2-1	Wisconsin River Threatened and Endangered Species Investigation Study	
	Area	3
Figure 2-2	Benthic Macroinvertebrates, Odonata and/or Mussel Sampling Locations	4
	Appendices	
Appendix A	Regulatory Agency Correspondence	

#### 1 Introduction

Crandon Mining Company (CMC) is proposing to develop a zinc/copper mine in an area south of Crandon, Wisconsin. Environmental studies to support the construction, operation and closure of the project have been conducted from the late 1970s into the mid-1990s. One such study, the September 1995 EIR Supplement: Wisconsin River Wastewater Discharge Pipeline for the Crandon Project (Foth & Van Dyke, 1995a), provided a description of the existing environment, an assessment of potential environmental impacts, and an alternatives analysis related to the proposed Wisconsin River wastewater discharge system. That report was submitted to the Wisconsin Department of Natural Resources (WDNR) and the U.S. Army Corps of Engineers (USCOE). In a May 3, 1996 letter, the WDNR requested that CMC complete aquatic surveys for mussels and macroinvertebrates downstream of the Wisconsin River from the proposed discharge point at Hat Rapids Dam similar in scope and detail to that provided for the Wolf River system as documented in the project's Environmental Impact Report (Foth & Van Dyke, 1995b). A work plan for this work was subsequently prepared and submitted to the WDNR on May 28, 1996, (CMC, 1996a). A copy of the work plan is included in Appendix A.

The May 28th work plan outlined investigations to assess the distribution of aquatic organisms in the following functional groups: benthic macroinvertebrates, Odonata (dragonfly and damselfly), mussels, and aquatic plants. In addition to general population investigations, the field work was to include activities which targeted species which are classified by the Wisconsin Natural Heritage Inventory as threatened, endangered, or of special concern.

In late spring of 1996, representatives of Foth & Van Dyke and Environmental Compliance Consultants, Inc., (ECCI) met with the WDNR to define the area of the Wisconsin River where the field investigation would be conducted. The proposed discharge location for the treated water from the project site is at the Hat Rapids Dam, approximately six miles downstream of the City of Rhinelander. The area of biological investigation began at the tailrace of the dam downstream to Menard Island (approximately 7 miles). The actual discharge is to be on the upstream side of the dam, in an intake structure, which will result in complete mixing of the mine discharge water at that point.

In the summer of 1996, CMC, after discussions with representatives of the WDNR, determined that it would be desirable to complete an intensive targeted fish survey on selected portions of the Wisconsin River downstream of the Hat Rapids Dam to supplement WDNR's on-going fish inventory program. An August 5, 1996 letter from Don Moe, CMC, to Bill Tans, WDNR, outlining the proposed work is contained in Appendix A (CMC, 1996b).

The following report contains a summary of the aquatic investigations that were conducted. Section 2 of the report addresses fauna, while Section 3 addresses flora. Aquatic fauna studies were primarily completed by William West of ECCI, Dr. Ken Tennessen of Florence, Alabama, Mr. Don Helms of Helms & Associates, Inc., Dr. Brian Armitage of the Ohio Biological Survey, Gregory Seegert of EA Engineering, Science, and Technology, and staff of Foth & Van Dyke. Aquatic flora studies were completed by Gary Fewless of the University of Wisconsin-Green Bay and staff of Foth & Van Dyke. Tim Weyenberg of Foth & Van Dyke led the development of the work plans and coordinated with the various experts working on the project. All of these parties contributed either data or narrative for this report.

#### 2 Fauna

Aquatic biology fauna studies on the Wisconsin River were undertaken from the beginning of June 1996 into August 1996. The study area for these investigations includes those areas of the Wisconsin River from the Hat Rapids Dam downstream to Menard Island, a distance of about 7 miles. The study area is presented in Figure 2-1. The primary objective of the investigations was to provide field data on federal or state listed threatened, endangered, or special concern species, i.e., species "listed" by the Wisconsin Natural Heritage Inventory. Target species were identified prior to initiation of the 1996 field season through a review of historical records to identify known or suspected occurrences in the area. Sampling locations and time windows were selected to coincide with the life cycle and habitats of the target species. As related to fish and mussels, the historical review included areas above Hat Rapids Dam and below Menard Island downstream to Kings Dam in Tomahawk, Wisconsin, to provide additional information regarding the presence or absence of threatened, endangered, or special concern species.

#### 2.1 Field Methods

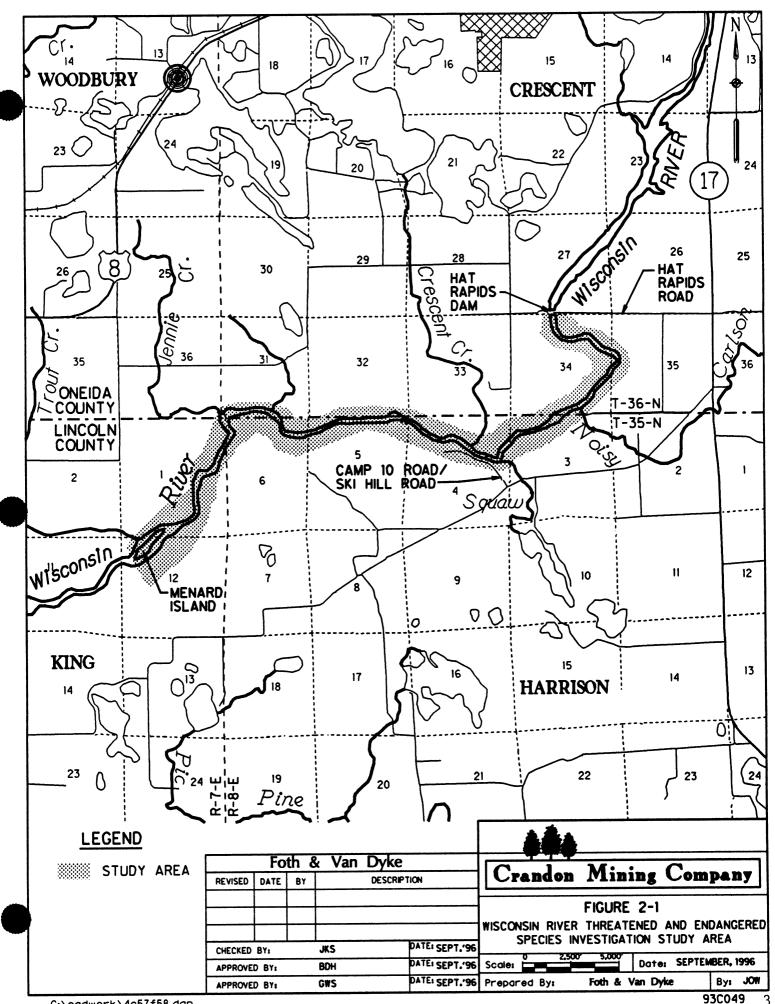
A discussion of sampling locations, field methods for the investigation, and quality control features follows.

#### 2.1.1 Sampling Locations

The area of the investigation on the Wisconsin River, bounded by the Hat Rapids Dam and Menard Island, is a true riverine environment. Below Menard Island the river tends to broaden and become somewhat slower and more indicative of a lentic environment. Substrates above Menard Island typically range from cobble to boulder with pockets of gravel and finely washed sand. Sedimentation is not prevalent above Menard Island with the exception of isolated pockets in sheltered areas.

Benthic macroinvertebrates, odonata, and mussels investigation sampling stations selected for monitoring are shown on Figure 2-2. The locations were established based on review of project objectives and completion of a site reconnaissance with the WDNR in May 1996. A list and description of the sampling stations is provided in Table 2-1. Fish were sampled continuously along a 5-mile stretch of the river from Hat Rapids Dam to Crescent Creek (approximately 100 yards below Camp Ten Road) and a 1-mile stretch in the vicinity of Menard Island.

Based on the site reconnaissance in May 1996, three major site locations were established for the biological field collections (CMC-WWI-301, 310, and 320). Most activities were completed within these three major site locations, however, mussels collections extended beyond the general site locations described. Two other sampling locations (CMC-WWI-315 and 319) were added for Odonata exuviae where riffle habitat suggested a potential existed for locating riffle species. Another sampling area (CMC-TCI-300) was selected in the field along Trout Creek for Odonata study. Finally, a separate sampling location (CMC-WWI-300) was selected for mussel collections and adult Odonata surveys. Sampling dates for individual groups of specimens, excluding fish, are shown on Table 2-2. Fish sampling was conducted on August 24, 1996.



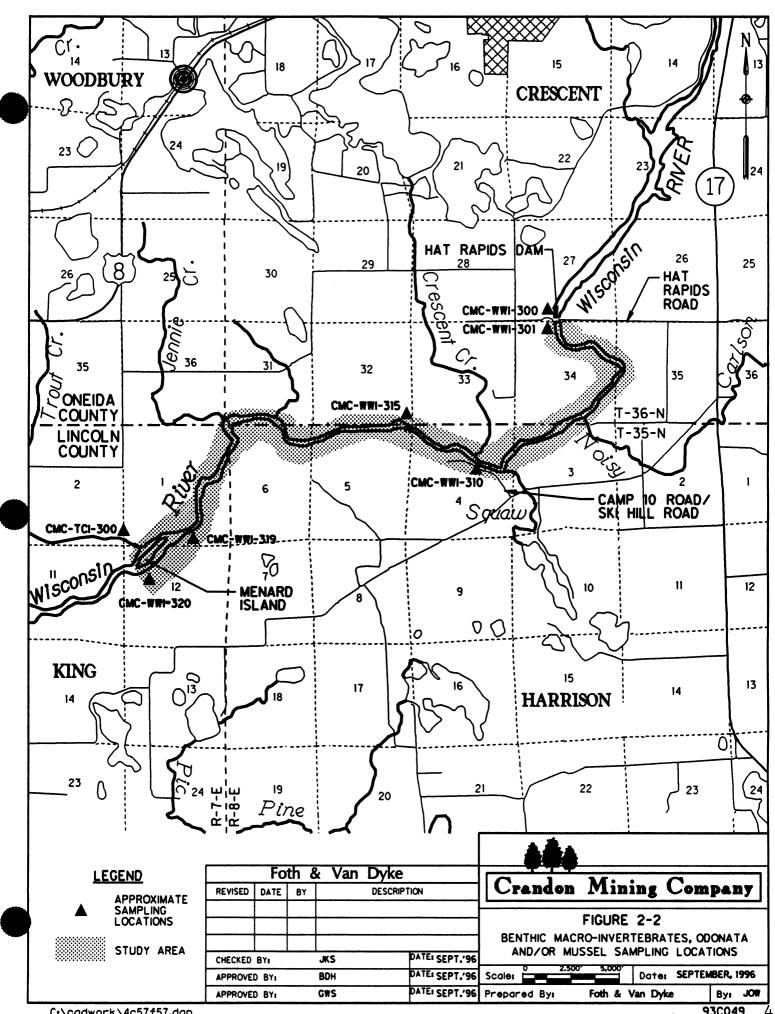


Table 2-1

# Sampling Site Locations and Descriptions Wisconsin River Below Rhinelander, Wisconsin

Site ID	Location	Description
CMC-WWI-300	Oneida County Section 27 T36N R8E	Wisconsin River immediately below Hat Rapids Dam downstream to the bridge on Hat Rapids Road. Covers the tailrace of the dam. Search for mussels and adult Odonata was conducted here. Habitat is comprised of boulders, rocks, and cobble with washed gravel in interstices; some debris below dam in tailrace.
CMC-WWI-301 <sup>1</sup>	Oneida County Section 34 T36N R8E	Wisconsin River immediately below the bridge on Hat Rapids Road to a point approximately 100 yards downstream. Collections consisted of benthic macroinvertebrates, Odonata adults and exuviae, and light trapping for insects. Habitat is comprised of few boulders, mostly rock and cobble with washed gravel; shoreline with some silt along erodible banks (left bank facing downstream).
CMC-WWI-310 <sup>1</sup>	Lincoln County Section 4 T35N R8E	Wisconsin River at Camp 10 landing. Area of study approximately 100 yards upstream and downstream of landing. Collections included benthic macroinvertebrates, Odonata adults and exuviae, light trapping for insects, and mussels. Mainstream with boulders and rocks, protected shore with gravel, cobble, and rock; silt along shore.
CMC-WWI-315	Oneida County Section 32 T36N R8E	Wisconsin River immediately upstream of Whirlpool Rapids. Collections included Odonata adults and exuviae. Habitat mostly boulders, rocks, and cobble along right bank where collections occurred.
CMC-WWI-319	Lincoln County Section 1 T35N R7E	Wisconsin River immediately upstream of Menard Island (approximately 100 yards upstream) where riffle exists. Collections included Odonata adults and exuviae. Both banks of boulder, rock, and cobble with gravel in interstices, a well-washed riffle area; very little silt except in slack water areas.
CMC-WWI-320 <sup>1</sup>	Lincoln County Section 1 & 12 T35N R7E	Wisconsin River immediately adjacent to Menard Island, approximately 200 yards from head of island toward toe. Collections included benthic macroinvertebrates, Odonata adults and exuviae, and mussels. Some gravel and rocks, mostly silt and soft sediment along right bank, left bank with more rock and cobble further downstream but turning to all soft sediments by downstream end of Menard Island.

Table 2-1 (Continued)

Site ID	Location	Description
CMC-TCI-300	Lincoln County Section 1 & 2 T35N R7E	Trout Creek approximately 1/8 mile west of Menard Island. Beaver pond with flooded meadow, discharge east to Wisconsin River. Sediments: washed sand and gravel turning to muck near Wisconsin River confluence. Collections included adult Odonata. Sediments include washed sand and gravel turning to muck near Wisconsin River confluence; muck bottom near beaver pond, center of Trout Creek washed gravel with edges of soft sediment and silt deposit and undercut bank common.

<sup>&</sup>lt;sup>1</sup>Designates sample site where the majority of field investigations were conducted.

Prepared by: WMW Checked by: BDH

Table 2-2
1996 Aquatic Species Sampling Effort

Date	CMC-WWI-300	CMC-WWI-301	CMC-WWI-310	CMC-WWI-315	CMC-WWI-319	CMC-WWI-320	CMC-TCI-300
06-05-96		B,L	B,L			В	
06-12-96		E	E			E	Α
06-18-96						E	A
06-19-96		L	E,A,L			A	•
06-20-96			A		E,A	A	Α
06-21-96	Α	E,A			<b>1</b> 2,7 1		
06-22-96			Α	E,A			
07-31-96			M,E,A				
08-01-96	M		A			MEA	
08-02-96	M,A		- <del>-</del>			M,E,A	

A = adult Odonata

B = benthos

E = exuviae

L = Light trapping

M = mussel

Prepared by: WMW Checked by: JWS

#### 2.1.2 General Benthic Macroinvertebrates

Aquatic macroinvertebrate collections were conducted on June 5, 1996 at the three primary sites on the Wisconsin River. In general, three collection techniques were used for aquatic macroinvertebrates, including kick seining with an 8 x 18 inch rectangular net (800 to 900 micron mesh), surber sampler, and Ekman dredge. The rectangular net was used in all habitats to search bottom substrate, undercut banks, and sweep aquatic vegetation. The rectangular net was supplemented in riffle areas with the surber sampler and in soft bottom habitat with the Ekman dredge. Where the surber sampler and Ekman dredge were used, triplicate samples were collected, washed in a 600 to 800 micron filter, and preserved in formalin. Each microhabitat was sampled by one biologist for a minimum of two hours or until a five minute period produced no new species, whichever was the longer period.

Some organisms, such as the nymphs of Ephemeroptera and Plecoptera and larvae of Trichoptera and Coleoptera are difficult to identify to species. Therefore, light trapping for the adults of these groups was conducted in the summer of 1996. Light trapping was conducted on June 5 at Hat Rapids Dam and at the Camp Ten Road boat landing and again on June 19 at the same two locations. For light trapping efforts, common camping type lanterns were used. Each lantern contained two ultraviolet lights powered by eight size D batteries. Batteries were fully charged each night of sampling. Trapping efforts included the first two hours after sunset.

All macroinvertebrate samples were preserved on site with 10 percent formalin. Preserved samples were shipped to Dr. Ken Tennessen in Florence, Alabama, for identification. General macroinvertebrate specimens were identified by Dr. Tennessen. For light trapping collections, Trichoptera were identified by Dr. Brian Armitage of the Ohio Biological Survey. Voucher specimens of all threatened, endangered, or special concern species were sent to William Smith, WDNR for documentation, when required. Otherwise, voucher specimens were prepared for storage at the Richter Museum, University of Wisconsin-Green Bay, Green Bay, Wisconsin.

#### 2.1.3 Odonata

Collection efforts for Odonata (dragonflies and damselflies) included searches for nymphs (aquatic), adults (terrestrial), and exuviae (casings left after emergence of nymphs from aquatic environment). Nymphs were collected during the general macroinvertebrate collection time period on June 5, 1996. Exuviae collections were conducted from shoreline locations in June with the greatest level of effort being expended from June 12 through June 22. Additional sampling was conducted in July and August in conjunction with the mussel survey work, however, no additional exuviae were collected during the later time window. Adult Odonata were collected or identified on the wing from late June into August, 1996. Collection methods and locations of Odonata nymph sampling are described above in Sections 2.1.2 and 2.1.1, respectively.

At each site, exuviae were collected over an approximate 100-meter distance along the shoreline within a minimum 3-foot strip from the water's edge landward. At each site except Whirlpool Rapids, both sides of the river were searched. During enumeration and identification, samples collected from each side of the river were kept separate. The sampling width increased if flat shoreline allowed emerging Odonata to penetrate further. Likewise, where steep banks occurred, the search area was more vertical than horizontal. All samples were placed in plastic containers

and preserved in 70 percent alcohol. Identifications were completed by Dr. Ken Tennessen, with assistance from William West of ECCI.

For some species of Odonata, nymph and exuviae collection techniques are not sufficient to document their presence or absence. Therefore, to provide a more complete collection effort, adults were sampled during the week of June 19, 1996. Dr. Tennessen, accompanied by William West, collected adult Odonata specimens from the three primary locations as well as CMC-WWI-315 and CMC-TCI-300. In general, all adult collections required the use of long handled (4 to 6 feet) sweep nets. Most specimens could be readily collected on the wing. Common species were collected, identified, the sex identified, recorded, and released. Special concern species were collected, identified, sexed, recorded and saved in plastic envelopes in the field. These specimens were placed in acetone in the laboratory.

Dr. Tennessen identified some adult Odonata specimens on the wing which were either common or which were out of reach, and therefore unable to be collected. Tentative identifications of visual observations were compared with other collection data (nymph and exuviae collections).

Additional adult Odonata collections were conducted by William West in conjunction with the mussel collection activities in late July and early August. These specimens were placed in plastic envelopes, preserved in acetone, and sent to Dr. Tennessen for identification.

#### 2.1.4 Mussels

Mussels were collected primarily by diving. The divers were directed to search a variety of habitats at each of the three locations (CMC-WWI-300, 310, and 320). In addition to visually searching, substrates were examined by passing the hands through the surface layers of sediment to feel for buried mussels. Rocks were moved to examine for mussels beneath them, and substrates beneath large boulders were examined by reaching under and sweeping material from beneath them. The latter technique was particularly important in searching for the salamander mussel (Simpsonaias ambigua) which is generally found beneath large rocks frequented by its salamander host.

In addition, diving was supplemented with wading and visually searching from the surface with or without glass bottomed buckets. This latter technique is often effective in shallow riffle and shoal areas.

As outlined in the May 28, 1996 work plan (CMC, 1996a), captured mussels were accumulated and retained in mesh bags until processed. The original intent was to accumulate them in lots of 20 for enumeration by species. Since sufficient numbers of mussels could not be collected to accomplish this goal, searching was discontinued after four hours of effort was expended. This sampling strategy is consistent with methodology for the surveys conducted in 1994 at other sites near Crandon (Helms and Associates, 1994).

Processing of mussels commenced soon after specimens were captured and proceeded quickly to reduce exposure time (Waller, et al., 1993). Mussels were kept submersed in ambient water to prevent thermal shock and/or desiccation while being identified and counted. Following processing, they were handplaced back into the substrate in their approximate original position in the river. Mr. David Heath of the WDNR assisted in identification. Keys used included Stern (1990) and Burch (1975). Nomenclature followed Turgeon, et al. (1988). Voucher specimens

were retained for each species identified for submittal to the WDNR. Water temperature and substrate type as well as other pertinent observations were recorded for each sample collection.

#### 2.1.5 Fish

Fish sampling was conducted on August 24, 1996. The objective was to determine the current status of the greater redhorse, *Moxostoma valenciennese*, and black redhorse, *Moxostoma duquesnei*, in the Wisconsin River between Hat Rapids Dam and Menard Island. However, all species of fish observed were recorded. Electrofishing was conducted in two areas: a 5-mile section from the base of Hat Rapids Dam to Crescent Creek and a 1-mile section in the vicinity of Menard Island. Equipment used during the sampling event included a 16 ft boat rigged with "Wisconsin" rings as the anode, and a Model VVP15 Coffelt electrofisher, used to control the output, which was typically between 400-450 volts pulsed DC and 4-6 amps. Sampling was conducted in a downstream direction. Actual shock time was three hours. Because of the habitat preference of the target species, the greatest portion of the sampling effort was aimed at swift water with rock substrates. Knowing this, lenthic species (i.e., rock bass, bluegill, pumpkinseed, etc.) were potentially underestimated.

The survey was conducted by Greg Seegert and Joseph Vondruska of EA Engineering, Science, and Technology, with assistance from Brad Helmandollar of Foth & Van Dyke. Because of the large number of redhorse that were observed, it was not possible to net every specimen. However, all stunned redhorse were observed, and any that could possibly represent either of the target species were netted for closer examination, then released.

#### 2.1.6 Quality Control

Field and laboratory quality control procedures were utilized during the aquatic biology studies such that the work was completed according to currently accepted standards of practice. Team leaders with senior level experience in the discipline in each field activity were assigned for each field task. Significant finds were documented in the field. Voucher specimens for all threatened, endangered, and special concern species were forwarded to WDNR. Voucher specimens for general species collections will be maintained for species verification at the University of Wisconsin-Green Bay Richter Museum.

A daily log of field activities was maintained by the field team leader who signed and dated the entries. A separate data sheet was used by Helms & Associates and Dave Heath (WDNR) to record the results of mussel field investigations.

#### 2.2 Results

#### 2.2.1 General Benthic Macroinvertebrates

A general list of aquatic macroinvertebrate specimens collected by site location is provided in Table 2-3. Only immature (larvae of nymphs) specimens which were in families containing a threatened, endangered, or special concern species were keyed to genus and, where possible, species. Table 2-4 provides the data summary for adult Trichoptera which were captured during light trapping collection efforts in June. With the exception of some Odonata, no threatened, endangered, or special concern species were collected from the study area. Odonata is discussed in Section 2.2.2.

Table 2-3
Benthic Aquatic Macroinvertebrates Collected June 1996

Site ID	Order	Family	Genus/species	Number found
CMC-WWI-301	Ephemeroptera	Baetidae	Acerpenna sp.1	4
			Acerpenna sp.2	3
		Ephemerellidae	Eurylophella sp.	3
			Ephemerella sp.	3
		Heptageniidae	Stenacron sp.	8
			Stenonema sp.	12
	Plecoptera	Perlodidae	Isoperla sp.	7
		Chloroperlidae	Haploperla sp.	1
	Trichoptera	Philopotamidae	Chimarra sp.	7
		Hydropsychidae	Ceratopsyche sp.	31
			Cheumatophyche sp.	46
			Hydrophyche sp.	1
	Coleoptera	Elmidae	Stenelmis	2 adults
			Stenelmis sp.	10 larvae
	Diptera	Chironomidae	Tanypodinae	6
			Orthocladiinae	10
		Tabanidae	Chrysops sp.	1
		Tipulidae	Antocha sp.	2
	Isopoda			6
	Amphipoda			3
	Decapoda			2
	Oligochaeta			5
	Hirudinea			2
	Snails			5
	Clams		Corbicula	1
CMC-WWI-310	Ephemeroptera	Baetidae	Acerpenna sp.1	21

Table 2-3 (Continued)

Site ID	Order	Family	Genus/species	Number found
			Acerpenna sp.2	6
		Ephemerellidae	Eurylophella sp.	1
			Ephemerella sp.	50
		Heptageniidae	Stenacron sp.	2
			Stenonema sp.	10
		Leptophlebiidae	Paraleptophlebia sp.	3
		Baetiscidae	Baetisca sp.	1
	Odonata	Gomphidae	Gomphus fraternus	1
			Gonphus lividus	1
			Hagenius brevistylus	1
			Ophiogomphus rupinsulensis	4
		Calopterygidae	Calopteryx sp.	1
	Plecoptera	Perlodidae	Isoperla sp.	4
		Chloroperlidae	Haploperla sp.	7
		Perlidae	Phasgonophora sp.	3
	Hemiptera	Corixidae	genus unidentified	2
	Trichoptera	Philopotamidae	Chimarra sp.	5
		Hydropsychidae	Ceratopsyche sp.	33
			Cheumatopsyche sp.	87
			Macrostemum sp.	2
		Polycentropidae	Cyrnellus sp.	1
			Neureclipsis sp.	1
			Polycentropus sp.	1
		Leptoceridae	Oecetis sp.	1

Table 2-3 (Continued)

Site ID	Order	Family	Genus/species	Number found
		Limnephilidae	Limnephilus sp.	20
	Coleoptera	Elmidae	Stenelmis	3 adults
			Stenelmis sp.	6 larvae
		Haliplidae	Peltodytes sp.	1 adult
			Peltodytes sp.	2 larvae
	Diptera	Chironomidae	Tanypodinae	1
			Orthocladiinae	9
		Tipulidae	Antocha sp.	1
		Diptera pupae	genera unidentified	2
	Amphipoda			8
	Decapoda			2
	Oligochaeta			2
	Snails			2
CMC-WWI-320	Ephemeroptera	Baetidae	Acerpenna sp. 1	3
		Ephemerellidae	Eurylophella sp.	2
			Ephemerella sp.	5
		Heptageniidae	Stenacron sp.	4
			Stenonema sp.	34
		Isonychiidae	Isonychia sp.	2
		Baetiscidae	Baetisca sp.	1
		Caenidae	Caenis sp.	1
	Odonata	Aeshnidae	Basiaeschna janata	1
		Gomphidae	Ophiogomphus rupinsulensis	1
		Calopterygidae	Calopteryx aequabilis	3
			Calopteryx maculata	1
		Coenagrionidae	Argia moesta	1

Table 2-3 (Continued)

Site ID	Order	Family	Genus/species	Number found
			Ischnura verticalis	3
	Plecoptera	Perlodidae	Isoperla sp.	3
		Chloroperlidae	Haploperla sp.	12
		Perlidae	Phasgonophora sp.	4
	Trichoptera	Philopotamidae	Chimarra sp.	1
		Hydropsychidae	Cheumatopsyche sp.	19
		Helicopsychidae	Helicopsyche sp.	1
		Limnephilidae	Limnephilus sp.	11
	Coleoptera	Elmidae	Stenelmis	2 adults
			Stenelmis sp.	1 larvae
	Diptera	Chironomidae	Tanypodinae <sup>1</sup>	1
			Orthocladiinae <sup>1</sup>	6
		Tabanidae	Chrysops sp.	1
	Isopoda			13
	Amphipoda			12
	Decapoda			2
	Oligochaeta			2
	Snails			3
	Clams		Corbicula	8

<sup>1</sup>Subfamily of chironomidae.

Prepared by: WMW Checked by: BDH

Table 2-4

Tricoptera Captured During Light Trapping Wisconsin River, June 12 and 19, 1996

	Site ID: CN	IC-WWI-301	Site ID: CMC-WWI-310		
Species	June 12	June 19	June 12	June 19	
Glossosomatidae					
Protoptila sp.				f	
Goeridae				•	
Goera stylata				f	
Helicopsychidae				•	
Helicopsyche borealis		m			
Hydropsychidae					
Ceratopsyche altemans			m		
Ceratopsyche morosa <sup>1</sup>	f	m,f	m,f	m,f	
Cheumatopsyche cympyla		f	f	f	
Cheumatopsyche pettiti <sup>1</sup>	${f f}$	m,f	f	f	
Hydroptilidae		·	-	•	
Hydroptila grandiosa¹	${f f}$	m,f	f	f	
Hydroptila nr. scolops		ŕ	<u>-</u>	m,f	
Oxyethira forcipata		m		m	
Stactobiella palmata		m,f		m,f	
Lepidostomatidae					
Lepidostoma sp.				f	
Leptoceridae				•	
Ceraclea ancylus		f		m,f	
Ceraclea resurgens		m		f	
Ceraclea sp.				f	
Oecetis cinerascens		m		4	
Oecetis inconspicua		m			
Triaenodes tardus		f			

Table 2-4 (Continued)

	Site ID: CN	AC-WWI-301	Site ID: CMC-WWI-310		
Species	June 12	June 19	June 12	June 19	
Limnephilidae					
Hydatophylax argus				f	
Philopotamidae					
Chimarra obscura		m,f		m,f (dominant)	
Polycentropodidae					
Neureclipsis validus		m			
Nyctiophylax sp.				f	
Phylocentropus placidus		m		m	
Polycentropus cinereus		m			
Psychomyiidae					
Psychomyia flavida <sup>1</sup>	f	f	f	f	

<sup>1</sup>common in all samples

m = male

f = female

Prepared by: BA Checked by: WMW

#### 2.2.2 Odonata

Collection efforts for Odonata (dragonflies and damselflies) included searches for nymphs (aquatic), adults (terrestrial), and exuviae (casings left after emergence of nymphs from aquatic environment). Nymphs were collected during the general macroinvertebrate collection time period on June 5, 1996. Exuviae were collected from shoreline locations during mid to late June. Adult Odonata were collected or identified on the wing from late June into August, 1996. Collection methods and locations of Odonata nymph sampling are described above in Section 2.1.

Comprehensive collections of each of the life forms of Odonata species, i.e., nymph, final instar exuviae, and adult from the study area revealed, in general, members of the Odonata are widely distributed throughout the study area. One species, *Ophiogomphus howei*, which is ranked as endangered by the Wisconsin Natural Heritage Inventory, was collected at a single location (CMC-WWI-310) in the study area. Seven special concern species were collected and/or observed at several locations in the study area. These special concern species include the following: *Gomphus lineatifrons*, *G. quadricolor*, *G. ventricosus*, *G. viridifrons*, *Nasiaeschna pentacantha*, *Somatochlora kennedyi*, and *S. franklini*. Results of the Odonata collection activities are provided in Table 2-5.

#### 2.2.3 Mussels

## 2.2.3.1 Abundance and Diversity

Mussels observed in the study area during collections were too sparse to allow the use of the technique of grouping the catch in lots of 20 for processing. Therefore, a minimum of four hours of effort were expended searching for mussels at each location. Total catch for the three locations combined was 123 individuals. Mussel abundance increased with increased distance downstream of Hat Rapids Dam as shown in Table 2-6. Twenty-three individuals were collected at Site CMC-WWI-300 while 34 and 66 specimens were collected at Sites CMC-WWI-310 and CMC-WWI-320, respectively. Similarly, species diversity appeared to increase progressively in a downstream direction from the dam as five, six, and eight species were encountered in each location respectively. Species diversity in these samples, however, may be a function of sample size as one would expect to increase the number of species collected with larger numbers of individuals.

#### 2.2.3.2 Species Composition

Nine taxa were collected from the Wisconsin River in the area of the survey. One species is classified as special concern in the Wisconsin Natural Heritage Inventory. No threatened or endangered species were encountered. Anodonta grandis was the most common species, comprising 23 percent of the overall catch. The next most common species were Lasmigona complanata (21%), Lampsilis siliquoidea (20%), Lampsilis cardium (17%), and Fusconia flava (11%). Lasmigona compressa, the species of special concern was moderately common at 4 percent of the total catch and was found at two of the three locations. Two specimens of Actinonaias carinata (2%) were collected below the Hat Rapids Dam and a single specimen each of Lasmigona costata and Strophitus undulata (1%) were collected at the furthest downstream location.

Table 2-5
Odonata Collected in June and August 1996

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number <sup>1</sup>
Amphiagrion saucium	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
Argia moesta	CMC-WWI-320	Lincoln	1 &12	35N7E	6-5-96	N	N	1
22.6w	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	Α	N	
Basiaeschna janata	CMC-WWI-301R	Oneida	34	36N8E	6-12-96	E	N	1
2	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 &12	35N7E	6-20-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-5-96	N	N	1
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	N	1
Calopteryx sp.	CMC-WWI-310	Lincoln	4	35N8E	6-5-96	N	N	1
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	E	N	1
Calopteryx aequabilis	CMC-WWI-310	Lincoln	4	35N8E	6-19-96	Α	N	
The state of the s	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-5-96	N	N	3
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	1
	CMC-WWI-301L	Oneida	34	36N8E	6-12-96	E	N	1
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	E	N	1
	CMC-WWI-320L	Lincoln	1 & 12	35N7E	6-20-96	E	N	1
Calopteryx maculata	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
Caropioryii iiiii	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-5-96	N	N	1
	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	

Table 2-5 (Continued)

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number <sup>1</sup>
Cordulegaster maculata	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	8-1-96	Α	N	
Coenagrion resolutum	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
Cordulia shurtleffi	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
Didymops transversa	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-301L	Oneida	34	36N8E	6-21-96	E	N	3
Dorocordulia libera	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	N	
Dromogomphus spinosus	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	E	N	1
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	E	N	2
	CMC-WWI-320	Lincoln	1 & 12	35N7E	8-1-96	Α	N	
Epitheca (Tetragoneuria) canis	CMC-WWI-310	Lincoln	4	35N8E	6-19-96	Α	N	
	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-12-96	Α	N	
Epitheca (Tetragoneuria) cynosura	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	N	
Epitheca (Tetragoneuria) spiningera	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	N	
Enallagma boreale	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
Gomphus adelphus	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	5
	CMC-WWI-319L	Lincoln	1	35N7E	6-20-96	Е	N	1

Table 2-5 (Continued)

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number <sup>1</sup>
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	Е	N	1
G. exilis	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	N	1
G. fraternus	CMC-WWI-310	Lincoln	4	35N8E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	N	
	CMC-WWI-310	Lincoln	4	35N8E	6-5-96	N	N	1
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	25
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	E	N	1
	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	E	N	4
	CMC-WWI-319L	Lincoln	1	35N7E	6-20-96	E	N	1
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	E	N	2
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	N	3
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	N	23
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-12-96	E	N	4
G. lineatifrons	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	SC	1
	CMC-WWI-301R	Oneida	34	36N8E	6-21-96	$\mathbf{E}^{-1}$	SC	4
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	SC	6
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	SC	4
G. lividus	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-310	Lincoln	4	35N8E	6-5-96	N	N	1
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	2

 Table 2-5 (Continued)

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number <sup>1</sup>
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	Е	N	1
	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	E	N	1
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	N	1
G. quadricolor	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-19-96	Α	SC	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	SC	
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	SC	13
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	E	SC	5
	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	E	SC	2
	CMC-WWI-320L	Lincoln	1 & 12	35N7E	6-20-96	E	SC	1
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	SC	1
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-12-96	E	SC	20
G. vastus	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	166
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	E	N	19
	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	E	N	23
	CMC-WWI-319L	Lincoln	1	35N7E	6-20-96	E	N	10
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	E	N	21
	CMC-WWI-301L	Oneida	34	36N8E	6-21-96	E	N	7
	CMC-WWI-301R	Oneida	34	36N8E	6-21-96	E	N	14
	CMC-WWI-320L	Lincoln	1 & 12	35N7E	6-20-96	E	N	6
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	N	65
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	N	84
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-12-96	E	N	6

Table 2-5 (Continued)

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number
G. ventricosus	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	SC	
G. viridifrons	CMC-WWI-301R	Oneida	34	36N8E	6-12-96	Α	SC	
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	Α	SC	
	CMC-WWI-301R	Oneida	34	36N8E	6-12-96	E	SC	1
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	E	SC	6
	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	E	SC	2
	CMC-WWI-319L	Lincoln	1	35N7E	6-20-96	E	SC	1
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	E	SC	2
	CMC-WWI-320L	Lincoln	1 & 12	35N7E	6-20-96	E	SC	2
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	SC	3
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	SC	3
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-12-96	E	SC	7
G. spicatus	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
Hagenius brevistylus	CMC-WWI-310	Lincoln	4	35N8E	6-5-96	N	N	1
	CMC-WWI-301L	Oneida	34	36N8E	6-21-96	E	N	1
Ischnura verticalis	CMC-WWI-310	Lincoln	4	35N8E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-5-96	N	N	3
Ladona julia	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
Lestes dryas	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
Leucorrhinia frigida	CMC-WWI-310	Lincoln	4	35N8E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
L. intacta	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	

 Table 2-5 (Continued)

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number <sup>1</sup>
L. proxima	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	A	N	
L. hudsonica	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
Libellula lydia	CMC-WWI-315	Oneida	32	36N8E	6-22-96	Α	N	
L. quadrimaculata	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-20-96	Α	N	
	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-12-96	Α	N	
Macromia illinoiensis	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	N	
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	2
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	E	N	1
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	N	4
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	N	2
Nasiaeschna pentacantha	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	SC	1
Nehalennia irene	CMC-TCI-300	Lincoln	1 & 2	35N7E	6-19-96	Α	N	
Ophiogomphus colubrinus	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	N	3
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-12-96	E	N	1
O. howei	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	E	END	1
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	END	1
O. rupinsulensis	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	N	
-	CMC-WWI-310	Lincoln	4	35N8E	6-5-96	N	N	4
	CMC-WWI-320	Lincoln	1 & 12	35N7E	6-5-96	N	N	1
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-18-96	E	N	178
	CMC-WWI-301L	Oneida	34	36N8E	6-12-96	E	N	3
	CMC-WWI-310L	Lincoln	4	35N8E	6-12-96	Е	N	188

Table 2-5 (Continued)

Species	Site ID	County	Section	T/R	Date	Form	Rank	Number <sup>1</sup>
	CMC-WWI-315R	Oneida	32	36N8E	6-22-96	Е	N	19
	CMC-WWI-319L	Lincoln	1	35N7E	6-20-96	E	N	84
	CMC-WWI-319R	Lincoln	1	35N7E	6-20-96	$\mathbf{E}$	N	59
	CMC-WWI-301L	Oneida	34	36N8E	6-21-96	E	N	3
	CMC-WWI-301R	Oneida	34	36N8E	6-21-96	E	N	2
	CMC-WWI-320L	Lincoln	1 & 12	35N7E	6-20-96	E	N	5
	CMC-WWI-310R	Lincoln	4	35N8E	6-19-96	E	N	201
	CMC-WWI-310L	Lincoln	4	35N8E	6-19-96	E	N	69
	CMC-WWI-320R	Lincoln	1 & 12	35N7E	6-12-96	E	N	240
	CMC-WWI-320	Lincoln	1 & 12	35N7E	8-1-96	Α	N	
Somatochlora kennedyi	CMC-WWI-310	Lincoln	4	35N8E	6-20-96	Α	SC	
S. franklini	CMC-WWI-310	Lincoln	4	35N8E	6-22-96	Α	SC	

Site ID: R = Right bank facing downstream.

L = Left bank facing downstream.

Form: A = Adult Rank: N = None

N = Nymph SC = Special Concern E = Exuviae END = Endangered

Number = Total number found of that particular form.

<sup>1</sup>Numbers only appear in this column for the forms nymph and exuviae.

Prepared by: WMW Checked by: BDH

Table 2-6

Mussels Collected July 31 - August 2, 1996

		Location		_		
Species	CMC-WWI-300	CMC-WWI-310	CMC-WWI-320	Total #	Percent	Status
Anodonta grandis	4	6	18	28	23	None
Lasmigona complanata	0	4	22	26	21	None
Lampsilis siliquoidea	10	9	6	25	20	None
Lampsilis cardium	4	1	16	21	17	None
Fusconia flava	3	10	1	14	11	None
Lasmigona compressa	0	4	1	5	4	Special Concern
Actinonaias carinata	2	0	0	2	2	None
Lasmigona costata	0	0	1	1	<1	None
Strophitus undulatus	0	0	1	1	<1	None
Totals	23	34	66	123	100.0	
No. of species	5	6	8	9		

Prepared by: WMW/DRH Checked by: BDH This species list was compared with a data set (Table 2-7) provided by David Heath of the WDNR in 1996 (Heath, 1996) for pertinent mussel records in the area. The Heath information is a compilation of data from 1992 through 1995. Data from available records for the reach of the Wisconsin River between Hat Rapids Dam and Kings Dam (16.2 miles) show total collection of 242 live individuals of seven species and 512 dead individuals of 14 species. Included in the WDNR data set for live individuals are two species not collected in the CMC survey. These included one individual of Anodonta imbicillis and three individuals of Anodontoides ferussacianus. It is unclear where these specimens were collected, but since both species are commonly found associated with softer substrates, it is possible they were collected further downstream where ponding effects of the reservoir made habitat more conducive to their existence. The CMC survey produced four living individuals of species not reported from previous surveys. These included: L. cardium, A. carinata, L. costata, and S. undulatus. L. compressa, a species of special concern, was represented in both data sets.

Five additional species which were found dead are included in the WDNR data set (Table 2-7). Since it is unclear how long these individuals had been dead before their discovery, some of them may no longer be present in the community. They have at least been present in the past.

Additional historical listings for the area are provided from an archaeological dig (Beard, et al., 1993) in the Kings Dam vicinity. That study reported the composition of shell middens presumably created by pearl hunters dating around the early 1900s.

In all, 19 species have been reported from this area from the three investigations. As presented in Table 2-7, six species found during the three surveys (i.e., Helms, 1996; WDNR, 1993; and Beard, et al., 1993) are included on the Wisconsin Natural Heritage Inventory. Two, Cyclonaias tuberculata and Plethobasus cyphyus are endangered, and one, Quadrula metanevra is threatened. Three others, Alasmidonta marginata, Lasmigona compressa and Pleurobema sintoxia, are on the special concern list.

#### 2.2.4 Fish

During the 1996 survey, 23 species of fish were documented (Table 2-8). Neither of the target species (greater redhorse and black redhorse) were observed. No species currently listed on the Wisconsin Natural Heritage Inventory were documented. Shorthead redhorse was clearly the most abundant species with approximately 1000 observations. Silver redhorse and northern hog sucker were also abundant. Although redhorse species were found throughout the study area, they were noticeably more common in the high gradient areas near Hat Rapids Dam, near the Camp 10 road access point, and adjacent to and upstream of Menard Island.

Except for logperch, forage fish (i.e., minnows and darters) were rare to uncommon. Smallmouth bass was the most common game fish observed, with small numbers of walleye, musky, northern pike, and largemouth bass also noted.

Fish sampling was done on the Wisconsin River by WDNR in August 1995 (Theis, 1996) from the Hat Rapids Dam downstream for 2 miles. Techniques used consisted of fyke nets and electrofishing. During the sampling, 24 species were recorded as shown in Table 2-8.

Table 2-7

Summary of CMC 1996 and Historical Mussel Collection Data
Wisconsin River Between Hat Rapids Dam and Kings Dam

		MC Survey 196	V	VDNR Surv	vey Data 1	1993¹	Archeol	ogical Dig 193 <sup>2</sup>		
Species	Total #	Percent	No. Live		No. Dead		47-	Li-88	Status	
Actinonaias carinata	2	2%	0	0	15	3%	407	23%	None	
Alasmidonta marginata	0	0	0	0	5	1%	21	1%	Special Concern	
Amblema plicata	0	0	0	0	4	<1%	12	<1%	None	
Anodontoides ferussacianus	0	0	3	1%	0	0	0	0	None	
Anodonta grandis	28	23%	178	74%	198	39%	0	0	None	
A. imbicillis	0	0	1	<1%	2	<1%	0	0	None	
Cyclonaias tuberculata	0	0	0	0	0	0	3	<1%	Endangered	
Elliptio dilatata	0	0	0	0	4	<1%	22	1%	None	
Fusconia flava	14	11%	14	6%	142	28%	0	0	None	
Lampsilis cardium	21	17%	0	0	16	3%	842	48%	None	
L. siliquoidea	25	20%	15	6%	91	18%	23	1%	None	
Lasmigona complanata	26	21%	27	11%	7	1%	1	<1%	None	
L. compressa	5	4%	4	2%	8	2%	0	0	Special Concern	
L. costata	1	<1%	0	0	10	2%	241	14%	None	
Legumia recta	0	0	0	0	9	2%	162	9%	None	
Plethobasus cyphyus	0	0	0	0	1	<1%	0	0	Endangered	
Pleurobema sintoxia	0	0	0	0	0	0	2	<1%	Special Concern	

Table 2-7 (Continued)

	Helms CMC Survey 1996		,	WDNR Surv	ey Data	1993¹	Archeo 1			
Species	Total #	Percent	N	o. Live	No	o. Dead	47-Li-88		Status	
Qaudrula metanevra	0	0	0	0	0	0	3	<1%	Threatened	
Strophitus undulatus	1	<1%	0	0	0	0	2	<1%	None	
Totals	123	100.0%	242	100.0%	512	100.0%	1741	100.0%		
No. of Species	9		7		14		13			

<sup>&</sup>lt;sup>1</sup>Heath, 1996.

<sup>2</sup>Beard, et al., 1993.

Prepared by: WMW/DRH

Checked by: BDH

Table 2-8

Fish Species Recorded in the Wisconsin River
Downstream of Hat Rapids Dam

Common Name	Scientific Name	Number Captured on August 24, 1996	Observed by WDNF in August 1993 <sup>1</sup>
Common shiner	Luxilus cornutus	15	X
Hornyhead chub	Nicomis biguttatus	10	X
Blacknose shiner	Notropis heterolepis	1 <sup>2</sup>	
Bluntnose minnow	Pimephales notatus	5	X
Longnose dace	Rhinichthys cataractae	2	X
White sucker	Catostomus commersoni	25	X
Silver redhorse	Moxostoma anisurum	~200	
Golden redhorse	Moxostoma erythrurum	5	X
Shorthead redhorse	Moxostoma macrolepidotum	~1,000	X
Northern hog sucker	Hypentelium nigricans	~300	X
Muskellunge	Exos masquinongy	11	X
Northern pike	Exos lucius	3	X
Yellow bullhead	Ameiurus natalis	1 <sup>2</sup>	X
Black crappie	Pomoxis nigromaculatus	1 <sup>2</sup>	X
Rock bass	Ambloplites rupestris	2	X
Bluegill	Lepomis macrochirus	1	X
Smallmouth bass	Micropterus dolomieu	~50	X
Largemouth bass	Micropterus salmoides	2	
Yellow perch	Perca flavescens	<b>7</b> <sup>2</sup>	X
Walleye	Stizostedion vitreum	15	X
Johnny darter	Etheostoma nigrum	2	X
Logperch	Percina caprodes	~75	X
Slenderhead darter	Percina phoxocephala	2	X
Black bullhead	Ictalurus melas		X
Greater redhorse	Moxostoma valenciennese		X
Pumpkinseed	Lepomis gibbosus		X
Rosyface shiner	Notropis ruvellus		X

<sup>1</sup>Total accumulated fish counts were not kept by WDNR.

Prepared by: GS Checked by: BDH

<sup>&</sup>lt;sup>2</sup>Collected only in the pooled portion of the river, downstream of Menard Island.

Comparing WDNR's results to CMC's 1996 results shows that 20 species were found common to both surveys. The CMC survey found three species not found by WDNR, while four species were found by WDNR that were not found during the CMC survey. Included in the WDNR survey was one greater redhorse, which is a state threatened species.

## 2.3 Ecological Significance of Findings

#### 2.3.1 General Benthic Macroinvertebrates

Most of the aquatic macroinvertebrate collections were instream life stages, such as annelids, leeches, insects, crustaceans and mollusks. However, to help identify some specimens to species, some groups were collected in the adult stages. Adult insect collections were conducted using light trapping techniques. Groups targeted for light trapping included members of the orders Ephemeroptera, Trichoptera, Coleoptera, and Plecoptera.

With the exception of Odonata, no threatened, endangered, or special concern species of aquatic macroinvertebrates were collected from the study area.

#### 2.3.2 Odonata

In contrast to fish and mussels, dragonflies represent a group of insects which are extremely mobile and have the ability to colonize suitable habitat fairly rapidly, i.e., they do not depend on other organisms or continuous aquatic habitat with which to disperse upstream or downstream. The Odonata are also very opportunistic. It would not be unreasonable to find populations of individual species in marginal habitat for short periods of time, and for this study, based on other similar work throughout northern Wisconsin, one would expect to find some state-listed species.

A total of 43 species of Odonata were identified from the study area. A breakdown of the findings shows that of the total species collected and/or observed, 86 percent were observed in the adult form, with 51 percent observed only in the adult form. Forty-two percent of the species were collected in the exuviae form, with 12 percent collected only as exuviae. Nymph forms were present in 21 percent of the total species encountered. However, for each species found as a nymph, an adult or exuviae form of the same species was also found resulting in positive identification and verification of the species. It is interesting to note that three of eight of the state-listed species recorded were found in the exuviae form only, highlighting the importance of varying collection methodologies when studying and inventorying dragonflies.

Several gomphids were collected from the study area, four of which are special concern species while one is an endangered species. These include Ophiogomphus howei (endangered), Gomphus lineatifrons, G. ventricosus, G. viridifrons and G. quadricolor.

G. lineatifrons is a listed species, but is fairly common in northern Wisconsin where suitable stream habitat exists. This species has a preference for medium-sized streams (15 to 20 feet wide), and was found as exuviae in low numbers at all stations within the study area.

G. lineatifrons nymphs can tolerate some degree of silt and muck in the substrate, but need a mix of sand and gravel. This microhabitat is common along the Wisconsin River above Menard Island. G. viridifrons requires much the same habitat as G. lineatifrons and the two species often occur together, although G. viridifrons appears to prefer slightly larger streams (Tennessen, 1994). G. viridifrons exuviae were found at all stations within the study area.

G. quadricolor prefers medium-sized to small streams with sand/gravel substrate and a series of pools and riffles. This species is indicative of good to excellent water quality. Larvae inhabit sandy gravel areas where flow is slow. G. ventricosus prefers medium-sized streams with silt/sand/gravel substrates and good to excellent water quality. Larvae inhabit slower flowing areas where silt and sand accumulate.

Three species of Ophiogomphus were collected from the study area, including O. nupinsulensis, O. colubrinus, and O. howei, the latter being an endangered species. O. howei was only collected in the exuviae form and only at the Camp 10 Landing (Site CMC-WII-310). Based on an assessment of habitat, this species may also occur downstream of the Camp 10 site to the Menard Island location as additional preferred habitat exists throughout this stretch of the river.

Nasiaeschna pentacantha, a species of special concern, prefers slow areas of woodland streams and lakes formed by slow streams. It also inhabits woodland ponds in the southern part of its range. Larvae cling to submerged logs and sticks, either in quiet water or along the edge of slow current where the bottom is muddy. The single specimen of N. pentacantha, an exuviae, was found in a reach of water sheltered from the main current and along a wooded bank containing numerous submerged logs.

Two species of Somatochlora were collected as adults in the study area. Both species, S. kennedyi and S. franklini are special concern species, however, because their habitat requirements during their pre-adult stages are not riverine in nature, there is no particular significance associated with these findings.

In general, habitat for state-listed species of Odonata appears to be abundant between Hat Rapids Dam and Menard Island. Although similar habitat occurs throughout the entire reach, species diversity and abundance is significantly greater from Camp 10 Landing to Menard Island. The reason for this apparent distribution pattern is unknown.

#### 2.3.3 Mussels

Nine species of mussels were collected from three locations within the study area. The number of species encountered increased the further the distance downstream from the Hat Rapids Dam. This in not typical of impounded rivers relative to mussel collections where higher numbers of specimens in the vicinity of a dam would be expected.

No threatened or endangered species were encountered during the three day search. One special concern specie, Lasmigona compressa, was collected at the two downstream sites but not at the site immediately downstream of Hat Rapids Dam. Previous records for this reach of the Wisconsin River indicate that threatened and endangered species may have occurred here including Cyclonaias tuberculata and Plethobasus cyphysus (endangered) and Quadrula metanevra (threatened). These previous records do not include live specimens.

There are a number of factors which influence the presence and distribution of mussels. These factors may include sedimentation, presence or absence of host fish species, water temperature, scouring potential of the river, and relative amount of free flowing stream.

In the reach of the river where the study was conducted, some of these factors may influence the presence and distribution of mussels. Severe scouring was noted in the area immediately downstream of Hat Rapids Dam. This causes corrosion and pitting of mussel shells.

The mussel population is somewhat isolated from the rest of the Wisconsin River by the presence of two dams (Hat Rapids and Kings). The factors favoring isolationism restricts the free movement of host species, in particular, the movement of host species upstream into the area of study. An increase in sedimentation below Menard Island was noted during the study. The accumulation of sediment has been known to be detrimental to mussel populations.

Those factors which currently influence the presence and distribution of mussels in the Wisconsin River below Hat Rapids Dam should be neither enhanced nor reduced with the addition of the proposed mine discharge. It is unlikely that any parameter in the Crandon Project discharge will be deleterious to mussel populations in the Wisconsin River. There should be a negligible increase in base flow for the system. The single special concern specie of mussel observed in the Wisconsin River in the study area should not be impacted by the discharge even if the mussel was found closer to the immediate area of the discharge.

#### 2.3.4 Fish

The fishery of the Wisconsin River below Hat Rapids Dam is a moderately diverse and healthy community. Data collected by the WDNR and through the investigation by EA Engineering, Science, and Technology and Foth & Van Dyke uncovered 27 species of fish within the study area. These species are typically found in northern Wisconsin rivers that have been developed for the purpose of generating hydroelectric power.

Records provided by the WDNR (Theis, 1996) indicated that one greater redhorse (threatened) was identified within the study area. During CMC's field survey which concentrated mainly on areas of swift water with rock substrates (i.e., redhorse habitat), neither of the target species, greater redhorse or black redhorse, were observed. Despite the sampling results and very limited historical records of occurrence, the greater redhorse may occur in very low numbers in this stretch of the Wisconsin River. However, the black redhorse was not documented during either the WDNR or CMC's fish surveys.

Assuming that the greater redhorse does exist in low numbers within the study area, the proposed mine discharge is not expected to affect its life cycle or to affect the overall fish community in any adverse manner. The pipeline will discharge directly into the dam so that mixing will be complete and immediate. There will be a negligible increase in flow, and the discharge water will meet WDNR standards selected to protect the most sensitive species.

#### 3 Flora

#### 3.1 Field Methods

The survey for rare vascular plants along the Wisconsin River was conducted on June 29, 30, and 31, and August 14, 15, and 16, 1996. The survey included the general study area (Figure 2-1) from the Hat Rapids Dam to Menard Island and to lesser extent, downstream of Menard Island to County Trunk Highway (CTH) A. The survey was conducted by Gary Fewless of the University of Wisconsin-Green Bay (UWGB), and Bradley Helmandollar of Foth & Van Dyke.

Research conducted before field work was initiated showed that no endangered or threatened vascular plant species are known to exist within the area of the study. The Wisconsin Department of Natural Resources reported one special concern species, *Epilobium palustre* (marsh willow-herb) from within the area of T36N R8E, which is within the study area. This species is typically found in bogs or boggy swamps.

The state list of endangered, threatened and special concern species was examined for other plants which might be expected on this site. Initial examination of the site suggested that the habitat was not favorable for most of the Wisconsin rare species, but a few were considered possible. Armoracia lacustris has been found in an unexpected riverine site in recent years and was considered possible here. Callitriche heterophylla, C. hermaphroditica, Equisetum palustre, and Poa paludigena were also considered possible and Ranunculus gmelinii might have been present in cold springs feeding the river. All fully aquatic species were very carefully considered during the survey and the standard practice was to identify any unknown species such that unexpected rare species were not overlooked.

The river is not easily accessible along its shoreline within the area studied except for the portion immediately below the Hat Rapids Dam. Therefore the survey was conducted largely by canoe, with periodic stops to wade along the shoreline and to check adjacent wetlands and several small streams entering the river. A list was kept of aquatic species encountered and vouchers were collected and returned to the laboratory for identification if immature or otherwise unknown plants were found which could conceivably represent rare species.

It is likely that any effects of the discharge, if any, would be most pronounced in the area near the discharge point. Therefore, the greatest effort was applied to the area from the Hat Rapids Dam downstream to the sharp turn of the river in the NE ¼ of Section 4, T35N, R8E, a distance of roughly 2.5 miles. A walking survey was conducted along both shorelines and in the adjacent shallow water in the area between the dam and Hat Rapids Road. The area from approximately 2.5 miles downstream to the Highway A bridge in Section 21, T35N, R7E in Lincoln County was searched less intently, but with the same methodology.

## 3.1.1 Quality Control

Field and laboratory quality control procedures were utilized during the botany studies such that the work was completed according to currently accepted standards of practice. Team leaders with senior level experience in the discipline in which the field activities involved were assigned for each task. Significant finds were documented in the field. Voucher specimens were collected where appropriate, and will be maintained for species verification at the University of Wisconsin, Green Bay Herbarium.

A daily log of observed specimens was maintained by the field team leader. A voucher specimen was collected for any unique species or any specimen that could not be definitively identified in the field.

#### 3.2 Results

A large proportion of the shoreline within the study area rises quickly to terrestrial communities which appear to be little affected by the river. Often the vegetation is small diameter mixed hardwoods or more uniform stands of young *Populus tremuloides* or plantations of *Pinus resinosa* or *P. banksiana*. Vascular plants likely to be directly affected by the river are aquatic macrophytes growing within the standing water of the river, or in narrow bands of emergent and wet soil species along the shoreline, or small areas of mostly open deciduous swamp or shrub carr adjacent to the river. A complete list of aquatic and wet soil species noted in this study is presented in Table 3-1.

## 3.2.1 Aquatic Macrophytes

Aquatic vegetation within the river is generally sparse in the upstream portion of the study area. The current is moderate in this area, the bottom is often rocky and the water is somewhat turbid. The most conspicuous vegetation noted in this area is an emergent bur-reed (Sparganium) which forms local populations in shallow water along the edges and sometimes produces large stands extending far out into the river. These plants are uniformly sterile in most cases and cannot be identified with a high degree of certainty, although the physical characteristics and the habitat are consistent with S. americanum and S. chlorocarpum. In a few calmer, shallower places a limited number of fertile S. americanum were found, and it is likely that most or all sterile populations of Sparganium were also S. americanum.

The only other regularly occurring aquatic species within the upper portion of the river is *Potamogeton epihydrus* which occurs in two forms. One form is the typical condition in which both oval floating leaves and long, linear submersed leaves are produced on the same plant. The second form, usually found in deeper and faster water, consists of only the long submersed leaves. A few other submersed species were found in the upper portion of the river, including *Vallisneria americana* and *Potamogeton richardsonii*, but they were uncommon.

Farther downstream the number of species increases and, beginning in the area of Menard Island, the current diminishes and there is a dramatic increase in the diversity and density of submerged and floating aquatic vegetation. Potamogeton epihydrus is present here along with P. natans, P. richardsonii, P. zosteriformis, Ceratophyllum demersum, Elodea canadensis, Najas flexilis, Polygonum natans, Utricularia vulgaris, Nymphaea odorata, Nuphar variegatum and others.

As the river approaches the Highway A bridge it widens, flow is almost imperceptible and conditions are more similar to a lake than to a stream. Both width and slow current of this portion of the river are probably due, at least in part, to the dam downstream. There are abundant submergent plants in this area and Zizania aquatica (wild rice) and Pontederia cordata (pickerel weed) are conspicuous. The high productivity and the appearance of a filamentous algae in this area suggests relatively high nutrient availability, perhaps enhanced by the activities associated with the cabins and homes along the river banks.

## Table 3-1

# Aquatic Macrophytes and Shoreland Vegetation Noted During June and August 1996

Abies balsamea Acer negundo Acer rubrum	Balsam fir Box elder Red maple Silver maple	
Acer rubrum	Red maple	
	•	
4 ,	Silver maple	
Acer saccharinum	<del>-</del>	
Acer spicatum	Mountain maple	
Acorus calamus	Sweetflag	
Agrostis gigantea	Red top	
Agrostis hyemalis	Ticklegrass	
Agrostis tenuis	Colonial bent	
Alisma plantago-aquatica	Water plantain	
Alnus rugosa	Speckled alder	
Alopecurus aequalis	grass	
Amelanchier sp.	Juneberry	
Amphicarpa bracteata	Hog-peanut	
Anemone canadensis	Canada anemone	
Aralia nudicaulis	Wild sarsaparilla	
Arisaema triphyllum	Jack-in-the-pulpit	
Asclepias incarnata	Swamp milkweed	
Aster lateriflorus	Calico aster	
Aster simplex	Panicled aster	
Aster umbellatus	Flat-topped white aster	
Athyrium filix-femina	Lady fern	
Betula alleghaniensis	Yellow birch	
Betula papyrifera	Paper birch	
Bidens discoidea	Sticktights	
Bidens sp.	Sticktights	

Table 3-1 (Continued)

Scientific Name	Common Name
Boehmeria cylindrica	False nettle
Botrychium virginianum	Rattlesnake fern
Bromus ciliatus	Fringed brome
Calamagrostis canadensis	Bluejoint grass
Calla palustris	Wild calla
Callitriche verna	Water starwort
Caltha palustris	Marsh marigold
Campanula aparinoides	Bedstraw bellflower
Cardamine pennsylvanica	Bitter Cress
Carex comosa	sedge
Carex crinita	sedge
Carex hystericina	sedge
Carex lacustris	sedge
Carex normalis	sedge
Carex projecta	sedge
Carex retrorsa	sedge
Carex scabrata	sedge
Carex spp.	sedge
Carex stricta	Tussock sedge
Carex tenera	sedge
Carex vesicaria	sedge
Ceratophyllum demersum	Coontail
Chelone glabra	Turtlehead
Chrysosplenium americanum	Golden saxifrage
Cicuta bulbifera	Water hemlock
Cicuta maculata	Water hemlock
Circaea alpina	Small enchanters nightshade
Cirsium muticum	Swamp thistle
Coptis trifolia	Goldthread

Table 3-1 (Continued)

Scientific Name	Common Name
Dryopteris cristata	Crested fern
Dulichium arundinacea	Three-way sedge
Echinocystis lobata	Wild cucumber
Eleocharis acicularis	spikerush
Eleocharis erythropoda	spikerush
Eleocharis obtusa	spikerush
Eleocharis smallii	spikerush
Elodea canadensis	Waterweed
Elymus virginicus	Wild-rye
Epilobium ciliatum	Willow-herb
Epilobium leptophyllum	Willow-herb
Equisetum arvense	Field horsetail
Equisetum fluviatile	Water horsetail
Equisetum sylvaticum	Woodland horsetail
Eupatorium maculatum	Joe pye weed
Eupatorium perfoliatum	Boneset
Fraxinus nigra	Black ash
Fraxinus pennsylvanica	Green ash
Galium asprellum	Rough bedstraw
Galium obtusum	Bedstraw
Galium trifidum	Bedstraw
Glyceria canadensis	Manna grass
Glyceria grandis	Manna grass
Glyceria striata	Manna grass
Gnaphalium uliginosum	Low cudweed
Gymnocarpium dryopteris	Oak fern
Helenium autumnale	Sneezeweed
Hieracium canadense	Canada hawkweek
Hydrophyllum virginianum	Virginia waterleaf

Table 3-1 (Continued)

Scientific Name	Common Name	
Ilex verticillata	Common winterberry holly	
Impatiens biflora	Jewelweed	
Iris versicolor	Blue flag	
Juncus brevicaudatus	rush	
Juncus effusus	rush	
Juncus filiformis	rush	
Juncus sp.	rush	
Lactuca biennis	Tall blue lettuce	
Laportea canadensis	Wood nettle	
Leersia oryzoides	Rice cut-grass	
Lemna minor	Duckweed	
Lemna trisulca	Star duckweed	
Lilium superbum	Turk's cap lily	
Lycopus uniflorus	Water horehound	
Lysimachia ciliata	Fringed loosestrife	
Lysimachia terrestris	Yellow loosestrife	
Lysimachia thyrsiflora	Tufted loosestrife	
Lythrum salicaria	Purple loosestrife	
Maianthemum canadense	Wild lily-of-the-valley	
Matteuccia struthiopteris	Ostrich fern	
Mentha arvensis	Wild mint	
Mimulus ringens	Monkey flower	
Mitella nuda	Naked miterwort	
Myosotis sp.	Forget-me-not	
Myrica gale	Sweet gale	
Najas flexilis	Water-nymph	
Nuphar variegatum	Bullhead-lily	
Nymphaea odorata	Water lily	
Oenothera biennis	Evening primrose	

Table 3-1 (Continued)

Scientific Name	Common Name
Onoclea sensibilis	Sensitive fern
Osmunda cinnamomea	Cinnamon fern
Osmunda claytoniana	Interrupted fern
Osmunda regalis	Royal fern
Oxalis acetosella	Wood-sorrel
Oxalis stricta	Yellow wood-sorrel
Parthenocissus vitacea	Virginia creeper
Penthorum sedoides	Ditch stonecrop
Phalaris arundinacea	Reed canary grass
Picea glauca	White spruce
Pilea fontana	Clearweed
Platanthera psychodes	Purple fringed orchid
Poa palustris	Fowl meadow grass
Polygonum hydropiper	Smartweed
Polygonum lapathifolium	Pale smartweed
Polygonum natans	Water smartweed
Polygonum pensylvanicum	Smartweed
Polygonum persicaria	Lady's thumb
Polygonum punctatum	Smartweed
Polygonum sagittatum	Smartweed
Pontederia cordata	Pickerel weed
Populus balsamifera	Balsam poplar
Potamogeton amplifolius	Pondweed
Potamogeton epihydrus	Pondweed
Potamogeton natans	Pondweed
Potamogeton nodosus	Pondweed
Potamogeton richardsonii	Pondweed
Potamogeton spirillus	Pondweed
Potamogeton zosteriformis	Pondweed

Table 3-1 (Continued)

Scientific Name	Common Name	
Potentilla palustris	Marsh cinquefoil	
Prunus virginiana	Choke cherry	
Pyrola asarifolia	Pink pyrola	
Ranunculus longirostris	White water crowfoot	
Ranunculus pensylvanicus	Bristly crowfoot	
Ranunculus recurvatus	Hooked buttercup	
Rorippa islandica	Yellow cress	
Rubus pubescens	Dwarf red blackberry	
Rubus strigosus	Raspberry	
Rudbeckia laciniata	Green-headed coneflower	
Rumex obtusifolius	Bitter dock	
Sagittaria latifolia	Arrowhead	
Sagittaria rigida	Arrowhead	
Salix bebbiana	Bebb's willow	
Salix discolor	Pussy willow	
Salix fragilis	Crack willow	
Salix lucida	Shining willor	
Sambucus canadensis	Common elderberry	
Scirpus cyperinus	Wool grass	
Scirpus validus	Soft stem bulrush	
Scutellaria galericulata	Skullcap	
Scutellaria lateriflora	Mad-dog skullcap	
Sium suave	Water-parsnip	
Smilax tamnoides	Bristly greenbriar	
Sparganium americanum	Bur-reed	
Sparganium angustifolium	Bur-reed	
Sparganium chlorocarpum	Bur-reed	
Sparganium eurycarpum	Bur-reed	
Sparganium fluctuans	Bur-reed	

Table 3-1 (Continued)

Scientific Name	Common Name
Sparganium sp (emergent)	Bur-reed
Spiraea alba	Meadowsweet
Spirodela polyrhiza	Greater duckweed
Stachys palustris	Hedge-nettle
Thalictrum dasycarpum	Purple meadow-rue
Thelypteris palustris	Marsh fern
Thuja occidentalis	Northern white cedar
Toxicodendron radicans	Poison ivy
Triadenum fraseri	Bog St. John's-wort
Trientalis borealis	Star flower
Typha latifolia	Broad-leaved cattail
Ulmus americana	American elm
Unica dioica	Stinging nettle
Utricularia vulgaris	Greater bladderwort
Verbena hastata	Blue vervain
Viburnum lentago	Nannyberry
Viburnum opulus	Highbush cranberry
Viola spp.	Violet
Zizania aquatica	Wild rice

Prepared by: GF Checked by: BDH

#### 3.2.2 Shoreline Vegetation

The zone of emergent vegetation in the shallow water at the edge of the river was very narrow in the upper area near the dam. Occasional small stands of *Scirpus validus* were noted as well as scattered small populations of *Juncus effusus*, *Sagittaria latifolia* and *Sparganium eurycarpum*. Farther downstream, beginning at about Menard Island, stands of these species were also noted on sand bars and shoals within the river. *Scirpus validus* and *Leersia oryzoides* were especially prominent there, sometimes with *Pontederia cordata* and *Sagittaria rigida*.

Muddy edges just out of the water supported small populations of common wetland species including Bidens spp., Callitriche verna, Cardamine pennsylvanica, Eleocharis erythropoda, Eleocharis obtusa, and Polygonum spp. Some similar muddy wet areas are found along small springs which drain into the river, often associated with adjacent wet forests. These sites are often on dark, mucky soil and typical species include Impatiens biflora, Lycopus uniflorus, Scutellaria lateriflora, S. galericulata, Polygonum sagittatum, Mimulus ringens, Glyceria striata, and Epilobium ciliatum.

In the broad, slow portion of the river near Highway A there is a wide marshy area along the shoreline which has some boggy characteristics including a more or less floating mat near its outer edge and some additional species such as *Triadenum fraseri*, Calla palustris, Dulichium arundinacea and Dryopteris cristata.

Any wetland vegetation beyond the immediate edge of the river is usually in the form of a mixed, open forest of trees and shrubs with frequent openings in the canopy and underlain by robust herbaceous species. Common trees and shrubs include Alnus rugosa, Acer saccharinum, Betula papyrifera, Fraxinus pennsylvanica, Ilex verticillata, Ulmus americana, and Salix spp. Less common species include Betula alleghaniensis, Acer rubrum, Fraxinus nigra, Viburnum lentago, Acer spicatum, Sambucus canadensis, Viburnum opulus, and rarely Abies balsamea and Populus balsamifera. In a few places there are small stands of Thuja occidentalis. They were often at least several feet above the current river water level and were obviously fed by springs emerging from adjacent slopes. Acer negundo was prominent only near the Hat Rapids Dam. Cornus stolonifera, often a prominent wetland species, was relatively rare in this study area.

Grasses and sedges are often prominent in the ground layer of these swamps with Calamagrostis canadensis the most prominent species. Other species include the sedges Carex stricta, Carex lacustris, Carex crinita and Scirpus cyperinus, robust forbs including Eupatorium maculatum, Asclepias incarnata, Rumex obtusifolius, Thalictrum dasycarpum, Urtica dioica and Helenium autumnale and Pteridophytes such as Equisetum arvense, Osmunda regalis and Matteuccia struthiopteris.

## 3.3 Ecological Significance of Findings

No endangered or threatened vascular plant species were previously known to exist within the area of the study, and none were found during the study. The special concern species, *Epilobium palustre* (marsh willow-herb) had been reported from within the area of T36N R8E, but was not encountered in this survey, although the similar *E. leptophyllum* was found in the boggy marsh near Highway A.

Concerns for rare plants might focus on two types of changes in the river, water volume (as it affects depth or current) and physical changes in the water. Because the proposed discharge will not significantly affect the volume of water within the Wisconsin River, the effects on rare plant species could involve changes in quality of the river water. The wetlands immediately adjacent to the river are generally small and appear to depend primarily on water from springs and surface runoff. Therefore the exchange of water is likely to be primarily from the wetlands to the river and it is very unlikely that any potential changes in river water composition would have an effect on the plants in most of the adjacent wetlands. Aquatic species within the river water would, of course, be susceptible to any changes in the water composition, but no rare species were found within the river. No unique or remarkable habitats were encountered which are likely to harbor rare species, although the possibility of unexpected occurrences cannot be ruled out.

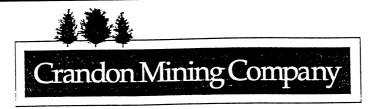
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## **Appendix A**

## **Regulatory Agency Correspondence**

- May 28, 1996 Work Plan for Wisconsin River Discharge Aquatic Investigation
- August 5, 1996 Letter from Don Moe, CMC to Bill Tans, WDNR, Re: Crandon Project - Threatened & Endangered Species Investigation, Wisconsin River Below Hat Rapids Dam, Supplementary Work Plan



7 N. BROWN ST., 3RD FLOOR RHINELANDER, WI 54501-3161

May 28, 1996

Mr. Bill Tans Wisconsin Department of Natural Resources 101 South Webster Street P.O. Box 7921 Madison, WI 53707-7921

Dear Mr. Tans:

Crandon Project - Threatened and Endangered Species Investigation Re: Wisconsin River Below Hat Rapids Dam

Enclosed is the work plan for an investigation of the Wisconsin River below the Hat Rapids Dam. It is submitted to the Wisconsin Department of Natural Resources (WDNR) in response to Comment 172, page 8 of the WDNR's May 3, 1996 EIR comment letter.

The work plan has been developed based on the following:

- The proposed discharge will be secured to the existing dam structure and will not disturb the 1. stream bed above or below the dam. Therefore, sampling above the dam is not required.
- The proposed discharge will have effluent limitations selected specifically for the Wisconsin 2. River at the Hat Rapids Dam to protect the most sensitive species.
- The purpose of conducting this survey is specifically related to determining the presence of aquatic 3. species of mussels and macroinvertebrates below Hat Rapids Dam that may have threatened or endangered status in Wisconsin or are listed as being of Special Concern by the WDNR.
- Previous fish inventories of the area, according to WDNR personnel, are sufficient for purposes 4. of environmental review and for permitting activities.

Schedule is very import because spring sampling should begin in early June this year. Crandon Mining Company is prepared to start this work immediately upon approval of the WDNR. Therefore, we ask you to respond as quickly as possible so the information you requested can be provided in a timeframe consistent with your schedule to produce a draft EIS.

If you have any questions regarding this submittal, please call me at (715) 365-1450.

Sincerely,

D. E. Mae

Don Moe Technical/Permitting Manager Crandon Mining Company

Mr. Bill Tans Wisconsin Department of Natural Resources May 28, 1996 Page 2

#### Enclosure

cc: Mr. Archie Wilson, Wisconsin Department of Natural Resources

Mr. Larry Lynch, Wisconsin Department of Natural Resources

Mr. Dave Heath, Wisconsin Department of Natural Resources

Mr. Bill Smith, Wisconsin Department of Natural Resources

Mr. John Pohlman, Wisconsin Department of Natural Resources

Mr. Robert Jaeger, U.S. Department of the Interior

Mr. Philip Shopodock, Forest County Potawatomi

Mr. Arlyn Ackley, Sokaogon Chippewa Community

Mr. John Teller, Menominee Indian Tribe of Wisconsin

Ms. M. Catherine Condon, Greene, Meyer & McElroy

Mr. Dan Cozza, U.S. Environmental Protection Agency

Mr. Dave Ballman, U.S. Army Corps of Engineers

Mr. Jerry Sevick, Foth & Van Dyke

Mr. Tim Weyenberg, Foth & Van Dyke

Mr. Bill West, Environmental Compliance Consultants, Inc.

# Crandon Project Work Plan for Wisconsin River Discharge Aquatic Investigations

#### 1 Introduction

Beginning in 1993 and continuing in 1994, Crandon Project aquatic investigations included a search for threatened, endangered, or listed species. These investigations targeted species which, based on habitat availability, past records, or National Heritage Inventory lists were possible candidates to be located in the project area. A discussion of findings relating to these species, and the potential impacts to these species was included in the May 1995 Crandon Project Environmental Impact Report (EIR).

In 1995 the focus of the discharge point for treated waters from the Crandon Project was changed from a Swamp Creek discharge to the Wisconsin River. The proposed discharge point on the Wisconsin River is at the Hat Rapids Dam some three to four miles downstream of the City of Rhinelander.

The Wisconsin Department of Natural Resources (WDNR) has reviewed certain aspects of the EIR relative to the aquatic investigations that were conducted for the Swamp Creek discharge. It has been suggested that a similar investigation be conducted for the Wisconsin River discharge. Specifically, as part of its May 3, 1996 letter the WDNR has that requested additional information relative to mussels and aquatic macroinvertebrates be collected for the proposed Wisconsin River discharge.

On May 20, 1996 Tim Weyenberg (Foth & Van Dyke) and Bill West [Environmental Compliance Consultants, Inc., (ECCI)], met with Dave Heath and Bill Smith (WDNR) to discuss the proposed Wisconsin River discharge location and conduct a site reconnaissance of the river. During the meeting, target areas for the aquatic investigations were discussed. In general, the area of investigation was identified as a section of the Wisconsin River below the Hat Rapids Dam downstream to and including the Menard Island environs (Figure 1). Menard Island is at the location of the confluence of Trout Creek with the Wisconsin River.

The following work plan has been developed to address the concerns of the WDNR with respect to the flora and fauna of the Wisconsin River. The proposed aquatic investigations are to focus on mussels and macroinvertebrates including Odonata. Other investigations which may be conducted include a single aquatic plant collection effort during low flow. Table 1 identifies times when collections are likely to occur.

## 2 Macroinvertebrates

## 2.1 Objective and Species List

The objective of the macroinvertebrate work is to determine the presence and/or status of macroinvertebrate species listed on the Wisconsin Heritage Inventory List of threatened and endangered species. Dragonflies (Odonata) are separated from the other invertebrate species in this work plan because distinct methods are proposed for this group.

Table 2 contains a target species working list organized by the preferred general collection technique. However, any of the techniques are suitable for the collection of each of the listed species. Species which may be collected equally well by more than one technique are listed within several of the categories listed in the table. During the general macroinvertebrate collection time periods, it is assumed that resident Odonata specimens will also be collected.

## 2.2 Methods for Odonata Collection

The field investigators will employ three techniques for collecting Odonata, including collection of exuviae from shoreline habitats, observation and collection of adult specimens, and instream sampling. Depending on the species of Odonata, one collection technique may be more suited than the other for obtaining information on potential species. For instance, the gomphid dragonflies will be most easily sampled by the collection of exuviae. The exuviae is a casing of a dragonfly which is left behind when the dragonfly emerges as an adult. Exuviae can be found along the banks of streams and lakes and on vegetation or other objects immediately after adults have emerged from the water body. Because of their relative size, members of the genus *Somatochlora* are best surveyed as adults.

In general, all larval Odonata may be collected using instream sampling techniques in either the fall or early spring while most species are in the late instars or at pre-emergence stages. It should be noted that instream sampling techniques may underestimate the numbers of organisms present and may miss some populations altogether. The collection of exuviae is a good technique for obtaining specimens which are uncommon or rare in an area and for determining relative species abundance.

Sites for sampling will be located on the Wisconsin River in the following areas; the tailrace of the Hat Rapids Dam, an access point in the vicinity of what is known as Camp Ten, and in the vicinity of Menard Island. All sites are downstream of the Hat Rapids Dam, the location of the proposed discharge site. Refer to Figure 1 for locations of sampling sites.

It is proposed to collect exuviae in the spring/early summer when adults have recently emerged. A field reconnaissance may be required to determine the specific timing of the emergence. Typically in northern Wisconsin, emergence will occur in late May or the first two weeks of June for the gomphids, although one gomphid (*Stylurus scudderi*) does not emerge until the second week of July. Because of the prolonged winter (1995/1996) and the late ice out period, the emergence window may be extended longer into June. Depending on exuviae abundance, 150 to

300 foot segments of river will be searched intensely. Both sides of the river will be searched. All specimens observed within a collection area will be included in the collection.

The reporting of exuviae will be qualitative. Where practical, attempts will be made to quantify species. Collections will be directed by Bill West with species verification completed by Dr. Ken Tennessen of the Tennessee Valley Authority (TVA), Florence, Alabama.

Dragonfly nymphs will be collected using instream techniques in the spring of the year (1996) prior to emergence. Kick seine sampling techniques will be used for collection of nymphs. Surber samplers, drift nets, and sweep nets may also be used if it is deemed that the site conditions suggest that these techniques are appropriate.

## 2.3 General Macroinvertebrate Collections

Aquatic macroinvertebrates other than Odonata included on the target list (Table 2) may be encountered in the project area. A search for these species will be conducted in spring 1996. Areas which will be targeted for field investigation include the area immediately downstream of the Hat Rapids Dam, the area in the vicinity of Camp Ten, and the area of Menard Island. These areas are identified on Figure 1. Qualitative instream sampling efforts will include the use of dip nets to hand pick a section of river selected from the general areas depicted on Figure 1 to represent a cross section of all available microhabitats in the river (i.e., pools, riffles, detrital masses in slackwater, cut banks with overhanging cover, snags, and various bottom types). Each micro-habitat will be sampled by a biologist hand picking for no less than one hour, or until a five minute period produces no new species, whichever is the longest. Some organisms such as the nymphs of Ephemeroptera and Plecoptera as well as the larvae of Trichoptera and Coleoptera generally cannot be identified to species. Therefore, sampling for adults using UV light traps and sweep netting will be conducted during the specific known flight seasons of the target species.

In addition, a riffle area in each site will be sampled using a surber sampler. Triplicate samples will be taken at each site. Pools with soft bottom substrates will be sampled using an Ekman dredge for collection of infaunal forms. Triplicate samples will be taken at each location. Samples will be washed through a surber net (mesh size 600 -800) and preserved in formalin. Sampling locations for the general macroinvertebrate collections and Odonata nymphs will be the same as those described for the exuviae collections. Dr. Tennessen will provide specimen verification.

## 2.4 Disposition of Specimens

Nymphs, larvae, or adults (live specimens) of listed species will be identified in the field, recorded, and released. Only voucher specimens will be retained for documentation. Voucher specimens of live organisms as well as exuviae of Odonata will be identified by Dr. Ken Tennessen and saved and deposited per requirements of the WDNR scientific collector's permit. All work to be conducted under this work plan will be authorized by a current threatened and

endangered species collectors permit issued by the WDNR. Disposition of specimens will be carried out as directed by the permit.

#### 2.5 Personnel

The Odonata exuviae and general macroinvertebrate work will be led by Bill West. Adult Odonata field collection and general macroinvertebrate, Odonata exuviae and adult identification will be conducted by Dr. Ken Tennessen with assistance by Bill West.

## 2.6 Quality Assurance

Following preliminary taxonomic identification, vouchers will be provided to the WDNR for verification. Specific collection schedules will be provided to the WDNR as early as possible prior to the proposed initiation of an individual work plan. The WDNR is encouraged to allow their representatives to participate in the sampling effort as their time permits.

#### 3 Mussels

## 3.1 Objective and Species List

The objective of the mussel work it to determine the occurrence or non-occurrence and status of listed threatened and endangered mussels or those listed as special concern species on the Wisconsin Heritage Inventory. Specific species targeted in the proposed study are listed in Table 3. This list represents the best and current information available at the time this plan was prepared.

#### 3.2 Methods for Mussel Collection

Collection efforts will concentrate on the Wisconsin River below the Hat Rapids Dam. The proposed discharge is to be located at the upstream side of the dam at the turbine intake. Therefore, any potential impacts from the discharge may only be observed on the downstream side of the dam. It is anticipated that the investigation for mussels will include three specific locations representative of the riverine habitat below Hat Rapids Dam (Figure 1). At each location one bed of mussels will be located and sampled. More beds may be added if specific habitat is identified which may accommodate a listed specie or if the specific habitat of a listed specie falls outside of the target area.

In shallow waters, the search team will use snorkel equipment to locate mussels. This method may be aided with a water telescope. If deeper water is encountered such as pools, divers will be required. A site reconnaissance prior to completion of the work plan, with WDNR personnel, was completed to discuss target species, locate possible collection sites, identify previous work which may have been completed in this section of the river, and to determine the need for a diving crew.

As noted above, a minimum of three beds of mussels will be evaluated. A "bed" of mussels may consist of an area of several feet in length or, depending on substrate and other conditions, 300 feet or more in length. If defined beds are located, collectors will randomly pick 20 mussels and place them in a mesh bag or several mesh bags. The mesh bags will be brought to shore, remaining submerged, where a taxonomist will identify the mussels. Collectors will repeat this procedure picking 20 mussels at a time until no new species are found for six replicate picking efforts. If insufficient mussels are encountered within a bed to accomplish this protocol, then the collectors will continue to search for four hours in lieu of completing the six replicate collections.

The search for the salamander mussel will involve looking under large, flat rocks including those greater than 12 inches in diameter where such stream conditions occur.

In addition to general reconnaissance and hand picking techniques described above, bank searches will also be conducted. Field technicians will walk designated sections of the river looking for shells which may lie in the shallows or which other animals may have left along the bank. Shells may also be found during other aquatic investigations. These findings will be documented and will supplement the instream picking technique.

## 3.3 Disposition of Specimens

Live specimens of mussels which have been identified will be returned to the approximate location of their finding and replaced with proper alignment to substrate and flow. Voucher specimens will be retained per requirements of a Wisconsin Department of Natural Resources collector's permit.

#### 3.4 Personnel

The mussel investigation will be carried out by Don Helms of Helms & Associates, Bellevue, Iowa. He will be assisted when required by a team of divers or by aquatic field technicians. Taxonomic identification and field reports will be provided by Don Helms. Mussel collection will be conducted in the summer of 1996 pending approval of this work plan.

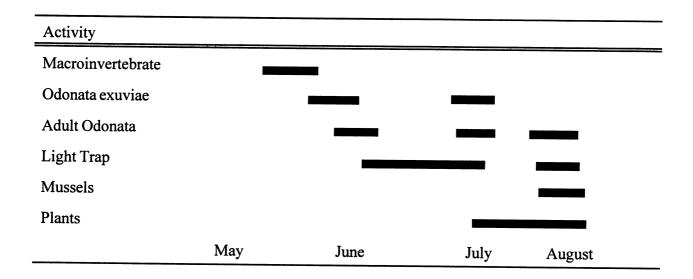
## 3.5 Quality Assurance

Following preliminary taxonomic identification, species verification will be completed by the WDNR. Specific collection schedules will be provided to the WDNR one month prior to the proposed initiation of an individual work plan.

## 4 Plant Identification

A single day float trip will be conducted in the area of the Wisconsin River from the Hat Rapids Dam to Menard Island. The purpose of the trip will be to identify plant species which may appear on the list of target species. The float trip will be scheduled during the low flow period of July or August. The aquatic plant search team will be led by Brad Helmandollar of Foth & Van Dyke with assistance by an aquatic botanist. Voucher specimens of listed species will be provided to the WDNR for verification.

Table 1
Proposed Aquatic Investigation Schedule
Wisconsin River Discharge 1996



Prepared by: WMW Checked by: TJW

Table 2
Targeted Macroinvertebrate Species

Target Species	Common Name	Wisconsin Status
A. Exuviae Collection Technique		
Gomphus graslinellus	Pronghorned clubtail	Special Concern
Gomphus lineatifrons	Splendid clubtail	Special Concern
Gomphus quadricolor	Rapids clubtail	Special Concern
Gomphus ventricosus	Skillet clubtail	Special Concern
Gomphus viridifrons	Green-faced clubtail	Special Concern
Ophiogomphus aspersus	Brook snaketail	Special Concern
Ophiogomphus carolus	Riffle snaketail	Special Concern
Ophiogomphus anomalus	Extra-striped snaketail	Endangered
Ophiogomphus howei	Pygmy snaketail	Endangered
Stylurus amnicola	Riverine clubtail	Special Concern
Stylurus scudderi	Zebra clubtail	Special Concern
B. Observation of Adult Odonata S	Specimens	
Aeshna clepsydra	Mottled darner	Special Concern
Aeshna eremita	Lake darner	Special Concern
Aeshna tuberculifera	Black-tipped darner	Special Concern
Aeshna verticalis	Green-striped darner	Special Concern
Coenagrion interrogatum	Subarctic bluet	Special Concern
Cordulegaster obliqua	Arrowhead spiketail	Special Concern
Gomphaeschna fucillata	Harlequin darner	Special Concern
Libellula incesta	Slaty skimmer	Special Concern
Nannothemis bella	Elfin skimmer	Special Concern
Nasiaeschna pentacantha	Cyrano darner	Special Concern

Table 2 (Continued)

Target Species	Common Name	Wisconsin Status
Somatochloraforcipata	Forcipate emerald	Special Concern
Somatochlorafranklini	Delicate emerald	Special Concern
Somatochlora incurvata	Warpaint emerald	Special Concern
Somatochlora kennedyi	Kennedy's emerald	Special Concern
Somatochlora tenebrosa	Clamp-tipped emerald	Special Concern
Sympetrum danae	Black meadowhawk	Special Concern
Williamsonia fletcheri	Ebony bog hunter	Special Concern
C. Instream Sampling for Odon	ata Nymphs	
Cordulegaster diastatops	Delta-spotted spiketail	Special Concern
Cordulegaster obliqua	Arrowhead spiketail	Special Concern
Naiaeschna pentacantha	Cyrano darner	Special Concern
Neurocodulia yamaskanensis	Stygian shadowfly	Special Concern
Ophiohomphus aspersus	Brook snaketail	Special Concern
Stylogomphus albistylus	Least clubtail	Special Concern
O. Instream Collection of Non-Collection	Odonata Macroinvertebrates	
Acanthametropus pecatonica	Pecatonica river mayfly	Endangered
Anepeorus simplex	A flat-headed mayfly	Endangered
Attaneuria ruralis	A stonefly	Special Concern
Dolania americana	American sand burying mayfly	Special Concern
Homoeoneuria ammophila	A mayfly	Special Concern
Hydroperla crosbyi	A stonefly	Special Concern
Lepidostoma libum	A bizarre caddisfly	Special Concern
Lepidostoma vernale	A bizarre caddisfly	Special Concern

Table 2 (Continued)

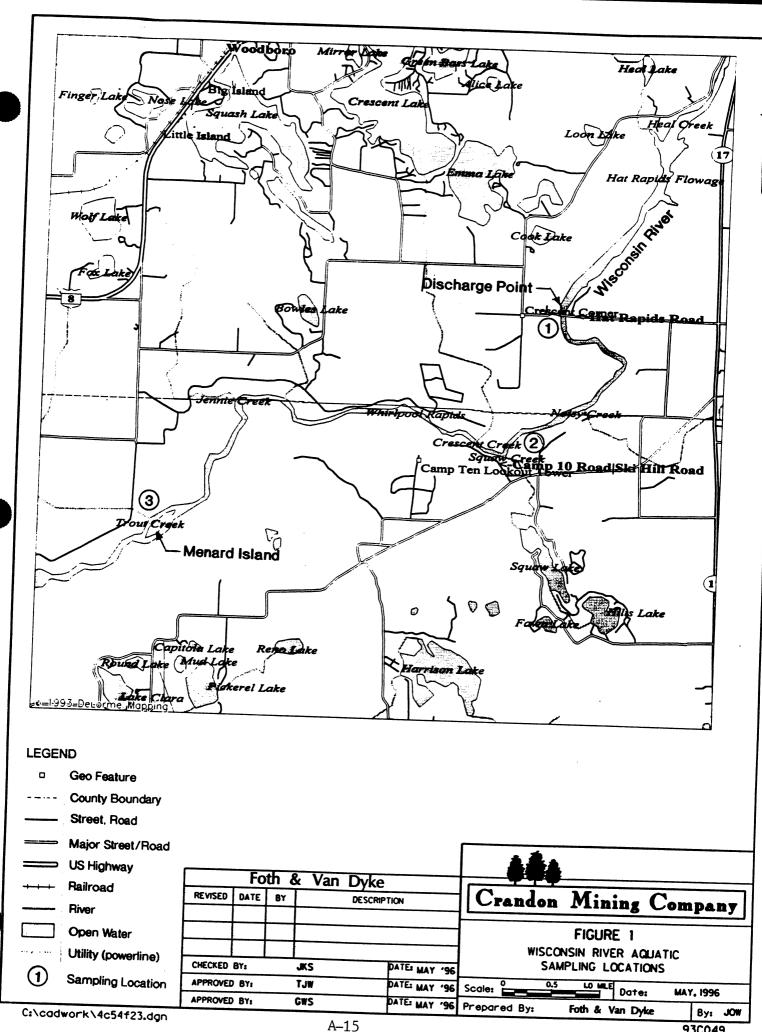
Target Species	Common Name	Wisconsin Status
Macdunnoa persimplex	A mayfly	Special Concern
Paracloeodes minutus	A small mayfly	Special Concern
Soyedina vallicularia	A stonefly	Special Concern
Stenelmus douglasensis	Douglas riffle beetle	Special Concern
Stenelmus knobeli	Knobel's riffle beetle	Endangered
Triaenodes dipsius	A long-horned casemaker caddisfly	Special Concern
Zealeuctra narfi	A rolled-winged winter stonefly	Special Concern

Prepared by: WMW Checked by: TJW

Table 3
Targeted Mussel Species

Target Species	Common Name	Wisconsin Status
Alasmidonta marginata	Elktoe	Special Concern
Alasmidonta viridis	Slippershell	Threatened
Anodonta cataracta cataracta	Eastern floater	Special Concern
Cyclonaias tuberculata	Purple wartyback	Endangered
Elliptio complanata	Atlantic elliptio	Special Concern
Epioblasma triquetra	Snuffbox	Endangered
Lasmigona compressa	Creek heelsplitter	Special Concern
Leptodea leptodon	Scaleshell	Special Concern
Plethobasus cyphyus	Bullhead	Endangered
Pleurobema sintoxia	Round pigtoe	Special Concern
Quadrula fragosa	Winged mapleleaf	Endangered
Quadrula metanerva	Monkeyface	Threatened
Simpsonaias ambigua	Salamander mussel	Threatened
Tritogonia verrucosa	Buckhorn	Threatened
Venustaconcha ellipsiformis	Ellipse	Threatened

Prepared by: WMW Checked by: TJW





7 N. BROWN ST., 3RD FLOOR **RHINELANDER, WI 54501-3161** 

August 5, 1996

Mr. Bill Tans Wisconsin Department of Natural Resources Bureau of Environmental Analysis and Review 101 South Webster Street P.O. Box 7921 Madison, WI 53707-7921

Dear Mr. Tans:

Crandon Project - Threatened & Endangered Species Investigation

Wisconsin River Below Hat Rapids Dam

Supplementary Work Plan

Based on an evaluation of the available biological information for the Wisconsin River below Hat Rapids Dam, Crandon Mining Company (CMC) is aware that the Wisconsin Department of Natural Resources (WDNR) has an on-going fish inventory program for this section of the river. The WDNR's survey is focused on developing information on the status of the fish community from Hat Rapids Dam to Menard Isle, with most of the effort dealing with larger game and forage species.

CMC is proposing to supplement the WDNR's on-going program by conducting an intensive survey (up to 10 hours of field time) using shocking and seining techniques to provide additional data on the occurrence of species listed on the Wisconsin Heritage Inventory List that may not have a high likelihood of being encountered using the WDNR's sampling methods. This work will be accomplished in late summer of this year (1996) to coincide with the annual summer low flow period. Sampling will be accomplished in locations of this stretch of the river best representing habitat associated with the target species. E.A. Engineering Associates, Inc. will be the lead investigator for this study effort. CMC believes this work to be sufficient for purposes of environmental review as stated in a letter to you dated May 28, 1996, for these groups of fish.

The purpose of this letter is to inform the WDNR of the supplemental sampling and to request your acceptance of this addition to CMC's approved work plan.

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Mr. Bill Tans Wisconsin Department of Natural Resources August 5, 1996 Page 2

If you have any questions, please call me at (715) 365-1450.

Sincerely,

Don Moe

Technical/Permitting Manager

Crandon Mining Company

D. E. Mac

#### DM:mld2

cc: Mr. Archie Wilson, Wisconsin Department of Natural Resources

Mr. Larry Lynch, Wisconsin Department of Natural Resources

Mr. Robert Jaeger, U.S. Department of the Interior

Mr. Philip Shopodock, Forest County Potawatomi

Mr. Arlyn Ackley, Sokaogon Chippewa Community

Mr. John Teller, Menominee Indian Tribe of Wisconsin

Ms. M. Catherine Condon, Greene, Meyer & McElroy

Mr. Dan Cozza, U.S. Environmental Protection Agency

Mr. Dave Ballman, U.S. Army Corps of Engineers

Mr. Jerry Sevick, Foth & Van Dyke

Mr. Tim Weyenberg, Foth & Van Dyke