

Great Northern Transmission Line Project

Draft Environmental Impact Statement Volume I: Impact Analyses



This page intentionally left blank

Draft

Great Northern
Transmission Line Project
Environmental Impact Statement

Volume I: Impact Analyses

U.S. Department of Energy
Office of Electricity Delivery
and Energy Reliability



Minnesota
Department of Commerce



Cooperating Agencies

U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

June 2015

This page intentionally left blank

COVER SHEET - ABSTRACT

DOE/EIS-0499

RESPONSIBLE FEDERAL AGENCY: U.S. Department of Energy (DOE), Office of Electricity Delivery and Energy Reliability

RESPONSIBLE STATE GOVERNMENTAL UNIT: Minnesota Department of Commerce (MN DOC)

COOPERATING AGENCIES: U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA)

TITLE: Great Northern Transmission Line Project Draft Environmental Impact Statement (DOE/EIS-0499)

LOCATION: Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca counties in Minnesota

The DOE and the Minnesota Department of Commerce—Energy Environmental Review and Analysis (DOC-EERA) are jointly preparing an EIS for the proposed Project.

CONTACTS: For additional information on this EIS contact:

U.S. Department of Energy
Julie Ann Smith, PhD, Electricity Policy Analyst
DOE NEPA Document Manager
202-586-7668
JulieA.Smith@hq.doe.gov
National Electricity Delivery Division (OE-20)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

For general information on the DOE NEPA process, please write or call:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance (GC-54)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585
askNEPA@hq.doe.gov
Telephone: (202) 586-4600 or Leave a message at (800) 472-2756

Minnesota Department of Commerce
William Cole Storm, Environmental Review Manager
Energy Environmental Review and Analysis
85 7th Place East, Suite 500
Saint Paul, Minnesota 55101
(651) 539-1844
bill.storm@state.mn.us

Project Applicant
Minnesota Power, an operating division of ALLETE
30 West Superior Street
Duluth, Minnesota 55802

Project Representatives

David Moeller	Mike Donahue	Jim Atkinson
Senior Attorney	Project Manager	Environmental Manager
218) 723-3963	(218) 355-2617	(218) 355-3561
dmoeller@allete.com	mdonahue@mnpower.com	jbatkinson@mnpower.com

DOE and DOC-EERA invite comments on this Draft EIS during the 45-day comment period that begins with the EPA publication of the Notice of Availability (NOA) in the Federal Register. The federal and state EIS Web sites provide information on public hearings and information meetings on the Draft EIS to be held at several locations in Minnesota during the comment period. Comments on the Draft EIS may be made verbally or in writing at a public hearing, or may be sent to Julie Smith at the address or email above or by fax to (202) 586-8008, or to William Storm at the address or email.

Written and oral comments will be given equal weight, and any comments received after the comment period ends will be considered to the extent practicable.

Abstract

On April 15, 2014, Minnesota Power (the Applicant) applied to the U.S. Department of Energy (DOE) for a Presidential permit to construct, operate, maintain, and connect an approximately 220-mile long, 500-kilovolt (kV) overhead, single-circuit, alternating current (AC) electric transmission system that would cross the international border between the Canadian Province of Manitoba and Roseau County, Minnesota (Minnesota Power 2014, reference (1)). On the same date, the Applicant also applied to the Minnesota Public Utilities Commission (MN PUC) for a Route Permit under the Minnesota Power Plant Siting Act (PPSA) (Minnesota Power 2014, reference (1)).

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to both DOE and the MN PUC, respectively, as a result of new information. The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration.

The Great Northern Transmission Line Project, as amended (proposed Project), would run from the Applicant's proposed international border crossing in Roseau County, Minnesota to the existing Blackberry Substation near Grand Rapids, Minnesota. It would be located on all new 200-foot wide right-of-way with a wider area required for certain spans at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The transmission towers would be steel lattice structures for the majority of the route, with the exact type of structure in any given location dependent on land type, land use, and potential effect on the surrounding landscape. Tower heights would range from approximately 100 feet to about 170 feet. In some instances, such as where the proposed Project crosses an existing transmission line, taller structures would be required. The Applicant is also proposing to expand the existing Blackberry Substation to accommodate the required 500 kV interconnection and to construct a new 500 kV series compensation station, regeneration stations, permanent access roads, temporary access roads, laydown areas, and fly-in sites.

COVER SHEET - ABSTRACT

This page intentionally left blank

Table of Contents

COVER SHEET/Abstract.....	CSA-1
Summary	S-1
S.1 Background	S-1
S.2 Regulatory Framework	S-3
S.2.1 DOE’s Purpose and Need for Agency Action	S-3
S.2.2 Minnesota Public Utilities Commission Actions.....	S-3
S.3 Applicant’s Objectives.....	S-3
S.4 Proposed Project Overview	S-3
S.4.1 Route Selection	S-4
S.4.2 Supporting Structures and Right of Way.....	S-4
S.4.3 Interference and Contingencies	S-4
S.4.4 Land Acquisition	S-4
S.4.5 Construction.....	S-4
S.4.6 Cost and Schedule	S-5
S.5 Agency Coordination and Public Involvement.....	S-5
S.5.1 Cooperating Agencies.....	S-5
S.5.2 Public Involvement	S-5
S.6 Alternatives Analyzed.....	S-6
S.6.1 No Action Alternative	S-6
S.6.2 DOE’s Proposed Federal Action and Preferred Alternative	S-6
S.6.3 Applicant’s Preferred Alternative.....	S-6
S.6.4 Border Crossing, Route, and Alignment Alternatives	S-7
S.7 Alternatives Considered but Eliminated from Detailed Analysis.....	S-13
S.8 Summary of General Impacts Common to All Alternatives	S-15
S.8.1 Human Settlement.....	S-15
S.8.2 Public Health and Safety	S-16
S.9 Summary of Route-Specific Impacts Associated with the Project.....	S-18
S.9.1 Route-Specific Impacts to West Section	S-19
S.9.2 Route-Specific Impacts to Central Section.....	S-21
S.9.3 Route-Specific Impacts to East Section	S-22
S.10 Comparative Environmental Consequences.....	S-24
S.10.1 West Section	S-24
S.10.1.1 West Section: Border Crossing Variation	S-24
S.10.1.2 West Section: Roseau Lake WMA Variation.....	S-26
S.10.1.3 West Section: Cedar Bend WMA Variation Area.....	S-27
S.10.1.4 West Section: Beltrami North Variation Area	S-29
S.10.1.5 West Section: Beltrami North Central Variation Area	S-30
S.10.1.6 Relative Merits Summary—West Section.....	S-31

S.10.2	Central Section	S-33
S.10.2.1	Central Section: Pine Island Variation Area.....	S-33
S.10.2.2	Central Section: Beltrami South Central Variation Area.....	S-35
S.10.2.3	Central Section: Beltrami South Variation Area.....	S-35
S.10.2.4	Central Section: North Black River Variation Area	S-36
S.10.2.5	Central Section: C2 Segment Option Variation Area	S-37
S.10.2.6	Central Section: J2 Segment Option Variation Area.....	S-39
S.10.2.7	Central Section: Northome Variation Area.....	S-40
S.10.2.8	Central Section: Cutfoot Variation Area	S-41
S.10.2.9	Relative Merits Summary—Central Section.....	S-42
S.10.3	East Section	S-44
S.10.3.1	East Section: Effie Variation Area	S-44
S.10.3.2	East Section: East Bear Lake Variation Area	S-45
S.10.3.3	East Section: Balsam Variation Area.....	S-46
S.10.3.4	East Section: Dead Man’s Pond Variation Area	S-48
S.10.3.5	East Section: Blackberry Variation Area.....	S-48
S.10.3.6	Relative Merits Summary—East Section.....	S-49
S.10.4	Alignment Modifications.....	S-51
S.10.4.1	West Section	S-51
S.10.4.2	Central Section.....	S-51
S.10.4.3	East Section	S-51
S.10.5	Hops.....	S-52
S.10.6	Associated Facilities.....	S-52
S.10.6.1	West Section	S-52
S.10.6.2	Central Section.....	S-53
S.10.6.3	East Section	S-53
S.11	Cumulative and Other Impacts	S-53
S.11.1	Other Actions Considered for Potential Cumulative Impacts	S-53
S.11.2	Cumulative Impacts.....	S-53
S.11.2.1	Human Settlement	S-53
S.11.2.2	Land-Based Economies	S-54
S.11.2.3	Archaeology and Historic Architectural Resources.....	S-54
S.11.2.4	Natural Resources.....	S-55
S.11.2.5	Rare Species and Communities.....	S-55
S.11.3	Adverse Impacts that Cannot Be Avoided.....	S-55
S.11.3.1	Irreversible and Irrecoverable Commitment of Resources.....	S-55
S.11.3.2	Rare Species.....	S-55
S.11.3.3	Wetland Type Conversion.....	S-56
S.11.3.4	Other.....	S-56
1.0	Introduction and Regulatory Framework.....	1
1.1	Organization of this EIS.....	1
1.2	Federal Permits, Approvals, and Consultations	3
1.2.1	United States Department of Energy – Presidential permit.....	3

1.2.2	DOE Purpose of and Need for Agency Action.....	3
1.2.3	Other Federal Approvals	4
1.2.4	Federal Consultations.....	5
1.3	State Permits and Approvals	6
1.3.1	Minnesota Public Utilities Commission – Route Permit.....	6
1.3.2	Minnesota Public Utilities Commission – Certificate of Need.....	9
1.3.3	Other State and Local Permits.....	9
1.4	Joint Federal and State EIS Process.....	11
1.4.1	Joint Process	11
1.4.2	Issues Outside the Scope of this EIS – Impacts in Canada.....	11
1.4.3	Cooperating Agencies and Coordination.....	12
1.4.4	Public Involvement.....	13
2.0	Proposed Project	15
2.1	Summary of Proposed Project	15
2.2	Applicant’s Objectives	16
2.2.1	Manitoba Hydroelectric Capacity.....	16
2.2.2	Northeast Minnesota and Regional Energy Demand.....	19
2.2.3	North Dakota Wind Energy Renewable Optimization Opportunity.....	20
2.3	Applicant’s Route Selection Process	20
2.3.1	Summary of Process	20
2.3.2	Study Area.....	21
2.3.3	Border Crossing - Applicant Considerations and Preference	22
2.4	Applicant’s Proposed Routes	23
2.4.1	Blue Route.....	23
2.4.2	Orange Route	23
2.4.3	Segment Options.....	24
2.4.4	Route Alternatives Considered but Rejected by Applicant.....	24
2.5	Technical Description.....	26
2.5.1	Number of Circuits	26
2.5.2	Operating Voltage and Frequency	26
2.5.3	Conductor Specifications	26
2.5.4	Typical Supporting Structure.....	26
2.5.5	Structure Spacing.....	27
2.5.6	Conductor Spacing.....	27
2.5.7	Line to Ground and Conductor Side Clearances.....	27
2.5.8	Wind and Ice Loading	27
2.5.9	Requested Route Width.....	27
2.6	Associated Facilities.....	28

2.6.1 Blackberry 500 kV Substation28

2.6.2 500 kV Series Compensation Station28

2.6.3 Regeneration Locations28

2.6.4 Permanent Access Roads28

2.6.5 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas28

2.6.6 Establishing the Final Alignment.....29

2.7 Route Width, Right-of-Way, and Anticipated Alignment.....30

2.8 Bulk Power System Information.....30

2.8.1 Expected Power Transfer Capability.....30

2.8.2 System Power Flow.....30

2.8.3 Weather Events30

2.8.4 Interference Reduction Data.....31

2.8.5 Relay Protection.....31

2.9 Land Acquisition32

2.9.1 Transmission Line Right-of-Way32

2.9.2 Minnesota PPSA “Buy the Farm” Provision33

2.9.3 Blackberry 500 kV Substation33

2.9.4 500 kV Series Compensation Station33

2.9.5 Regeneration Site Locations33

2.9.6 Permanent Access Roads34

2.9.7 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas34

2.10 Preconstruction Activities.....34

2.11 Construction Procedures.....34

2.11.1 Transmission Line ROW34

2.11.2 500 kV Substation.....39

2.11.3 500 kV Series Compensation Station39

2.11.4 Regeneration Site Locations39

2.11.5 Permanent Access Roads40

2.11.6 Temporary Access Roads, Laydown Areas, Fly-in Sites, and Stringing Areas40

2.12 Maintenance and Operation.....40

2.12.1 Transmission Line40

2.12.2 500 kV Substation.....40

2.12.3 500 kV Compensation Station43

2.12.4 Regeneration Sites.....43

2.12.5 Permanent Access Roads43

2.13 Summary of Applicant Proposed Measures to Minimize Environmental Impacts.....43

2.14 Estimated Costs.....43

2.15 Project Schedule43

3.0	No Action Alternative	45
4.0	Route and Alignment Alternatives Proposed during Scoping.....	47
4.1	Federal and State Alternative Review	47
4.1.1	Federal Action Alternatives Reviewed Under this EIS	47
4.1.2	State Alternatives Reviewed Under this EIS	48
4.2	Definitions of Key Terms.....	48
4.3	Presentation of Alternatives in the EIS.....	49
4.3.1	West Section	49
4.3.2	Central Section.....	61
4.3.3	East Section	68
5.0	Affected Environment and Potential Impacts.....	77
5.1	Introduction.....	77
5.2	General Impacts Common to All Routes.....	77
5.2.1	Human Settlement	78
5.2.2	Public Health and Safety	141
5.3	Route Specific Impacts to West Section	158
5.3.1	Human Settlement	158
5.3.2	Land-Based Economies.....	166
5.3.3	Archaeology and Historic Architectural Resources.....	171
5.3.4	Natural Environment.....	176
5.3.5	Rare and Unique Natural Resources.....	185
5.3.6	Corridor Sharing	193
5.3.7	Electrical System Reliability	194
5.3.8	Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route	97
5.4	Route Specific Impacts to Central Section.....	197
5.4.1	Human Settlement	197
5.4.2	Land-Based Economies.....	204
5.4.3	Archaeology and Historic Architectural Resources.....	208
5.4.4	Natural Environment.....	209
5.4.5	Rare and Unique Natural Resources.....	213
5.4.6	Corridor Sharing	217
5.4.7	Electrical System Reliability	218
5.4.8	Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route.....	219
5.5	Route Specific Impacts to East Section.....	219
5.5.1	Human Settlement	220
5.5.2	Land-Based Economies.....	224
5.5.3	Archaeology and Historic Architectural Resources.....	229

5.5.4	Natural Environment.....	230
5.5.5	Rare and Unique Natural Resources.....	234
5.5.6	Corridor Sharing.....	237
5.5.7	Electric System Reliability.....	237
5.5.8	Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route	239
6.0	Comparative Environmental Consequences.....	241
6.1	Introduction.....	241
6.2	West Section	241
6.2.1	Border Crossing Variation Area.....	242
6.2.2	Roseau Lake WMA Variation Area	267
6.2.3	Cedar Bend WMA Variation Area.....	287
6.2.4	Beltrami North Variation Area.....	307
6.2.5	Beltrami North Central Variation Area	325
6.2.6	Relative Merits Summary	344
6.3	Central Section.....	381
6.3.1	Pine Island Variation Area.....	381
6.3.2	Beltrami South Central Variation Area	399
6.3.3	Beltrami South Variation Area.....	412
6.3.4	North Black River Variation Area.....	424
6.3.5	C2 Segment Option Variation Area.....	439
6.3.6	J2 Segment Option Variation Area.....	456
6.3.7	Northome Variation Area.....	472
6.3.8	Cutfoot Variation Area	483
6.3.9	Relative Merits Summary	495
6.4	East Section	533
6.4.1	Effie Variation Area.....	533
6.4.2	East Bear Lake Variation Area	553
6.4.3	Balsam Variation Area.....	567
6.4.4	Dead Man’s Pond Variation Area	584
6.4.5	Blackberry Variation Area.....	596
6.4.6	Relative Merits Summary	610
6.5	Alignment Modifications.....	633
6.5.1	West Section	633
6.5.2	Central Section.....	633
6.5.3	East Section	634
6.6	Hops.....	647
6.6.1	West Section	647
6.6.2	Central Section.....	647

6.6.3	East Section	647
6.7	Associated Facilities	651
6.7.1	West Section	651
6.7.2	Central Section	651
6.7.3	East Section	652
7.0	Cumulative and Other Impacts	657
7.1	Cumulative Impacts Analysis	657
7.2	Other Actions Considered for Potential Cumulative Impacts	657
7.2.1	Past Actions	657
7.2.2	Present and Reasonably Foreseeable Future Actions	657
7.3	Cumulative Impacts	661
7.3.1	Human Settlement	661
7.3.2	Public Health and Safety	665
7.3.3	Land-Based Economies	666
7.3.4	Archaeology and Historic Resources	666
7.3.5	Natural Resources	667
7.3.6	Rare and Unique Natural Resources	669
7.4	Adverse Impacts that Cannot be Avoided	669
7.5	Relationship between Short-term uses of the Environment and the Maintenance and Enhancement of Long-term Productivity	670
7.6	Irreversible and Irretrievable Commitment of Resources	670
7.6.1	Rare Species	670
7.6.2	Wetland Type Conversion	670
7.6.3	Materials	671
7.6.4	Energy	671
7.6.5	Landfill Space	671
7.6.6	Human Resources	671
8.0	List of Preparers	673
8.1	Federal and State Agencies	673
8.2	EIS Preparation Team	673
8.3	Responsibilities	673
9.0	References	677
10.0	Acronyms	689
11.0	Index	693

List of Tables

Table S-1	Sections and Corresponding Variation Areas	S-7
Table S-2	Proposed Route and Variations in the West Section	S-12
Table S-3	Proposed International Border Crossing in the West Section.....	S-13
Table S-4	Proposed Route Alternatives, Variations, and Alignment Modifications in the Central Section....	S-13
Table S-5	Proposed Routes, Variations, and Alignment Modifications in the East Section.....	S-14
Table 1-1	Major Federal Authorizations	4
Table 1-2	Federal Consultations	5
Table 1-3	State and Local Permits	10
Table 2-1	Comparison of Resources Types in the Western and Eastern Regions.....	25
Table 2-2	Applicant Proposed Measures to Minimize Environmental Impacts.....	41
Table 2-3	Proposed Project Cost Estimates.....	43
Table 2-4	Proposed Project Schedule	44
Table 4-1	Sections and Corresponding Variation Areas	49
Table 4-2	Proposed Routes and Variations in the West Section	50
Table 4-3	Proposed International Border Crossings and Variations in the West Section.....	50
Table 4-4	Proposed Routes, Variations, and Alignment Modifications in the Central Section.....	61
Table 4-5	Proposed Routes, Variations, and Alignment Modifications in the East Section.....	73
Table 5-1	Noise Levels from Common Sources	103
Table 5-2	Minnesota Noise Standards.....	103
Table 5-3	Typical Noise Levels of Construction Equipment	104
Table 5-4	Predicted Audible Noise Levels from the Proposed Project Transmission Line in Rainy Weather Conditions	105
Table 5-5	Predicted Audible Noise Levels from the Proposed 500 kV Blackberry Substation and 500 kV Compensation Station	106
Table 5-6	National Ambient Air Quality Standards	107
Table 5-7	Major Roadways in the Project Area	117
Table 5-8	Federal Aviation Administration Airports in the ROI	120
Table 5-9	Minority Population Composition of Five-County Region of Comparison (ROC) and State of Minnesota.....	124
Table 5-10	Minority Population Composition in Region of Influence (ROI) Census Tracts, Region of Comparison (ROC), and State	125
Table 5-11	2008-2012 Poverty and Income Characteristics of Five-County Region of Comparison (ROC) and State of Minnesota.....	126
Table 5-12	Percentage of Individuals Below the Poverty Line and Median Household Income in Census Tracts Traversed by the Proposed Project Routes and Variations, Region of Comparison (ROC), and State	127
Table 5-13	Population Trends in the ROI	131

Table 5-14	Civilian Labor Force and Number Employed and Unemployed, 2014 Annual Average.....	132
Table 5-15	Percent Employment by Industry for ROI Counties based on the 2008-2012 American Community Survey 5-Year Estimates	134
Table 5-16	Temporary Housing Supply within Commuting Distance of Proposed Routes and Variations by Geographic Section of Proposed Project	137
Table 5-17	Typical Sources of Magnetic Fields.....	142
Table 5-18	Limits on Electric and Magnetic Fields Near High Voltage AC Transmission Lines for Various States	143
Table 5-19	International Electric and Magnetic Field Guidelines	143
Table 5-20	Predicted Electric Field Strength at Maximum Operating Voltage for Scenario 1: Stand-alone 500 kV Transmission Line.....	144
Table 5-21	Predicted Electric Field Strength at Maximum Operating Voltage for Scenario 2: Paralleling Existing Transmission Lines	144
Table 5-22	Predicted Magnetic Field Strengths for the Proposed Project.....	145
Table 5-23	MPCA's "What's in my Neighborhood" Listed Sites in the Proposed Project Area	153
Table 5-24	Summary of Impaired Waters in the West Section.....	177
Table 5-25	Federally-listed Species Known to Occur in Roseau and/or Lake of the Woods Counties.....	187
Table 5-26	State-Endangered, Threatened, and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the West Section	189
Table 5-27	Proposed Routes and Variations in the West Section	198
Table 5-28	Summary of Impaired Waters in the Central Section	210
Table 5-29	Federally-Listed Species Known to Occur in Lake of the Woods, Koochiching, Beltrami, and/or Itasca Counties.....	214
Table 5-30	State-endangered, Threatened, and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the Central Section	216
Table 5-31	Proposed Routes and Variations in the Central Section.....	219
Table 5-32	Summary of Impaired Waters in the East Section.....	231
Table 5-33	Federally-listed Species Known to Occur in Koochiching and Itasca Counties.....	234
Table 5-34	State-Threatened and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the East Section.....	235
Table 5-35	Proposed Routes and Variations in the East Section	239
Table 6-1	Aesthetic Resources within the ROI in the Border Crossing Variation Area.....	243
Table 6-2	Land Uses within the ROI in the Border Crossing Variation Area	246
Table 6-3	Land Ownership within the Anticipated ROW in the Border Crossing Variation Area.....	248
Table 6-4	Land-Based Economy Resources within the Anticipated ROW in the Border Crossing Variation Area	250
Table 6-5	Archaeological and Historic Architectural Resources within the Border Crossing Variation Area 254	
Table 6-6	Water Resources within the Anticipated ROW in the Border Crossing Variation Area.....	256
Table 6-7	Vegetation Resources within the Anticipated ROW in the Border Crossing Variation Area....	260
Table 6-8	Wildlife Resources within the Vicinity of the Border Crossing Variation Area	262

Table of Contents

Table 6-9	Rare Species Documented within One Mile of the Anticipated ROW in the Border Crossing Variation Area.....	
Table 6-10	Rare Communities and Resources within the Vicinity of the Border Crossing Variation Area.....	266
Table 6-11	Corridor Sharing in the Border Crossing Variation Area.....	268
Table 6-12	Construction Costs in the Border Crossing Variation Area.....	269
Table 6-13	Aesthetic Resources within the ROI in the Roseau Lake WMA Variation Area.....	270
Table 6-14	Land Uses within the ROI in the Roseau Lake WMA Variation Area.....	272
Table 6-15	Land Ownership within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	274
Table 6-16	Land-Based Economy Resources within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	275
Table 6-17	Archaeological and Historic Architectural Resources within the Roseau Lake WMA Variation Area.....	278
Table 6-18	Water Resources within the Anticipated ROW in the Roseau Lake Variation Area.....	279
Table 6-19	Vegetation resources within the anticipated ROW in the Roseau Lake WMA Variation Area.....	284
Table 6-20	Wildlife Resources within the Vicinity of the Roseau Lake WMA Variation Area.....	284
Table 6-21	Rare Species Documented within One Mile of the Anticipated ROW in the Roseau Lake WMA Variation Area.....	285
Table 6-22	Rare Communities and Resources within the Vicinity of the Roseau Lake WMA Variation Area..	286
Table 6-23	Corridor Sharing in the Roseau Lake WMA Variation Area.....	287
Table 6-24	Construction Costs in the Roseau Lake WMA Variation Area.....	288
Table 6-25	Aesthetic Resources within the ROI in the Cedar Bend WMA Variation Area.....	289
Table 6-26	Land Uses within the ROI in the Cedar Bend WMA Variation Area.....	291
Table 6-27	Land Ownership within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	292
Table 6-28	Land-Based Economy Resources within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	294
Table 6-29	Archaeological and Historic Architectural Resources within the Cedar Bend WMA Variation Area.....	297
Table 6-30	Water Resources within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	298
Table 6-31	Vegetation Resources within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	302
Table 6-32	Wildlife Resources within the Vicinity of the Cedar Bend WMA Variation Area.....	303
Table 6-33	Rare Species Documented within One Mile of the Anticipated ROW in the Cedar Bend WMA Variation Area.....	304
Table 6-34	Rare Communities and Resources within the Vicinity of the Cedar Bend WMA Variation Area.....	305
Table 6-35	Corridor Sharing in the Cedar Bend WMA Variation Area.....	307
Table 6-36	Construction Costs in the Cedar Bend WMA Variation Area.....	306
Table 6-37	Aesthetic Resources within the ROI in the Beltrami North Variation Area.....	306
Table 6-38	Land Uses within the ROI in the Beltrami North Variation Area.....	309
Table 6-39	Land Ownership within the Anticipated ROW in the Beltrami North Variation Area.....	309

Table 6-40	Land-Based Economy Resources within the Anticipated ROW in the Beltrami North Variation Area.....	311
Table 6-41	Archaeological and Historic Architectural Resources within the Beltrami North Variation Area.....	314
Table 6-42	Water Resources within the Anticipated ROW in the Beltrami North Variation Area.....	316
Table 6-43	Vegetation Resources within the Anticipated ROW in the Beltrami North Variation Area.....	321
Table 6-44	Wildlife Resources within the Vicinity of the Beltrami North Variation Area.....	321
Table 6-45	Rare Species Documented within One Mile of the Anticipated ROW in the Beltrami North Variation Area.....	322
Table 6-46	Rare Communities and Resources within the Vicinity of the Beltrami North Variation Area..	323
Table 6-47	Corridor Sharing in the Beltrami North Variation Area.....	324
Table 6-48	Construction Costs in the Beltrami North Variation Area.....	325
Table 6-49	Aesthetic Resources within the ROI in the Beltrami North Central Variation Area.....	326
Table 6-50	Land Uses within the ROI in the Beltrami North Central Variation Area.....	328
Table 6-51	Land Ownership within the Anticipated ROW in the Beltrami North Central Variation Area.	328
Table 6-52	Land-Based Economy Resources within the Anticipated ROW in the Beltrami North Central Variation Area.....	331
Table 6-53	Archaeological and Historic Architectural Resources within the Beltrami North Central Variation Area.....	334
Table 6-54	Water Resources within the Anticipated ROW in the Beltrami North Central Variation Area	334
Table 6-55	Vegetation Resources within the Anticipated ROW in the Beltrami North Central Variation Area.....	337
Table 6-56	Wildlife Resources within the Vicinity of the Beltrami North Central Variation Area.....	338
Table 6-57	Rare Species Documented within One Mile of the Anticipated ROW in the Beltrami North Central Variation Area.....	340
Table 6-58	Rare Communities and Resources within the Vicinity of the Beltrami North Central Variation Area.....	341
Table 6-59	Corridor Sharing in the Beltrami North Central Variation Area.....	342
Table 6-60	Construction Costs in the Beltrami North Central Variation Area.....	343
Table 6-61	Relative Merits Assessment for the Border Crossing Variation Area.....	347
Table 6-62	Relative Merits Assessment for the Roseau Lake WMA Variation Area.....	349
Table 6-63	Relative Merits Assessment for the Cedar Bend WMA Variation Area.....	350
Table 6-64	Relative Merits Assessment for the Beltrami North Variation Area.....	351
Table 6-65	Relative Merits Assessment for the Beltrami North Central Variation Area.....	353
Table 6-66	Aesthetic Resources within the ROI in the Pine Island Variation Area.....	382
Table 6-67	Land Uses within the ROI in the Pine Island Variation Area.....	384
Table 6-68	Land Ownership within the anticipated ROW in the Pine Island Variation Area.....	385
Table 6-69	Land-Based Economy Resources within the Anticipated ROW in the Pine Island Variation Area.....	387
Table 6-70	Archaeological and Historic Architectural Resources within the Pine Island Variation Area...	390

Table of Contents

Table 6-71	Water Resources within the Anticipated ROW in the Pine Island Variation Area	391
Table 6-72	Vegetation Resources within the Anticipated ROW in the Pine Island Variation Area	395
Table 6-73	Wildlife Resources within the Vicinity of the Pine Island Variation Area.....	395
Table 6-74	Rare Species Documented within One Mile of the Anticipated ROW in the Pine Island Variation Area.....	396
Table 6-75	Rare Communities and Resources within the Vicinity of the Pine Island Variation Area.....	397
Table 6-76	Corridor Sharing in the Pine Island Variation Area.....	399
Table 6-77	Construction Costs in the Pine Island Variation Area	401
Table 6-78	Aesthetic Resources within the ROI in the Beltrami South Central Variation Area	401
Table 6-79	Land Uses within the ROI in the Beltrami South Central Variation Area.....	402
Table 6-80	Land Ownership within the Anticipated ROW in the Beltrami South Central Variation Area.....	402
Table 6-81	Land-Based Economy Resources within the Anticipated ROW in the Beltrami South Central Variation Area.....	404
Table 6-82	Water Resources within the Anticipated ROW in the Beltrami South Central Variation Area.....	406
Table 6-83	Vegetation Resources within the Anticipated ROW in the Beltrami South Central Variation Area.....	407
Table 6-84	Wildlife Resources within the Vicinity of the Beltrami South Central Variation Area.....	409
Table 6-85	Rare Species Documented within One Mile of the Anticipated ROW in the Beltrami South Central Variation Area.....	410
Table 6-86	Rare Communities and Resources within the Vicinity of the Beltrami South Central Variation Area.....	411
Table 6-87	Corridor Sharing in the Beltrami South Central Variation Area.....	411
Table 6-88	Construction Costs in the Beltrami South Central Variation Area	412
Table 6-89	Aesthetic Resources within the ROI in the Beltrami South Variation Area.....	412
Table 6-90	Land Uses within the ROI in the Beltrami South Variation Area.....	413
Table 6-91	Land Ownership within the Anticipated ROW in the Beltrami South Variation Area.....	414
Table 6-92	Land-Based Economy Resources within the Anticipated ROW in the Beltrami South Variation Area.....	415
Table 6-93	Water Resources within the Anticipated ROW in the Beltrami South Variation Area	418
Table 6-94	Vegetation Resources within the Anticipated ROW in the Beltrami South Variation Area	419
Table 6-95	Wildlife Resources within the Vicinity of the Beltrami South Variation Area.....	421
Table 6-96	Rare Species Documented within One Mile of the Anticipated ROW in the Beltrami South Variation Area.....	422
Table 6-97	Rare Communities and Resources within the Vicinity of the Beltrami South Variation Area..	423
Table 6-98	Corridor Sharing in the Beltrami South Variation Area.....	423
Table 6-99	Construction Costs in the Beltrami South Variation Area	425
Table 6-100	Aesthetic Resources within the ROI in the North Black River Variation Area.....	425
Table 6-101	Land Uses within the ROI in the North Black River Variation Area.....	427

Table 6-102	Land Ownership within the Anticipated ROW in the North Black River Variation Area.....	427
Table 6-103	Land-Based Economy Resources within the Anticipated ROW in the North Black River Variation Area.....	429
Table 6-104	Water Resources within the Anticipated ROW in the North Black River Variation Area.....	433
Table 6-105	Vegetation Resources within the Anticipated ROW in the North Black River Variation Area.....	435
Table 6-106	Wildlife Resources within the Vicinity of the North Black River Variation Area.....	436
Table 6-107	Rare Communities and Resources within the Vicinity of the North Black River Variation Area.....	437
Table 6-108	Corridor Sharing in the North Black River Variation Area.....	438
Table 6-109	Construction Costs in the North Black River Variation Area.....	438
Table 6-110	Aesthetic Resources within the ROI in the C2 Variation Area.....	439
Table 6-111	Land Uses within the ROI in the C2 Variation Area	441
Table 6-112	Land Ownership within the Anticipated ROW in the C2 Variation Area.....	442
Table 6-113	Land-Based Economy Resources within the Anticipated ROW in the C2 Segment Option Variation Area.....	443
Table 6-114	Archaeological and Historic Architectural Resources within the C2 Segment Option Variation Area.....	447
Table 6-115	Water Resources within the Anticipated ROW in the C2 Segment Option Variation Area.....	447
Table 6-116	Vegetation Resources within the Anticipated ROW in the C2 Segment Option Variation Area.....	450
Table 6-117	Wildlife Resources within the Vicinity of the C2 Segment Option Variation Area.....	451
Table 6-118	Rare Species Documented within One Mile of the Anticipated ROW in the C2 Segment Option Variation Area	452
Table 6-119	Rare Communities and Resources within the Vicinity of the C2 Segment Option Variation Area.....	453
Table 6-120	Corridor Sharing in the C2 Variation Area.....	454
Table 6-121	Construction Costs in the C2 Segment Option Variation Area.....	456
Table 6-122	Aesthetic Resources within the ROI in the J2 Variation Area.....	457
Table 6-123	Land Uses within the ROI in the J2 Variation Area.....	458
Table 6-124	Land Ownership within the Anticipated ROW in the J2 Variation Area.....	459
Table 6-125	Land-Based Economy Resources within the Anticipated ROW in the J2 Segment Option Variation Area.....	461
Table 6-126	Archaeological and Historic Architectural Resources within the J2 Segment Option Variation Area.....	464
Table 6-127	Water Resources within the Anticipated ROW in the J2 Segment Option Variation Area	465
Table 6-128	Vegetation Resources within the Anticipated ROW in the J2 Segment Option Variation Area.....	468
Table 6-129	Wildlife Resources within the Vicinity of the J2 Segment Option Variation Area.....	469
Table 6-130	Rare Species Documented within One Mile of the Anticipated ROW in the J2 Segment Option Variation Area	470

Table of Contents

Table 6-131	Rare Communities and Resources within the Vicinity of the J2 Segment Option Variation Area.....	471
Table 6-132	Corridor Sharing in the J2 Segment Option Variation Area.....	472
Table 6-133	Construction Costs in the J2 Segment Option Variation Area.....	472
Table 6-134	Aesthetic Resources within the ROI in the Northome Variation Area.....	473
Table 6-135	Land Uses within the ROI in the Northome Variation Area.....	473
Table 6-136	Land Ownership within the Anticipated ROW in the Northome Variation Area.....	474
Table 6-137	Land-Based Economy Resources within the Anticipated ROW in the Northome Variation Area.....	476
Table 6-138	Archaeological and Historic Architectural Resources within the Northome Variation Area.....	477
Table 6-139	Water Resources within the Anticipated ROW in the Northome Variation Area.....	478
Table 6-140	Vegetation Resources within the Anticipated ROW in the Northome Variation Area.....	480
Table 6-141	Wildlife Resources within the Vicinity of the Northome Variation Area.....	481
Table 6-142	Construction Costs in the Northome Variation Area.....	482
Table 6-143	Aesthetic Resources within the ROI in the Cutfoot Variation Area.....	483
Table 6-144	Land Uses within the ROI in the Cutfoot Variation Area.....	484
Table 6-145	Land Ownership within the Anticipated ROW in the Cutfoot Variation Area.....	484
Table 6-146	Land-Based Economy Resources within the Anticipated ROW in the Cutfoot Variation Area.....	486
Table 6-147	Archaeological and Historic Architectural Resources within the Cutfoot Variation Area.....	489
Table 6-148	Water Resources within the Anticipated ROW in the Cutfoot Variation Area.....	490
Table 6-149	Vegetation Resources within the Anticipated ROW in the Cutfoot Variation Area.....	492
Table 6-150	Rare Communities and Resources within the Vicinity of the Cutfoot Variation Area.....	494
Table 6-151	Construction Costs in the Cutfoot Variation Area.....	495
Table 6-152	Relative Merits Assessment for the Pine Island Variation Area.....	498
Table 6-153	Relative Merits Assessment for the Beltrami South Central Variation Area.....	499
Table 6-154	Relative Merits Assessment for the Beltrami South Variation Area.....	500
Table 6-155	Relative Merits Assessment for the North Black River Variation Area.....	501
Table 6-156	Relative Merits Assessment for the C2 Segment Option Variation Area.....	502
Table 6-157	Relative Merits Assessment for the J2 Segment Option Variation Area.....	503
Table 6-158	Relative Merits Assessment for the Northome Variation Area.....	504
Table 6-159	Relative Merits Assessment for the Cutfoot Variation Area.....	505
Table 6-160	Aesthetic Resources within the ROI in the Effie Variation Area.....	534
Table 6-161	Land Uses within the ROI in the Effie Variation Area.....	536
Table 6-162	Land Ownership within the Anticipated ROW in the Effie Variation Area.....	537
Table 6-163	Land-Based Economy Resources within the Anticipated ROW in the Effie Variation Area.....	539
Table 6-164	Archaeological and Historic Architectural Resources within the Effie Variation Area.....	542

Table 6-165	Water Resources within the Anticipated ROW in the Effie Variation Area	543
Table 6-166	Vegetation Resources within the Anticipated ROW in the Effie Variation Area	547
Table 6-167	Wildlife Resources within the Vicinity of the Effie Variation Area.....	548
Table 6-168	Rare Species Documented within One Mile of the Anticipated ROW in the Effie Variation Area.....	549
Table 6-169	Rare Communities and Resources within the Vicinity of the Effie Variation Area.....	550
Table 6-170	Corridor Sharing in the Effie Variation Area.....	551
Table 6-171	Construction Costs in the Effie Variation Area	553
Table 6-172	Aesthetic Resources within the ROI in the East Bear Lake Variation Area	554
Table 6-173	Land Uses within the ROI in the East Bear Lake Variation Area.....	555
Table 6-174	Land Ownership within the Anticipated ROW in the East Bear Lake Variation Area.....	555
Table 6-175	Land-Based Economy Resources within the Anticipated ROW in the East Bear Lake Variation Area.....	557
Table 6-176	Water Resources within the Anticipated ROW in the East Bear Lake Variation Area	560
Table 6-177	Vegetation Resources within the Anticipated ROW in the East Bear Variation Area.....	562
Table 6-178	Information Relevant to Wildlife Resources in the Vicinity of the East Bear Variation Area....	563
Table 6-179	Rare Species Documented within One Mile of the Anticipated ROW in the East Bear Variation Area.....	564
Table 6-180	Rare Communities and Resources within the Vicinity of the East Bear Variation Area	565
Table 6-181	Corridor Sharing in the East Bear Lake Variation Area.....	567
Table 6-182	Construction Costs in the East Bear Lake Variation Area	567
Table 6-183	Aesthetic Resources within the ROI in the Balsam Variation Area.....	568
Table 6-184	Land Uses within the ROI in the Balsam Variation Area	570
Table 6-185	Land Ownership within the Anticipated ROW in the Balsam Variation Area	570
Table 6-186	Land-Based Economy Resources within the Anticipated ROW in the Balsam Variation Area.....	572
Table 6-187	Archaeological and Historic Architectural Resources within the Balsam Variation Area	574
Table 6-188	Water Resources within the Anticipated ROW in the Balsam Variation Area.....	575
Table 6-189	Vegetation Resources within the Anticipated ROW in the Balsam Variation Area.....	578
Table 6-190	Information Relevant to Wildlife Resources in the Vicinity of the Balsam Variation Area.....	579
Table 6-191	Rare Species Documented within One Mile of the Anticipated ROW in the Balsam Variation Area.....	580
Table 6-192	Rare Communities and Resources within the Vicinity of the Balsam Variation Area.....	581
Table 6-193	Corridor Sharing in the Balsam Variation Area	582
Table 6-194	Construction Costs in the Balsam Variation Area.....	584
Table 6-195	Aesthetic Resources within the ROI in the Dead Man’s Pond Variation Area	585
Table 6-196	Land Uses within the ROI in the Dead Man’s Pond Variation Area	586
Table 6-197	Land Ownership within the Anticipated ROW in the Dead Man’s Pond Variation Area	587

Table of Contents

Table 6-198	Land-Based Economy Resources within the Anticipated ROW in the Dead Man's Pond Variation Area.....	588
Table 6-199	Archaeological and Historic Architectural Resources within the Dead Man's Pond Variation Area.....	590
Table 6-200	Water Resources within the Anticipated ROW in the Dead Man's Pond Variation Area.....	590
Table 6-201	Vegetation Resources within the Anticipated ROW in the Dead Man's Pond Variation Area.....	592
Table 6-202	Corridor Sharing in the Dead Man's Pond Variation Area	594
Table 6-203	Construction Costs in the Dead Man's Pond Variation Area.....	595
Table 6-204	Aesthetic Resources within the ROI in the Blackberry Variation Area.....	596
Table 6-205	Land Uses within the ROI in the Blackberry Variation Area	598
Table 6-206	Land Ownership within the Anticipated ROW in the Blackberry Variation Area.....	598
Table 6-207	Land-Based Economy Resources within the Anticipated ROW in the Blackberry Variation Area.....	600
Table 6-208	Archaeological and Historic Architectural Resources within the Blackberry Variation Area.....	602
Table 6-209	Water Resources within the Anticipated ROW in the Blackberry Variation Area.....	603
Table 6-210	Vegetation Resources within the Anticipated ROW in the Blackberry Variation Area.....	605
Table 6-211	Wildlife Resources within the Vicinity of the Blackberry Variation Area	606
Table 6-212	Rare Species Documented within One Mile of the Anticipated ROW in the Blackberry Variation Area.....	606
Table 6-213	Rare Communities and Resources within the Vicinity of the Blackberry Variation Area.....	607
Table 6-214	Corridor Sharing in the Blackberry Variation Area.....	608
Table 6-215	Construction Costs in the Blackberry Variation Area.....	610
Table 6-216	Relative Merits Assessment for the Effie Variation Area.....	611
Table 6-217	Relative Merits Assessment for the East Bear Lake Variation Area.....	612
Table 6-218	Relative Merits Assessment for the Balsam Variation Area	613
Table 6-219	Relative Merits Assessment for the Dead Man's Pond Variation Area.....	614
Table 6-220	Relative Merits Assessment for the Blackberry Variation Area	615
Table 8 1	List of Preparers - Federal and State Organizations.....	673
Table 8 2	List of Preparers - EIS Preparation Team.....	674

List of Figures

Figure 1-1	Typical Route and ROW Schematic.....	8
Figure 2-1	Structure Schematics.....	26
Figure 5-1	Frequencies of Electronic Communications Compared with Frequencies of Electromagnetic Noise Created by Transmission Line.....	115
Figure 5-2	Annual Unemployment Rate, 2005-2014.....	133
Figure 6-1	Residences within the ROI in the Border Crossing Variation Area.....	244
Figure 6-2	Land Uses within the ROI in the Border Crossing Variation Area(2).....	247
Figure 6-3	Land Ownership within the ROI in the Border Crossing Variation Area.....	249
Figure 6-4	Acres of Farmland by Type within the Anticipated ROW in the Border Crossing Variation Area.....	251
Figure 6-5	Acres of State Forest Land within the Anticipated ROW in the Border Crossing Variation Area.....	252
Figure 6-6	Non-PWI Water Crossings by Type in the Border Crossing Variation Area.....	257
Figure 6-7	Acres of Floodplain by Type within the Anticipated ROW in the Border Crossing Variation Area.....	258
Figure 6-8	Acres of Wetland by Type within the Anticipated ROW in the Border Crossing Variation Area.....	259
Figure 6-9	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Border Crossing Variation Area.....	261
Figure 6-10	Corridor Sharing in the Border Crossing Variation Area.....	269
Figure 6-11	Residences within the ROI in the Roseau Lake WMA Variation Area.....	271
Figure 6-12	Land Uses within the ROI in the Roseau Lake WMA Variation Area(1).....	273
Figure 6-13	Land Ownership within the ROI in the Roseau Lake WMA Variation Area(1).....	274
Figure 6-14	Acres of Farmland by Type within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	276
Figure 6-15	Acres of State Forest Land within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	277
Figure 6-16	Non-PWI Water Crossings by Type in the Roseau Lake WMA Variation Area.....	280
Figure 6-17	Acres of Floodplain by Type within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	281
Figure 6-18	Acres of Wetland by Type within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	282
Figure 6-19	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Roseau Lake WMA Variation Area.....	283
Figure 6-20	Corridor Sharing in the Roseau Lake WMA Variation Area.....	288
Figure 6-21	Residences within the ROI in the Cedar Bend WMA Variation Area.....	290
Figure 6-22	Land Uses within the ROI in the Cedar Bend WMA Variation Area.....	292
Figure 6-23	Land Ownership within the ROI in the Cedar Bend WMA Variation Area.....	293
Figure 6-24	Acres of Farmland by Type within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	294

Table of Contents

Figure 6-25	Acres of State Forest Land within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	295
Figure 6-26	Acres of State Mining Land within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	296
Figure 6-27	PWI Water Crossings by Type in the Cedar Bend WMA Variation Area.....	299
Figure 6-28	Non-PWI Water Crossings by Type in the Cedar Bend WMA Variation Area	300
Figure 6-29	Acres of Wetland by Type within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	301
Figure 6-30	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Cedar Bend WMA Variation Area.....	303
Figure 6-31	Residences within the ROI in the Beltrami North Variation Area.....	308
Figure 6-32	Land Ownership within the ROI in the Beltrami North Variation Area(1).....	310
Figure 6-33	Acres of Farmland by Type within the Anticipated ROW in the Beltrami North Variation Area.....	312
Figure 6-34	Acres of State Forest Land within the Anticipated ROW in the Beltrami North Variation Area.....	313
Figure 6-35	Acres of State Mining Land within the Anticipated ROW in the Beltrami North Variation Area.....	314
Figure 6-36	PWI Water Crossings by Type in the Beltrami North Variation Area.....	317
Figure 6-37	Non-PWI Water crossings by Type in the Beltrami North Variation Area	318
Figure 6-38	Acres of Wetland by Type within the ROW in the Beltrami North Variation Area.....	319
Figure 6-39	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Beltrami North Variation Area	320
Figure 6-40	Corridor Sharing in the Beltrami North Variation Area.....	324
Figure 6-41	Residences within the ROI in the Beltrami North Central Variation Area.....	327
Figure 6-42	Land Ownership within the ROI in the Beltrami North Central Variation Area	329
Figure 6-43	Acres of Farmland by Type within the Anticipated ROW in the Beltrami North Central Variation Area.....	332
Figure 6-44	Acres of State Forest Land within the Anticipated ROW in the Beltrami North Central Variation Area.....	333
Figure 6-45	Non-PWI Water Crossings by Type in the Beltrami North Central Variation Area.....	335
Figure 6-46	Acres of Wetland by Type within the Anticipated ROW in the Beltrami North Central Variation Area.....	336
Figure 6-47	Corridor Sharing in the Beltrami North Central Variation Area.....	343
Figure 6-48	Residences within the ROI in the Pine Island Variation Area.....	383
Figure 6-49	Land Ownership within the ROI in the Pine Island Variation Area	386
Figure 6-50	Acres of Farmland by Type within the Anticipated ROW in the Pine Island Variation Area.....	387
Figure 6-51	Acres of State Forest Land within the Anticipated ROW in the Pine Island Variation Area.....	388
Figure 6-52	Acres of State Mining Land within the Anticipated ROW in the Pine Island Variation Area.....	389

Figure 6-53	PWI Water Crossings by Type in the Pine Island Variation Area	392
Figure 6-54	Non-PWI Water Crossings by Type in the Pine Island Variation Area.....	393
Figure 6-55	Acres of Wetland by Type within the Anticipated ROW in the Pine Island Variation Area.....	394
Figure 6-56	Corridor Sharing in the Pine Island Variation Area.....	400
Figure 6-57	Land Ownership within the ROI in the Beltrami South Central Variation Area(1)	403
Figure 6-58	Acres of State Forest Land within the Anticipated ROW in the Beltrami South Central Variation Area.....	405
Figure 6-59	Acres of Wetland by Type within the Anticipated ROW in the Beltrami South Central Variation Area.....	407
Figure 6-60	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Beltrami South Central Variation Area.....	408
Figure 6-61	Land Ownership within the ROI in the Beltrami South Variation Area	414
Figure 6-62	Acres of State Forest Land within the Anticipated ROW in the Beltrami South Variation Area.....	416
Figure 6-63	Acres of State Mining Land within the Anticipated ROW in the Beltrami South Variation Area.....	417
Figure 6-64	Acres of Wetland by Type within the Anticipated ROW in the Beltrami South Variation Area.....	419
Figure 6-65	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Beltrami South Variation Area.....	421
Figure 6-66	Corridor Sharing in the Beltrami South Variation Area.....	424
Figure 6-67	Residences within the ROI in the North Black River Variation Area.....	426
Figure 6-68	Land Ownership within the ROI in the North Black River Variation Area	428
Figure 6-69	Acres of Farmland by Type within the Anticipated ROW in the North Black River Variation Area.....	430
Figure 6-70	Acres of State Forest Land within the Anticipated ROW in the North Black River Variation Area.....	431
Figure 6-71	Acres of State Mining Land within the Anticipated ROW in the North Black River Variation Area.....	432
Figure 6-72	Non-PWI Water Crossings by Type in the North Black River Variation Area.....	433
Figure 6-73	Acres of Wetland by Type within the Anticipated ROW in the North Black River Variation Area.....	434
Figure 6-74	Residences within the ROI in the C2 Segment Option Variation Area.....	440
Figure 6-75	Land Ownership within the ROI in the Segment C2 Segment Option Variation Area(1).....	442
Figure 6-76	Acres of Farmland by Type within the Anticipated ROW in the C2 Segment Option Variation Area.....	444
Figure 6-77	Acres of State Forest Land within the Anticipated ROW in the C2 Variation Area.....	445
Figure 6-78	Acres of State Mining Land within the Anticipated ROW in the C2 Variation Area.....	446
Figure 6-79	Non-PWI Water Crossings by Type in the C2 Segment Option Variation Area.....	448
Figure 6-80	Acres of Wetland by Type within the Anticipated ROW in the C2 Segment Option Variation Area.....	449

Table of Contents

Figure 6-81	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the C2 Segment Option Variation Area.....	451
Figure 6-82	Corridor Sharing in the C2 Variation Area.....	455
Figure 6-83	Residences within the ROI in the J2 Segment Option Variation Area.....	458
Figure 6-84	Land Ownership within the ROI in the J2 Segment Option Variation Area.....	460
Figure 6-85	Acres of Farmland by Type within the Anticipated ROW in the J2 Segment Option Variation Area.....	462
Figure 6-86	Acres of State Forest Land within the Anticipated ROW in the J2 Segment Option Variation Area.....	463
Figure 6-87	Acres of State Mining Land within the Anticipated ROW in the J2 Segment Option Variation Area.....	464
Figure 6-88	Non-PWI Water Crossings by Type in the J2 Segment Option Variation Area.....	466
Figure 6-89	Acres of Wetland by Type within the Anticipated ROW in the J2 Segment Option Variation Area.....	467
Figure 6-90	Land Ownership within the ROI in the Northome Variation Area.....	475
Figure 6-91	Acres of Farmland by Type within the Anticipated ROW in the Northome Variation Area.....	476
Figure 6-92	Acres of Wetland by Type within the Anticipated ROW in the Northome Variation Area.....	479
Figure 6-93	Land Ownership within the ROI in the Cutfoot Variation Area.....	485
Figure 6-94	Acres of Farmland by Type within the Anticipated ROW in the Cutfoot Variation Area.....	487
Figure 6-95	Acres of State Forest Land within the Anticipated ROW in the Cutfoot Variation Area.....	488
Figure 6-96	Acres of State Mining Land within the Anticipated ROW in the Cutfoot Variation Area.....	489
Figure 6-97	Acres of Wetland by Type within the Anticipated ROW in the Cutfoot Variation Area.....	491
Figure 6-98	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Cutfoot Variation Area.....	493
Figure 6-99	Residences within the ROI in the Effie Variation Area.....	535
Figure 6-100	Land Ownership within the ROI in the Effie Variation Area(1).....	538
Figure 6-101	Acres of Farmland by Type within the Anticipated ROW in the Effie Variation Area.....	540
Figure 6-102	Acres of State Forest Land within the Anticipated ROW in the Effie Variation Area.....	541
Figure 6-103	Acres of State Mining Land within the Anticipated ROW in the Effie Variation Area.....	542
Figure 6-104	PWI water Crossings by Type in the Effie Variation Area.....	544
Figure 6-105	Non-PWI Water Crossings by Type in the Effie Variation Area.....	545
Figure 6-106	Acres of Wetland by Type within the Anticipated ROW in the Effie Variation Area.....	546
Figure 6-107	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Effie Variation Area.....	548
Figure 6-108	Corridor Sharing in the Effie Variation Area.....	552
Figure 6-109	Land Ownership within the ROI in the East Bear Lake Variation Area.....	556
Figure 6-110	Acres of Farmland by Type within the Anticipated ROW in the East Bear Lake Variation Area.....	557
Figure 6-111	Acres of State Forest Land within the Anticipated ROW in the East Bear Lake Variation Area.....	558

Figure 6-112	Acres of State Mining Land within the Anticipated ROW in the East Bear Lake Variation Area.....	559
Figure 6-113	Acres of Wetland by Type within the Anticipated ROW in the East Bear Lake Variation Area.....	561
Figure 6-114	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the East Bear Variation Area.....	563
Figure 6-115	Corridor Sharing in the East Bear Lake Variation Area.....	566
Figure 6-116	Residences within the ROI in the Balsam Variation Area.....	569
Figure 6-117	Land Ownership within the ROI in the Balsam Variation Area(1).....	571
Figure 6-118	Acres of Farmland by Type within the Anticipated ROW in the Balsam Variation Area.....	573
Figure 6-119	Acres of State Mining Land within the Anticipated ROW in the Balsam Variation Area.....	574
Figure 6-120	PWI Water Crossings by Type in the Balsam Variation Area.....	576
Figure 6-121	Non-PWI Water Crossings by Type in the Balsam Variation Area (to be provided in FEIS).....	
Figure 6-122	Acres of Wetland by Type within the Anticipated ROW in the Balsam Variation Area.....	577
Figure 6-123	Acres of all Forested GAP Land Cover Types within the Anticipated ROW in the Balsam Variation Area.....	579
Figure 6-124	Corridor Sharing in the Balsam Variation Area.....	583
Figure 6-125	Residences within the ROI in the Dead Man’s Variation Area.....	586
Figure 6-126	Land Ownership within the ROI in the Dead Man’s Pond Variation Area.....	587
Figure 6-127	Acres of Farmland by Type within the Anticipated ROW in the Dead Man’s Pond Variation Area.....	589
Figure 6-128	Acres of Wetland by Type within the Anticipated ROW in the Dead Man’s Pond Variation Area.....	591
Figure 6-129	Corridor Sharing in the Dead Man’s Pond Variation Area.....	595
Figure 6-130	Residences within the ROI in the Blackberry Variation Area.....	597
Figure 6-131	Land Ownership within the ROI in the Blackberry Variation Area(1).....	599
Figure 6-132	Acres of Farmland by Type within the Anticipated ROW in the Blackberry Variation Area.....	600
Figure 6-133	Acres of State Mining Land within the Anticipated ROW in the Blackberry Variation Area.....	601
Figure 6-134	PWI Water Crossings by type in the Blackberry Variation Area.....	604
Figure 6-135	Acres of Wetland by Type within the Anticipated ROW in the Blackberry Variation Area.....	605
Figure 6-136	Corridor Sharing in the Blackberry Variation Area.....	609

List of Maps

Map S-1 Proposed Project..... S-2

Map S-2 Project Sections Overview..... S-8

Map S-3 West Section Overview..... S-9

Map S-4 Central Section Overview S-10

Map S-5 East Section Overview..... S-11

Map 2-1 Proposed Project..... 17

Map 4-1 Project Sections Overview..... 51

Map 4-2 West Section Overview..... 52

Map 4-3 Border Crossing Variation Area 53

Map 4-4 Roseau Lake WMA Variation Area..... 54

Map 4-5 Cedar Bend WMA Variation Area 57

Map 4-6 Beltrami North Variation Area 58

Map 4-7 Beltrami North Central Variation Area..... 59

Map 4-8 Central Section Overview 60

Map 4-9 Pine Island Variation Area..... 63

Map 4-10 Beltrami South Central and Beltrami South Variation Areas..... 64

Map 4-11 North Black River Variation Area 65

Map 4-12 C2 Segment Option Variation Area 66

Map 4-13 J2 Segment Option, Northome and Cutfoot Variation Areas..... 69

Map 4-14 East Section Overview..... 70

Map 4-15 Effie Variation Area..... 71

Map 4-16 East Bear Lake Variation Area..... 72

Map 4-17 Balsam, Dead Man’s Pond, and Blackberry Variation Areas..... 75

Map 5-1 Peatlands Overview..... 79

Map 5-2 Ecological Subsections 80

Map 5-3 Census Tracts..... 81

Map 5-4 Human Settlement in West Section..... 82

Map 5-5 Land Use in West Section 83

Map 5-6 Cultural Resources in West Section 84

Map 5-7 Water Resources in West Section 85

Map 5-8 Wildlife Resources in West Section..... 86

Map 5-9 Rare and Unique Natural Resources in West Section..... 87

Map 5-10 Corridor Sharing in West Section 88

Map 5-11 Human Settlement in Central Section..... 89

Map 5-12 Land Use in Central Section..... 90

Map 5-13	Cultural Resources in Central Section.....	91
Map 5-14	Water Resources in Central Section.....	92
Map 5-15	Wildlife Resources in Central Section	93
Map 5-16	Rare and Unique Natural Resources in Central Section.....	94
Map 5-17	Corridor Sharing in Central Section.....	95
Map 5-18	Human Settlement in East Section	96
Map 5-19	Land Use in East Section.....	97
Map 5-20	Cultural Resources in East Section	98
Map 5-21	Water Resources in East Section.....	99
Map 5-22	Wildlife Resources in East Section.....	100
Map 5-23	Rare and Unique Natural Resources in East Section.....	101
Map 5-24	Corridor Sharing in East Section.....	102
Map 6-1	Human Settlement within Border Crossing Variation Area	355
Map 6-2	Cultural Resources within Border Crossing Variation Area.....	356
Map 6-3	Water and Wildlife Resources within Border Crossing Variation Area	357
Map 6-4	Rare and Unique Natural Resources within Border Crossing Variation Area.....	358
Map 6-5	Corridor Sharing within Border Crossing Variation Area.....	359
Map 6-6	Human Settlement within Roseau Lake WMA Variation Area.....	360
Map 6-7	Cultural Resources within Roseau Lake WMA Variation Area.....	361
Map 6-8	Water and Wildlife Resources within Roseau Lake WMA Variation Area.....	362
Map 6-9	Rare and Unique Natural Resources within Roseau Lake WMA Variation Area	363
Map 6-10	Corridor Sharing within Roseau Lake WMA Variation Area	364
Map 6-11	Human Settlement within Cedar Bend WMA Variation Area	365
Map 6-12	Cultural Resources within Cedar Bend WMA Variation Area	366
Map 6-13	Water and Wildlife Resources within Cedar Bend WMA Variation Area	367
Map 6-14	Rare and Unique Natural Resources within Cedar Bend WMA Variation Area.....	368
Map 6-15	Corridor Sharing within Cedar Bend WMA Variation Area.....	369
Map 6-16	Human Settlement within Beltrami North Variation Area	370
Map 6-17	Cultural Resources within Beltrami North Variation Area	371
Map 6-18	Water and Wildlife Resources within Beltrami North Variation Area	372
Map 6-19	Rare and Unique Natural Resources within Beltrami North Variation Area.....	373
Map 6-20	Corridor Sharing within Beltrami North Variation Area.....	374
Map 6-21	Human Settlement within Beltrami North Central Variation Area.....	375
Map 6-22	Cultural Resources within Beltrami North Central Variation Area	376
Map 6-23	Water and Wildlife Resources within Beltrami North Central Variation Area.....	377
Map 6-24	Rare and Unique Natural Resources within Beltrami North Central Variation Area.....	378

Table of Contents

Map 6-25	Corridor Sharing within Beltrami North Central Variation Area	379
Map 6-26	Human Settlement within Pine Island Variation Area.....	507
Map 6-27	Cultural Resources within Pine Island Variation Area	508
Map 6-28	Water and Wildlife Resources within Pine Island Variation Area.....	509
Map 6-29	Rare and Unique Natural Resources within Pine Island Variation Area.....	510
Map 6-30	Corridor Sharing within Pine Island Variation Area	511
Map 6-31	Human Settlement within Beltrami South and South Central Variation Areas.....	512
Map 6-32	Cultural Resources within Beltrami South and South Central Variation Areas	513
Map 6-33	Water and Wildlife Resources within Beltrami South and South Central Variation Areas.....	514
Map 6-34	Rare and Unique Natural Resources within Beltrami South and South Central Variation Areas	515
Map 6-35	Corridor Sharing within Beltrami South and South Central Variation Areas	516
Map 6-36	Human Settlement within North Black River Variation Area	517
Map 6-37	Cultural Resources within North Black River Variation Area	518
Map 6-38	Water and Wildlife Resources within North Black River Variation Area	519
Map 6-39	Rare and Unique Natural Resources within North Black River Variation Area.....	520
Map 6-40	Corridor Sharing within North Black River Variation Area.....	521
Map 6-41	Human Settlement within C2 Segment Option Variation Area	522
Map 6-42	Cultural Resources within C2 Segment Option Variation Area.....	523
Map 6-43	Water and Wildlife Resources within C2 Segment Option Variation Area	524
Map 6-44	Rare and Unique Natural Resources within C2 Segment Option Variation Area.....	525
Map 6-45	Corridor Sharing within C2 Segment Option Variation Area.....	526
Map 6-46	Human Settlement within J2 Segment Option, Northome, and Cutfoot Variation Areas.....	527
Map 6-47	Cultural Resources within J2 Segment Option, Northome, and Cutfoot Variation Areas	528
Map 6-48	Water and Wildlife Resources within J2 Segment Option, Northome, and Cutfoot Variation Areas.....	529
Map 6-49	Rare and Unique Natural Resources within J2 Segment Option, Northome, and Cutfoot Variation Areas.....	530
Map 6-50	Corridor Sharing within J2 Segment Option, Northome, and Cutfoot Variation Areas.....	531
Map 6-51	Human Settlement within Effie Variation Area.....	617
Map 6-52	Cultural Resources within Effie Variation Area.....	618
Map 6-53	Water and Wildlife Resources within Effie Variation Area.....	619
Map 6-54	Rare and Unique Natural Resources within Effie Variation Area	620
Map 6-55	Corridor Sharing within Effie Variation Area	621
Map 6-56	Human Settlement within East Bear Lake Variation Area.....	622
Map 6-57	Cultural Resources within East Bear Lake Variation Area	623
Map 6-58	Water and Wildlife Resources within East Bear Lake Variation Area.....	624
Map 6-59	Rare and Unique Natural Resources within East Bear Lake Variation Area.....	625

Map 6-60	Corridor Sharing within East Bear Lake Variation Area	626
Map 6-61	Human Settlement within Balsam, Dead Man’s Pond, and Blackberry Variation Areas.....	627
Map 6-62	Cultural Resources within Balsam, Dead Man’s Pond, and Blackberry Variation Areas.....	628
Map 6-63	Water and Wildlife Resources within Balsam, Dead Man’s Pond, and Blackberry Variation Areas	629
Map 6-64	Rare and Unique Natural Resources within Balsam, Dead Man’s Pond, and Blackberry Variation Areas.....	630
Map 6-65	Corridor Sharing within Balsam, Dead Man’s Pond, and Blackberry Variation Areas	631
Map 6-66	Silver Creek WMA Alignment Modification.....	637
Map 6-67	Airstrip Alignment Modification	638
Map 6-68	Mizpah Alignment Modification	639
Map 6-69	Gravel Pit Alignment Modification.....	640
Map 6-70	Bass Lake Alignment Modification.....	641
Map 6-71	Wilson Lake Alignment Modification.....	642
Map 6-72	Grass Lake Alignment Modification.....	643
Map 6-73	Dead Man’s Pond Alignment Modification	644
Map 6-74	Trout Lake Alignment Modification	645
Map 6-75	Cedar Bend WMA and Beltrami North Variation Hops.....	649
Map 6-76	Beltrami North Central Variation Hops	650
Map 6-77	Proposed Regeneration Site Locations	653
Map 6-78	Proposed Site of Series Compensation Station	654
Map 6-79	Proposed Blackberry 500 kV Substation	655
Map 7-1	Cumulative Project Impacts - South.....	659
Map 7-2	Cumulative Project Impacts - North.....	660

List of Appendices

Appendix A	Tribal Consultations
Appendix B	Route Permit Generic Template and Example
Appendix C	Narrative of the Scoping Summary Report
Appendix D	DOC-EERA Scoping Decision
Appendix E	Route Analysis Data Tables
Appendix F	Rare Species Data Tables
Appendix G	Rare Communities Data Tables
Appendix H	Noise Supplement
Appendix I	Applicant's Audible Noise and EMF Calculations
Appendix J	Property Values Supplement
Appendix K	EMF Supplement
Appendix L	Stray Voltage Supplement
Appendix M	MPCA What's In My Neighborhood Sites
Appendix N	Photo Simulations
Appendix O	Agricultural Impact Mitigation Plan (AIMP) Example
Appendix P	Cultural Resources Report
Appendix Q	USFWS and DOE Section 7 Consultation
Appendix R	Biological Assessment
Appendix S	Detailed Map Books
Appendix T	NEPA Disclosure Statements

S.1 Background

Minnesota Power, a regulated utility division of ALLETE, Inc. (Applicant), proposes to construct and operate the Great Northern Transmission Line, which is an approximately 220-mile long, 500 kilovolt (kV) overhead, single-circuit, alternating current (AC) transmission line. The proposed Great Northern Transmission Line would cross the international border from Canada into the United States in Roseau County, Minnesota, and it would connect into a new 500 kV substation adjacent to the existing Blackberry Substation near Grand Rapids, Minnesota (Map S-1).

On April 15, 2014, the Applicant applied to the U.S. Department of Energy (DOE) for a Presidential permit to cross the U.S. / Canadian border in Roseau County, Minnesota.¹⁻² On the same date, the Applicant also applied to the Minnesota Public Utilities Commission (MN PUC) for a Route Permit under the Minnesota Power Plant Siting Act (PPSA).¹⁻³

On October 29, 2014, the Applicant submitted an amendment to their Presidential permit and Route Permit applications to both DOE and the MN PUC, respectively. The amended Presidential permit application changed the location of the proposed international border crossing under DOE's consideration to cross the U.S. / Canadian border at latitude 49 00 00.00 N and longitude 95 54 50.49 W, which is approximately 2.9 miles east of Highway 89 in Roseau County.

The Great Northern Transmission Line Project, as amended (proposed Project), would be located on all new 200-foot wide right-of-way (ROW) with a wider area required for certain spans at angle and corner structures, for guyed structures, or for areas where special design requirements are dictated by topography. The transmission towers would be steel lattice structures for the majority of the route, with the exact type of structure in any given location dependent on land type, land use, and potential effect on the surrounding landscape. Tower heights would range from approximately 100 feet to about 170 feet. In some instances, such as where the proposed Project crosses an existing transmission line, taller structures would be required. As a part of its proposal, the Applicant would expand the existing Blackberry Substation to accommodate the required 500 kV interconnection and construct a new 500 kV series compensation station, regeneration stations,

permanent access roads, temporary access roads, laydown areas, and fly-in sites.

Transmission lines that cross an international border with the United States require a Presidential permit from the DOE.¹⁻⁴ DOE's National Electricity Delivery Division, in the Office of Electricity Delivery and Energy Reliability, is responsible for issuing Presidential permits for such cross-border electric transmission facilities. If issued, a Presidential permit would allow for the construction, operation, maintenance, and connection of the U.S. portion of the proposed Project at the international border.

DOE has determined that the potential issuance of a Presidential permit for the proposed Project would constitute a major Federal action and that an Environmental Impact Statement (EIS) is the appropriate level of review under the National Environment Policy Act of 1969 (NEPA). DOE issued its Notice of Intent (NOI) to prepare an EIS and to conduct public scoping for the proposed Federal Action in June 2014 (79 FR 36493). This EIS is prepared in compliance with the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations (CFR) Parts 1500-1508) and DOE's NEPA regulations (10 CFR Part 1021), and other applicable federal laws.

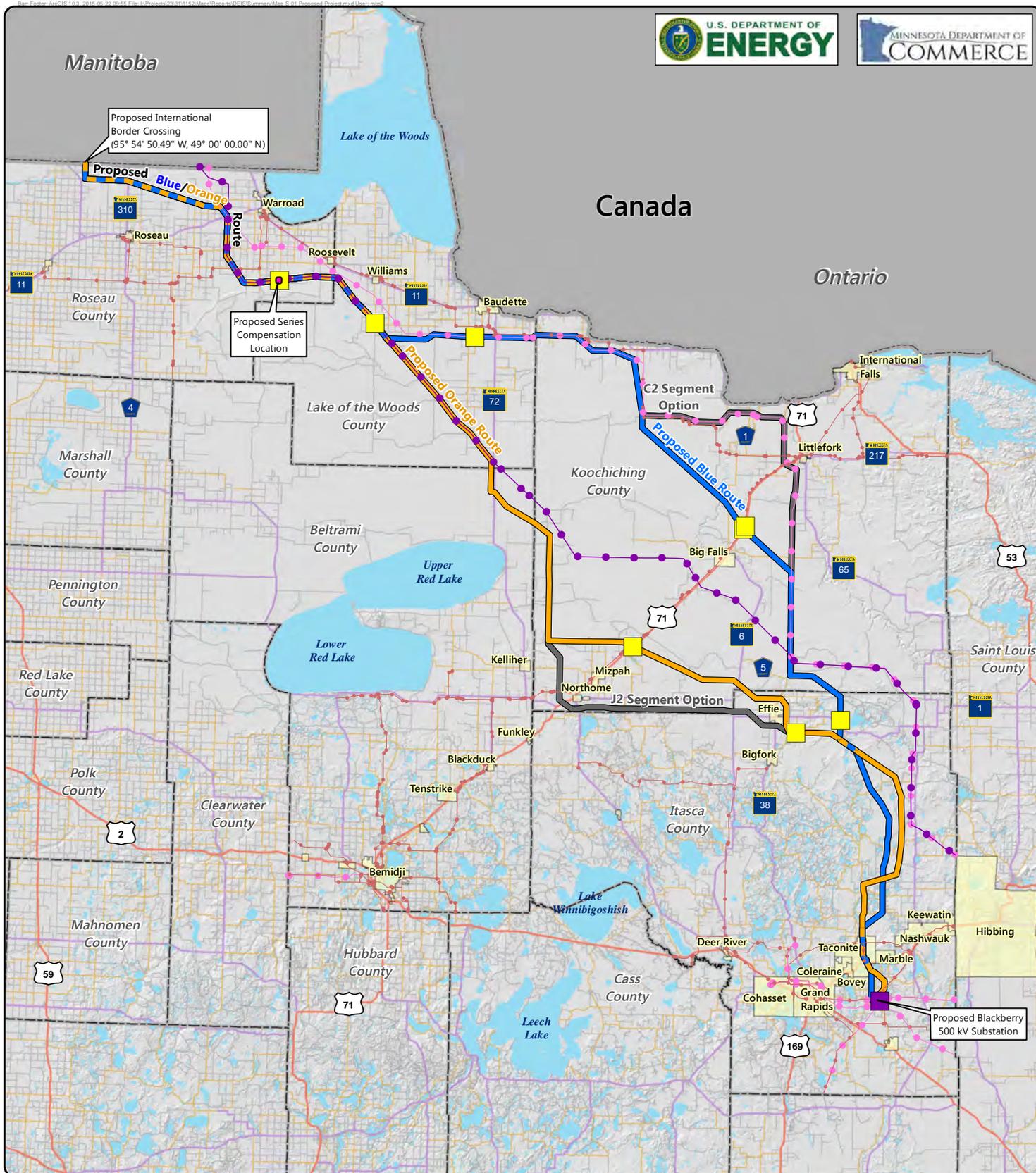
Other federal environmental actions being implemented in coordination with the NEPA process include: floodplain and wetlands assessments, in accordance with Executive Orders 11988 and 11990, respectively, and DOE floodplain and wetland review requirements at 10 CFR Part 1022; Clean Air Act conformity requirements; Clean Water Act (CWA) permit requirements; threatened and endangered species consultation under the Endangered Species Act (ESA); and consultation under the National Historic Preservation Act (NHPA).

The Minnesota PPSA provides that no person may construct a high voltage transmission line without a Route Permit from the MN PUC. Under the PPSA¹⁻⁵, a high voltage transmission line includes a transmission line of 100 kV or more and greater than 1,500 feet in length, with associated facilities.¹⁻⁶ As part of the Route Permit, the MN PUC would also list any conditions it will require for constructing, operating, and maintaining the proposed Project.

Applications for transmission line route permits are subject to environmental review conducted by the Minnesota Department of Commerce – Energy

2 The Presidential permit application and application amendment are available at: <http://www.greatnortherneis.org/Home/documents>
 3 Available at: <http://mn.gov/commerce/energyfacilities/resource.html?id=33849> (The Route Permit Application is nearly identical to the Presidential permit application)

4 Pursuant to Executive Order (EO) 10485 of 1953, as amended by Executive Order 12038, and 10 Code of Federal Regulations (CFR) Section 205.320
 5 Minnesota Statute, Section 216E.03, subdivision 2
 6 Minnesota Statute, Section 216E.01; subdivision 4



- Proposed Regeneration Site
 - Proposed Series Compensation Station
 - Proposed Blackberry 500 kV Substation
- Proposed Routes**
- Blue/Orange Route
 - Blue Route
 - Orange Route
 - Segment Option

- Existing Transmission Lines**
- 69 or 115 kV
 - 230 kV
 - 500 kV
- Boundaries**
- Municipal Boundary
 - County Boundary
 - International Boundary

Map S-1

PROPOSED PROJECT
Great Northern Transmission Line
Draft Environmental Impact Statement



Environmental Review and Analysis (DOC-EERA) staff (Minnesota Rules, part 7850.2500). Projects proceeding under the full state permitting process, such as this one, require the preparation of a state EIS. A state EIS is a document which describes the potential human and environmental impacts of the project and possible mitigation measures, including route, alignment, and site alternatives.

In order to avoid duplication in environmental review procedures, DOE and DOC-EERA prepared a single EIS to comply with environmental review requirements under NEPA and the Minnesota PPSA. DOE is acting as federal joint lead agency with the DOC-EERA acting as state joint lead agency per 40 CFR 1501.5(b).

DOE and DOC-EERA will jointly implement public involvement and the public comment process on the Draft EIS by holding joint federal and state public hearings and informational meetings on the Draft EIS in various locations in the project area in northern Minnesota.

S.2 Regulatory Framework

S.2.1 DOE's Purpose and Need for Agency Action

The purpose of and need for DOE action is to decide whether to or not to grant the Applicant a Presidential permit. If granted, the Presidential permit for the U.S. portion of the proposed Project (Office of Electricity Delivery and Energy Reliability (OE) Docket Number PP-398) would authorize the Applicant to construct, operate, maintain, and connect the U.S. portion of the proposed Project that would cross the international border between the U.S. and Canada.

S.2.2 Minnesota Public Utilities Commission Actions

The MN PUC is charged with selecting routes that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity. Route Permits issued by the MN PUC include a permitted final route and anticipated alignment, as well as conditions specifying construction and operation standards. Under Minnesota law, the Route Permit process does not determine whether the proposed Project is needed. That decision is made as part of a separate process: the certificate of need.

The MN PUC must also determine whether there is a need for a transmission line, and establish the

size, type, and required end points of the proposed Project. The Applicant filed its certificate of need application for the proposed Project with the MN PUC on October 22, 2013. Following a formal contested case hearing, the Administrative Law Judge (ALJ) issued a report on March 31, 2015, which concluded that the Applicant satisfied the certificate of need requirements and recommended the MN PUC grant a certificate of need to the Applicant for the construction of the proposed Project and associated facilities. In May 2015, the MN PUC granted a certificate of need to the Applicant for the proposed Project.¹⁻⁷

S.3 Applicant's Objectives

The Applicant's proposal is primarily driven by three factors: 1) the opportunity to access new hydroelectric generating capacity in Manitoba, 2) projected electricity shortages in their service territory and across the region by 2020, and 3) the potential to use hydroelectric power to complement the Applicant's wind energy investments in North Dakota.

The Applicant has a 250 MW power purchase agreement with Manitoba Hydro. The proposed Project would permit Manitoba Hydro, which has been supplying power to the regional grid since 1970, to transmit approximately 883 megawatt (MW) of additional power to Minnesota.

S.4 Proposed Project Overview

The Applicant proposes to construct, operate, maintain, and connect a 220-mile, overhead, single-circuit 500 kV AC transmission line between the Minnesota-Manitoba border crossing northwest of Roseau, Minnesota, and the existing Blackberry 230/115 kV Substation near Grand Rapids, Minnesota. The Applicant's proposal also includes associated substation facilities and transmission system modifications at the Blackberry Substation site, construction of a new 500 kV series compensation station series compensation station (a structure which will house the 500 kV series capacitor banks necessary for reliable operation and performance of the proposed transmission line), and necessary access roads, construction lay-down areas and fly-in sites. A new Blackberry 500 kV Substation would be required for the proposed Project and would be constructed adjacent to and east of the existing Blackberry 230/115 kV Substation. The

⁷ MN PUC Docket No. E015/CN-12 1163, "Certificate of Need Application" is available at: <https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={65F60020-4419-41F0-AB43-E4D7F22A6E28}&documentTitle=20153-108775-01>

proposed Project would carry hydropower generated by facilities operated by Manitoba Hydro, a Canadian electric utility, and would support the regional electric grid.

S.4.1 Route Selection

The Applicant underwent a lengthy process to identify route alternatives for analysis in their permit applications, and in response to public comment, they identified two route alternatives – the Blue Route and the Orange Route to be submitted as part of their permit applications to both DOE and MN PUC. These two proposed routes are described in detail in Sections 2.4.1 and 2.4.2 of the EIS. In response to comments from agencies and the public, the Applicant also identified four segment options, as described in Section 2.4.3.

S.4.2 Supporting Structures and Right of Way

The proposed GNTL Project would be located on all new ROW that would be approximately 200 feet wide. A wider ROW (250 to 300 feet) would be required for certain spans of the proposed Project, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The Applicant is evaluating several steel structure types and configurations, including a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed-delta structure. The Applicant estimates that four to five structures would be needed per mile of transmission line.

The structures would typically range in height from 100 to 170 feet, depending on the structure type and the terrain. In some instances, such as where the proposed Project crosses an existing transmission line, taller structures may be required. Structures are not anticipated to be taller than 200 feet so they would not be required to meet Federal Aviation Administration (FAA) lighting standards. The structures would be placed approximately 1,000 to 1,700 feet apart, with a maximum span of 1,700 feet.

The Applicant has requested a ROW width of 200 feet and a route width that varies from 650 to 3,000 feet in order to provide flexibility during detailed design, and in part to try to accommodate landowner's preferences along the selected route.

S.4.3 Interference and Contingencies

The proposed Project would be designed to minimize interference with radio and television signals and two-way mobile radios. The Applicant would also take into account the possibility that

extreme weather events could cause simultaneous outages of both the proposed 500 kV transmission line and the existing 500 kV transmission line. They would also install protective devices such as circuit breakers and relays.

S.4.4 Land Acquisition

The Applicant would have to obtain easement rights for any private property that the 200-foot ROW would cross. An ROW representative would contact the owners who would analyze the property and point out to the landowner where the facilities would be located on their property. The representative would value the property and make an offer for the easement rights. If they cannot agree, the utility can initiate a condemnation proceeding, and a three-person condemnation commission would hold a valuation hearing and finally make an award.

The landowner may then file an appeal, and a jury would decide the outcome. At any point in this process, the case can be dismissed if the parties reach a settlement. Additional land for the proposed Blackberry Substation has already been secured.

S.4.5 Construction

Once the Applicant has obtained all the necessary permits, they would coordinate with landowners to prepare the ROW and temporary use areas for construction. They would also coordinate with local utilities and transportation authorities, and would then clear the ROW of woody plants, while taking measures to avoid impacts to birds, rare species, and rare ecological communities.

They would mitigate any possible damage to soils, follow best management practices to avoid introduction of invasive species, and take preventive measure to keep from damaging wetlands. They can also prevent potentially damaging spills by carefully maintaining their vehicles. Any spills that do occur would be treated according to the Applicant's previously determined Spill Prevention Control and Countermeasure plans.

Construction materials would be hauled either directly to structure sites from the local highway or railroad network, or brought first to material staging areas and then to the structure sites. They can be moved by flatbed trucks, or in the case of reinforced concrete foundations, by large rubber-tired vehicles. The Applicant and its contractors would remove construction waste and scrap on a regular schedule or at the end of each construction phase to minimize short-term visual impacts.

The Applicant would mitigate impacts on watercourses and waterbodies during construction by spanning these resources, placing structures above the normal high water level, restricting vehicular activity within riparian corridors, and minimizing the use of heavy equipment when clearing riparian corridors. Once all construction has been completed, the Applicant would fully restore any areas that have not been permanently altered.

For a summary of Applicant proposed measures to minimize environmental impacts, see Table 2-2 in the EIS.

S.4.6 Cost and Schedule

Based on current information, the estimated cost of the total proposed Project is between \$495.5 and \$647.7 million. The cost for routine operation and maintenance typically ranges from \$1,100 to \$1,600 per mile, so the annual costs would range from \$242,000 to \$352,000 for the 220-mile transmission line. Construction is projected to begin in October 2016, and the projected in-service date is June 2020.

S.5 Agency Coordination and Public Involvement

Public participation and interagency coordination are integral elements of the NEPA and state environmental review process under the PPSA and are intended to promote open communication between DOE, DOC-EERA, federal and state regulatory agencies, local governments, American Indian tribes, potential stakeholder organizations, and the public. All individuals and organizations with a potential interest in the proposed Project are encouraged to participate in the public involvement process.

S.5.1 Cooperating Agencies

DOE invited other federal agencies to participate in the preparation of the EIS as cooperating agencies because of their special expertise or jurisdiction by law (40 CFR Part 1501.6). The cooperating agencies are U.S. Army Corps of Engineers – St. Paul District (USACE), U.S. Fish and Wildlife Service – Twin Cities Ecological Field Office (USFWS), and Region 5 of the U.S. Environmental Protection Agency (EPA). DOE also invited the Red Lake Nation of Chippewa Indians to participate as a cooperating agency in the preparation of the EIS and is working with the tribe in order to coordinate this relationship moving forward. See Section 1.2.4.1 and Appendix A for more information about previous and planned tribal consultation.

S.5.2 Public Involvement

DOE and DOC-EERA have implemented a joint planning and scoping process to encourage agency and public involvement in reviewing the proposed Project, and to identify the range of reasonable alternatives. On June 20, 2014, MN PUC issued a Notice of Public Information and EIS Scoping Meeting. The notice described the proposed Project and provided an overview of the MN PUC process and opportunities for public comment.

On June 27, 2014, DOE published its NOI to Prepare an EIS and to Conduct Public Scoping Meetings; Notice of Floodplains and Wetlands Involvement for the Great Northern Transmission Line (79 Federal Register (FR) 36493). The NOI explained that DOE would be assessing potential environmental impacts and issues associated with the proposed Project and the No Action alternative.

During the public scoping period, DOE and DOC-EERA conducted eight joint scoping meetings, and scoping comments were accepted by DOE and DOC-EERA through August 15, 2014. DOE prepared a Scoping Summary Report which is available in Appendix C of this EIS as well as on the EIS Website (<http://www.greatnortherneis.org>). Comments received during the scoping period were used to identify matters to be addressed in this EIS including resources potentially impacted by the project and alternative route segment and alignment modifications.

In addition, DOC-EERA conducted two citizen Workgroup meetings and consultation with local units of government within the project area in an effort to provide an additional opportunity for local representatives to discuss their concerns, develop potential alternative route segments, and review potential zoning conflicts. Based on the scoping comments, feedback provided by the Workgroup, and discussions with DOE and the cooperating agencies, the DOC-EERA issued a scoping decision for the EIS on January 8, 2015. The scoping decision identified the issues to be addressed by DOE and DOC-EERA in the EIS. A description of how public involvement was incorporated into additional alternatives is provided on pages S-12 and S-20 of this Summary.

DOE and DOC-EERA are providing a 45-day public review period and will hold joint public hearings/informational meetings for the Draft EIS. The public review period is initiated through the publication of a Notice of Availability (NOA) in the *Federal Register* by the EPA. State regulations also require mailed notices and publication of the notice of Draft EIS availability

and the opportunity for the public to comment in the Environmental Quarterly Bulletin (EQB) Monitor.

Under Minnesota law, an ALJ will hold state public hearings and an evidentiary contested case hearing on the Route Permit application following release of the Draft EIS, during which interested persons can submit evidence supporting or challenging the proposed Project. Evidence submitted as part of the MN PUC Route Permit process, as well as the comments received on the draft EIS by DOE and DOC-EERA, will ultimately inform the development of the final EIS.

S.6 Alternatives Analyzed

The EIS addresses the No Action alternative, DOE's Proposed Action, the Applicant's preferred alternative (proposed Project), four alternative border crossings, 22 route segment alternatives, and nine alignment modifications.

S.6.1 No Action Alternative

CEQ and DOE regulations require consideration of a No Action alternative. The No Action alternative serves as a baseline against which the potential environmental impacts of a proposed action can be evaluated. Under the No Action alternative, DOE would not issue a Presidential permit for the proposed Project, the transmission line would not be constructed as proposed, and none of the potential environmental impacts associated with the project would occur. However, there would also be a number of negative consequences.

First, the Applicant would not be able to take delivery from Manitoba Hydro under the MN PUC-approved 250 MW power purchase agreement and a pending 133 MW Renewable Optimization Agreement. This, in turn, could prevent the Applicant from filling its customers' future energy needs in a way that would minimize both costs and environmental impacts.

Second, the proposed line would not be available during a contingency on the existing 500 kV transmission line to reduce loading and improve performance. System reliability would be adversely impacted.

Third, future North Dakota wind generation options would be adversely impacted. According to the *Midcontinent Independent System Operator (MISO)*

*Manitoba Hydro Wind Synergy Study*¹⁻⁸, a new 500 kV interconnection with Manitoba would provide benefits to the entire MISO footprint, including substantial reductions in wind curtailments and better use of both wind and hydro resources, resulting in increased efficiency for the energy supply system as a whole.

S.6.2 DOE's Proposed Federal Action and Preferred Alternative

DOE's proposed federal action is the granting of the Presidential permit to authorize the construction, operation, and maintenance of the proposed Project at the Applicant's proposed international border crossing. DOE's Presidential permit decision is solely for the international border crossing, while the proposed construction, operation, maintenance, and connection of the portion of the transmission line within the United States is a connected action to DOE's proposed action.

DOE's preferred alternative is to grant a Presidential permit for the Applicant's proposed international border crossing at latitude 49 00 00.00 N and longitude 95 54 50.49 W, approximately 2.9 miles east of Highway 89 in Roseau County, Minnesota.

S.6.3 Applicant's Preferred Alternative

The Applicant's preferred alternative is referred to as the Blue Route in the EIS Map S-1 and would originate at the Minnesota-Manitoba border roughly 2.9 miles east of Highway 89 in Roseau County, Minnesota. It would proceed southeast 0.5 miles to 410th Street, approximately 0.16 of a mile from the intersection of 410th Street and County Road 3. The proposed Project would travel south 2 miles to 390th Street and turn east following 390th Street for 10.5 miles (where 390th street then turns into County Road 118). At 0.25 miles from Highway 310 the proposed transmission line would turn southeast and continue for another 12 miles. At 0.5 miles from 510th Avenue the proposed transmission line would again turn and travel 2.3 miles east to join the existing Minnkota Power 230 kV transmission line. The proposed Project would parallel the existing Minnkota Power 230 kV transmission line southeast for 1.8 miles and then turn south where it would meet the existing Xcel 500 kV transmission line. Beginning at a tenth of mile north of US Highway 11, the proposed transmission line would parallel the existing Xcel 500 kV transmission line route for 36

8 Available at: https://www.google.com/search?sourceid=navlient&aq=&oq=Miso+Manitoba+Hydro+wind+energy+study&ie=UTF-8&rlz=1T4NDKB_enUS570US570&q=Miso+Manitoba+Hydro+wind+energy+study&gs_l=hp...0.0.0.13675.....0.oBT5HzE-xNA

miles after which it would turn east, leaving the Xcel 500 kV transmission line 2 miles southeast of the intersection of Faunce Forest Road and 19th Street Southwest in Lake of the Woods County (the Blue Route enters the Central Section in this location).

This alternative would proceed east for 5.8 miles and then turn northeast to rejoin the existing Minnkota Power 230 kV transmission line at its intersection with Pitt Grade Trail. The proposed transmission line would then parallel this existing 230 kV transmission line in an easterly direction for 31 miles to a point 1.5 miles west of the County Road 86 in Koochiching County where it would then proceed southeast for 8.3 miles and then south for 1.8 miles. At this point, the proposed Project would be roughly 1.5 miles south from the intersection of County Road 32 and County Road 36 in Koochiching County. The transmission line would then continue southeast for 21.3 miles and intersect Highway 71 roughly 4.5 miles northeast of Big Falls, where it would continue an additional 9.6 miles to the southeast where it would rejoin the existing Minnkota Power 230 kV transmission line, following the existing transmission line in a southerly direction for 12.3 miles.

The proposed Project would continue south for 3 miles following Deer River Line Road (also called County Road 62). The transmission line would turn east for 3.5 miles and then turn southeast again and travel 5 miles to Itasca County near the intersection of County Road 523 and South Lofgrin Forest Road (the Blue Route enters the East Section

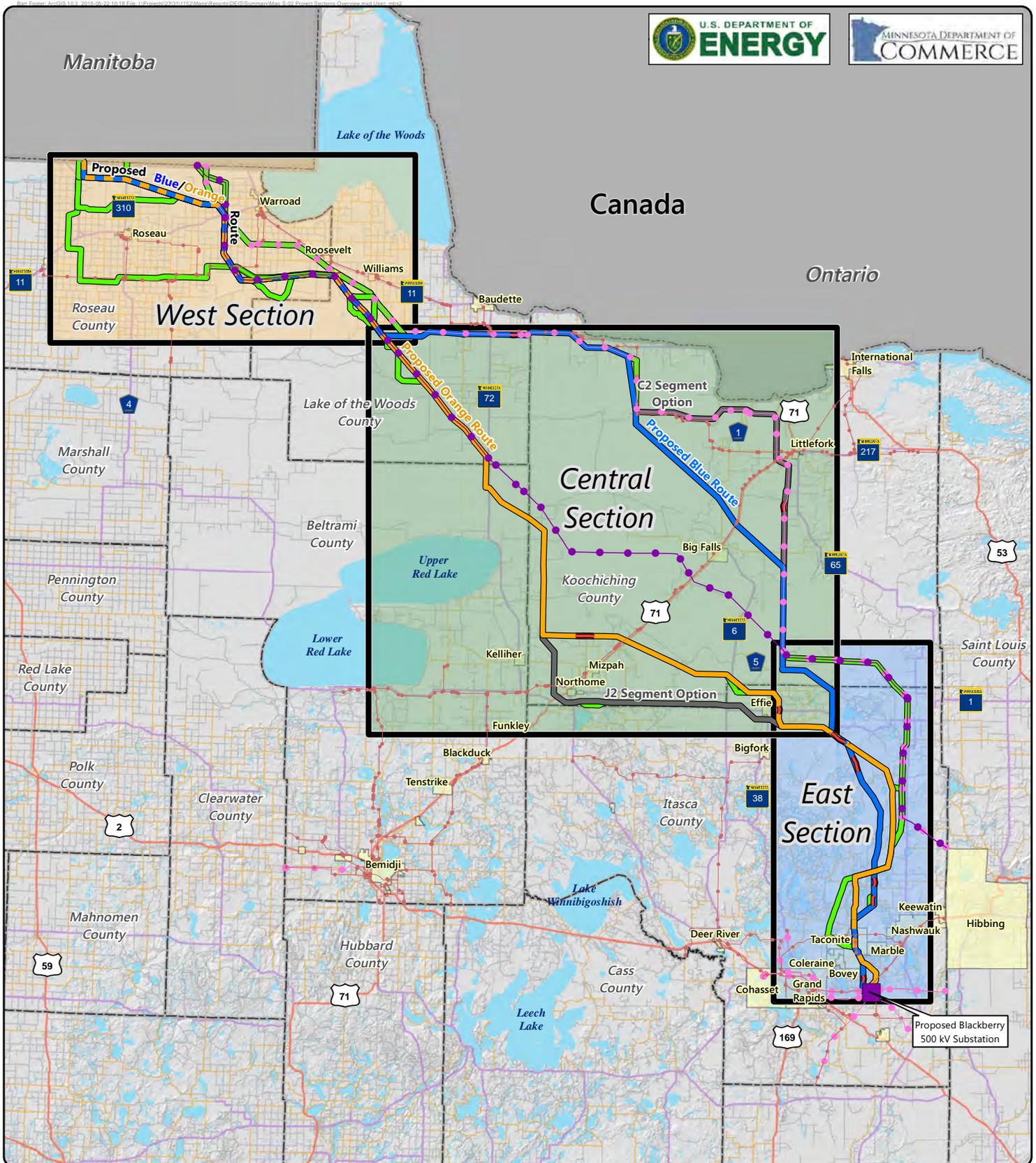
in this location). The proposed transmission line would extend south for 6.4 miles, turning slightly southeast for another 2.8 miles, and then head south for 11.5 miles. At 2.8 miles north of Scooty Lake, the proposed Project would continue to travel 7.5 miles south to County Road 530, where it would cross the West Fork Prairie River. At County Road 530, the proposed transmission line would again turn south and continue 6.5 miles to County Road 57. The transmission line would turn southwest for 3.7 miles, and then head south for 3.8 miles to Diamond Lake Road. The route then heads south, southeast for 2.7 miles. At the Swan River, the proposed Project heads south for 4.4 miles where it would meet the existing Minnesota Power 230-kV transmission line, paralleling it for 1 mile to the Blackberry 500 kV Substation near Grand Rapids, Minnesota. The Blue Route is 220 miles in length.

S.6.4 Border Crossing, Route, and Alignment Alternatives

For the purposes of understanding the environmental settings associated with the proposed Great Northern Transmission Line Project, and to facilitate the analysis in the EIS, the transmission line route was divided into three geographical sections: West, Central, and East (Map S-2). These sections are shown on Map S-3, Map S-4, and Map S-5, respectively. Within each section, multiple variation areas were developed by DOE and DOC-EERA to address local issues (Table S-1).

Table S-1 Sections and Corresponding Variation Areas

Sections	Variation Areas
West Section	Border Crossing Variation Area
	Roseau Lake WMA Variation Area
	Cedar Bend WMA Variation Area
	Beltrami North Variation Area
	Beltrami North Central Variation Area
Central Section	Pine Island Variation Area
	Beltrami South Central Variation Area
	Beltrami South Variation Area
	North Black River Variation Area
	C2 Segment Option Variation Area
	J2 Segment Option Variation Area
	Northome Variation Area
	Cutfoot Variation Area
East Section	Effie Variation Area
	East Bear Lake Variation Area
	Balsam Variation Area
	Dead Man’s Pond Variation Area
	Blackberry Variation Area



- Proposed Blackberry 500 kV Substation
- Project Section
- Proposed Routes**
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

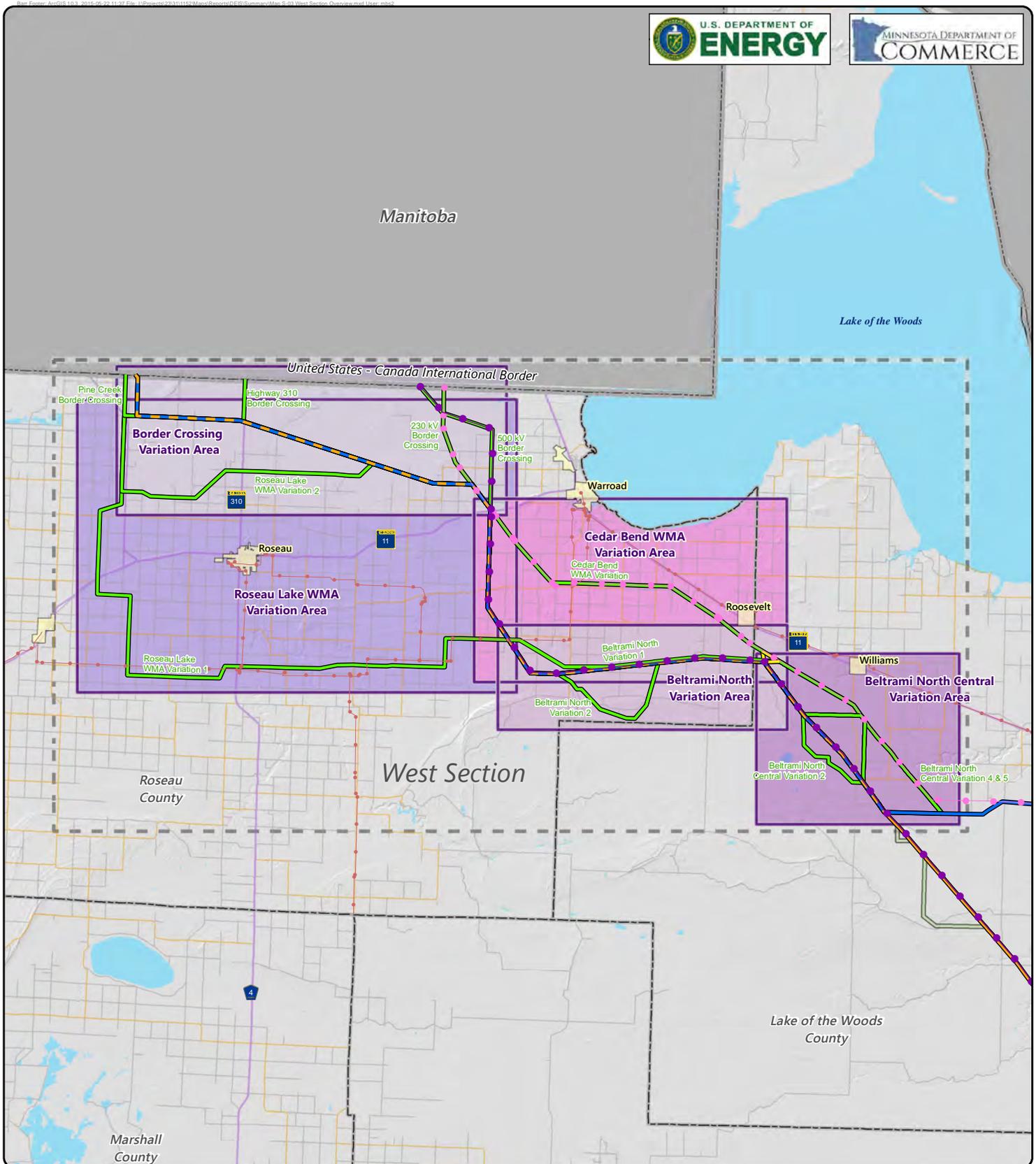
- Alternatives**
- Route Variation
- Route Variation Hop
- Alignment Modification
- Existing Transmission Lines**
- 69 or 115 kV
- 230 kV
- 500 kV

- Municipal Boundary
- County Boundary
- International Boundary

Map S-2

PROJECT SECTIONS OVERVIEW
Great Northern Transmission Line
Draft Environmental Impact Statement





Proposed Routes

- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives

- Route Variation
- Route Variation Hop

Existing Transmission Lines

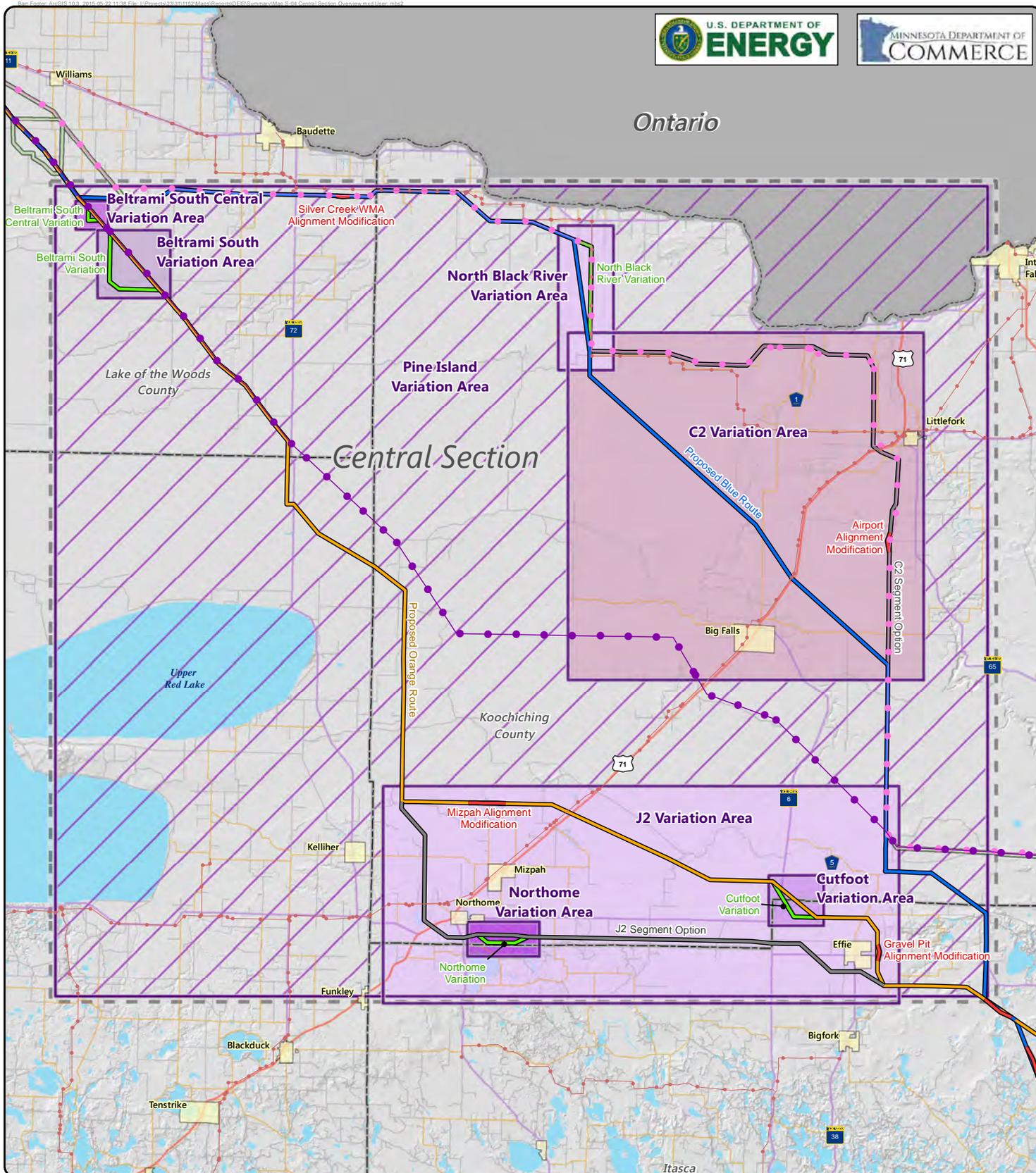
- 69 or 115 kV
- 230 kV
- 500 kV

- Municipal Boundary
- County Boundary
- International Boundary

Map S-3

WEST SECTION OVERVIEW
Great Northern Transmission Line
Draft Environmental Impact Statement



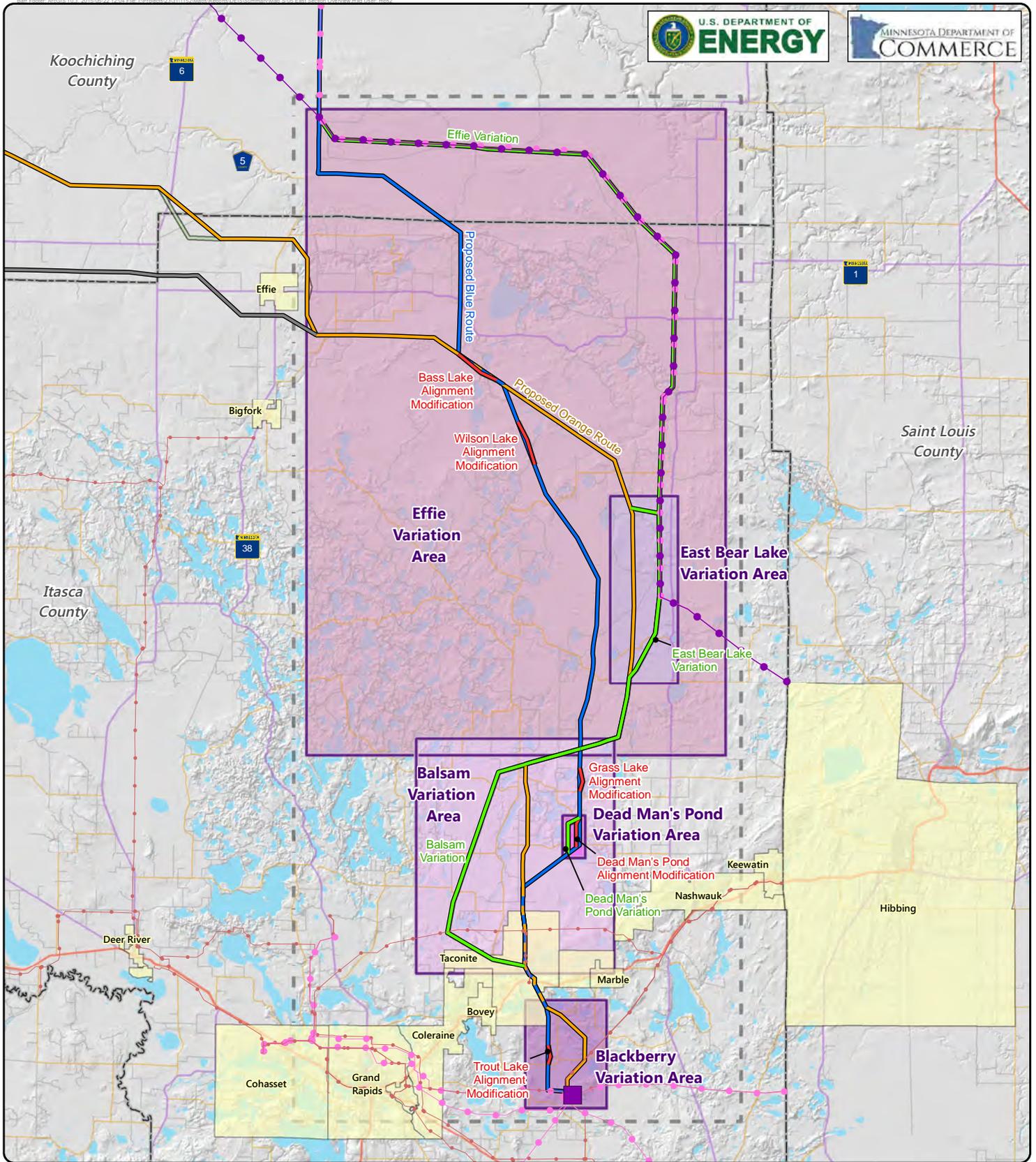


- | | |
|------------------------|------------------------------------|
| Proposed Routes | Variation Area |
| Blue/Orange Route | Existing Transmission Lines |
| Blue Route | 69 or 115 kV |
| Orange Route | 230 kV |
| Segment Option | 500 kV |
| Alternatives | Municipal Boundary |
| Route Variation | County Boundary |
| Alignment Modification | International Boundary |

Map S-4

CENTRAL SECTION OVERVIEW
Great Northern Transmission Line
Draft Environmental Impact Statement





Map S-5

EAST SECTION OVERVIEW
Great Northern Transmission Line
Draft Environmental Impact Statement



“Variation areas” are smaller geographic areas that allow evaluation and comparison of local issues, such as wildlife management areas or colocation of transmission lines, across alternatives. Each variation area includes the Applicant’s proposed routes and local route alternatives or “variations.” The EIS evaluates the local issues within each variation area, progressing from west to east across each section.

The “variations” analyzed are specific combinations of segments within a variation area designed to avoid specific local issues. These variations were developed from alternative route segments identified during the scoping process, as described in Chapter 1. The EIS evaluates the potential environmental impacts and presents the results for the variation(s) and the proposed route(s) within each variation area.

The connector segments, or “hops”, connect the end of one variation to the beginning of another variation. These hops generally connect variations from west to east from one variation area to a different variation area. The exception is one hop that connects the end of a variation from east to west in order to allow additional flexibility for a complete route alternative. The EIS uses the hops to develop complete route alternatives.

“Alignment modifications” are minor adjustments of the transmission line alignment (centerline and

associated ROW) within the proposed routes that are analyzed in the EIS. During the scoping process, commenters developed and proposed these alignment modifications. The purpose for each alignment modification is to provide a potential alternative for analysis that avoids a specific issue raised by commenters (e.g., sensitive lands, residences, airstrips, etc.). The EIS evaluates issues identified during the scoping process and presents the results for the alignment modification and the comparable segment of the Applicant’s proposed route alternative.

There are five variation areas within the West Section: Border Crossing, Roseau Lake WMA, Cedar Bend WMA, Beltrami North, and Beltrami North Central. In addition, there are five connector segments, or hops, that connect variations between the Cedar Bend WMA, Beltrami North, and Beltrami North Central variation areas (Table S-2).

In addition, there are five proposed international border crossings within the Border Crossing Variation Area of the West Section as identified in Table S-3. These alternatives include the Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 230kV Variation, and the Border Crossing 500kV Variation alternatives.

Table S-2 Proposed Route and Variations in the West Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Border Crossing	Proposed Border Crossing-Blue/Orange Route	Blue/Orange Shared	25.0
	Border Crossing Pine Creek Variation	Pine Creek Border Crossing Alternative Route Segment	25.7
	Border Crossing Hwy 310 Variation	Hwy 310 Border Crossing Alternative Route Segment	18.6
	Border Crossing 500kV Variation	500kV Border Crossing Alternative Route Segment	10.1
	Border Crossing 230kV Variation	230kV Border Crossing Alternative Route Segment	8.2
Roseau Lake WMA	Proposed Blue/Orange Route	Blue/Orange Shared Route	30.7
	Roseau Lake WMA Variation 1	Roseau Lake WMA Alternative Route Segment 1	44.1
	Roseau Lake WMA Variation 2	Roseau Lake WMA Alternative Route Segment 2	37.5
Cedar Bend WMA	Proposed Blue/Orange Route	Blue/Orange Route	24.7
	Cedar Bend WMA Variation	Cedar Bend WMA Alternative Route Segment	19.6
Beltrami North	Proposed Blue/Orange Route	Blue/Orange Route	16.5
	Beltrami North Variation 1	Beltrami WMA Alternative Route Segment 1 North	15.8
	Beltrami North Variation 2	Beltrami WMA Alternative Route Segment 2	19.7
Beltrami North Central	Proposed Blue/Orange Route	Blue/Orange Route	11.6
	Beltrami North Central Variation 1	Beltrami WMA Alternative Route Segment 4 & 5	13.7
	Beltrami North Central Variation 2	Beltrami WMA Alternative Route Segment 3	12.6
	Beltrami North Central Variation 3	Beltrami WMA Alternative Route Segment 1 South & 5	12.2
	Beltrami North Central Variation 4	Beltrami WMA Alternative Route Segment 1 South	13.5
	Beltrami North Central Variation 5	Beltrami WMA Alternative Route Segment 4 & 1 South	15.0

Table S-3 Proposed International Border Crossing in the West Section

Variation Area	Name in the EIS	Location of International Border Crossing	
		Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)
Border Crossing	Proposed Border Crossing-Blue/Orange Route	49° 00' 00.00" N	95° 55' 35.79" W
	Border Crossing Pine Creek Variation	49° 00' 00.00" N	95° 54' 50.49" W
	Border Crossing Hwy 310 Variation	49° 00' 00.00" N	95° 46' 8.82" W
	Border Crossing 500kV Variation	49° 00' 00.00" N	95° 32' 23.96" W
	Border Crossing 230kV Variation	49° 00' 00.00" N	95° 30' 26.18" W

Table S-4 Proposed Route Alternatives, Variations, and Alignment Modifications in the Central Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Pine Island	Proposed Blue Route	Blue Route	109.8
	Proposed Orange Route	Orange Route	105.4
	Silver Creek WMA Alignment Modification	Silver Creek WMA Alignment Modification	1.0
	Proposed Blue Route	Blue Route	1.0
Beltrami South Central	Proposed Orange Route	Orange Route	1.2
	Beltrami South Central Variation	Beltrami WMA Alternative Route Segment 7	1.7
Beltrami South	Proposed Orange Route	Orange Route	5.6
	Beltrami South Variation	Beltrami WMA Alternative Route Segment 8	7.5
North Black River	Proposed Blue Route	Blue Route	8.4
	North Black River Variation	North Black River Alternative Route Segment	9.2
C2 Segment Option	Proposed Blue Route	Blue Route	32.8
	C2 Segment Option Variation	C2 Proposed Alternative	46.0
	Airstrip Alignment Modification	Airstrip Alignment Modification	1.5
	C2 Segment Option Variation	C2 Proposed Alternative	1.5
J2 Segment Option	Proposed Orange Route	Orange Route	42.2
	J2 Segment Option Variation	J2 Proposed Alternative	45.2
	Mizpah Alignment Modification	Mizpah Alignment Modification	2.8
	Proposed Orange Route	Orange Route	2.8
	Gravel Pit Alignment Modification	Gravel Pit Alignment Modification	1.2
	Proposed Orange Route	Orange Route	1.2
Northome	J2 Segment Option Variation	J2 Proposed Alternative	3.7
	Northome Variation	Northome Alternative Route Segment	4.0
Cutfoot	Proposed Orange Route	Orange Route	4.2
	Cutfoot Variation	Cutfoot Alternative Route Segment	4.8

There are eight variation areas within the Central Section: Pine Island, Beltrami South Central, Beltrami South, North Black River, C2, J2, Northome, and Cutfoot identified in Table S-4. In addition, there are four alignment modifications within the proposed routes, Section 4.2): Silver Creek WMA, Airstrip, Mizpah, and Gravel Pit.

There are five variation areas within the East Section: Effie, East Bear Lake, Balsam, Dead Man's Pond, and

Blackberry. In addition, there are five alignment modifications: Bass Lake, Wilson Lake, Grass Lake, Dead Man's Pond, and Trout Lake (Table S-5).

S.7 Alternatives Considered but Eliminated from Detailed Analysis

A few scoping comments focused on the potential effects of the proposed Project on Canadian resources and First Nations. Consistent with

Table S-5 Proposed Routes, Variations, and Alignment Modifications in the East Section

Variation Area	Name in the EIS	Name(s) in the Scoping Decision Document	Length (mi)
Effie	Proposed Blue Route	Blue & Blue/Orange Routes	41.1
	Proposed Orange Route	Blue, Blue/Orange, & Orange Routes	44.6
	Effie Variation	Effie Alternative Route Segment	49.8
	Bass Lake Alignment Modification	Bass Lake Alignment Modification	2.5
	Proposed Blue/Orange Route	Blue/Orange Route	2.4
	Wilson Lake Alignment Modification	Wilson Lake Alignment Modification	2.4
	Proposed Blue Route	Blue Route	2.4
East Bear Lake	Proposed Orange Route	Orange Route	8.9
	East Bear Lake Variation	East Bear Lake Alternative Route Segment	10.5
Balsam	Proposed Blue Route	Blue & Blue/Orange Routes	12.9
	Proposed Orange Route	Orange & Blue/Orange	13.7
	Balsam Variation	Balsam Alternative Route Segment 1	17.8
	Grass Lake Alignment Modification	Grass Lake Alignment Modification	1.3
	Proposed Blue Route	Blue Route	1.3
Dead Man's Pond	Proposed Blue Route	Blue Route	2.2
	Dead Man's Pond Variation	Dead Man's Pond Alternative Route Segment	2.3
	Dead Man's Pond Alignment Modification	Dead Man's Pond Alignment Modification	1.6
	Proposed Blue Route	Blue Route	1.6
Blackberry	Proposed Blue Route	Blue Route	5.4
	Proposed Orange Route	Orange Route	6.1
	Trout Lake Alignment Modification	Trout Lake Alignment Modification	1.0
	Proposed Orange Route	Orange Route	1.0

Executive Order 12114, Environmental Effects Abroad of Major Federal Actions (January 4, 1979), this issue was determined by DOE and DOC-EERA to be outside of the scope of the EIS. Implementation of the proposed Project would require construction of a transmission line and other infrastructure in Canada. An environmental review of potential impacts from the portion of the proposed transmission line project in Manitoba will be developed and submitted as part of Canada's authorization process associated with the facilities to be constructed in the province. NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. For that reason, potential environmental impacts in Canada are not addressed in this EIS.

During the public scoping period, five (5) border crossing alternatives, forty (40) new alternative route segments and nine (9) alignment modifications were suggested by the public and agencies for detailed study in the EIS. Four of these border crossing alternatives were determined by DOE as potentially reasonable alternatives and are included in the scope of the EIS. The fifth border crossing alternative was

not included because it was proposed to cross a restricted MN Department of Natural Resources Scientific and Natural Area and was thereby determined by DOE to be infeasible.

With respect to the new route alternatives, the DOC-EERA is charged with including alternatives which will "assist in the [Commission's] decision on the permit application." When route alternatives are proposed during the scoping process, the DOC-EERA analyzes them using a set of criteria, which include considerations related to timing, justification for inclusion in the EIS (i.e., does it mitigate a potential impact from the proposed Project?), jurisdictional restrictions, and feasibility. The DOC-EERA Scoping Decision, determined in coordination with DOE, specifies that the EIS will evaluate 22 new alternative route segments and all nine new alignment modifications. The DOC-EERA Scoping Decision document articulates in detail the agencies' rationale for eliminating each of the 11 alternative route segments from analysis in this EIS.

S.8 Summary of General Impacts Common to All Alternatives

General impacts that are common to all alternatives are provided in Chapter 5 and are discussed below.

S.8.1 Human Settlement

The proposed Project could potentially result in displacement, noise, air quality, property value, electronic interference, and transportation and public service impacts.

Displacement. There are no residences, churches, schools, daycare centers, or nursing homes within the 200-foot ROW or within 1,500 feet of the proposed Project's anticipated alignment. Therefore, none of these structures would be displaced during construction, operation, or maintenance of the proposed Project. A limited number of non-residential structures (e.g., farm structures and animal sheds) are located within the ROW, however as the proposed routes and variations cross relatively sparsely populated areas, adequate space is generally available to allow the alignment of the transmission line to be adjusted so that no buildings would ultimately be located within the ROW. Minor structures, such as farm structures and animal sheds may be displaced. Owners will be consulted and made a land acquisition offer as described in Section S.4.4.

Noise. Potential noise associated with the proposed Project could result from machinery used for constructing and operating the transmission line and the new Blackberry Substation, 500 kV series compensation station, or regeneration stations.

Since noise impacts are a function of the transmission line and equipment, predicted noise levels would not vary by proposed route or variation. The proposed routes and variations cross relatively sparsely populated areas and only a few sensitive receptors (schools, daycares, and nursing homes) could be impacted and those noise levels would be expected to be below Minnesota noise standards for any proposed route or variation. Construction noise at any proposed Project location would occur on a temporary, intermittent, and localized basis during daytime hours. In addition, noise from operating, maintaining, and making emergency repairs to the transmission line would be expected to be limited.

Air Quality. Air quality conditions relative to National Ambient Air Quality Standards (NAAQS) in the State of Minnesota are assessed at the county level. EPA designates Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca Counties as being

in attainment or unclassifiable (to be considered in attainment) for all NAAQS (EPA 2015, reference (2)). Therefore, DOE's proposed action is exempt from the General Conformity Rule requirements of the Clean Air Act.

Constructing and operating the proposed Project would result in direct and indirect emissions of criteria air pollutants and greenhouse gases (GHGs). These emissions would be short-term and localized. In addition, the proposed Project would reduce indirect criteria pollutants and GHGs because it would reduce the need for coal-fired generation in Minnesota by replacing it with wind and hydroelectric generation (for detailed information on air quality, see Section 5.2.1.3).

Property Values. The precise relationship between property values and proximity to high voltage transmission lines is difficult to quantify, since numerous interrelated factors impact property values. Based on the trends identified in numerous property value studies (Weber and Jensen 1978, reference (3); Jensen and Weber 1982, reference (4); Jackson and Pitts 2010, reference (5)), the impacts from the proposed Project would be expected to be minimal.

Electronic Interference. Potential electronic interference impacts would be expected to be minimal for the proposed Project and would be similar for all proposed routes and variations. No communication towers have been identified within the ROW, and electromagnetic noise from the proposed Project would not be expected to interfere with television, radio, or cell phone transmissions.

Transportation and Public Services. Due to relatively low existing traffic volumes, impacts on local roadways would be short-term and localized. Use of oversized or heavy vehicles would be approved in advance by the Minnesota Department of Transportation (MnDOT), and the Applicant would repair any damage.

Similarly, the proposed Project would not be expected to impact either public airports or private airstrips. All airports are located more than a mile from the proposed Project, and the Applicant would abide by all Federal Aviation Administration (FAA) guidelines. The Applicant has already developed alignment modifications to eliminate potential impacts on unregulated private airstrips.

The proposed Project would not be expected to impact public electric, gas or water utilities, although it could impact existing electric transmission and distribution lines when it passes over them. Design

of the proposed Project would minimize such potential interference.

Emergency Services. The proposed Project would not be expected to impact police, fire, or emergency medical services, and impacts would not be expected to vary by proposed route or variation. The Applicant would coordinate temporary road closures with local authorities and would provide safe access for emergency vehicles. During construction and operation of the proposed Project, some emergency services might also be required. However, existing emergency services are equipped to handle such situations.

Environmental Justice. Analysis indicates that no minority or low-income groups would be exposed to disproportionate impacts from the proposed Project. In addition, many of the impacts would be short-term and localized and would not be expected to differ between the proposed routes and variations considered.

Socioeconomics. During construction, an average of 120 construction workers would be employed annually, with a peak as high as 213 workers. Jobs would also be created in service sectors that support construction and workers. No full- or part-time workers would be expected to be hired during operation and maintenance of the proposed Project.

The proposed Project would also have positive tax benefits. The estimated tax and revenue impacts of the proposed Project would not differ by proposed route or variation considered. Taxes would be collected at the local, county, and state levels and tax rates would be set independently in each jurisdiction.

During the pre-development and construction phases, the proposed Project would generate approximately \$28 million in state and local taxes through compensation, business, household, and corporate taxes. Direct and indirect expenditures during construction would total approximately \$839 million.

Housing demand would also not differ by proposed route or variation considered. Given the available temporary housing supply in each geographic section of the proposed Project, the short-term construction period, and the movement of workers along the route, impacts to temporary housing would be expected to be limited. The proposed Project would also bring economic benefits to proprietors of the hotels, motels, and RV campgrounds rented by temporary workers.

Recreation and Tourism. Recreational resources within 1,500 feet of the proposed centerline include

state forests, state parks, scenic byways, state trails, and snowmobile and water trails. Further, state trails, forests, scenic byways, and snowmobile and water trails all cross the ROW for the proposed routes and variations.

State forests, for example, offer opportunities for camping, hunting, bird watching, hiking, canoeing/kayaking, picnicking, horseback riding, snowmobiling, boating, and fishing. State parks offer opportunities for wildlife and bird watching, hiking, mountain biking, cross country skiing, snowmobiling, camping, fishing, and swimming.

Impacts to recreation and tourism during construction would be expected to be short-term and local, lasting only for the duration of construction. Once constructed, project components, such as the overhead transmission line, could have long-term indirect aesthetic impacts that could detract from the setting of nearby recreational activities. Coordination with relevant state agencies will continue to minimize these impacts.

The proposed Project could result in long-term indirect impacts to recreation and tourism. While potential impacts to recreation and tourism could occur, they would not be expected to vary by proposed route or variation considered, as the proposed Project would cross state forests and have a similar impact wherever it is visible.

S.8.2 Public Health and Safety

Public health and safety concerns from the proposed Project include electric and magnetic fields (EMFs), implantable medical devices, stray voltage, induced voltage, intentional destructive acts, and environmental contamination.

Electric and Magnetic Fields. Human-made EMFs are caused by electrical devices and are characterized by their wavelength, amplitude (strength), and the frequencies at which they alternate. Electric fields are produced by voltage and increase in strength as the voltage increases.

Electric field strength is measured in kilovolts per meter (kV/m), and the strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees or buildings.

Magnetic fields result from the flow of electrical current (measured in amps) moving through wires or electrical devices. The strength of a magnetic field is proportional to the electrical current, and

it is typically measured in milliGauss (mG). As with electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. Unlike electric fields, however, magnetic fields are not easily shielded or weakened by objects or materials.

A concern related to EMF is the potential for adverse health effects due to EMF exposure. Laboratory, animal, and cellular studies fail to show a cause and effect relationship between disease and EMF exposure at common EMF levels and a biological mechanism for how EMF might cause disease has not been established. Epidemiological studies, however, indicate that there is an association between childhood leukemia and EMF exposure, but there is no consistent association between EMF exposure and other diseases in children or adults.

The Applicant modeled and calculated EMF with two transmission line structure configurations (stand-alone 500 kV transmission line and 500 kV transmission line paralleling existing transmission lines). The extensive modeling and analysis showed that potential public-health effects of EMFs are not expected from the proposed Project. EMF levels are predicted based on the proposed Project components rather than the surrounding environment. Therefore, EMF levels within the ROW would remain below the Minnesota standard regardless of the proposed route or variation considered.

Implantable Medical Devices. Implantable medical devices, such as pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps may be subject to interference from EMFs, which could mistakenly trigger a device or inhibit it from responding appropriately.

A 2005 theoretical study evaluated the risk for a patient with a unipolar cardiac pacemaker under worst-case and real-life conditions under a high voltage overhead transmission line (Scholten 2005, reference (6)). This study concluded that beneath high voltage overhead transmission lines a life-threatening situation for cardiac pacemaker patients is unlikely because if a cardiac device is affected, it is typically a temporary asynchronous pacing (i.e., fixed rate pacing), and the device returns to its normal operation when the person moves away from the source of EMFs. An interference between the implant and the electromagnetic fields, however, cannot be excluded.

There are no residences, businesses, or sensitive receptors such as hospitals or nursing homes located nearby, so the regular presence of implantable

medical devices within the ROW would not be expected.

Electric field strength levels decrease with distance, and maximum levels at the edge of the ROW are anticipated to be less than 2 kV/m, and, in most instances, less than 1 kV/m; manufacturers indicate that electric fields below 6.0 kV/m are unlikely to affect most implantable medical devices (Electric Power Research Institute 2004, reference (7)). In the event that a cardiac device is affected, the effect is typically a temporary asynchronous pacing, and the device returns to its normal operation when the person moves away from the source of EMFs

Accordingly, potential impacts to implantable medical devices and their users would be expected to be minimal, regardless of the proposed route or variation considered.

Stray Voltage. Stray voltage can arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Therefore, stray voltage could exist at any business, residence, or farm which uses electricity, independent of whether there is a transmission line nearby. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods and the current being grounded.

The proposed 500 kV transmission line would not directly connect to businesses, residences, or farms in the area, so impacts from stray voltage would not be expected from operating the transmission line. All proposed routes and variations, however, would at some point parallel existing distribution lines, so in those locations additional currents could occur on the distribution line. These currents would not be expected to result in stray voltage in the proposed Project area. If there is not proper grounding or wiring on the distribution system or at a nearby residence, business, or farm, however, these currents could result in a small amount of current flowing through people or livestock, resulting in involuntary muscle contractions and/or pain.

Induced Voltage. The electric field from a transmission line can couple with any object, like a vehicle or metal fence, capable of conducting electrical energy.

If the objects upon which a voltage is induced are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This might be accompanied by a spark discharge and

mild shock. For metallic objects where effective grounding is more difficult to achieve, impacts such as mild shock could occur.

The primary means of minimizing this potential impact would be to avoid exiting and entering machinery directly under a transmission line and adhering to MN PUC and National Electric Safety Code (NESC) standards on electric field-limit and line-to-ground clearances. That being the case, induced voltage resulting from the proposed Project would be expected to be minimal and would not vary by proposed route or variation.

Intentional Destructive Acts. While the likelihood for intentional destructive acts to the proposed Project is difficult to predict, it is unlikely that such acts would occur, based on past experience along the thousands of miles of electrical transmission lines in the U.S.

Far more likely would be mischievous or criminal acts of theft or vandalism, which would generally pose lower safety risks. Although the possibility of some theft or vandalism is considered likely, related health and safety effects on workers or the public from the proposed Project would be expected to be minimal and do not vary by proposed route or variation.

Environmental Contamination. During construction, spills may occur or excavation may uncover existing contamination, which could pose a safety or health risk to construction workers, the public, wildlife, botanical habitats, soil and sediment, and water resources.

The Applicant is currently developing a Spill Prevention, Control, and Countermeasures Plan (SPCC), which is required to prevent discharge of oil into navigable waters of the U.S., if the aboveground storage capacity for the substance is greater than 1,320 gallons and there is a reasonable expectation of a discharge.

Constructing and maintaining any transmission line involves using hazardous materials and generating waste. If handled improperly, the public or the surrounding environment could be adversely impacted. For all the proposed routes and variations, soil would be disturbed and, as a result, any existing contaminated soil or groundwater could be mobilized.

Four active investigation and cleanup sites and three active hazardous waste sites are located within approximately 2,000 feet of the proposed routes and variations. If contamination is identified during construction activities, the construction would be

discontinued in that location until further evaluation of the conditions is performed.

One contaminated site has been identified within a proposed ROW (J2 Segment Option Variation in the J2 Segment Option Variation Area (see Appendix M). Potential impacts to public health and safety from environmental contamination would be expected to be minimal. Potential impacts from the proposed Project would not be expected to vary by proposed route or variation.

Worker Health and Safety. Constructing transmission lines and related structures is relatively dangerous. Accidents that could occur at construction sites would include heavy equipment and commuting vehicle accidents, electrocution, personal accidents (e.g., slips, trips, and falls), hazardous materials spills, construction-induced fires, and accidents from using watercraft, aircraft, or driving equipment on the ice in winter.

The Applicant and its contractors would comply with Occupational Safety and Health Administration regulations and with other federal, state, and local regulatory requirements and would implement best management practices to safeguard workers and the public from construction and operational hazards. Construction activities would also be similar at all locations and would not vary by route or variation.

To minimize dangers from lightning strikes, the Applicant would also incorporate safety measures, including the use of shield wires, circuit breakers, and relays, into design plans.

S.9 Summary of Route-Specific Impacts Associated with the Project

Impacts that are unique to a specific alternative within the West, Central, and East sections are described below. Impacts are presented geographically (rather than by resource) to assist readers of this EIS in finding information specific to particular areas or locations of interest to them along the length of the proposed Project. The Applicant's proposed route, the Applicant's alternative routes, the 22 alternative route segments, and nine alignment modifications that were proposed by agencies and the public during scoping were analyzed by DOE in coordination with the DOC-EERA, and were jointly determined to be within the scope of this EIS, and therefore studied in detail.

S.9.1 Route-Specific Impacts to West Section

Impacts that are unique to a specific alternative within the West Section are described below.

Human Settlement. Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area.

Much of the West Section is characterized by forest, woodland, brushland, and peatland, with lakes, ponds, streams, and wetlands. Agricultural land is also present within this section.

No county parks, state parks, state forest campgrounds, national parks, or water access points are present within the 200-foot ROW or within 1,500 feet of the anticipated alignment of the proposed routes and variations in the West Section; however residences, historic architectural sites, state forests, national forests, scenic byways, state trails, snowmobile trails, and state water trails are present within 1,500 feet. No residences, state trails, historic architectural sites, national forests, nor state water trails are located within the 200-foot ROW, State forests, scenic byways, snowmobile trails are crossed by the ROW in the West Section.

Constructing and operating the proposed Project could impact views of the landscape, and short-term impacts could be caused by everything from ROW clearing and building access roads to dust from vehicle traffic, the presence of large delivery vehicles, or worker parking. Long-term impacts could include transmission line forms, textures, or colors that conflict with natural forms.

Land-Use Compatibility. The predominant land uses in the West Section, crossed by the proposed routes and alternatives, include state forest land, state fee lands, USFWS interest lands, and agriculture. In addition, a large number of Red Lake Reservation parcels are located throughout the West Section but these parcels are not crossed by the ROW. State forests offer a variety of recreational opportunities.

County and state ordinances and land management plans generally permit, or at least do not prohibit, the construction of transmission lines.

Constructing the transmission line and associated facilities would result in temporary disturbances to land uses within the ROW and surrounding area. Such disturbances would include limiting property access due the presence of construction work areas and equipment.

Operating and maintaining the transmission line would have long-term impacts on land use within the ROW and surrounding area. It would require that all woody vegetation and brush within the ROW be cleared, resulting in long-term change in land cover for forest or shrub land. The conversion from forest land in state fee areas where timber can no longer be harvested would result in a reduction of revenues to the School Trust Land program.

Agricultural land uses would still be allowed in the ROW, but the presence of transmission structures could prevent some farm equipment from accessing land. Transmission towers could also impact private aircraft.

Cultural Values. Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable and provide a framework for unity and sense of identity for a community, region, or people. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being. The values of individualism and community pride are tied to the overall quality of life experienced by the area's residents.

Public comments provided during the EIS scoping period raised concerns related to avoiding impacts to agricultural land, an indication of the value placed on preservation of agricultural life.

Impacts to cultural values can be minimized primarily by paralleling existing transmission infrastructure. Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities whose values are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level, conflict with cultural values is not expected from the proposed Project.

Land-Based Economies. Constructing and operating the proposed Project could potentially impact land-based economies and could prevent or limit other uses of the land. Transmission line structures could potentially interfere with farming, forestry, or mining operations.

Agriculture is present in the West Section, and the proposed Project could potentially impact farmland, organic farms, livestock, aerial spraying, irrigation system, and precision farming practices.

The proposed Project could interfere with forestry operations by limiting timber harvesting, damaging trees, compacting soil, or causing erosion.

There are no mining resources located within the 200-foot ROW of the proposed routes or variations in the West Section, although there is an aggregate source located within 1,500 feet of the Roseau Lake WMA Variation in the Roseau Lake WMA Variation Area. In addition, the proposed Project could interfere with surface estate mineral resources and could impact future mining operations.

Archaeology and Historic Architectural Resources. Ground-disturbing activities could damage or destroy buried archaeological resources as well as historic architectural sites if they are located within the ROW (direct Area of Potential Effect [APE]). Further, historic architectural sites within one mile of the proposed Project (indirect APE) could be impacted if the proposed Project results in changes to the setting of historic architectural sites if these historic architectural or built resources are determined to be National Register of Historic Places-eligible (NRHP-eligible) and if the setting is determined to be a character defining feature that contributes to the significance of the resource.

The potential effects of the proposed Project on historic properties, including cultural resources, cannot be fully determined prior to approval of the proposed Project. DOE intends to execute a Programmatic Agreement (PA) in consultation with the Minnesota State Historic Preservation Office, the Advisory Council on Historic Preservation, federally-recognized Indian tribes, the Applicant, representatives of local governments, and other consulting parties, to ensure that stipulations developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures to avoid, minimize, and mitigate adverse effects on cultural resources and historic properties are implemented.

Natural Environment. Water resources include rivers and streams, lakes and ponds, wetlands, floodplains, and groundwater resources. Impacts on water resources may include the potential for soil erosion and subsequent sedimentation of local water resources. Water resources could also become contaminated during construction, due to accidental spilling of fuels or other hazardous substances. Impacts on wetlands may include conversion of wetland types from forested and shrub wetlands to open wetland types. In some cases, the proposed Project may need to cross areas of floodplain and/or wetlands that are too large to span, requiring permanent placement of structures within these areas.

Impacts could be mitigated by using construction matting to traverse wetlands, limiting crossing of watercourses, spanning, timing construction in these areas to take place during frozen conditions, and using low ground pressure equipment to the extent practical. Where permanent placement of structures in floodplains and/or wetlands is unavoidable, these activities would require appropriate permits and approvals.

Vegetation in the West Section consists primarily of herbaceous agricultural vegetation, upland forests, and lowland swamps. Construction activities could impact existing vegetation, and removing vegetation could indirectly impact native vegetation by increasing the potential for the spread of invasive species and noxious weeds, which have potential to dominate and displace native plants and plant communities, permanently altering ecosystem functions.

Wildlife in the West Section includes a wide range of resident and migratory wildlife species. The West Section contains natural wildlife habitat as well as managed wildlife habitat, such as Wildlife Management Areas (WMAs).

During construction, wildlife within the anticipated ROW would temporarily be displaced. Long-term adverse impacts on wildlife could come from the loss or conversion of habitat and habitat fragmentation. Wildlife species previously occupying forested communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Impacts would be expected to be extensive in areas where new ROW would be created and more localized in situations where an existing ROW is expanded. Species that rely on shrubby or grassland habitats may be less susceptible.

Once the project is built, there would be potential for avian collision and electrocution with transmission conductors.

Rare and Unique Natural Resources. Six federally threatened or endangered species are known to be present in the counties where the West Section is located. Six state threatened or endangered species have been documented within one mile of some the proposed routes and variations in the West Section. In addition, 17 state-special concern species have been documented within one-mile of some of the proposed routes and variations in the West Section: nine vascular plants, four birds, one mammal, two mussels, and one fish.

Several rare communities have been identified within or adjacent to the variation areas in the West

Section, many of them located within one of the three state forests in this area.

Construction and operation of the proposed Project could have short- and long-term impacts on rare and unique natural resources. Construction could temporarily displace some rare species or rare communities. Construction could also cause the loss or conversion of habitat and habitat fragmentation. Rare species could also be impacted by the introduction of non-native species, which could alter the quality and function of habitats.

Corridor Sharing. In the West Section, the proposed Project would parallel existing 230 kV and 500 kV transmission lines, roads, field lines, trails, and public land survey sections. By paralleling existing corridors, and thereby reducing the need for new transmission line corridors, potential impacts on human settlements, land-based economies, and the natural environment would be expected to be minimized.

Electric System Reliability. One of the Applicant's stated purposes for the proposed Project is to enhance electrical system reliability and help meet long-term regional needs. All of the proposed routes and variations in the West Section include segments that would run parallel and adjacent to, but not within, the ROW of one of the two existing high voltage transmission lines.

Construction, operation, maintenance, or emergency repairs of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety. As such, no impacts would be expected as a result of construction, operation, maintenance, or emergency repairs of the proposed Project.

Costs that Depend on Design and Route. Projected costs for the routes and variations in the West Section are provided in Section 5.3.8. These cost estimates are based on an estimated cost per mile for the general structure type planned for each proposed route or variation. Since property acquisition, access costs, or segment-specific design criteria are uncertain, these are not full construction estimates and were developed for comparative purposes only.

S.9.2 Route-Specific Impacts to Central Section

Human Settlement. Much of the Central Section is forested and contains extensive peatlands, and a number of state forests occur in the section.

No county parks, state parks, state forest campgrounds, national parks, or water access points are present within the 200-foot ROW or within 1,500 feet of the anticipated alignment of any of the proposed routes and variations in the Central Section. State trails, state forests, scenic byways, snowmobile and water trails are crossed by the ROW in the Central Section.

General impacts on existing aesthetic resources in the Central Section are similar to those in the West Section. Short-term aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations. Long-term impacts on aesthetic resources are most likely to occur once the transmission line is operating.

Land-Use Compatibility. The predominant land use in the Central Section and within the 200-foot ROW is undeveloped forest and swampland, much of which is state forest land and state fee land. The Central Section also includes some limited concentrations of agricultural land uses near the northern and southern borders of the section. Developed land, including residences, are scattered near the agriculture land and incorporated cities. Several airports and air strips are also located near developed areas, but not within the 200-foot ROW. In addition, there are scattered parcels of USFWS interest lands in the northwest part of the Central Section that are crossed by the ROW. Any route crossing USFWS interest lands (including easements) would require a right-of-way permit under 50 CFR Part 29.

Impacts from constructing and operating the proposed Project are similar to those discussed for the West Section. (See Land-Use Compatibility discussion in Section S.9.1.).

Cultural Values. Cultural values in the Central Section are in many ways similar to the cultural values in the West Section. Cultural values unique to the Central Section are an individualistic orientation that places value on undisturbed independence in the wilderness. The proposed Project, however, is not expected to result in any unique impacts to designated wilderness areas and cultural values in the Central Section.

Land-Based Economies. Agriculture is limited in the Central Section, although the proposed Project could potentially impact farmland, organic farms, livestock, aerial spraying, irrigation system and precision farming practices.

The proposed Project could interfere with forestry operations by limiting timber harvesting, damaging trees, compacting soil, or causing erosion.

In the Central Section, there are aggregate sources located within the 200-foot ROW of the Proposed Orange Route (2 sites) in the Pine Island Variation Area; the Proposed Orange Route (2 sites) and J2 Segment Option Variation (1 site) in the J2 Segment Option Variation Area; and the Proposed Orange Route (1 site) and the Cutfoot Variation (1 site) in the Cutfoot Variation Area. There are also several aggregate sources located within 1,500 feet of the proposed routes and variations in the Central Section. In addition, the proposed Project could impact future mining operations.

Archaeology and Historic Architectural Resources. Archaeological and historic architectural sites present within the ROW and historic architectural sites located within 1 mile of the anticipated alignment could be impacted by the proposed Project similar to that described for the West Section. (See Archaeology and Historic Architectural Resources discussion in Section S.9.1.)

Natural Environment. Water resources include rivers and streams, lakes and ponds, wetlands, floodplains, and groundwater resources. The proposed Project's impacts on water resources are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Vegetation consists primarily of upland forests and lowland swamps. The proposed Project's impacts on vegetation are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Wildlife in the Central Section includes a wide range of resident and migratory wildlife species. The Central Section contains natural wildlife habitat as well as managed wildlife habitat, such as WMAs. The proposed Project's impacts on wildlife are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Rare and Unique Natural Resources. Six federally threatened or endangered species are known to be present in the counties where the Central Section is located. Six state threatened or endangered species have been documented within one mile of some of the proposed routes and variations in the Central Section. In addition, 13 state-special concern species have been documented within one-mile of some of the proposed routes and variations in the Central Section: seven vascular plants, two birds, one insect, two mussels, and one fish.

Several rare communities have been identified within or adjacent to the variation areas in the Central Section, many of them located within one of the eight state forests in this area. Potential short- and long-term impacts on rare and unique natural resources in the Central Section are similar to those described for the West Section. (See Rare and Unique Natural Resources discussion in Section S.9.1.)

Corridor Sharing. In the Central Section, the proposed Project would parallel existing 230 kV and 500 kV transmission lines, roads, field lines, trails, and public land survey sections. By paralleling existing corridors, and thereby reducing the need for new transmission line corridors, potential impacts on human settlements, land-based economies, and the natural environment would be expected to be minimized.

Electric System Reliability. All of the Applicant's proposed routes and variations in the Central Section include segments that would run parallel and adjacent to, but not within, the ROW of one of the two existing high voltage transmission lines. Impacts associated with construction, operation, maintenance, or emergency repair of the proposed Project in the Central Section are similar to those described for the West Section. (See Electric System Reliability discussion in Section S.9.1.)

Costs that Depend on Design and Route. Projected costs for the routes and variations in the Central Section are given in Section 5.4.8. These cost estimates are based on an estimated cost per mile for the general structure type planned for each proposed route or variation. Since property acquisition, access costs, or segment-specific design criteria are uncertain, these are not full construction estimates and were developed for comparative purposes only.

S.9.3 Route-Specific Impacts to East Section

Human Settlement. Much of the East Section is characterized by forest, wetlands, lakes, and ponds. No state parks, state forest campgrounds, national forests, scenic byways, water trails, or national parks were found within 1,500 feet of the centerline of the proposed routes and variations in the East Section. Although state trails, state forests, and snowmobile trails are crossed by the ROW of various routes and variations in the East Section.

General impacts on existing aesthetic resources in the East Section are similar to those in the West Section. Short-term aesthetic impacts could result

from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations. Long-term impacts on aesthetic resources are most likely to occur once the transmission line is operating.

Land-Use Compatibility. The predominant land uses in the East Section are state forests and fee lands, undeveloped forest, and wetlands. There is also sparsely scattered agriculture and developed land. A large number watercourses and waterbodies are present in the East Section, and there are also a number of private airstrips and airports.

Constructing and operating the proposed Project in the East Section would result in similar impacts as anticipated in the West Section. (See Land-Use Compatibility discussion in Section S.9.1.)

Cultural Values. Cultural values in the East Section are in many ways similar to the cultural values in the West and Central Sections. Cultural values unique to the East Section are largely tied to the transition to lake and cabin country and, at the south end of the East Section, intersection with the western portion of the Mesabi Iron Range.

The communities in Balsam and Lawrence appear to strongly value the aesthetics of their communities as well as the small town, rural atmosphere. The Mesabi Iron Range is characterized by a more industrial, blue collar population.

The proposed Project, however, is not expected to result in any unique impacts to cultural values.

Land-Based Economies. Agriculture is limited in the East Section, although the proposed Project could potentially impact farmland, organic farms, livestock, aerial spraying, irrigation systems, and precision farming systems.

The proposed Project could interfere with forestry operations in the East Section by limiting timber harvesting, damaging trees, compacting soil, or causing erosion.

Several active and abandoned metallic mineral, iron ore, and taconite mining sites are found along the proposed routes and variations in the East Section. These proposed routes and variations cross active state metallic mineral leases in zones having high potential for metallic mineral resources. The Mesabi Iron Range has known iron resources, which have been developed into an economic resource in various locations. According to the Minnesota Department of Natural Resources (MnDNR), the proposed routes do not encumber known state mineral resources.

The construction of the proposed Project could impact future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources.

Archaeology and Historic Architectural Resources. Archaeological and historic architectural sites present within the ROW and historic architectural sites located within 1 mile of the anticipated alignment could be impacted by the proposed Project similar to that described for the West Section. (See Archaeology and Historic Architectural Resources discussion in Section S.9.1.)

Natural Environment. Water resources in the East Section include watercourses, waterbodies, wetlands, floodplains, and groundwater resources. The proposed Project's impacts on water resources are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Vegetation in the East Section consists primarily of upland forests and lowland swamps. The proposed Project's impacts on vegetation are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Wildlife in the East Section includes a wide range of resident and migratory wildlife species. The East Section contains natural wildlife habitat as well as managed wildlife habitat, such as WMAs. The proposed Project's impacts on wildlife are similar to those described for the West Section. (See Natural Environment discussion in Section S.9.1.)

Rare and Unique Natural Resources. Three federally threatened or endangered species are known to be present in the counties where the East Section is located. Three state threatened species have been documented within one mile of some of the proposed routes and variations in the East Section. In addition, six state special concern species have been documented within one-mile of some of the proposed routes and variations in the East Section: three vascular plants, one bird, and two mussels.

Several rare communities have been identified within or adjacent to the variation areas in the East Section, many of them located within state forests. Potential short- and long-term impacts on rare and unique natural resources in the East Section are similar to those described for the West Section. (See Rare and Unique Natural Resources discussion in Section S.9.1.)

Corridor Sharing. In the East Section, the proposed Project would parallel existing 115 kV, 230 kV, and 500 kV transmission lines, roads, field lines, trails, and public land survey sections. By paralleling

existing corridors, and thereby reducing the need for new transmission line corridors, potential impacts on human settlements, land-based economies, and the natural environment would be expected to be minimized.

Electric System Reliability. Both of the Applicant's proposed routes and three variations in the East Section include segments that would run parallel and adjacent to, but not within, the ROW of two existing high voltage transmission lines. Impacts associated with construction, operation, maintenance, or emergency repairs of the proposed Project in the Central Section are similar to those described for the West Section. (See Electric System Reliability discussion in Section S.9.1.)

Costs that Depend on Design and Route. Projected costs for the routes and variations in the East Section are given in Section 5.5.8. These cost estimates are based on an estimated cost per mile for the general structure type planned for each proposed route or variation. Since property acquisition, access costs, or segment-specific design criteria are uncertain, these are not full construction estimates and were developed for comparative purposes only.

S.10 Comparative Environmental Consequences

Data and analyses presented in Chapter 6 are commensurate with the potential significance of the impact and with the level of concern raised during the scoping process. The following resource areas are presented: human settlement (aesthetics and land use compatibility), water resources, vegetation, wildlife, rare and unique resources, archaeology and historic architectural resources, the reliability of the electrical system, and the costs of constructing, operating, and maintaining the facility which are dependent on design and route.

S.10.1 West Section

The West Section contains five variation areas: Border Crossing, Roseau Lake WMA, Cedar Bend WMA, Beltrami North, and Beltrami North Central.

S.10.1.1 West Section: Border Crossing Variation

The Border Crossing Variation Area contains five international border crossings and the transmission lines associated with five route alternatives: Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, Border Crossing Hwy 310 Variation, Border Crossing 500kV Variation, and Border Crossing 230kV Variation.

Human Settlement. The Proposed Border Crossing-Blue/Orange Route and Border Crossing Pine Creek Variation would not parallel any existing corridors at the proposed border crossings but due to the lack of residences and historic architectural sites within the ROW and 1,500 feet, potential impacts would not be expected. The border crossing for the Border Crossing Hwy 310 Variation is located within 1,000 feet of a snowmobile trail and on state forest, but parallels an existing corridor and is not located near residences; therefore impacts to aesthetics are not anticipated.

Based on proximity to residences, state forests, and other sensitive viewing areas, and the contrast, length, and extent of paralleling existing transmission lines and roads, the Border Crossing 230kV Variation and the Border Crossing 500kV Variation would likely have fewer aesthetic impacts than the Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, or Border Crossing Hwy 310 Variation..

All transmission line alternatives associated with the Border Crossing Variation Area would cross state forest land (ranging from 96 acres to 394 acres) and snowmobile trails. The transmission line alternatives associated with the Border Crossing 500kV Variation and Border Crossing 230kV Variation are likely to produce less contrast because they parallel existing transmission line corridors of similar size and design along their entire lengths. The Border Crossing 500kV Variation and Border Crossing 230kV Variation have the least impacts on forests and/or swamps (2,797 and 1,896 acres, respectively, compared to 4,456 to 5,837 acres) and agricultural land (819 and 1,057 acres, respectively compared to 1,901 to 3,609 acres) and the extent of paralleling existing transmission line corridors for more of their length (100 percent for both, compared to 7 to 10 percent) than the Proposed Border Crossing Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation. As a result, the Border Crossing 500kV Variation and Border Crossing 230kV Variation would be most compatible with surrounding land uses.

Land-Based Economies. The border crossings for the Proposed Border Crossing-Blue/Orange Route, Border Crossing 500kV Variation, and Border Crossing Hwy 310 Variation would have the least impact on farmland because there are fewer acres of land designated as prime farmland present (85 acres and 77 acres of land designated as "prime farmland if drained" and "all areas are prime farmland within" the ROW for the Border Crossing 500kV Variation and Border Crossing Hwy 310 Variation, respectively and 92 acres to 167 acres of land designated as

“prime farmland if drained” and “all areas are prime farmland” within the ROW the other alternatives in this variation area). The Border Crossing 230kV Variation crosses the least state forest land (96 acres within the ROW for the Border Crossing 230kV Variation and 120 acres to 394 acres within the ROW if the other alternatives in this variation area); this border crossing would therefore have the least impact on state forests.

Given the extent of paralleling existing transmission lines, the transmission lines associated with the Border Crossing 230kV Variation would have the least impact on farmland and state forests. No mining resources are located within the Border Crossing Variation Area, so mining resources would not be impacted by the proposed route or variations.

Archaeology and Historic Architectural Resources. No archaeological or historic architectural resources are located within the direct APE of the Proposed Border Crossing-Blue/Orange Route, Border Crossing Hwy 310 Variation, and Border Crossing 230kV Variation, however the Border Crossing Pine Creek Variation and the Border Crossing 500kV Variation both have one archaeological resource present within the ROW, which could be affected by ground-disturbing activities associated with construction of the proposed Project. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological resources and historic architectural properties. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. There are no watercourse crossings at any of the international border crossings. All border crossings are all located within a wetland or a portion of the ROW overlaps with a wetland. The border crossing for the Proposed Border Crossing-Blue/Orange Route is located in forested wetland and would result in conversion of forested wetland to an herbaceous wetland type through removal of woody vegetation in the ROW. The border crossing for the Border Crossing Pine Creek Variation is located within a Federal Emergency Management Agency (FEMA) floodplain. It is expected that the proposed Project would be designed and permitted according to current Federal Flood Risk Management Standards.

The transmission line associated with the Border Crossing 230kV Variation has the shortest length, fewest PWI (no crossings compared to two or more crossings) and impaired water crossings (no crossings compared to one crossing), and second

fewest crossings of non-PWI water resources (nine crossings compared to seven crossings). The transmission lines associated with the Border Crossing 500kV Variation and Border Crossing 230kV Variation would not cross floodplains, while the other alternative would cross 213 acres or more of floodplains. None of the transmission lines associated with the Proposed Border Crossing-Blue/Orange Route or Border Crossing variations would cross waterbodies or PWI waters, but all would cross non-PWI watercourses and ditches. The transmission line associated with the Border Crossing 230kV Variation contains the least combined forested and shrub wetlands (72 acres compared to 137 or more acres) and would result in the least wetland type conversion. None of the floodplain or wetland crossings would be spannable.

The border crossings for the Proposed Border Crossing-Blue/Orange Route, Border Crossing Hwy 310 Variation, and Border Crossing 230kV Variation are located primarily in forested land cover types within the Lost River State Forest, while the Border Crossing Pine Creek Variation border crossing is located in herbaceous agricultural vegetation.

The transmission line associated with the Border Crossing 230kV Variation would have the smallest amount (125 acres compared to 184 acres to 411 acres for the other alternatives) of forested land cover types within the ROW of the proposed routes and variations in the Border Crossing Variation Area. The Border Crossing 500kV Variation and Border Crossing 230kV Variation would parallel existing transmission line corridor for their entire length, and would therefore avoid forest fragmentation.

There are no managed wildlife habitats crossed by the border crossings for the Proposed Border Crossing-Blue/Orange Route and all Border Crossing variations. The transmission line associated with the Border Crossing 230kV Variation has the shortest length and would not pass through any WMAs, Grassland Bird Conservation Areas, or the Gray Owl Management Area; therefore it would likely have the least impact on natural and managed wildlife habitat.

Rare and Unique Natural Resources. There are no documented rare species within one mile of the border crossings for the Border Crossing 230kV Variation or Border Crossing 500kV Variation. The border crossing for the Proposed Border Crossing-Blue/Orange Route has the most occurrences of documented rare species within one mile of it (five records compared to one record).

The transmission lines associated with the Proposed Border Crossing-Blue/Orange Route and the

Border Crossing Pine Creek Variation have the most documented rare species within one mile of their respective ROWs (eleven and eight records, respectively, compared to five or less records).

Minnesota Biological Survey (MBS) Sites of Biodiversity Significance ranked as outstanding, MBS native plant communities, and MnDNR High Conservation Value Forest are present within the ROW of the border crossings for the Proposed Border Crossing-Blue/Orange Route and the Border Crossing Hwy 310 Variation. MBS Sites of Biodiversity Significance ranked as moderate are present within the ROW of the border crossings for the Border Crossing 230kV Variation and the Border Crossing 500kV Variation, but no MnDNR High Conservation Value Forest or MBS native plant communities are present. The most acres of rare communities within 200 feet of them, including Minnesota Biological Survey (MBS) Sites of Biodiversity Significance, High Conservation Value Forest, or MBS native plant communities. There are no rare communities within the ROW of the border crossing for the Border Crossing Pine Creek Variation.

Several rare communities have been identified within the ROW of the transmission lines associated with the proposed route and variations in the Border Crossing Variation Area. The transmission line associated with the Proposed Border Crossing-Blue/Orange Route would likely impact the greatest number of rare communities because there are more MBS Sites of Biodiversity Significance (381 acres compared to 326 acres or less), High conservation Value Forest (82 acres compared to 29 acres or less), and MBS native plant communities (124 acres compared to 69 or less acres). The transmission line associated with the Border Crossing 230kV Variation has the fewest acres of rare communities in the ROW. The Border Crossing 500kV Variation and 230kV Variation would cross native plant communities in areas previously disturbed because they parallel an existing transmission line corridor.

Corridor Sharing. The border crossings and transmission lines associated with the Border Crossing 500kV Variation and Border Crossing 230kV Variation parallel existing transmission line corridor for 100 percent of their lengths. The other alternatives parallel existing corridor for less than 50 percent of their lengths; paralleling existing transmission line corridors for less than 10 percent of their lengths.

Costs that Depend on Design and Route. As the longest alternative, the Border Crossing Pine Creek Variation would cost the most to build, while the

shortest alternative, the Border Crossing 230kV Variation, would cost the least to build.

5.10.1.2 West Section: Roseau Lake WMA Variation

The Roseau Lake WMA Variation Area contains three route alternatives: the Proposed Blue/Orange Route, Roseau Lake WMA Variation 1, and Roseau Lake WMA Variation 2.

Human Settlement. Based on proximity to residences (12 residences within 1,500 feet compared to 23 and 50 for Roseau Lake WMA Variation 1 and 2, respectively), historic architectural resources (none within 5,280 feet compared to one and two for Roseau Lake WMA Variation 1 and 2, respectively), state forests (one state forest crossed by each alignment), length (30.7 miles, compared to 44.1 and 37.5 miles for Roseau Lake WMA Variation 1 and 2, respectively), and the extent of paralleling existing transmission lines (33 percent of length compared to 7 and 27 percent for Roseau Lake WMA Variation 1 and 2, respectively), the Proposed Blue/Orange Route would have less aesthetic impact than the other alternatives.

Roseau Lake WMA Variation 1, compared to the Proposed Blue/Orange Route and Roseau Lake WMA Variation 2, would have the least impact on state forest (6 acres, compared to 334 and 52 acres, respectively), state fee lands (6 acres compared to 453 and 145 acres, respectively), and forested and/or swamp lands (2,615 acres compared to 7,350 and 4,269 acres, respectively); although it parallels existing corridors the least amount (7 percent compared to 33 and 27 percent, respectively).

Land-Based Economies. The Proposed Blue/Orange Route, which parallels existing corridors for 60 percent of its length and has the shortest length, would have the least impact on farmland. None of the three alternatives, however, would impact more than 25 acres of farmland of statewide importance.

The Roseau Lake WMA Variation 1, which would parallel existing corridors for 54 percent of its length and pass through fewer acres of State Forest land (6 acres within the ROW of Roseau Lake WMA Variation 1, 52 acres within the ROW of Roseau Lake WMA Variation 2, and 334 acres within the ROW of the Proposed Blue/Orange Route), would have the least impact on forest lands. No mining resources exist within Roseau Lake WMA Variation Area.

Archaeology and Historic Architectural Resources. No archaeological or historic architectural sites are located within the direct APE for the Proposed Blue/Orange Route or either variation. Both Roseau Lake

WMA variations would have historic architectural sites located within the indirect APE (one mile) (one and two sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological resources and historic architectural properties. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. Roseau Lake WMA Variation 1 would cross the most PWI and non-PWI watercourses (10 and 38 crossings, respectively), while the Proposed Blue-Orange Route and the Roseau Lake WMA Variation 1 would each cross one non-PWI waterbody. Neither the proposed route nor the variations would cross PWI waterbodies. The Proposed Blue/Orange Route would cross more floodplains (321 acres) than Roseau Lake WMA Variation 1 (202 acres) and more than five times as many wetlands (547 acres compared to 102 acres, respectively). None of these floodplain or wetland crossings would be spannable. The Proposed Blue/Orange Route and both variations would require conversion of forested and shrub wetland areas to herbaceous wetlands since woody vegetation would have to be removed from the ROW. Roseau Lake WMA Variation 1 has fewer acres of forested and shrub wetlands (55 acres compared to 141 acres or more) and would require less wetland type conversion.

The Proposed Blue/Orange Route would pass through the most forested land (515 acres, compared to 275 acres or less), resulting in more impacts on forested vegetation, although that would be mitigated by its sharing the most corridor, which would reduce forest fragmentation. The two variations would pass through more herbaceous agricultural vegetation. While direct, adverse impacts on forested areas would be long term, they would be expected to be minimal because of the small amount of disturbance relative to the large amount of surrounding contiguous forest.

Roseau Lake WMA Variation 1 would have the least impact on natural and managed wildlife habitat because it does not travel through a WMA and passes through the least amount of Grassland Bird Conservation Area (40 acres compared to 131 acres for the Proposed Blue/Orange Route and 220 acres for Roseau Lake WMA Variation 2).

Rare and Unique Natural Resources. The Proposed Blue/Orange Route has the most documented rare species within one mile of the ROW (seven records compared to four records). However, the full extent

of potential impacts from the Proposed Blue/Orange Route or either variation cannot be determined without pre-construction field surveys. Coordination with relevant federal, state, and local agencies will continue during development of the Project.

Roseau Lake WMA Variation 1 would have the least impact on rare communities, as the ROW has the fewest acres of MBS Sites of Biodiversity Significance (14 acres compared to 153 acres for Roseau Lake WMA Variation 2 and 404 acres for the Proposed Blue/Orange Route), High Conservation Value Forest (6 acres compared to 22 acres for the Proposed Blue/Orange Route), and MBS native plant communities (5 acres compared to 75 acres for Roseau Lake WMA Variation 2 and 107 acres for the Proposed Blue/Orange Route).

Corridor Sharing. The Proposed Blue/Orange Route would parallel the greatest percentage of existing transmission line corridor (33 percent), while Roseau Lake WMA Variation 1 would parallel the least amount (7 percent).

Costs that Depend on Design and Route. As the longest alternative, Roseau Lake WMA Variation 1 would cost the most to construct, while the shortest alternative, the Proposed Blue/Orange Route, would cost the least to construct.

S.10.1.3 West Section: Cedar Bend WMA Variation Area

The Cedar Bend WMA Variation Area contains two route alternatives: the Proposed Blue/Orange Route and the Cedar Bend WMA Variation.

Human Settlement. Based on proximity to residences (11 residences within 1,500 feet compared to 101 for the Cedar Bend WMA Variation), historic architectural site (zero sites within 5,280 feet compared to eight sites for the Cedar Bend WMA Variation), and forests (two forests crossed by each alternative), the Proposed Blue/Orange Route would have less aesthetic impact than the Cedar Bend WMA Variation. One scenic byway and two snowmobile trails are within 1,500 feet of the Proposed Blue/Orange Route and the Cedar Bend WMA Variation.

The Proposed Blue/Orange Route and the Cedar Bend WMA Variation would cross state forest (372 acres compared to 78 acres, respectively), state fee lands (441 acres compared to 84 acres, respectively), USFWS interest lands (6 acres compared to zero acres, respectively), and forested and/or swamp lands (8,045 acres compared to 4,180 acres, respectively); with the Cedar Bend Variation likely having less impact on these lands. However, Cedar Bend Variation would likely have a greater impact

on agricultural land than the Proposed Blue/Orange Route (2,625 acres and 844 acres, respectively).

Land-Based Economies. The Proposed Blue/Orange Route, because it parallels an existing transmission line corridor for its entire length and crosses fewer acres of prime farmland (83 acres of land designated as prime farmland if drained and all areas are prime farmland within the ROW for the Proposed Blue/Orange Route and 186 acres of land designated as “prime farmland if drained” and “all areas are prime farmland” within the ROW for the Cedar Bend WMA Variation), would have the least impact on farmland. The Cedar Bend WMA Variation, however, would have the least impact on the state forest lands (78 acres of state forest within the ROW of the Cedar Bend WMA Variation and 186 acres of state forest within the ROW of the Proposed Blue/Orange Route). The Proposed Blue/Orange Route would also traverse several acres of mining lands with state mineral leases, with the potential to impact future mining activities in these areas, while the Cedar Bend WMA Variation would not traverse any areas.

Archaeology and Historic Architectural Resources. No archaeological sites or historic architectural structures are present within the ROW (direct APE) of the Proposed Blue/Orange Route but one archaeological site is located within the ROW of the Cedar Bend WMA Variation. The Cedar Bend WMA Variation also has eight historic architectural sites located within 1 mile of the anticipated alignment compared to zero for the Proposed Blue/Orange Route. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Blue/Orange Route and the Cedar Bend WMA Variation would cross approximately the same number of PWI (four and five crossings, respectively), non-PWI (12 and 11 crossings, respectively) and impaired waters (two and three crossings, respectively), all of which would be spannable. The Proposed Blue/Orange Route would not cross any floodplains, while the Cedar Bend WMA Variation would cross floodplains (32 acres). Both would have to cross wetlands too large to span, although the Proposed Blue/Orange Route would have to cross three times the area (466 acres compared to 154 acres for the Cedar Bend WMA Variation).

The Proposed Blue/Orange Route and the Cedar Bend WMA Variation would require conversion of

forested and shrub wetland areas to herbaceous wetlands since woody vegetation would have to be removed from the ROW. Cedar Bend WMA Variation has fewer acres of forested and shrub wetlands (109 acres compared to 381 acres) and would require less wetland type conversion.

The Proposed Blue/Orange Route would pass through more forested land (543 acres compared to 266 acres for the Cedar Bend WMA Variation), including state forest (372 acres compared to 78 acres for the Cedar Bend WMA Variation). Both the Proposed Blue/Orange Route and the Cedar Bend WMA Variation, however, would parallel existing transmission line corridors for their entire lengths, which would reduce forest fragmentation. The Cedar Bend WMA Variation would pass through more herbaceous agricultural vegetation. While direct, adverse impacts to forested areas would be long term, they would be expected to be minimal because of the amount of surrounding contiguous forest.

The Cedar Bend WMA Variation has fewer acres of wildlife habitat within the ROW and would likely have the least impact on natural and managed wildlife habitat, as it does not pass through a WMA, passes through less Grassland Bird Conservation Areas (10 acres compared to 50 acres for the Proposed Blue/Orange Route), and does not cross a MnDNR-designated shallow lake.

Rare and Unique Natural Resources. The Proposed Blue/Orange Route may result in more impacts on rare species, as two records of terrestrial species have been documented within one mile of the ROW, while only one record of a rare fish has been documented within one mile of the ROW of the Cedar Bend WMA Variation. All watercourses would likely be spanned so impacts to fish are not anticipated. However, the full extent of potential impacts from the Proposed Blue/Orange Route or the Cedar Bend WMA Variation cannot be determined without pre-construction field surveys.

There are more MBS Sites of Biodiversity Significance present within the ROW of the Proposed Blue/Orange Route (454 acres) than the Cedar Bend WMA Variation (112 acres). In addition, High Conservation Value Forest and MBS native plant communities are present within the ROW of the Proposed Blue/Orange Route, while none are present within the ROW of the Cedar Bend WMA Variation. Because of this, the Proposed Blue/Orange Route would likely have more impact on rare communities.

Corridor Sharing. The Proposed Blue/Orange Route and Cedar Bend WMA Variation would both parallel

existing transmission line corridors for their entire lengths.

Costs that Depend on Design and Route. As the longer alternative, the Proposed Blue/Orange Route would cost more to construct than the Cedar Bend WMA Variation.

S.10.1.4 West Section: Beltrami North Variation Area

The Beltrami North Variation Area contains three route alternatives: the Proposed Blue/Orange Route, Beltrami North Variation 1, and Beltrami North Variation 2.

Human Settlement. Because the Proposed Blue/Orange Route is moderate in length (16.5 miles compared to 15.8 and 19.7 miles for the Beltrami North Variation 1 and 2, respectively), parallels an existing transmission line of similar size and design for its full length (compared to 72 percent and 53 percent for the Beltrami North Variation 1 and 2, respectively), and impacts very few residences (three residences within 1,500 feet compared to six and one residence for the Beltrami North Variation 1 and 2, respectively) and other sensitive visual resources (no historic architectural sites within 5,280 feet compared to zero and two sites for the Beltrami North Variation 1 and 2, respectively), the Proposed Blue/Orange Route would have the least aesthetic impact.

Beltrami North Variation 1 would have the least impact on state forest (291 acres compared to 372 and 462 acres, respectively for the Proposed Blue/Orange Route and the Beltrami North Variation 2) or state fee lands (297 acres compared to 364 and 450 acres, respectively for the Proposed Blue/Orange Route and the Beltrami North Variation 2). The Proposed Blue/Orange Route would cross USFWS interest lands (6 acres) whereas Beltrami North Variation 1 and 2 do not cross these lands. Consultation with the USFWS regarding the crossing of these USFWS interest lands is on-going.

Land-Based Economies. The Proposed Blue/Orange Route and the two variations pass through similar amounts of farmland (approximately 27 acres of land designated as “prime farmland if drained and “all areas are prime farmland” within the ROW of each alternative). Beltrami North Variation 1 would have the least impact on forest lands (291 acres of state forest within the ROW of Beltrami North Variation 1, 465 acres of state forest within the ROW of Beltrami North Variation 2, and 372 acres of state forest within the ROW of the Proposed Blue/Orange Route).

Beltrami North Variation 2 would likely impact the most acres of state mineral lease lands and therefore would be expected to have the greatest potential impact on future mining activity (approximately 150 acres of state mining land within the ROW of Beltrami North Variation 2, and less than 100 acres of state mining land within the ROW of the Proposed Blue/Orange Route and Beltrami North Variation 1).

Archaeology and Historic Architectural Resources. No archaeological or historic architectural sites are located within the direct or indirect APE of the Proposed Blue/Orange Route and Beltrami North Variation 1; however Beltrami North Variation 2 has an archaeological site within the direct APE and two historic architectural sites within the indirect APE. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural site. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. Beltrami North Variation 2 would cross the fewest PWI waters (three crossings), while Beltrami North Variation 1 would cross the most (nine crossings). Beltrami North Variation 1 would cross the fewest non-PWI waters (four crossings), while Beltrami North Variation 2 would cross the most (12 crossings). The Proposed Blue/Orange Route and Beltrami North Variation 2 would cross the fewest impaired waters (two crossings each), while Beltrami North Variation 1 would cross the most (eight crossings). All of these watercourse crossings would be spannable.

The Proposed Blue/Orange Route and both Beltrami North variations would require conversion of forested and shrub wetland areas to herbaceous wetlands since woody vegetation would have to be removed from the ROW. Beltrami North Variation 1 has the fewest acres of forested and shrub wetlands (285 acres), while Beltrami North Variation 2 would have the most (345 acres) and require the most wetland type conversion. None of these wetland crossings would be spannable.

Beltrami North Variation 2 would pass through the most forested land (473 acres compared to 389 acres or less), including state forest (462 acres compared to 372 acres or less). In addition, Beltrami North Variation 2 parallels the least amount of existing transmission line corridor and crosses more state forest, which would result in more forest fragmentation. While direct, adverse impacts to forested areas would be long-term, they would be

expected to be minimal because of the amount of surrounding contiguous forest.

Beltrami North Variation 2 would pass through the Big Bog Important Bird Area and require the creation of a new corridor, which could impact bird habitat. In addition, the Proposed Blue/Orange Route and Beltrami North Variation 2 would cross an unnamed MnDNR-designated shallow lake, which could impact wildlife that use this lake. However, in this location, the Beltrami North Variation 2 would parallel and existing transmission line corridor.

Rare and Unique Natural Resources. Beltrami North Variation 2 would likely result in more impacts on rare species because more rare species have been documented within a mile of the ROW (seven records) than the Proposed Blue/Orange Route (two records) or Beltrami North Variation 1 (one record). However, the full extent of potential impacts from the Proposed Blue/Orange Route and the variations cannot be determined without pre-construction field surveys.

The Beltrami North Variation 2 passes through more MBS Sites of Biodiversity Significance (460 acres) compared to the Proposed Blue/Orange Route (369 acres) and the Beltrami North Variation 1 (276 acres). In addition, Beltrami North Variation 2 would pass through High Conservation Value Forest and MBS native plant communities, while the Proposed Blue/Orange Route and Beltrami North Variation 1 would not pass through these resources. Because of this, Beltrami North Variation 2 would likely have more impact on rare communities.

Corridor Sharing. The Proposed Blue/Orange Route would parallel existing transmission line corridors for its entire length, Beltrami North Variation 1 would parallel existing transmission line corridor for 72 percent of its length, and Beltrami North Variation 2 would parallel existing corridor for 53 percent of its length.

Costs that Depend on Design and Route. As the longest alternative, Beltrami North Variation 2 would cost the most to construct, while the shortest option, Beltrami North Variation 1, would cost the least construct.

S.10.1.5 West Section: Beltrami North Central Variation Area

The Beltrami North Central Variation Area contains six route alternatives: the Proposed Blue/Orange Route and Beltrami North Central Variations 1 through 5.

Human Settlement. The Beltrami North Central Variation Area alternatives would all be located within 1,500 feet of two state forests and one snowmobile trail. Because the Proposed Blue/Orange Route is the shortest alternative (11.6 miles compared to 12.2 miles to 15.0 miles) and would parallel an existing transmission line of similar size and design for its entire length (compared to 48 to 92 percent), it would have the least aesthetic impact. The aesthetic impact of the Proposed Blue/Orange Route and the Beltrami North Central variations would be expected to be minimal.

The Proposed Blue/Orange Route would parallel an existing corridor for its entire length but would cross the most USFWS interest lands (18 acres compared to 0 to 1 acre), while Beltrami North Central Variation 4 avoids the greatest amount of state forest (178 acres compared to 184 acres to 255 acres) and state fee lands (178 acres compared to 184 acres to 246) and does not cross any USFWS interest lands.

Land-Based Economies. Beltrami North Central Variation 2 would not impact any prime farmland or farmland of statewide importance, while the Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would impact 20 acres of farmland of statewide importance and 6 acres of prime farmland. Beltrami North Central Variation 4, which parallels an existing 230 kV transmission line corridor for 92 percent of its length and crosses the least state forest land (178 acres of state forest within the ROW of Beltrami North Central Variation 4, 185 acres of state forest within the ROW of Beltrami North Central Variation 5, and more than 225 acres of state forest within the ROW of all other alternatives in this variation area), would have the least impact on state forest lands. There is no mining activity in the Beltrami North Central Variation Area.

Archaeology and Historic Architectural Resources. Beltrami North Central Variation 4 and Beltrami North Central Variations 5 each have one historic architectural site within the indirect APE (one mile). Neither the Proposed Blue/Orange Route nor any of the variations would directly impact any archaeological or historic architectural sites. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological resources are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Blue/Orange Route would cross the least amount of PWI waters (no crossings compared to one or more crossings),

floodplains (one acre compared to two acres) and forested/shrub wetlands (249 acres compared to 265 or more acres), and the second least amount of non-PWI waters (five crossings compared to four crossings). Watercourse and floodplain crossings would be spannable, while the Proposed Blue/Orange Route and Beltrami North Central Variations 1 through 5 would cross wetlands too large to span. Since the Proposed Blue/Orange Route crosses the least forested/shrub wetland area, it would require less wetland type conversion.

The Proposed Blue/Orange Route and all of the Beltrami North Central variations would generally pass through similar amounts of forested land and state forest. The Proposed Blue/Orange Route and the Beltrami North Central Variation 4, however, would parallel the most existing transmission line corridor (100 percent and 92 percent, respectively, compared to 48 percent to 70 percent for the other variations) and would therefore fragment the least amount of forest.

The Proposed Blue/Orange Route and all variations would pass through the Big Bog Important Bird Area. All but Beltrami North Central Variation 2, however, would parallel an existing transmission line corridor through this area.

Rare and Unique Natural Resources. No rare species have been documented within one mile of the ROW of Beltrami North Central Variation 4, while between three and four rare species have been documented within the ROW of the Proposed Blue/Orange Route and Beltrami North Central Variations 1, 2, 3, and 5. However, the Proposed Blue/Orange Route would parallel an existing transmission line corridor for its entire length, which would likely minimize impacts. The full extent of potential impacts from the Proposed Blue/Orange Route and the variations cannot be determined without pre-construction field surveys.

MBS Sites of Biodiversity Significance are present in the ROW of the Proposed Blue/Orange Route and all variations. Because the Proposed Blue/Orange Route would parallel an existing transmission line corridor for its entire length and Beltrami North Central Variation 4 for 92 percent of its length, these alternatives would have the least impact on rare communities.

Corridor Sharing. The Proposed Blue/Orange Route would parallel existing transmission line corridor for its entire length, Beltrami North Variation 4 would parallel existing transmission line corridor for 92 percent of its length, Beltrami North Variation 3 and 5 would parallel existing transmission line corridor

for 70 percent of their lengths, and Beltrami North Variation 1 and Beltrami North Variation 2 would parallel existing corridor for just less than 50 percent of their lengths.

Costs that Depend on Design and Route. Beltrami North Variation 5 would be the longest alternative, however, Beltrami North Variation 4 would cost the most to construct. The Proposed Blue/Orange Route would be the shortest alternative, however Beltrami North Variation 1 would cost the least to construct.

S.10.1.6 Relative Merits Summary—West Section

Border Crossing Variation Area

Within the Border Crossing Variation Area, the analysis indicates a general tradeoff between impacts to elements of the human settlement factors (e.g., the aesthetics element of the human settlement factor and the agriculture element of land-based economies) and impacts to elements of the natural environment factors (e.g., the water resources element of the natural environment factor and the rare communities element of the rare and unique resources factor). The Proposed Border Crossing-Blue/Orange Route and the Border Crossing Pine Creek Variation, for example, would have more potential impacts to the aesthetics element of human settlement because they would pass the greatest number of residences and parallel the least amount of existing transmission line corridor. The Border Crossing Pine Creek Variation would pass the most farmland and would therefore have more potential impacts to the agriculture element of land-based economies. The Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation would have more impacts to all three elements of the natural environment factor and to the rare communities' element of the rare and unique natural resources factor. In particular, the Proposed Border Crossing-Blue/Orange Route would have the most potential impacts to forested and shrub wetlands and MBS native plant communities and MBS Sites of Biodiversity Significance. The Border Crossing Pine Creek Variation would avoid some of these impacts to these elements of the natural environment and rare and unique natural resources factors by avoiding the wetlands, state forest land, and MBS Sites of Biodiversity Significance ranked outstanding immediately south of the international border. This variation would also provide more distance between the proposed Project and the Pine Creek Peatland SNA than the Proposed Border Crossing-Blue/Orange Route, but by doing so would create more aesthetic and farmland impacts by passing near one

more residence than the Proposed Border Crossing-Blue/Orange Route and crossing more agricultural land.

By paralleling existing transmission line corridors, the Border Crossing 230kV Variation and Border Crossing 500kV Variation would achieve a balance of sorts in terms of potential impacts to the aesthetic element of human settlement, the agricultural element of land-based economies, and all three elements of the natural environment. While these two variations would pass near residences and agricultural land, the paralleling of existing transmission lines would likely result in marginal aesthetic impacts to residents in the area and marginal impacts to agricultural land. These variations would intersect less wetland habitat and rare communities and would further minimize potential impacts by paralleling existing infrastructure and thereby minimizing habitat fragmentation.

The Border Crossing 230kV Variation and Border Crossing 500kV Variation are also much shorter than the other alternatives in this variation area. Their shorter length would result in a smaller total area of impact and lower impact in terms of the cost of construction factor.

Impacts to the archaeological and historic architectural resources factor would be expected to be slightly greater for the Border Crossing 500kV Variation and Border Crossing Pine Creek Variation as both variations would cross sections identified as containing known cultural resources.

Roseau Lake WMA Variation Area

Similar to the Border Crossing Variation Area, the analysis of the Roseau Lake WMA Variation Area indicates a tradeoff between impacts to human settlement factors and impacts to natural environment factors. Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 would both have fewer impacts on all three elements of natural environment and on the rare communities element of the rare and unique resource factor than the Roseau Lake WMA Proposed Blue/Orange Route as they would avoid crossing the Roseau Lake WMA, MBS Sites of Biodiversity Significance ranked moderate, and extensive wetland areas. However, the Roseau Lake WMA variations, particularly Roseau Lake WMA Variation 1, would impact the aesthetic element of the human settlement factor and the agricultural element of the land-based economies factor more than the Proposed Blue/Orange Route. Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 would pass through agricultural land and are located near more residences. Roseau

Lake WMA Variation 1 would also have more impact on the elements of human settlement and land-based economies because it would parallel a minimal amount of existing corridors and therefore, it would create new aesthetic impacts and a new encumbrance on farmland. Both variations are longer than the Proposed Blue/Orange Route and would result in a greater total area of impact and higher impact in terms of the cost of construction factor.

Impacts to the cultural resources factor would be expected to be greater for Roseau Lake WMA Variation 2 than for the other two alternatives in this variation area, as the Roseau Lake WMA Variation 2 passes near or through more sections identified with known cultural resources.

Cedar Bend WMA Variation Area

Both alternatives in the Cedar Bend Variation Area would minimize potential impacts by paralleling existing transmission line corridors for their entire lengths. While paralleling existing corridors would minimize habitat fragmentation (less impacts to the fauna element of the natural environment factor) along the Proposed Blue/Orange Route, and would make the Cedar Bend WMA Variation less conspicuous in terms of potential impacts to the aesthetic element of human settlement, the analysis indicates a tradeoff between impacts to human settlement factors and impacts to natural environment factors between the two alternatives in this variation area.

The Cedar Bend WMA Variation was proposed to minimize impacts to the flora and fauna elements of the natural environment factor and the rare communities element of the and rare and unique resources by avoiding crossing the Cedar Bend WMA and Beltrami Island State Forest, which is crossed by the Proposed Blue/Orange Route. In avoiding these natural resources, the Cedar Bend WMA Variation would impact the aesthetic element of the human settlement factor and the agricultural element of the land-based economies factor by crossing farmland in more populated areas and would create aesthetic impacts by passing near approximately ten times as many residences. The Cedar Bend WMA Variation also passes near more areas where known cultural resources are located, potentially creating more impacts to the archaeological and historic architectural resources factor.

Beltrami North Variation Area

The alternatives in the Beltrami North Variation Area are differentiated primarily in terms of three factors: impacts to the natural environment, cost of construction, and potential cultural resource

impacts. The Proposed Blue/Orange Route would minimize impacts to the fauna element of the natural environment factor by paralleling existing corridors and avoiding habitat fragmentation. Beltrami North Variation 1 would parallel less existing corridor than the Proposed Blue/Orange Route, but would minimize impacts to the water resources and flora elements of the natural environment factor by passing through fewer wetlands and fewer acres of forest. Both the Proposed Blue/Orange Route and Beltrami North Variation 1 are similar in length and therefore would be similar in terms of the construction costs factor.

Beltrami North Variation 2, on the other hand, is longer than the Proposed Blue/Orange Route and Beltrami North Variation 1 and would likely require many more angle structures, making it more expensive to construct. In addition, the Beltrami North Variation 2 would have relatively more impacts to the water resources and flora elements of the natural environment factor and the rare communities element of the rare and unique resources factor, passing through more wetland, forest, MBS Sites of Biodiversity Significance, High Conservation Value Forest, MBS native plant communities, and an Important Bird Area. In addition, Beltrami North Variation 2 would have more impacts to the archaeological and historic architectural resources factor as it passes near more sections identified with known archaeological and historic architectural resources.

Beltrami North Central Variation Area

Within the Beltrami North Central Variation Area, the analysis indicates that impacts to the aesthetics element of the human settlement factor and the agriculture element of the land-based economies factor would be minimized by Beltrami North Central Variation 1 and the Proposed Blue/Orange Route, as these alternatives would combine paralleling existing transmission line corridors and passing by relatively fewer residences than any of the other alternatives in this variation area. In contrast, Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would result in more impacts to the aesthetics element of the human settlement factor and the agricultural element of and land-based economies factor, as they would cross slightly more farmland and would be in proximity to more residences. The Proposed Blue/Orange Route would have more impacts to the land use compatibility element of the human settlement factor because it would pass through USFWS lands; however it would do so while paralleling an existing transmission line corridor.

All of the alternatives in this variation area would have high potential for impacts to the water resources and wetland elements of the natural environment factor, passing through mostly forested and wetland areas. Beltrami North Central Variation 5 would cross the least amount of forested and shrub wetlands. Of the all the alternatives in this variation area, Beltrami North Central Variation 2 would have more impacts to the elements of the natural environment factor and to rare and unique resource impacts as it would pass through the Big Bog Important Bird Area and an MBS Site of Biodiversity Significance ranked high, without paralleling any existing infrastructure corridors through these areas. While the Proposed Blue/Orange Route would cross some of these same sensitive areas, paralleling the existing 500 kV transmission line corridor would result in fewer impacts to the fauna element of the natural environment factor associated with habitat fragmentation. Beltrami North Central Variation 4 would have fewer impacts to the fauna element of the natural environment factor and to the rare communities element of the rare and unique resources factor than the other alternatives in this variation area, as it would avoid the sensitive areas crossed by the Beltrami North Central Variation 2 and the Proposed Blue/Orange Route, and would also parallel an existing 230 kV transmission line corridor for its entire length.

The Proposed Blue/Orange Route and Beltrami North Central Variation 1 would have shorter lengths and would cost less to build.

S.10.2 Central Section

The Central Section contains eight variation areas: Pine Island, Beltrami South Central, Beltrami South, North Black River, C2 Segment Option, J2 Segment Option, Northome, and Cutfoot.

S.10.2.1 Central Section: Pine Island Variation Area

The Pine Island Variation Area has two route alternatives: the Proposed Blue Route and the Proposed Orange Route.

Human Settlement. Based on proximity to other sensitive viewing areas like historic architectural sites and state forests (two historic architectural sites within 5,280 feet of the Proposed Blue Route compared to seven historic architectural sites for the Proposed Orange Route, and four state forests for the Proposed Blue Route compared to six state forests for the Proposed Orange Route), and the extent of paralleling existing transmission lines (39 percent for the Proposed Blue Route compared to

23 percent for the Proposed Orange Route), the Proposed Blue Route would result in fewer aesthetic impacts. The ROW for the proposed routes would be within 1,500 feet of one state trail, snowmobile trails (three and four, respectively), and one state water trail. Despite that, both proposed routes are long (109.8 and 105.4 miles, respectively) and only parallel existing transmission lines of similar size and design for a relatively small percentage of their lengths (39 and 23 percent, respectively), therefore, aesthetic impacts of both proposed routes would potentially be significant.

The Proposed Blue Route would likely impact more acres of state forest (2,291 acres compared to 1,980 acres for the Proposed Orange Route) but would avoid crossing a greater amount of state fee lands (2,095 acres compared to 2,310 acres for the Proposed Orange Route), and USFWS interest lands (8 acres compared to 16 acres for the Proposed Orange Route). It would also parallel existing transmission line corridor more (39 percent compared to 23 percent for the Proposed Orange Route).

Land-Based Economies. Both the Proposed Blue Route and the Proposed Orange Route would impact 70 acres of land designated as “all areas are prime farmland”. The Proposed Blue Route would have fewer potential impacts to agriculture as it has fewer acres of land designated as “prime farmland if drained” (307 acres in the ROW of the Proposed Blue Route and 503 acres in the ROW of the Proposed Orange Route) and would parallel an existing transmission line for a greater proportion of its length (approximately 40 percent of the Proposed Blue Route compared to 23 percent of the Proposed Orange Route). The Proposed Orange Route would impact fewer acres of state forest lands (2,291 acres of state forest within the ROW of the Proposed Orange Route and 1,980 acres of state forest within the ROW of the Proposed Blue Route). The Proposed Orange Route would also impact fewer acres of state mining lands (370 acres of state mineral leases in the ROW of the Proposed Orange Route and 1,205 within the ROW of the Proposed Blue Route). In addition, two aggregate resources are present within the ROW of the Proposed Orange Route, while none are present in the ROW of the Proposed Blue Route.

Archaeology and Historic Architectural Resources. Neither route has any archaeological or historic architectural sites within its ROW. The Proposed Orange Route has a higher number of historic architectural sites within 1 mile (seven sites compared to two sites). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for

archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross the most PWI waters (25 crossings compared to 18 crossings for the Proposed Blue Route), while the Proposed Blue Route would cross slightly more non-PWI waters (48 crossings compared to 46 crossings for the Proposed Orange Route). Each proposed route would cross one impaired water, and the Proposed Blue Route would cross one MnDNR-designated trout stream. All water course crossings would be spannable. The Proposed Blue Route would also cross the greatest amount of floodplains (20 acres compared to 11 acres for the Proposed Orange Route) and wetlands (2,102 acres compared to 1,875 acres for the Proposed Orange Route). Floodplains would be spannable, while both the Proposed Blue Route and the Proposed Orange Route would cross wetlands too large to span.

Both proposed routes would pass through similar amounts of forested land, including state forest land, but because the Proposed Blue Route parallels existing transmission line corridor for a greater percentage of its length, it would likely have less impact on intact forested areas.

The Proposed Orange Route would pass through more WMA land (274 acres compared to 49 acres for the Proposed Blue Route) and more of the Big Bog Important Bird Area (1,722 acres compared to 1,405 acres for the Proposed Blue Route).

Rare and Unique Natural Resources. The Proposed Orange Route has more documented rare species within one mile of its ROW (14 records compared to 8 records for the Proposed Blue Route) and would likely have a greater impact on rare species. However, the full extent of potential impacts from either the Proposed Blue Route or the Proposed Orange Route cannot be determined without pre-construction field surveys. The Proposed Blue Route would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross less of this resource than the Proposed Orange Route.

Rare communities are present in the ROW of the Proposed Blue Route and Proposed Orange Route. Because the Proposed Blue Route would parallel more existing transmission line corridor (39 percent compared to 23 percent for the Proposed Orange Route), it would likely have less impact on these communities.

Corridor Sharing. The Proposed Blue Route and Proposed Orange Route would parallel existing transmission line corridor for 39 percent and 23 percent of their lengths, respectively. Both proposed routes would parallel existing road/trail, field line, and other corridors for less than 10 percent of their length.

Costs that Depend on Design and Route. As the longer alternative, the Proposed Blue Route would cost more to build than the Proposed Orange Route.

S.10.2.2 Central Section: Beltrami South Central Variation Area

The Beltrami South Central Variation Area contains two route alternatives: the Proposed Orange Route and the Beltrami South Central Variation.

Human Settlement. Because it is slightly shorter (1.2 miles compared to 1.7 miles for the Beltrami South Central Variation), and parallels an existing 500 kV transmission line for its entire length (compared to no paralleling for the Beltrami South Central Variation), and crosses less state forest land (30 acres compared to 43 acres for the Beltrami South Central Variation) the Proposed Orange Route would have the fewest aesthetic impacts and would be expected to be more compatible with existing land uses than the Beltrami South Central Variation, although it crosses more USFWS interest lands (16 acres compared to zero acres for the Beltrami South Central Variation).

Land-Based Economies. No prime farmland or mining lands are present in the ROW of either the Proposed Orange Route or the Beltrami South Central. The Proposed Orange Route would have less impact on forest lands with 30 acres of state forest land in it's ROW compared to 43 acres in the Beltrami South Central Variation ROW.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the Beltrami South Central Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route contains less combined forested and shrub wetlands than the Beltrami South Central Variation (28 acres compared to 39 acres, respectively) and would result in less wetland type conversion. Both the

Proposed Orange Route and the Beltrami South Central Variation would cross wetlands too large to span.

The Proposed Orange Route would pass through slightly less forested land (30 acres compared to 43 acres for the Beltrami South Central Variation), including state forest, and would parallel existing transmission line corridor for its entire length, thereby resulting in less forest fragmentation.

Both the Proposed Orange Route and the Beltrami South Central Variation would pass through the Big Bog Important Bird Area. The Proposed Orange Route, however, would traverse a smaller portion (30 acres compared to 43 acres for the Beltrami South Central Variation) and would not require that a new transmission line corridor be created.

Rare and Unique Natural Resources. Four rare species have been documented within one mile of both the Proposed Orange Route and Beltrami South Central Variation; impacts to rare species would likely be similar with either alternative. However, the full extent of potential impacts from either the Proposed Orange Route or the Beltrami South Central Variation cannot be determined without pre-construction field surveys.

The Proposed Orange Route would pass through fewer MBS Sites of Biodiversity Significance (30 acres compared to 43 acres for the Beltrami South Central Variation), and would do so while paralleling an existing transmission line corridor; therefore this alternative would likely have less impacts on this resource.

Corridor Sharing. The Proposed Orange Route parallels existing transmission line corridors for its entire length. The Beltrami South Central Variation does not parallel any existing corridor.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to construct and less per mile to construct.

S.10.2.3 Central Section: Beltrami South Variation Area

The Beltrami South Variation Area contains two route alternatives: the Proposed Orange Route and the Beltrami South Variation.

Human Settlement. State forest lands (one state forest within 1,500 feet of each alternative), but no residences, historic architectural sites, state trails, state parks, national forest, scenic byways, or snowmobile or water trails, would be located within

the 200-foot ROWs of the Proposed Orange Route or the Beltrami South Variation. The Proposed Orange Route, however, is shorter (5.6 miles compared to 7.5 miles for the Beltrami South Variation) and parallels transmission line corridor for its entire length compared to no paralleling for the Beltrami South Variation, so it would likely have the fewest adverse impacts on aesthetics. It also crosses less forested and/or swamp area (2,185 acres compared to 2,887 acres for the Beltrami South Variation), so it would be more compatible with existing land uses.

Land-Based Economies. Neither the Proposed Orange Route nor the Beltrami South Variation crosses prime farmland. The Proposed Orange Route, crosses less state forest and mineral lease land (136 acres of state forest and 58 acres of state mineral lease land for the Proposed Orange Route compared to 136 acres of state forest and 58 acres of state mineral lease land for the Proposed Orange Route), is shorter, and parallels an existing transmission line for its entire length, thereby having the least impact on forest and mining lands.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the Beltrami South Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route contains less combined forested and shrub wetlands than the Beltrami South Variation (133 acres compared to 180 acres, respectively) and would result in less wetland type conversion. Both the Proposed Orange Route and the Beltrami South Variation would cross wetlands too large to span.

The Proposed Orange Route would pass through slightly less forested land (135 acres compared to 183 acres for the Beltrami South Variation), including state forest (136 acres compared to 183 acres for the Beltrami South Variation), and because it parallels existing transmission line corridor, it would fragment less forested land.

Both the Proposed Orange Route and the Beltrami South Variation would pass through the Big Bog Important Bird Area. The Proposed Orange Route, however, would traverse a smaller portion (136 acres compared to 183 acres for the Beltrami South

Variation) and would not require creation of a new transmission line corridor.

Rare and Unique Natural Resources. Two rare *Botrychium* (moonwort) species have been documented within one mile of the Beltrami South Variation, one of which was also documented within one mile of the Proposed Orange Route. Because species in this genus prefer disturbed, open habitats, impacts would be similar with either alternative. However, the full extent of potential impacts from either the Proposed Orange Route or the Beltrami South Variation cannot be determined without pre-construction field surveys. The Proposed Orange Route would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross less of this resource and would do so in an area where critical habitat designated for gray wolf has already been fragmented.

The Proposed Orange Route would pass through fewer MBS Sites of Biodiversity Significance (120 acres compared to 160 acres for the Beltrami South Variation) and would parallel existing transmission line corridor; it would therefore likely have the fewest adverse impacts on these resources.

Corridor Sharing. The Proposed Orange Route parallels existing transmission line corridor for its entire length. The Beltrami South Variation does not parallel any corridor.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to construct and less per mile to construct.

S.10.2.4 Central Section: North Black River Variation Area

The North Black River Variation Area contains two route alternatives: the Proposed Blue Route and the North Black River Variation.

Human Settlement. Although the North Black River Variation would be slightly longer (9.2 miles compared to 8.4 miles for the Proposed Blue Route) and would impact several more residences than the Proposed Blue Route (five residences within 1,500 feet for the North Black River Variation compared to one residence for the Proposed Blue Route), it would likely have fewer aesthetic impacts because it would parallel an existing transmission line for its entire length compared to the Proposed Blue Route which does not parallel an existing transmission line. Neither alternative would be expected to have aesthetic impacts, as historic architectural sites, state trails, state parks, national forest, scenic byways, or

water trails are not located within the 200-foot ROW of either the Proposed Blue Route or the North Black River Variation. Snowmobile trails are crossed by both alternatives.

The Proposed Blue Route crosses less forested area (3,190 acres compared to 3,296 acres for the North Black River Variation) so it would be more compatible with existing land uses.

Land-Based Economies. The North Black River Variation would pass through more acres of farmland (50 acres of land designated as “prime farmland if drained” and 14 acres of farmland of statewide importance within the North Black River Variation ROW compared to 12 acres of land designated as “prime farmland if drained” and 29 acres of farmland of statewide importance within the Proposed Blue Route ROW). However, because the North Black River Variation would parallel an existing transmission line for its entire length, it would be expected to have fewer impacts on farmland.

The North Black River Variation would pass through less state forest and mining land (156 acres of state forest and 362 acres of state mineral lease land for the North Black River Variation ROW compared to 188 acres of state forest and 405 acres of state mineral lease land for the Proposed Blue Route ROW), so it would likely have fewer adverse impacts on these resources.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the North Black River Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. Both the Proposed Blue Route and the North Black River Variation would cross non-PWI waters four times. All these crossings are spannable. Both the Proposed Blue Route and the North Black River Variation would cross wetlands, although the North Black River Variation would cross less combined forested and shrub wetlands than the Proposed Blue Route (156 acres compared to 185 acres, respectively) and would therefore result in less wetland type conversion. Both the Proposed Blue Route and the North Black River Variation would cross wetlands too large to span.

Both the Proposed Blue Route and the North Black River Variation would pass through similar amounts of forested land, including state forest, but because the North Black River Variation parallels existing transmission line corridor, it would cause less fragmentation of intact forest in areas.

Both the Proposed Blue Route and the North Black River Variation would pass through the Big Bog Important Bird Area. The North Black River Variation would cross slightly more of this area (214 acres compared to 191 acres for the Proposed Blue Route), but because it would parallel existing transmission line corridor, it would likely have less impact.

Rare and Unique Natural Resources. No state or federally-listed species have been documented within one mile of the Proposed Blue Route or the North Black River Variation. However, the full extent of potential impacts from either the Proposed Blue Route or the North Black River Variation cannot be determined without pre-construction field surveys.

The North Black River Variation would pass through fewer acres of MBS Sites of Biodiversity Significance (109 acres compared to 165 acres for the Proposed Blue Route) and would parallel an existing transmission line corridor; therefore it would fragment less intact forest in areas where forest vegetation is present.

Corridor Sharing. The North Black River Variation would parallel corridor with existing transmission lines for its entire length. The Proposed Blue Route would not parallel any existing corridor.

Costs that Depend on Design and Route. Although the North Black River Variation would be the longer alternative, it would cost the less to build and less per mile.

S.10.2.5 Central Section: C2 Segment Option Variation Area

The C2 Segment Option Variation Area contains two route alternatives: the Proposed Blue Route and the C2 Segment Option Variation.

Human Settlement. Although the C2 Segment Option Variation would be longer than the Proposed Blue Route (46.0 miles compared to 32.8 miles, respectively) and would impact substantially more residences (29 residences within 1,500 feet compared to zero residences within 1,500 feet, respectively). The C2 Segment Option Variation also parallels an existing transmission line for a large portion of the route (81 percent of total length compared to zero percent for the Proposed Blue Route) and therefore is likely to result in somewhat fewer aesthetic

impacts than the Proposed Blue Route. Both the Proposed Blue Route and C2 Segment Option Variation would be within 1,500 feet of a state trail, state forest land (two and three forests, respectively), snowmobile trails (two and one, respectively), and a water trail.

The C2 Segment Option Variation crosses more forested and agricultural land (16,121 acres and 167 acres, respectively) than the Proposed Blue Route (11,922 acres and zero acres, respectively), although the Proposed Blue Route would contain more state forest (797 acres compared to 274 acres for the C2 Segment Option Variation) and state fee land (731 acres compared to 640 acres for the C2 Segment Option Variation). Because the C2 Segment Option Variation parallels an existing transmission line corridor for 81 percent of its length compared to zero percent for the Proposed Blue Route, it would be more compatible with surrounding land uses.

Land-Based Economies. The Proposed Blue Route would pass through fewer acres of farmland, including prime farmland (2 acres within the ROW of the Proposed Blue Route and 25 acres within the ROW of the C2 Segment Option Variation), "prime farmland if drained," (92 acres within the ROW of the Proposed Blue Route and 124 acres within the ROW of the C2 Segment Option Variation) and farmland of statewide importance (78 acres within the ROW of the Proposed Blue Route and 177 acres within the ROW of the Segment Option Variation) and may have fewer impacts on agriculture.

The C2 Segment Option Variation would impact fewer acres of state forest land (247 acres within the ROW) compared to the Proposed Blue Route (797 acres within the ROW).

Because the C2 Segment Option Variation passes through more mining lands with state mineral leases (67 acres of state mineral lease land within the C2 Segment Option Variation ROW and 16 acres of state mineral lease land within the Proposed Blue Route ROW), it is more likely to potentially interfere with future mining activities in this area.

Archaeology and Historic Architectural Resources. No known archaeological or historic architectural resources are present within the North Black River Variation Area. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The C2 Segment Option Variation would cross fewer PWI and non-PWI waters (eight crossings compared to 17 crossings for the Proposed Blue Route) but more impaired waters (two crossings compared to one crossing for the Proposed Blue Route). All of these watercourses would be spannable. Both the Proposed Blue Route and the C2 Segment Option Variation would cross floodplains and wetlands, and the C2 Segment Option Variation would cross more acres of each (8 acres compared to 28 acres of floodplain for the Proposed Blue Route; 728 acres compared to 829 acres of wetland for the Proposed Blue Route). Both the Proposed Blue Route and the C2 Segment Option Variation would cross wetlands too large to span.

The C2 Segment Option Variation would pass through more forested land (1,080 acres compared to 789 acres for the Proposed Blue Route), but the Proposed Blue Route would pass through more state forest land (797 acres compared to 274 acres for the C2 Segment Option Variation), and even though the C2 Segment Option Variation is longer, it would parallel existing transmission line corridor for much of its length (81 percent), thereby causing less fragmentation of intact forest.

Both the Proposed Blue Route and the C2 Segment Option Variation would also pass through the Big Bog Important Bird Area. The C2 Segment Option Variation would traverse less area (406 acres compared to 469 acres for the Proposed Blue Route) and parallel existing transmission line corridor, therefore it would likely have less impact on this resource.

Rare and Unique Natural Resources. The C2 Segment Option Variation Area contains one state threatened vascular plant within one mile. Habitat for this vascular plant species is likely present within one mile of both the Proposed Blue Route and the C2 Segment Option Variation. Because the Proposed Blue Route would require the creation of new corridor for its entire length, while the C2 Segment Option Variation would parallel an existing transmission line for over 80 percent of its length, the Proposed Blue Route could have more impact on rare species. However, the full extent of potential impacts from either the Proposed Blue Route or C2 Segment Option Variation cannot be determined without pre-construction field surveys.

The C2 Segment Option Variation would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross this resource in an area where critical habitat designated for gray wolf has already been fragmented.

Both the Proposed Blue Route and the C2 Segment Option Variation would pass through MBS Sites of Biodiversity Significance and MnDNR Ecologically Important Lowland Conifers. However, because it would parallel an existing corridor for over 80 percent of its length, the C2 Segment Option would likely have less impact on these resources.

Corridor Sharing. The C2 Segment Option Variation would parallel existing transmission line corridor for 81 percent of its length. The Proposed Blue Route would not parallel any existing corridor.

Costs that Depend on Design and Route. As the shortest alternative, the Proposed Blue Route would cost less to build and less per mile to build.

S.10.2.6 Central Section: J2 Segment Option Variation Area

The J2 Segment Option Variation Area contains two route alternatives: the Proposed Orange Route and the J2 Segment Option Variation.

Human Settlement. Given the length (42.2 miles for the Proposed Orange Route compared to 45.2 miles), and proximity to residences (zero and six residences within 1,500 feet for the Proposed Orange Route and J2 Segment Option Variation, respectively), historic architectural resources (two and seven historic architectural sites within 1,500 feet, for the Proposed Orange Route and J2 Segment Option Variation, respectively), state scenic byways (zero compared to two within 1,500 feet for the Proposed Orange Route and J2 Segment Option Variation, respectively), and snowmobile trails (two compared to four within 1,500 feet for the Proposed Orange Route and J2 Segment Option Variation, respectively), the Proposed Orange Route would have less aesthetic impact than the J2 Segment Option Variation. Both alternatives would be located within 1,500 feet of a state trail and state forest (three compared to two for the Proposed Orange Route and J2 Segment Option Variation, respectively), and snowmobile trails.

The Proposed Orange Route would cross more state forest land (851 acres compared to 715 acres for the J2 Segment Option Variation) and state fee land (945 acres compared to 840 acres for the J2 Segment Option Variation) but the J2 Segment Option Variation would cross more USFWS interest lands (28 acres compared to zero acres for the Proposed Orange Route). Long-term changes to land use would be expected to be minimal.

Land-Based Economies. The Proposed Orange Route, which is shorter, would have less impact on farmland (434 acres of land designated as “prime farmland if drained” and “all areas are prime farmland” within

the J2 Segment Option Variation ROW, and 459 acres of land designated as “prime farmland if drained” and “all areas are prime farmland” within the Proposed Orange Route ROW), but because it would contain more state forest lands (851 acres of state forest within the Proposed Orange Route ROW and 715 acres of state forest within the J2 Segment Option Variation ROW), it would be expected to have the greater potential impact on forestry. The Proposed Orange Route also has slightly more mining lands in its ROW (82 acres of state mineral lease land within the Proposed Orange Route ROW versus 73 acres of state mineral lease land within the J2 Segment Option Variation ROW).

Archaeology and Historic Architectural Resources. No archaeological or historic architectural sites are located within the ROW of the Proposed Orange Route or J2 Segment Option Variation but both have historic architectural sites located within one mile (indirect APE) that could potentially be affected (two and seven sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross more PWI waters but fewer non-PWI waters than the J2 Segment Option Variation (six compared to three PWI water crossings, respectively and 24 compared to 36 non-PWI water crossings, respectively). The Proposed Orange Route would also cross floodplains, while the J2 Segment Option Variation would not cross any. These watercourses and floodplains would all be spannable. The Proposed Orange Route would also cross more forested and shrub wetlands (312 acres compared to 483 acres for the J2 Segment Option Variation), which would result in more wetland type conversion. Both the Proposed Orange Route and the J2 Segment Option Variation would cross wetlands too large to span.

The Proposed Orange Route and the J2 Segment Option Variation would pass through similar amounts of forested land, with the Proposed Orange Route passing through more state forest land (851 acres compared to 715 acres for the J2 Segment Option Variation). Therefore, they would result in similar fragmentation of intact forest, with the Proposed Orange Route fragmenting more state forest land.

The Proposed Orange Route would pass through 262 acres of the Big Bog Important Bird Area, while the J2 Segment Option Variation would pass through 72 acres of the Chippewa Plains Important Bird Area.

Rare and Unique Natural Resources. The Proposed Orange Route has more documented rare species within one mile of its ROW (four records compared to two records for the J2 Segment Option Variation). However, the full extent of potential impacts from either of the Proposed Orange Route or J2 Segment Option Variation cannot be determined without pre-construction field surveys. The J2 Segment Option Variation has two colonial waterbird nesting sites within 1,500 feet of its anticipated alignment, while no colonial waterbird nesting sites have been documented within one mile of the Proposed Orange Route. The J2 Segment Option Variation would be expected to have less potential impact on critical habitat designated for gray wolf because it would cross less of this resource than the Proposed Orange Route.

The Proposed Orange Route would pass through more acres of MBS Sites of Biodiversity Significance (489 acres compared to 185 acres for the J2 Segment Option Variation) and would therefore have a greater adverse impact on these resources.

Corridor Sharing. Neither the Proposed Orange Route nor the J2 Segment Option Variation would parallel existing transmission line corridor.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to build, but cost about the same per mile to build.

S.10.2.7 Central Section: Northome Variation Area

The Northome Variation Area contains two route alternatives: the J2 Segment Option Variation and the Northome Variation.

Human Settlement. Both the J2 Segment Option Variation and the Northome Variation would be within 1,500 feet of a state forest, and the Northome Variation is also within 1,500 feet of a national forest, although it does not cross the ROW. Because both alternatives are short (3.7 and 4.0 miles, respectively) and impact no residences and few other sensitive visual resources (state and national forests), aesthetic impacts would be expected to be minimal. No historic architectural sites, state trails, state parks, scenic byways, snowmobile or water trails are within the ROW of either alternative.

The Northome Variation ROW contains a greater amount of state fee land (81 acres compared to 39 acres for the J2 Segment Option Variation) while the J2 Segment Option Variation crosses more USFWS interest lands (28 acres compared to zero acres for the Northome Variation). Both alternatives contain less than half an acre of state forest land.

Land-Based Economies. The Northome Variation, which is longer, would pass through more farmland, including more prime farmland and “prime farmland if drained” (43 acres of land designated as “prime farmland if drained” and “all areas are prime farmland” for the Northome Variation ROW, and 22 acres of land designated as “prime farmland if drained” and “all areas are prime farmland” for the J2 Segment Option Variation ROW). The Northome Variation would, however, impact less farmland of statewide importance (28 acres of farmland of statewide importance for the Northome Variation ROW, and 39 acres of land designated as “prime farmland if drained” and “all areas are prime farmland” for the J2 Segment Option Variation ROW).

The J2 Segment Option Variation and the Northome Variation would impact minimal amounts of state forest lands. No mining lands would be located within the ROW of either alternative.

Archaeology and Historic Architectural Resources. No archaeological or historic architectural resources are located within the direct and indirect APEs for the J2 Segment Option Variation or the Northome Variation. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The J2 Segment Option Variation would cross more non-PWI waters (six crossings compared to one crossing for the Northome Variation), all of which would be spannable. The J2 Segment Option Variation would also contain more acres of forested and shrub wetlands (eight acres compared to 13 acres for the Northome Variation), which would result in more wetland type conversion. Both the J2 Segment Option Variation and the Northome Variation would cross wetlands too large to span.

The J2 Segment Option Variation and the Northome Variation would pass through similar amounts of forested land and would therefore fragment similar amounts of intact forest.

The Northome Variation would cross a MnDNR-designated shallow lake along a new transmission line corridor, which could impact the wildlife that uses this lake. Due to its longer length, the Northome Variation could also have a greater overall impact on wildlife.

Rare and Unique Natural Resources. No federally- or state-listed species have been documented within one mile of either alternative. However, the full extent of impacts from either the Proposed J2 Segment Option Variation and Northome Variation cannot be determined without pre-construction field surveys. One and two colonial waterbird nesting sites have been documented within one mile of the J2 Segment Option Variation and of the Northome Variation, respectively.

No documented rare communities appear within the ROW of the J2 Segment Option Variation or the Northome Variation.

Corridor Sharing. Neither the J2 Segment Option Variation nor the Northome Variation parallel any existing corridors.

Costs that Depend on Design and Route. As the shorter alternative, the J2 Segment Option Variation would cost less to build and less per mile to build.

S.10.2.8 Central Section: Cutoff Variation Area

The Cutoff Variation Area contains two route alternatives: the Proposed Orange Route and the Cutoff Variation.

Human Settlement. The ROWs of both the Proposed Orange Route and the Cutoff Variation are within 1,500 feet of three state forests, but neither alternative would be likely to impact other aesthetic resources or residences with high visual sensitivity such as historic architectural resources, state trails, state parks, national forest, scenic byways, snowmobile or water trails as they are not within the ROW or within 1,500 feet of the anticipated alignments. Because the Cutoff Variation is slightly longer (4.8 miles compared to 4.2 miles for the Proposed Orange Route), it would have a greater impact on aesthetics.

The Proposed Orange Route and the Cutoff Variation contain roughly the same amount of forest lands (1,652 acres compared to 1,874 acres, respectively), and neither alternative contains any farmland. No long-term changes to land use would be expected to be minimal from either alternative.

Land-Based Economies. The Proposed Orange Route would pass through more acres of farmland, including “prime farmland if drained” (53 acres within the ROW) than the Cutoff Variation (32 acres within the ROW). Each alternative would impact less than 5 acres of farmland of statewide importance and would not impact prime farmland. The Cutoff Variation would cross slightly more acres of state forest lands (116 acres within the ROW) than the Proposed Orange Route (103 acres within the ROW), and therefore may have more impact on these lands. The Proposed Orange Route would cross more state mining lands (29 acres of state mineral lease land within the ROW of the Proposed Orange route and 4 acres of state mineral lease land within the ROW of the Cutoff variation), and both alternatives would have one aggregate resource within its ROW.

Archaeology and Historic Architectural Resources. Neither the Proposed Orange Route nor the Cutoff Variation affects any archaeological or historic architectural resources in the direct and indirect APEs. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross two non-PWI waters, while the Cutoff Variation would not cross any. Both of these non-PWI waterbodies would be spannable. The Cutoff Variation contains more forested and shrub wetlands and would result in a greater amount of wetland type conversion (52 acres compared to 64 acres for the Proposed Orange Route). Both the Proposed Orange Route and the Cutoff Variation would cross wetlands too large to span.

Because the Cutoff Variation is longer, it would pass through more forested land (115 acres compared to 99 acres for the Proposed Orange Route), including more state forest land (116 acres compared to 103 acres for the Proposed Orange Route), and would result in more fragmentation of intact forest.

Rare and Unique Natural Resources. No state- or federally-listed species have been documented within one mile of the Proposed Orange Route or the Cutoff Variation. However, the full extent of potential impacts from either the Proposed Orange Route or Cutoff Variation cannot be determined without pre-construction field surveys. The Proposed Orange Route would be expected to have less potential impact on critical habitat designated for

gray wolf because it would cross slightly less of this resource than the Cutfoot Variation.

The Cutfoot Variation would pass through more acres of MBS Sites of Biodiversity Significance (60 acres) than the Proposed Orange Route (43 acres) and therefore would likely have more impact on this resource.

Corridor Sharing. Neither the Proposed Orange Route nor the Cutfoot would parallel any existing corridors.

Costs that Depend on Design and Route. The Proposed Orange Route would cost less to build but slightly more per mile to build.

S.10.2.9 Relative Merits Summary—Central Section

Pine Island Variation Area

Within the Pine Island Variation Area, the analysis indicates a tradeoff between impacts to human settlement factors and impacts to natural environment factors. Though both routes would pass through reaches of forest lands and floodplain and forested wetlands too large to span, the Proposed Orange Route would cross the least, resulting in placement of fewer structures in floodplains and requiring the least wetland type conversion. The Proposed Blue Route would have a greater impact on the watercourse/waterbody crossing indicator of the water resources element as it would cross a trout stream, potentially requiring vegetation along the banks of the stream to be cleared. With respect to the vegetation, wildlife, and rare and unique natural resources elements of the natural environment factor, the Proposed Blue Route would cross more state forest land, wetlands and Ecologically Important Lowland Conifer stands, while the Proposed Orange Route would cross greater areas of MBS Sites of Biodiversity Significance, a WMA, and Important Bird Areas and also has more documented Natural Heritage Information System ((NHIS) records within one mile.

The Proposed Blue Route would impact the aesthetics element of the human settlement factor by passing near more residences than the Proposed Orange Route. Though the Proposed Orange Route would pass near the Big Bog Recreation area, a valued resource with respect to both the aesthetics element and the recreation and tourism element of the human settlement factor, the Proposed Orange Route would not be visible from the Big Bog Recreation Area. Both the Proposed Blue Route and the Proposed Orange Route would cross USFWS land, affecting the land use compatibility

element of the human settlement factor; however, the Proposed Blue Route could avoid USFWS land by using the Silver Creek Alignment Modification. The Proposed Blue Route would cross more mineral resources, affecting the mining and mineral resources element of the land based economies factor, though the Proposed Orange Route would pass in close proximity to more aggregate resources. The Proposed Blue Route would parallel existing corridors, including transmission line corridors, for a greater length than the Proposed Orange Route; however, the Proposed Orange Route is shorter and would incur lower construction, operation, and maintenance costs.

Beltrami South Central Variation Area

Within the Beltrami South Central Variation Area, the analysis indicates that due to its overall greater length, lack of paralleling existing corridors, and sharply-angled route, the Beltrami South Central Variation would have greater impacts than the Proposed Orange Route for the elements of three key factors: natural environment, rare and unique resources, and construction cost. The Beltrami South Central Variation would avoid USFWS land; however, it would cross the most forest land, wetland, and portions of the Important Bird Area. The Beltrami South Central Variation would cross the most forested and shrub wetland, requiring the most wetland type conversion. Furthermore, the Beltrami South Central Variation would not parallel any existing corridors and would be longer than the Proposed Orange Route, requiring more corner structures and costing more to build.

Beltrami South Variation Area

Within the Beltrami South Variation Area, the analysis indicates that due to its overall greater length, lack of paralleling existing corridors, and numerous angle structures, the Beltrami South Variation would have greater impacts than the Proposed Orange Route for the elements of three key factors: natural environment, rare and unique resources, and construction cost. The Beltrami South Variation would avoid USFWS lands; however, it would cross the most forest land, mineral leasing areas, wetlands, portions of the Important Bird Area, and MBS Sites of Biodiversity Significance. The Beltrami South Variation would cross the most forested and shrub wetland, requiring the most wetland type conversion. Furthermore, the Beltrami South Variation would not parallel any existing corridors and would be longer than the Proposed Orange Route, requiring more corner structures and costing more to build.

North Black River Variation Area

In the North Black River Variation Area, the analysis indicates a potential tradeoff between impacts to the aesthetic element of the human settlement factor and to elements of the land-based economies, natural environment, and rare and unique natural resources factors. The North Black River Variation would have more impacts to the aesthetics element of the human settlement factor as it passes close to more residences than the Proposed Blue Route, but these impacts are moderated to some extent by paralleling existing roadway and transmission line corridors.

The Proposed Blue Route would cross more forested land, mineral leases, wetland, and MBS Sites of Biodiversity Significance. In addition, the Proposed Blue Route would cross the most forested and shrub wetland, requiring the most wetland type conversion. Impacts associated with the North Black River Variation would primarily be moderated by paralleling existing corridors; the proposed Blue Route would not parallel any corridors. Though the North Black River Variation is longer, the Proposed Blue Route would have a slightly higher construction cost.

C2 Segment Option Variation Area

In the C2 Segment Option Variation Area, the analysis indicates a potential tradeoff between elements of the human settlement, natural environment, and rare and unique resources factors. The Proposed Blue Route parallels a very small amount of existing corridors and impacts the forestry and agriculture elements of the land based economies factor by passing through more state trust land and farmland; however, it does not pass in close proximity to any residences, thereby minimizing impacts to the aesthetic element of *human settlement*. The C2 Segment Option Variation, on the other hand, would have more potential impacts to the aesthetic element of human settlement as it passes near more residences while paralleling the existing 230 kV transmission line corridor. The C2 Segment Option Variation would also cross more mineral lease areas.

The C2 Segment Option Variation would moderate impacts to the vegetation and wildlife elements of the natural environmental factor by paralleling existing corridors. However, the C2 Segment Option Variation would cross the most watercourses/waterbodies, FEMA floodplain, wetlands, gray wolf designated critical habitat, and more SNA WPAs. The Proposed Blue Route would cross more MBS Sites of Biodiversity Significance and would not moderate impacts by paralleling existing corridors. The C2

Segment Option Variation would cross the most forested and shrub wetland and would require more wetland type conversion. Due to its longer length and many angle structures, the C2 Segment Option Variation would cost more to construct than the Proposed Blue Route.

J2 Segment Option Variation Area

In the J2 Segment Option Variation Area, the analysis indicates a potential tradeoff between impacts to elements of the of the human settlement factor and to elements of the land-based economies, natural environment, and rare and unique natural resources factors. The J2 Segment Option Variation would cross more farmland, an SNA, and would pass by more residences. The J2 Segment Option Variation would also cross several sections with known archaeological and historic architectural resources. However, the Proposed Orange Route would cross more state forest land, mineral lease areas, aggregate resources, and MBS Sites of Biodiversity Significance. The Proposed Orange Route would cross the most shrub and forested wetland, requiring the most wetland type conversion. This alternative would also span FEMA-designated floodplains, crosses more gray wolf designated critical habitat, and has more documented NHIS records of rare species within one mile of it. Though the construction cost per mile would be similar for either alternative, the J2 Segment Option Variation would cost more to construct due to its greater length.

Northome Variation Area

In the Northome Variation Area, the analysis indicates that due to its overall greater length and additional angle structures, the Northome Variation would have greater impacts than the J2 Segment Option Variation for the following factors: land based economies, archaeological and historic architectural resources, natural environment, rare and unique natural resources, and construction cost. The Northome Variation would pass closer to aggregate resources, would cross a section with known archaeological and historic architectural resources, and would cross more MBS Sites of Biodiversity Significance. Though the J2 Segment Option Variation crosses more wetlands, the Northome Variation is longer and, as such, would have a greater impact on vegetation and wildlife and would cost more to construct.

The J2 Segment Option Variation would have a greater impact on the land use compatibility element of the human settlement factor by crossing USFWS land. It would also cross the most forested and shrub wetland, requiring the most wetland type conversion.

Cutoff Variation Area

In the Cutoff Variation Area, the analysis indicates that due to its overall greater length and additional angle structures, the Cutoff Variation would have greater impacts than the Proposed Orange Route for the following factors: natural environment, rare and unique natural resources, and construction cost. The Cutoff Variation could cross more state forest land, watercourses/waterbodies, wetlands, and MBS Sites of Biodiversity Significance. However, the Proposed Orange Route would cross more farmland and mineral lease areas and would also cross a section identified as containing known archaeological sites. The Cutoff Variation would cost more to construct because it is longer, though its cost per mile is slightly less than that of the Proposed Orange Route.

S.10.3 East Section

The East Section contains five variation areas: Effie, East Bear Lake, Balsam, Dead Man's Pond, and Blackberry.

S.10.3.1 East Section: Effie Variation Area

The Effie Variation Area contains three route alternatives: the Proposed Blue Route, the Proposed Orange Route, and the Effie Variation.

Human Settlement. Although the Effie Variation is longer compared to the Proposed Blue Route and Proposed Orange Route (49.8 miles compared to 41.1 and 44.6 miles, respectively) and would impact more residences (14 residences within 1,500 feet compared to four and five residences, respectively) and aesthetic resources (three historic architectural sites within 5,280 feet, compared to one and one site, respectively), it parallels two existing transmission lines for 80 percent of its length compared to no paralleling for the Proposed Blue Route and Proposed Orange Route and would therefore likely have the least impact on aesthetic resources. All three route alternatives would have a state trail, two state forests, and snowmobile trails (between four and six) within 1,500 of the anticipated alignment. Historic architectural sites, state parks, national forests, scenic byways, and water trails are not crossed by any of the route alternatives.

Although the Effie Variation ROW would have a greater amount of state forest land (1,086 acres compared to 909 and 958 acres, respectively), state fee land (772 acres compared to 645 and 694 acres, respectively), and state conservation land (293 acres compared to 200 and 196 acres, respectively) than the two proposed routes, it parallels existing transmission line corridors for 80 percent of its length (compared to no paralleling for the proposed

routes), which would likely make it the most compatible with surrounding land uses.

Land-Based Economies. The Proposed Blue Route, which is the shortest route, would have the least impact on farmland, including farmland of statewide importance (121 acres of farmland of statewide importance within the Proposed Blue Route ROW, 123 acres of farmland of statewide importance within the Proposed Orange Route ROW, and 159 acres of farmland of statewide importance within the Effie Variation ROW), prime farmland (246 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Blue Route ROW, 387 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Orange Route ROW, and 506 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Effie Variation ROW). The Proposed Blue Route would also have the least impact on state forest lands (909 acres of state forest within the Proposed Blue Route ROW, 958 acres of acres of state forest within the Proposed Orange Route ROW, and 1,086 acres of acres of state forest within the Effie Variation ROW).

Although the Effie Variation crosses the most state mineral lease lands (647 acres of state mineral lease lands within the Proposed Blue Route ROW, 819 acres of acres of state mineral lease lands within the Proposed Orange Route ROW, and 824 acres of state mineral lease lands within the Effie Variation ROW), it does so while paralleling an existing transmission line corridor. All three alternatives would cross a volcanic belt with known metallic mineral occurrences (gold, copper-zinc-lead, iron). No known aggregate resources are located within the Effie Variation Area.

Archaeology and Historic Architectural Resources. The Effie Variation has an archaeological site within the direct APE and more historic architectural sites within the indirect APE relative to either of the proposed routes (three sites compared to one site each for the Proposed Blue Route and Orange Route). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route and the Effie Variation would cross the most PWI waters (13 crossings each). The Effie Variation would cross the most non-PWI waters (15 crossings

compared to 11 crossings or fewer for the other alternatives) and is the only alternative that would cross MnDNR-designated trout streams (six crossings). Only the proposed routes would cross floodplains. All these crossings are spannable. The Proposed Blue Route would cross the most forested and shrub wetlands (418 acres compared to 377 acres or less for the other alternatives), requiring the most wetland type conversion. All of the alternatives would require crossing wetlands too large to span.

Although the Effie Variation would pass through the most forested land (1,164 acres compared to 978 acres to 1,047 acres for the other alternatives), including state forest land (1,086 acres compared to 909 acres to 958 acres for the other alternatives), it would parallel an existing transmission line corridor for the majority of its length and would likely have the least impact on forested lands.

Unlike the Proposed Blue Route and Proposed Orange Route, the Effie Variation would avoid the Chippewa Plains Important Bird Area and would parallel an existing transmission line corridor for the majority of its length, which would result in less fragmentation of forested habitats.

Rare and Unique Natural Resources. The Effie Variation has the fewest rare species within one mile of its ROW (three records compared to five to six records for the proposed routes) and the fewest colonial waterbird nesting sites (two sites compared to three sites for the proposed routes). Because the Effie Variation parallels existing transmission line corridor, it would likely have the fewest impacts on rare species. However, the full extent of potential impacts from the Proposed Blue Route, the Proposed Orange Route, and the Effie Variation cannot be determined without pre-construction field surveys. Although the Effie Variation would cross more critical habitat designated for gray wolf than the proposed routes, it would be expected to have less potential impact on this resource because it would cross in an area where critical habitat designated for gray wolf has already been fragmented.

The Proposed Blue Route, Proposed Orange Route, and the Effie Variation would all pass through MBS Sites of Biodiversity Significance. Because the Effie Variation would parallel an existing transmission line for 80 percent of its length, it is likely to have the least impact on this resource.

Corridor Sharing. The Effie Variation would parallel existing transmission line corridor for 80 percent of its length. The Proposed Blue Route and Proposed Orange Route would not parallel any transmission line corridor.

Electrical System Reliability. The Effie Variation would parallel 500 kV and 230 kV transmission lines for 80 percent of its length. Three high voltage transmission lines in adjacent corridors could decrease the reliability of the proposed Project. When facilities are close together, 1) there is a greater risk that a single event could take out multiple lines, and 2) repairing the lines could be more difficult, which could increase outage times, should an outage occur.

Costs that Depend on Design and Route. As the shortest alternative, the Proposed Blue Route would cost the least to build, but the Proposed Orange Route would cost the least per mile to build.

S.10.3.2 East Section: East Bear Lake Variation Area

The East Bear Lake Variation Area contains two route alternatives: the Proposed Orange Route and the East Bear Lake Variation.

Human Settlement. The Proposed Orange Route and East Bear Lake Variation would impact similar numbers of aesthetic resources, including a state trail, state forest, and three snowmobile trails within 1,500 feet of the anticipated alignment. No historic architectural sites, state parks, national forests, scenic byways, or water trails are within the ROW of either route alternative. The East Bear Variation, however, although slightly longer (10.5 miles compared to 8.9 miles for the Proposed Orange Route), would parallel two existing transmission lines for 42 percent of its length compared to zero percent for the Proposed Orange Route and would therefore likely have fewer aesthetic impacts.

The East Bear Lake Variation ROW would contain a greater amount of state forest land (256 acres compared to 217 acres for the Proposed Orange Route) and state fee land (256 acres compared to 217 acres for the Proposed Orange Route), but because it would parallel existing transmission line corridor (42 percent of its length compared to zero percent for the Proposed Orange Route), it would be more compatible with current land use.

Land-Based Economies. The East Bear Lake Variation would pass through more acres of farmland, including prime farmland (160 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the East Bear Lake Variation ROW and 85 acres of land designated as "prime farmland if drained" and "all areas are prime farmland" within the Proposed Orange Route ROW). However, because the East Bear Lake Variation parallels existing transmission line corridor for just under half of its length, it may have less impact on

farmland. The Proposed Orange Route would pass through fewer acres of state forest lands (217 acres of state forest within the Proposed Orange Route ROW and 256 acres of acres of state forest within the East Bear Lake Variation ROW) and would have the least impact on forestry.

The East Bear Lake Variation would pass through more state mining lands (193 acres of state mineral lease lands within the East Bear Lake Variation ROW and 96 acres of acres of state mineral lease lands within the Proposed Orange Route ROW), although both alternatives could potentially interfere with future mining activities in this area.

Archaeology and Historic Architectural Resources. Neither alternative is known to contain any archaeological or historic architectural resources. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross more PWI waters (four crossings compared to two crossings for the East Bear Lake Variation) but fewer non-PWI-waters (no crossings compared to three crossings for the East Bear Lake Variation); all crossings would be spannable. The Proposed Orange Route would cross more forested and shrub wetlands (99 acres compared to 87 acres for the East Bear Lake Variation), requiring the most wetland type conversion. Both the Proposed Orange Route and the East Bear Lake Variation would cross wetlands too large to span.

Although the East Bear Lake Variation would pass through more forested land (251 acres compared to 216 acres for the Proposed Orange Route), including state forest land (256 acres compared to 217 acres for the Proposed Orange Route), and is longer than the Proposed Orange Route, it would parallel existing transmission line corridor and would likely result in fewer impacts on intact forested land and would fragment less forested habitat and thereby displace fewer wildlife species associated with those forest communities.

Rare and Unique Natural Resources. One state-special concern vascular plant species was documented within one mile of both the Proposed Orange Route and East Bear Lake Variation. In addition, two state-special concern mussel species have been documented within one mile of the Proposed Orange Route, one of which was also documented

within one mile of the East Bear Lake Variation. Because it is anticipated that all watercourses would be spanned, impacts to these rare mussels are not expected. Because the Proposed Orange Route would require creation of new corridor for its entire length, it would likely result in more impacts on rare species relative to the East Bear Lake Variation; however, the full extent of potential impacts from either the Proposed Orange Route or East Bear Lake Variation cannot be determined without pre-construction field surveys.

Although the East Bear Lake Variation would pass through more MBS Sites of Biodiversity Significance (255 acres compared to 217 acres for the Proposed Orange Route), it would likely have less impact on this resource because it parallels and existing transmission line corridor for over 40 percent of its length.

Corridor Sharing. The East Bear Lake Variation would parallel existing transmission line corridor for 42 percent of its length. The Proposed Orange Route would parallel other existing corridors for 55 percent of its length.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Orange Route would cost less to build and less per mile to build.

S.10.3.3 East Section: Balsam Variation Area

The Balsam Variation Area contains three route alternatives: the Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation.

Human Settlement. Considering the proximity of residences (seven residences for the Proposed Blue Route compared to 21 and 11 for the Proposed Orange Route and Balsam Variation, respectively), and snowmobile trails (two trails for the Proposed Blue Route compared to two and three trails for the Proposed Orange Route and Balsam Variation, respectively) within 1,500 feet of the anticipated alignment and other historic architectural sites within one mile (13 sites for the Proposed Blue Route compared to 24 and 28 sites for the Proposed Orange Route and Balsam Variation, respectively), the Proposed Blue Route would have the fewest aesthetic impacts compared to the Proposed Orange Route and Balsam Variation. Aesthetic impacts of all three alternatives, however, could potentially be significant.

All three alternatives would cross primarily through forested lands. The Proposed Orange Route avoids the most state fee lands (50 acres) compared to 67 and 107 acres for the Proposed Blue Route and Balsam Variation, respectively, thereby avoiding

long-term changes to land use. The Balsam Variation, however, would parallel an abandoned transmission line corridor for two-thirds of its length compared to the Proposed Blue Route and Proposed Orange Route following an existing or abandoned transmission line for 15 and 36 percent of their lengths, respectively.

Land-Based Economies. The Balsam Variation, which has the least acres of farmland (203 acres of land designated as “prime farmland if drained”, “all areas are prime farmland” and “farmland of statewide importance” within the Balsam Variation ROW, 206 acres of land designated as “prime farmland if drained”, “all areas are prime farmland” and “farmland of statewide importance” within the Proposed Blue Route ROW, and 203 acres of land designated as “prime farmland if drained”, “all areas are prime farmland” and “farmland of statewide importance” within the Proposed Orange Route ROW) and parallels an abandoned transmission line corridor for approximately two-thirds of its length, would likely have the least impact on farmlands.

The Balsam Variation is the only alternative that would cross state mining lands (89 acres of state mineral lease lands within the ROW), and it could potentially interfere with future mining activities in this area.

Archaeology and Historic Architectural Resources. There are no known archaeological or historic architectural sites located within the ROW of the Proposed Blue Route, Proposed Orange Route, or Balsam Variation but all have many historic architectural sites within one mile of the anticipated alignment (13, 24, and 28, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Blue Route would cross the most PWI waters (seven crossings compared to five or fewer crossings for the other alternatives), and the Proposed Orange Route would cross the most non-PWI waters (four crossings compared to three or fewer crossings for the other alternatives); all crossings would be spannable. The Proposed Orange Route and the Balsam Variation would both cross floodplains (26 acres and 22 acres, respectively) too large to span, with the Proposed Orange Route crossing the most floodplain. The Balsam Variation would cross the most forested and shrub wetlands (83 acres compared to 59 acres

or less for the other alternatives), requiring the most wetland type conversion. The Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation would all require crossing wetlands too large to span.

Although the Balsam Variation would pass through the most forest land (401 acres compared to 299 acres to 318 acres for the Proposed Blue Route and Proposed Orange Route, respectively), it would parallel an abandoned transmission line corridor for about two-thirds of its length and would thereby have the least impact on intact forested areas and would likely fragment less forested habitat and thereby displace fewer wildlife species associated with those forest communities. The Balsam Variation, however, would be located within approximately 500 feet of the Chippewa Plains Important Bird Area and could impact more birds and other wildlife associated with that area.

Rare and Unique Natural Resources. The three state special concern species documented within one mile of the three alternatives are aquatic, and because waters would be spanned, impacts would not be expected. However, the full extent of potential impacts from the Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation cannot be determined without pre-construction field surveys.

The Proposed Blue Route, the Proposed Orange Route, and the Balsam Variation would all pass through MBS Sites of Biodiversity Significance, but by paralleling an abandoned transmission line corridor, the Balsam Variation would have the least impact on this resource.

Corridor Sharing. The Balsam Variation would parallel an abandoned transmission line corridor for 66 percent of its length, while the other alternatives would parallel existing corridors for less than half of their lengths.

Electrical System Reliability. The Proposed Blue Route and Proposed Orange Route would parallel two 115 kV transmission lines for approximately 15 percent of their lengths. Three high voltage transmission lines in adjacent corridors could decrease the reliability of the proposed Project. When facilities are close together, 1) there is a greater risk that a single event could take out multiple lines, and 2) repairing the lines could be more difficult, which could increase outage times, should an outage occur.

Costs that Depend on Design and Route. As the shortest alternative, the Proposed Blue Route would cost the least to build, but the Balsam Variation would cost the least per mile to build.

S.10.3.4 East Section: Dead Man's Pond Variation Area

The Dead Man's Pond Variation Area contains two route alternatives: the Proposed Blue Route and the Dead Man's Pond Variation.

Human Settlement. Because the Proposed Blue Route would impact fewer residences within 1,500 feet of the anticipated alignment (two residences compared to four residences for the Dead Man's Pond Variation), and would be slightly shorter (2.2 miles compared to 2.3 miles for the Dead Man's Pond Variation), it would be expected to have fewer impacts on aesthetics. Because both alternatives are relatively short and do not directly cross any sensitive aesthetic resources, aesthetic impacts would be expected to be limited.

The 200-foot ROW of the Proposed Blue Route would contain slightly less state fee land than the Dead Man's Pond Variation (19 acres compared to 37 acres, respectively) and would parallel a road/trail for a portion of its length (17 percent compared to zero percent, respectively). Therefore, the Proposed Blue Route would be slightly more compatible with existing land uses.

Land-Based Economies. The Proposed Blue Route would pass through fewer acres of farmland (20 acres of land designated as "prime farmland if drained" or "all areas are prime farmland" within the Proposed Blue Route ROW and 39 acres of land designated as "prime farmland if drained" or "all areas are prime farmland" within the Dead Man's Pond Variation ROW), including prime farmland, and would therefore likely have less impact on agriculture. No state mining lands are located within the ROW of either alternative.

Archaeology and Historic Architectural Resources. Each alternative would have one historic architectural site within one mile of its anticipated alignment. Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. There would be no PWI or non-PWI water crossings for either the Proposed Blue Route or the Dead Man's Pond Variation. Both alternatives would cross wetlands. The Proposed Blue Route would have more forested and shrub wetland (14 acres compared to four acres for the Dead Man's Pond Variation) and would require more wetland type conversion. Both the Proposed Blue

Route and the Dead Man's Pond Variation would likely cross wetlands too large to span.

The Proposed Blue Route and the Dead Man's Pond Variation would pass through a similar amount of forested land and would therefore fragment similar amounts of intact forest and would likely impact similar amounts of wildlife habitat.

Rare and Unique Natural Resources. No state- or federally-listed species have been documented within one mile of the Proposed Blue Route or the Dead Man's Pond Variation. However, the full extent of potential impacts from either the Proposed Blue Route or Dead Man's Pond Variation cannot be determined without pre-construction field surveys.

No rare communities been documented within the ROW of the Proposed Blue Route or the Dead Man's Pond Variation.

Corridor Sharing. The Proposed Blue Route would parallel existing road/trail corridors for 17 percent of its length, while the Dead Man's Pond Variation would not parallel any existing corridors.

Costs that Depend on Design and Route. While both alternatives are similar in length, the Proposed Blue Route would cost less to build and less per mile to build.

S.10.3.5 East Section: Blackberry Variation Area

The Blackberry Variation Area contains two route alternatives: the Proposed Blue Route and the Proposed Orange Route.

Human Settlement. Although the Proposed Orange Route impacts more residences within 1,500 feet than the Proposed Blue Route (22 and 11 residences, respectively), it would impact slightly fewer historic architectural sites within one mile (one and six sites, respectively) and would likely produce less contrast by paralleling an existing large transmission line for a greater percentage of its length (37 percent and 20 percent, respectively). The Proposed Orange Route is therefore likely to result in slightly fewer aesthetic impacts. A snowmobile trail is located within 1,500 feet of both alternatives.

The 200-foot ROW for the Proposed Orange Route would have a slightly greater amount of state fee land than the Proposed Blue Route (54 acres compared to 41 acres, respectively), but because it parallels more existing transmission line corridor, it would be slightly more compatible with surrounding land uses.

Land-Based Economies. The Proposed Blue Route would pass through less farmland, including prime farmland and would likely have less impact on agriculture (71 acres of land designated as “prime farmland if drained” or “all areas are prime farmland” within the Proposed Blue Route ROW and 88 acres of land designated as “prime farmland if drained” or “all areas are prime farmland” within the Proposed Orange Route ROW). Neither alternative would impact more than 15 acres of farmland of statewide importance. The Proposed Orange Route would likely have less impact on of state mining land (33 acres of state mineral lands within the Proposed Orange Route ROW, 37 acres of state mineral lands within the proposed Blue Route ROW).

Archaeology and Historic Architectural Resources. Neither the Proposed Blue Route nor the Proposed Orange Route has any archaeological or historic architectural sites within the ROW. The Proposed Orange Route would have fewer historic architectural sites within one mile than does the Proposed Blue Route (one compared to six sites, respectively). Further cultural resources investigations would need to be conducted in compliance with federal and/or state regulations for archaeological and historic architectural resources. If previously unidentified archaeological sites are discovered during construction, adverse effects will be resolved according to the terms of the Section 106 PA.

Natural Environment. The Proposed Orange Route would cross the most PWI waters (three crossings compared to one crossing for the Proposed Blue Route), and both the Proposed Blue Route and the Proposed Orange Route would each cross a Minnesota Pollution Control Agency (MPCA)-listed impaired water once. All of these crossings would be spannable. The Proposed Blue Route would cross more forested and shrub wetlands (51 acres compared to 39 acres for the Proposed Orange Route), requiring more wetland type conversion. Both the Proposed Blue Route and the Proposed Orange Route would likely require crossing wetlands too large to span.

The Proposed Blue Route and the Proposed Orange Route would fragment similar amounts of intact forest and would likely impact similar amounts of wildlife habitat.

Rare and Unique Natural Resources. Two state-threatened vascular plants have been documented within one mile of the Proposed Blue Route and the Proposed Orange Route. In addition, a state-special concern bird has been documented within one mile of the Proposed Orange Route; however, preferred habitat for this species is also likely available within

the vicinity of the Proposed Blue Route. Although the Proposed Blue Route is just under a mile shorter in length than the Proposed Orange Route, it would require creation of new corridor for a greater percentage of its length. The full extent of potential impacts on rare species from either the Proposed Blue Route or the Proposed Orange Route cannot be determined without pre-construction field surveys.

The Proposed Orange Route would pass through more MBS Sites of Biodiversity Significance (79 acres compared to 57 acres for the Proposed Blue Route), but it would also parallel an existing transmission line corridor through a portion of these sites, which would minimize impacts to this resource.

Corridor Sharing. The Proposed Orange Route would parallel existing transmission line corridor for 37 percent of its length. The Proposed Blue Route would parallel existing transmission line corridor for 20 percent of its length.

Electrical System Reliability. The Proposed Blue Route would parallel 230 kV and 115 kV transmission lines for approximately 20 percent of its length, and the Proposed Orange Route would parallel two 115 kV transmission lines for approximately 40 percent of its length. Three high voltage transmission lines in adjacent corridors could decrease the reliability of the proposed Project. When facilities are close together, 1) there is a greater risk that a single event could take out multiple lines, and 2) repairing the lines could be more difficult, which could increase outage times, should an outage occur.

Costs that Depend on Design and Route. As the shorter alternative, the Proposed Blue Route would cost less to build and less per mile to build.

S.10.3.6 Relative Merits Summary—East Section

Effie Variation Area

Within the Effie Variation Area, the analysis indicates a tradeoff between impacts to human settlement factors and impacts to natural environment factors. The Effie Variation would parallel two existing transmission line corridors, therefore minimizing impacts to the flora and fauna elements of the natural resources factor and to the rare and unique natural resources factor by reducing habitat fragmentation, avoiding state forest land, and avoiding the MBS Sites of Biodiversity Significance in the Bear Wolf Peatland. However, the Effie Variation would be a longer route, therefore creating greater impacts to the aesthetics element of the human settlement factor by passing near more residences. Because of its longer length, the Effie Variation

would also be more expensive to construct. The Proposed Blue Route and Proposed Orange Route are both alternatives to avoid these aesthetic and cost impacts, but would not parallel existing corridors and would have more impacts to the fauna element of the natural environment factor and to the rare communities element of the rare and unique resources factor, due to habitat fragmentation and proximity to MBS Sites of Biodiversity Significance in the Bear Wolf Peatland.

The Applicant has indicated that paralleling an existing transmission line corridor (with two existing transmission lines) along the Effie Variation could reduce electric system reliability because three high voltage transmission lines would be in parallel corridors, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

East Bear Lake Variation Area

Similar to the Effie Variation, the East Bear Lake Variation in the East Bear Variation would parallel an existing transmission line corridor, therefore reducing impacts to the elements of the natural environment factor and the rare communities element of the rare and unique resources factor by avoiding habitat fragmentation, and the MBS Sites of Biodiversity Significance in the Bear Wolf Peatland. However, unlike the Effie Variation, the East Bear Lake Variation does so without shifting impacts to the aesthetics element of the human settlement factor.

Because of its slightly longer length and need for angle structures, the East Bear Lake Variation would be more expensive to construct than the Proposed Orange Route. The Proposed Orange Route would have more impacts to the flora and fauna elements of natural environment factor and to the rare communities' element of the rare and unique resources factor due to habitat fragmentation, its proximity to MBS Sites of Biodiversity Significance in the Bear Wolf Peatland, and lack of paralleling an existing transmission line.

The Applicant has indicated that paralleling an existing transmission line corridor (with two existing transmission lines) along the East Bear Lake Variation could reduce electric system reliability because three high voltage transmission lines would be in parallel corridors, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

Balsam Variation Area

In the Balsam Variation Area, there would be a tradeoff between impacts to the land use and aesthetics elements of the human settlement factor, and impacts to the mining element of land-based economies factor and the construction cost factor. The Proposed Blue Route and Balsam Variation avoid impacts to the land use element of human settlement factor as they are located further from communities in Balsam and Lawrence townships. In addition, the Balsam Variation would have fewer impacts to the aesthetics element of the human settlement factor by passing close to fewer residences than Proposed Blue Route or Proposed Orange Route.

The Balsam Variation, however, would have more potential impacts to the mining and mineral resources element of the land-based economies factor as it is longer and would have more potential for impacts in terms of encumbering areas that have been explored for mineral resources in the Taconite area. The Balsam Variation may result in fewer impacts to the flora and fauna elements of the natural resource factor as it would parallel an abandoned transmission line corridor for much of its length and may result in fewer impacts associated with new habitat fragmentation than the Proposed Blue Route or Proposed Orange Route.

The Applicant has indicated that corridor sharing along the Proposed Blue Route and Proposed Orange Route may reduce electric system reliability because it would place three high voltage transmission lines parallel along the same corridor, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

Dead Man's Pond Variation Area

Within the Dead Man's Pond Variation Area, the analysis indicates that the Dead Man's Pond Variation would create more potential impacts to the aesthetics element of the human settlement factor than the Proposed Blue Route by passing closer to additional residences. The Dead Man's Pond Variation would also create more potential impacts to the agriculture element of the land-based economies factor than the Proposed Blue Route by crossing more farmland.

The Proposed Blue Route may result in fewer impacts to the flora and fauna elements of the natural resource factor as it parallels a corridor for part of its length and may result in fewer impacts associated with new habitat fragmentation than the Dead Man's Pond Variation. Because it would likely require more

angle structures, the Dead Man's Pond Variation would also be more expensive to construct.

Blackberry Variation Area

In the Blackberry Variation Area, the Proposed Orange Route would result in more impacts to the aesthetics element of the human settlement factor, the vegetation element of the natural environment factor, and the rare communities element of the rare and unique resources factor than the Proposed Blue Route, as the Proposed Orange Route passes through areas with more residences, lakes, and designated MBS Sites of Biodiversity Significance. In addition, the Proposed Orange Route is a slightly longer route and would likely require more angle structures than the Proposed Blue Route, so it would be more costly to construct.

The Proposed Orange Route would offer more opportunity for corridor sharing than the Proposed Blue Route. While both alternatives parallel existing transmission line corridor, the Proposed Orange Route parallels more corridor than the Proposed Blue Route.

The Applicant has indicated that corridor sharing along the Proposed Blue Route and Proposed Orange Route could reduce electric system reliability because three high voltage transmission lines would be in parallel corridors, which may increase vulnerability to simultaneous outages and increase safety risks associated with transmission line maintenance and repair.

S.10.4 Alignment Modifications

Minor adjustments to alternative route segments, or alignment modifications, were proposed during the scoping period. The purpose for each alignment modification is to avoid a specific issue raised by the commenters. In the sections that follow, only the issues that differ between the proposed route and the alignment modification are described.

S.10.4.1 West Section

No alignment modifications were proposed for the West Section.

S.10.4.2 Central Section

Four alignment modifications were proposed for the Central Section: Silver Creek WMA, Airstrip, Mizpah, and Gravel Pit.

Silver Creek WMA Alignment Modification. The Silver Creek WMA Alignment Modification, located in the north-central portion of the Pine Island Variation Area, shifts the centerline approximately 150 feet

south onto state forest land and avoids impacts to federal land and the Silver Creek WMA. It does not, however, parallel an existing corridor like the Proposed Blue Route and would result in more fragmentation of intact state forest.

Airstrip Alignment Modification. The Airstrip Alignment Modification, located in the east portion of the C2 Segment Option Variation Area, shifts the centerline approximately 725 feet west to avoid impacts to a private airstrip located east of the existing 230 kV transmission line. This alignment modification would be located approximately 1,000 feet west of the existing 230 kV transmission line and would provide additional distance for use of the landing strip.

Mizpah Alignment Modification. The Mizpah Alignment Modification, located in the J2 Segment Option Variation Area, would shift the centerline north from a mix of private and state lands onto only state lands. Both the Proposed Orange Route and this alignment modification would require creation of new corridor for their entire length and would fragment intact forest.

Gravel Pit Alignment Modification. The Gravel Pit Alignment Modification, located in the southeast portion of the J2 Variation Area, shifts the centerline approximately 750 feet east to avoid impacts to a private gravel pit and to remove privately-owned land from the ROW. In addition, the Effie dump would be located more than 100 feet west and outside of the ROW.

S.10.4.3 East Section

Five alignment modifications were proposed for the East Section: Bass Lake, Wilson Lake, Grass Lake, Dead Man's Pond, and Trout Lake.

Bass Lake Alignment Modification. The Bass Lake Alignment Modification, located in the central portion of the Effie Variation Area, shifts the centerline approximately 750 feet southwest and away from the Bass Lake Itasca County Park (which includes a campground). This would, however, shift the alignment closer to the Larson Lake State Forest campground and crosses lands designated as Outstanding Rank for the Preliminary MBS Sites of Biodiversity Significance. Land ownership includes slightly more state land and less private corporate land than the Proposed Blue/Orange Route.

Wilson Lake Alignment Modification. The Wilson Lake Alignment Modification, located in the central portion of the Effie Variation Area, shifts the centerline approximately 500 feet east from corporate and state forest lands onto an alignment

with a greater percentage of state forest land and crosses lands designated as Moderate Rank for the Preliminary MBS Sites of Biodiversity Significance.

Grass Lake Alignment Modification. The Grass Lake Alignment Modification, located in the northeast portion of the Balsam Variation Area, shifts the centerline approximately 900 feet east to avoid crossing Grass Lake. In addition, this alignment modification also shifts the transmission line away from one residence on the south end of Grass Lake, but shifts the alignment closer to six residences on the west side of Bray Lake.

Dead Man's Pond Alignment Modification. The Dead Man's Pond Alignment Modification, located in the central portion of the Dead Man's Pond Variation Area, shifts the centerline approximately 1,000 feet west and away from one residence located near CSAH 8, but shifts the alignment closer to two residences located along CSAH 57. It also crosses Dead Man's Pond, a PWI waterbody, and lands designated as Moderate Rank for the Preliminary MBS Sites of Biodiversity Significance.

Trout Lake Alignment Modification. The Trout Lake Alignment Modification, located in the central portion of the Blackberry Variation Area, shifts the centerline away from two residences located west of the Proposed Blue Route, leaving only one residence located within 1,000 feet to the southeast.

S.10.5 Hops

Five Hops, all located within the West Section, were identified for the proposed Project

Hop 1. Hop 1, located in the southeastern portion of the Cedar Bend WMA Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 0.7 miles. It crosses the existing 500 kV transmission line and either shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or moderate significance.

Hop 2. Hop 2, located in the southeastern portion of the Cedar Bend WMA Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 1 mile. This hop, which parallels an existing 230 kV transmission line for its entire length, crosses Lake of the Woods and Beltrami Island state forests and both shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or moderate significance.

Hop 3. Hop 3, located in the southeastern portion of the Cedar Bend WMA Variation Area and the

northwestern corner of the Beltrami North Central Variation Area, is approximately 1.2 miles. It crosses the existing 500 kV transmission line and either shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or moderate significance.

Hop 4. Hop 4, located in the eastern portion of the Beltrami North Variation Area and the northwestern corner of the Beltrami North Central Variation Area, is approximately 1 mile. This hop does not cross any existing transmission lines, but it does cross either shrub or forested wetlands and MBS Sites of Biodiversity Significance ranked as high significance.

Hop 5. Hop 5, located in the southwestern portion of the Beltrami North Central Variation Area, is approximately 3.5 miles. This hop crosses Lake of the Woods and Beltrami Island state forests, the Border Trails snowmobile trail and an unnamed watercourse. It also crosses the existing 500 kV transmission line, emergent, shrub, or forested wetlands and MBS Sites of Biodiversity Significance ranked as high or unknown significance.

S.10.6 Associated Facilities

The associated facilities for the proposed Project include the 500 kV Compensation Station, regeneration stations, and Blackberry 500 kV Substation.

S.10.6.1 West Section

The associated facilities located in the West Section include two regeneration stations and the proposed 500 kV series compensation station.

Proposed Regeneration Stations. The two proposed regeneration stations located along the Proposed Blue/Orange Route within the West Section are both situated in upland areas, one with a residence within 0.6 miles and the other with a residence within 0.13 miles. Land in both cases is privately owned.

Proposed 500 kV series compensation station. The nearest residence to the 60-acre site for the proposed 500 kV series compensation station is located approximately 0.4 miles away. Land ownership includes private land with MnDNR-identified potential mineral resources and scattered emergent wetlands. Based on the United States Geological Survey (USGS) National Landscape Conservation System (NLCS) Gap Analysis Program (GAP) data, the southern half of the site is in the U.S. Department of Agriculture (USDA)-Farm Service Agency Conservation Reserve Program. The compensation station could contrast strongly with its

surroundings and could be viewed from residences or other sensitive visual resources.

S.10.6.2 Central Section

The associated facilities located in the Central Section include the four proposed regeneration stations.

Proposed Regeneration Stations. The four regeneration stations consist of fairly small buildings and although they may contrast somewhat with their surroundings, the new transmission line nearby would produce stronger contrast and be more dominant due to its substantially taller height and contrasting form. For these reasons, aesthetic impacts of the regeneration stations would be expected to be minimal.

S.10.6.3 East Section

The associated facilities located in the East Section include the two proposed regeneration stations and the proposed 500 kV Blackberry Substation.

Proposed Regeneration Stations. Both regeneration stations would be located in upland areas, one with a residence located 0.4 miles away, and the Big Fork River 0.5 miles away. The other would have a residence 0.2 miles away.

Proposed Blackberry 500 kV Substation. The proposed Blackberry Substation would be located approximately 0.25 miles east of the existing Blackberry Substation, with three residences located within a quarter mile. The fenced area of the substation directly impacts 0.3 acres of a shallow marsh/forested wetland complex, but wetlands south of the fenced substation site would not be impacted by the proposed Project. No other natural resources were identified within or near the fenced substation area.

Because the proposed Blackberry Substation would be visible in the same views from surrounding locations, the addition of the proposed substation adjacent to the existing substation and transmission lines would result in only an incremental increase in contrast for these views, and the aesthetic impacts of the new Blackberry Substation would be expected to be minimal.

S.11 Cumulative and Other Impacts

In addition to analyzing the individual impacts of the alternatives, the federal environmental review process requires consideration of the cumulative environmental impacts of multiple actions within an area.

S.11.1 Other Actions Considered for Potential Cumulative Impacts

Past actions are considered part of the existing environment and are not considered here.

Present and Reasonably Foreseeable Future Actions. One power plant and the associated transmission line and natural gas pipeline (Excelsior Energy's Mesaba Project) and one 230 kV transmission line (Minnesota Power's Nashwauk Project) have been issued route permits by the MN PUC but have not yet been constructed. Sections of the approved routes for both of these projects are within the Applicant's proposed routes. In addition, as part of the route permit process for the proposed Enbridge Sandpiper oil pipeline project, the MN PUC has included one route for consideration that would cross alternatives for the proposed Project ROW. The proposed Enbridge Line 3 project, another oil pipeline, would parallel the same route as the proposed Enbridge Sandpiper project, also crossing portions of the proposed Project ROW alternatives.

Iron-ore mining from previously developed stockpiles, basins, underground workings, or open pits ("scram" mining) would be within four to six miles of the proposed routes and variations, and one variation would cross a 115 kV transmission line that serves one of the scram mining facilities.

S.11.2 Cumulative Impacts

The following sections summarize the resources that were analyzed for potential impacts in Chapter 6 of this EIS.

S.11.2.1 Human Settlement

Aesthetics. Though many of the aesthetic impacts of the proposed Project would be short-term during construction, the presence of transmission structures in the landscape and clearing the ROW of trees would result in a long-term change in local aesthetics. In addition, utilities paralleling existing corridors can cumulatively create wide, long areas of visual disturbance.

The reasonably foreseeable future projects mentioned above are all in the Balsam and Blackberry variation areas where there are more population centers, infrastructure, and mining activity. The Sandpiper Pipeline RA-06 route, if selected, and the Enbridge Line 3 project would intersect the Proposed Blue/Orange Route, but would be located underground and would cross the 200-foot ROW for the proposed Project. The potential cumulative aesthetic impacts in this area

would be expected to be minimal because they would only involve paralleling transmission lines for approximately nine miles, and this infrastructure would not be incompatible with existing conditions.

Air Quality, Greenhouse Gas Emissions, and Climate Change. Construction activities for the proposed Project and other reasonably foreseeable future projects would generate criteria pollutant emissions, but these would be short-term and localized. The proposed Project would reduce indirect criteria pollutants and GHGs because it would reduce the need for coal-fired generation in Minnesota by replacing it with wind and hydroelectric generation (for detailed information on air quality, see Section 5.2.1.3). If the large electric power generating plant for the Mesaba Energy project were built, it would result in long-term emissions from operations. None of the reasonably foreseeable future projects individually or cumulatively, however, would contribute to air emission impacts because the projects would be in attainment for all NAAQS.

Socioeconomics. If all the reasonably foreseeable future projects mentioned above were constructed at the same time, there would be a cumulative socioeconomic benefit, primarily in the form of short-term construction employment, value-added services, and long-term revenue from taxes. The proposed Project would employ an average of 120 construction workers annually during the five year construction period, and during the pre-construction and construction phases would generate approximately \$26.5 million dollars in state and local taxes.

The Mesaba Energy Project, if constructed, would also employ 1,600 during its peak year of construction, plus create another 955 new jobs through increased consumer spending. The Enbridge Sandpiper pipeline project and the Enbridge Line 3 project would also create new employment during construction in the area, and could contribute to a temporary housing shortage in the area all these projects were to be constructed at the same time. Because Grand Rapids is within commuting distance of the construction area of these reasonably foreseeable future projects, any housing shortage would be expected to be minimal.

In addition, the proposed Project would benefit the entire MISO footprint, by reducing wind curtailments and better using both wind and hydro resources, thereby increasing the efficiency of the energy supply system as a whole. MISO estimated that these benefits, over a 20-year period, would total \$1.6 billion based on 2012 dollars.

S.11.2.2 Land-Based Economies

Agriculture. The proposed Project and other reasonably foreseeable future projects, could cumulatively increase impacts on agriculture. However, these cumulative impacts to agriculture would only occur in the Balsam and Blackberry variation areas; since farmland is not common in these variation areas, adverse cumulative impacts would be expected to be minimal.

Forestry. The proposed Project and other reasonably foreseeable future projects could collectively result in adverse, localized cumulative impacts to forestry and timber operations. The cumulative impacts of the foreseeable projects would, however, occur in the southern portion of the Balsam Variation Area and the Blackberry Variation Area, where there are fewer areas of state forests and state fee lands. The cumulative impacts to forestry and timber operations from the reasonably foreseeable future projects are therefore expected to be minimal.

Mining and Mineral Resources. The Proposed Blue Route and the transmission line and pipeline routes for the Mesaba Energy project all cross one area of known mineral resources in the north portion of the Blackberry Variation Area. Route RA-06 for the Enbridge Sandpiper pipeline project and the Enbridge Line 3 project also would cross through areas with known mineral resources. If all of these projects were eventually constructed, they might all need to be relocated in the future in order to access that mineral resource area.

According to the Applicant, the proposed Project is needed in part to meet increased industrial and mining electricity demand, especially on the Iron Range. The proposed Project would also facilitate recent contracts for firm power sales from Manitoba Hydro to the Wisconsin Public Service Corporation. The potential indirect, cumulative impacts of the proposed Project on mining development and the related environmental impacts are too remote and speculative to evaluate meaningfully.

S.11.2.3 Archaeology and Historic Architectural Resources

Indirect, long-term, adverse visual effects on architectural resources are likely to occur wherever the cumulative projects are visibly prominent and appear inconsistent with other architectural resources. Since this would mainly occur in a developed area, none of the cumulative projects would be expected to be inconsistent with other architectural resources.

As the proposed routes and variations have not been surveyed, cultural resource assessments are required to comply with federal and/or state regulations.

S.11.2.4 Natural Resources

Water Resources. The long-term impacts of removing woody wetland vegetation and maintaining herbaceous wetland vegetation in the ROWs of all cumulative projects would result in adverse impacts to wetland hydrology, vegetation composition, and wetland function. Adverse cumulative wetland impacts would be expected to be minimal given the amount of surrounding forested and shrub wetlands in the region. The Applicant for the proposed Project and other reasonably foreseeable future project proponents would need to mitigate wetland impacts as part of permit negotiations for their individual projects.

Vegetation. Permanently removing trees and shrubs along project ROWs could result in cumulative impacts if these reasonably foreseeable future projects are constructed close to one another and do not minimize impacts through paralleling existing corridors.

Wildlife. Clearing vegetation and trees and disturbing wildlife habitats could physically harm or displace wildlife species. In addition, indirect impacts such as disturbance related to construction noise could occur. For non-listed wildlife species, these impacts would be minimal because these species do not suffer from population level declines, and these impacts would be localized and there would be abundant forested habitat in the vicinity.

S.11.2.5 Rare Species and Communities

Rare Species. The proposed Project, when considered with any other reasonably foreseeable future project that could involve removing trees, could contribute to cumulative impacts on the northern long-eared bat, which relies on forested habitat for roosting. Cumulative impacts could also be detrimental to individual rare vascular plant communities, although some rare vascular plant species colonize disturbed areas and could benefit from new habitat created as a result of ground disturbance from multiple projects. A Biological Assessment is being prepared and consultation with the USFWS is on-going. Avoidance, minimization, and mitigation measures for federally listed species will need to be coordinated with the USFWS in compliance with the ESA.

Rare Communities. Permanently removing trees and shrubs along project ROWs could result in cumulative impacts if reasonably foreseeable future

projects are constructed close to one another and do not minimize impacts through paralleling existing corridors.

S.11.3 Adverse Impacts that Cannot Be Avoided

Despite minimization and mitigation efforts, some project impacts cannot be avoided. Unavoidable adverse effects related to the proposed Project construction would last only as long as the construction period and would include: soil compaction, erosion, and vegetation degradation; disturbance to and displacement of some species of wildlife; disturbance to nearby residences; traffic delays in some areas; and minor air quality impacts due to fugitive dust.

Unavoidable adverse effects related to the proposed Project that would last at least as long as the life of the proposed Project would include: the addition of transmission structures and lines to the visual landscape; habitat type changes and fragmentation; adverse impacts to wildlife and wildlife habitat due to project-related changes to wetland type (palustrine forested [PFO] and palustrine shrub [PSS] to palustrine emergent [PEM]) and the removal of other vegetation; and direct adverse impacts to wildlife as a result of avian collisions.

S.11.3.1 Irreversible and Irrecoverable Commitment of Resources

Irreversible and irretrievable commitments of resources refer to impacts on or losses of resources that cannot be reversed or recovered, even after an activity has ended. Irreversible commitment applies primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity. Irrecoverable commitment applies to the loss of production, harvest, or natural resources.

S.11.3.2 Rare Species

Activities involving heavy machinery could result in the direct mortality of individual listed species. The loss of an individual of a protected species would be adverse, but is not expected to have irreversible or irretrievable impacts on the species as a whole. A Biological Assessment is being prepared and consultation with the USFWS is on-going. Avoidance, minimization, and mitigation measures for federally listed species will need to be coordinated with the USFWS in compliance with the ESA.

S.11.3.3 Wetland Type Conversion

Removing woody vegetation within forested or shrub wetlands would convert these areas to a different vegetation community and wetland type. This would be considered an irretrievable and irreversible impact because the area would be continuously managed in an emergent, herbaceous state for the life of the project.

S.11.3.4 Other

Materials, energy, landfill space, and human resources irretrievably used to construct the proposed Project are not in such short supply as to be meaningful.