Appendix S

Detailed Map Books

- Map Book Page
- Border Crossing Point
- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Proposed Series Compensation Station

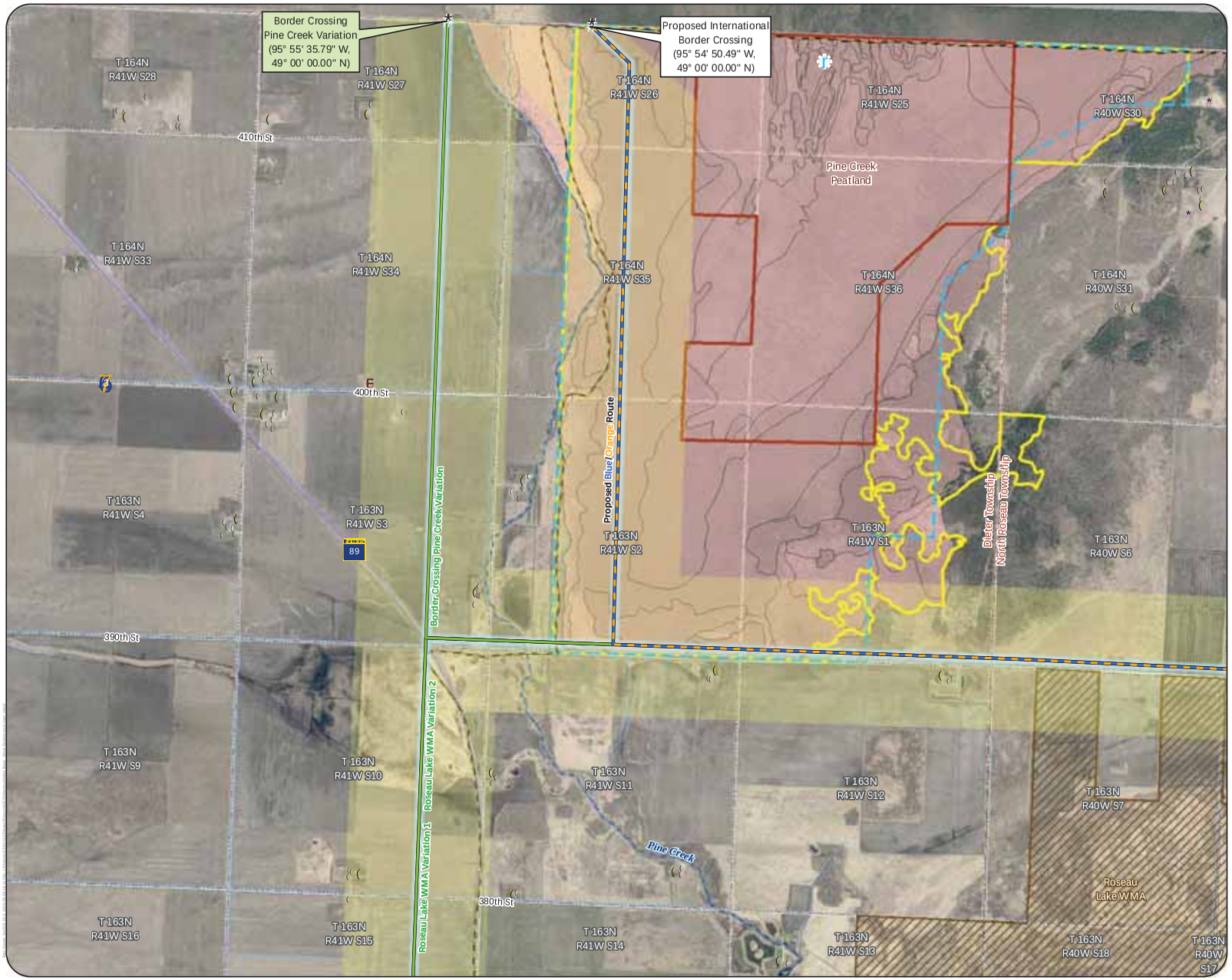
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

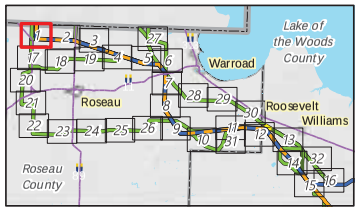
Streets and Highways
- State Trunk Highway
- County State Aid Highway
- Local Road
- Municipal Boundary
- County Boundary
- International Boundary

Miles
4.5 0 4.5

Appendix S - West Section Cover

WEST SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement





* Border Crossing Point

Proposed Routes

Blue/Orange Route

Alternatives

Route Variation

Anticipated Right-of-Way

Anticipated Route Width

Residences

Commercial or Non-Residential Structure

Cemetery

Approximate Calcareous Fen Location

Aggregate Source Location

NHD Watercourse

PWI Watercourse

Wildlife Management Area (WMA)

Scientific and Natural Area (SNA)

Preliminary Peatland SNA Watershed Protection Area

High Conservation Value Forest

Native Plant Community (Data only available for Roseau County)

Snowmobile Trail

Civil Township

Public Land Survey Section

County Boundary

International Boundary

Feet

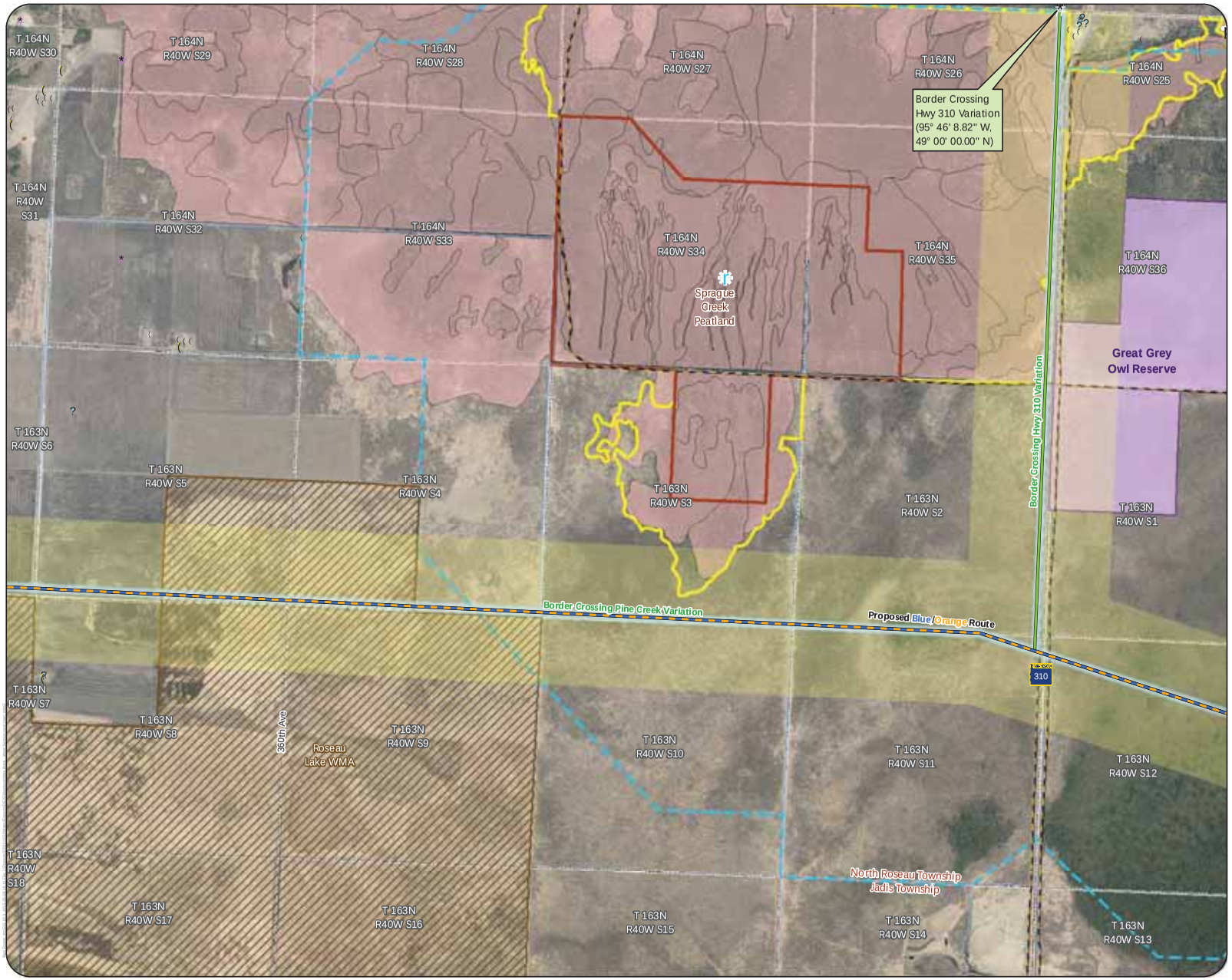
2,000 0 2,000

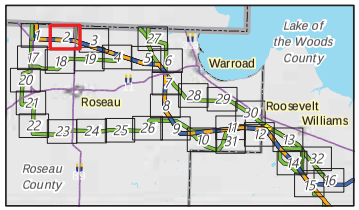
Appendix S - Map 1

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





* Border Crossing Point

Proposed Routes

Blue/Orange Route

Alternatives

Route Variation
Anticipated Right-of-Way
Anticipated Route Width
(Residences
(Commercial or Non-Residential Structure
Approximate Calcareous Fen Location
p Airstrip
Aggregate Source Location
? County Well Index
NHD Watercourse
Wildlife Management Area (WMA)
Great Grey Owl Reserve
Scientific and Natural Area (SNA)
Preliminary Peatland SNA Watershed Protection Area
High Conservation Value Forest
Native Plant Community (Data only available for Roseau County)
Snowmobile Trail
Civil Township
Public Land Survey Section
County Boundary
International Boundary

MPCA Database

Tanks and Leaks

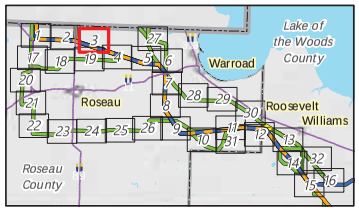
Feet

2,000 0 2,000

Appendix S - Map 2

MAP BOOK - WEST SECTION

Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Great Grey Owl Reserve
- Preliminary Peatland SNA Watershed Protection Area
- Snowmobile Trail
- Public Land Survey Section

Feet

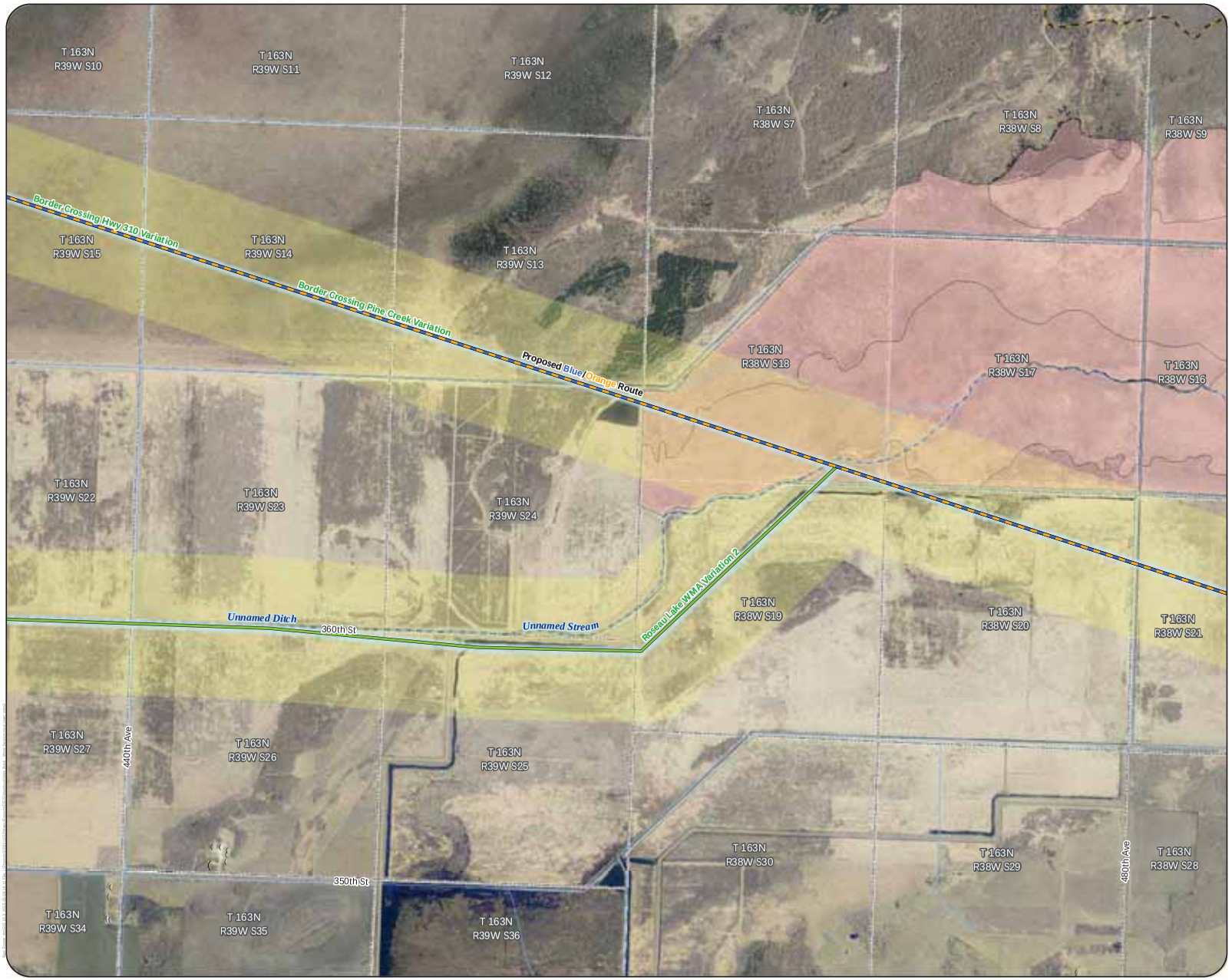
2,000 0 2,000

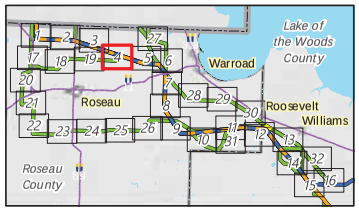
Appendix S - Map 3

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Native Plant Community (Data only available for Roseau County)
- Snowmobile Trail
- Public Land Survey Section

Feet

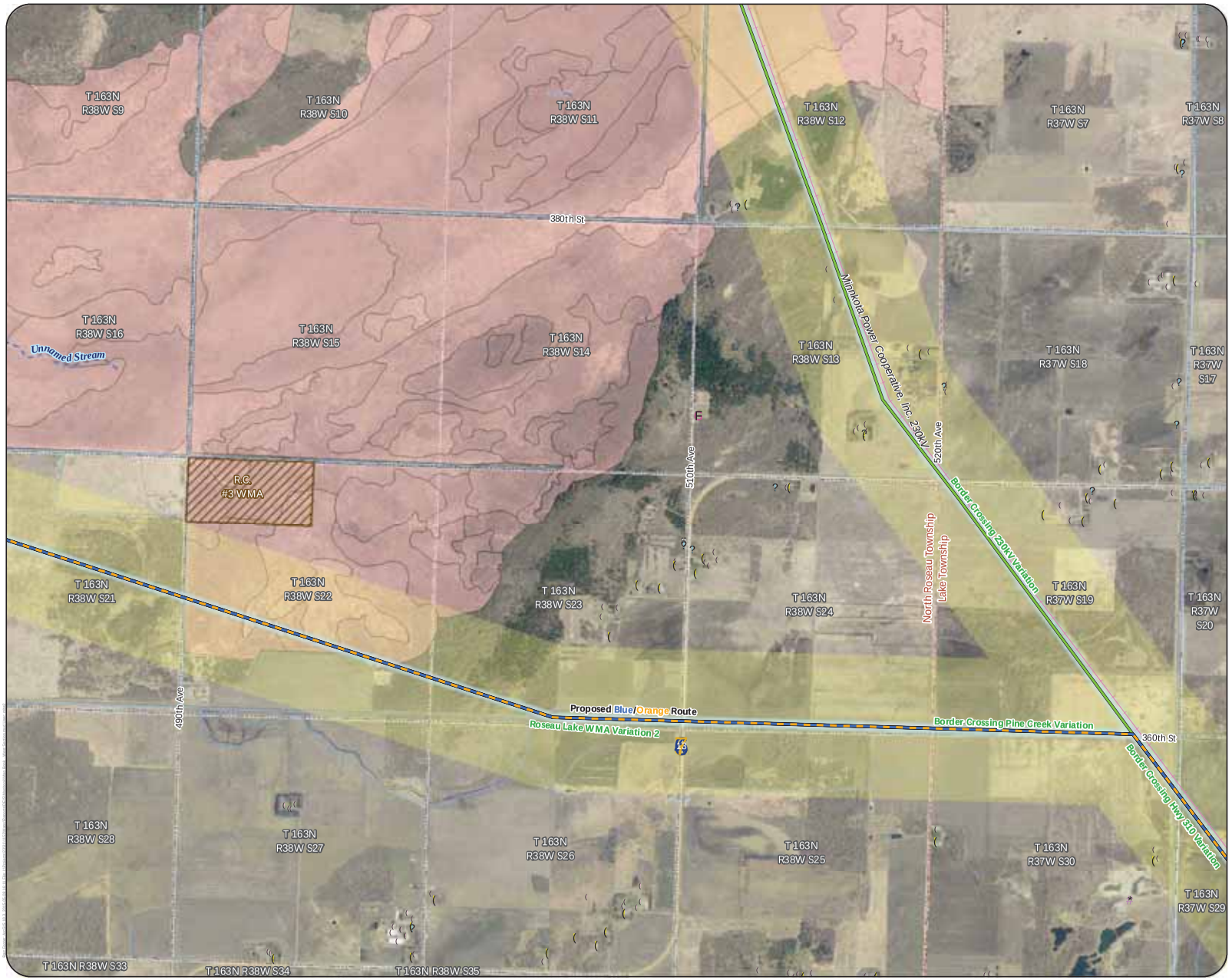
2,000 0 2,000

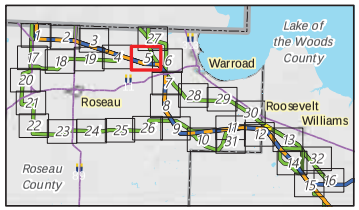
Appendix S - Map 4

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Church
- Cemetery
- Aggregate Source Location
- County Well Index
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- Native Plant Community (Data only available for Roseau County)
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 230 kV

Feet

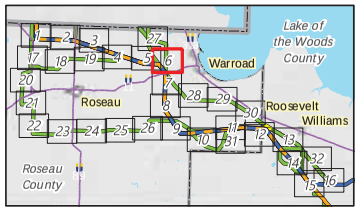
2,000 0 2,000

Appendix S - Map 5

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route

Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- NHD Watercourse
- Native Plant Community (Data only available for Roseau County)
- Scenic Byway
- Civil Township
- Public Land Survey Section

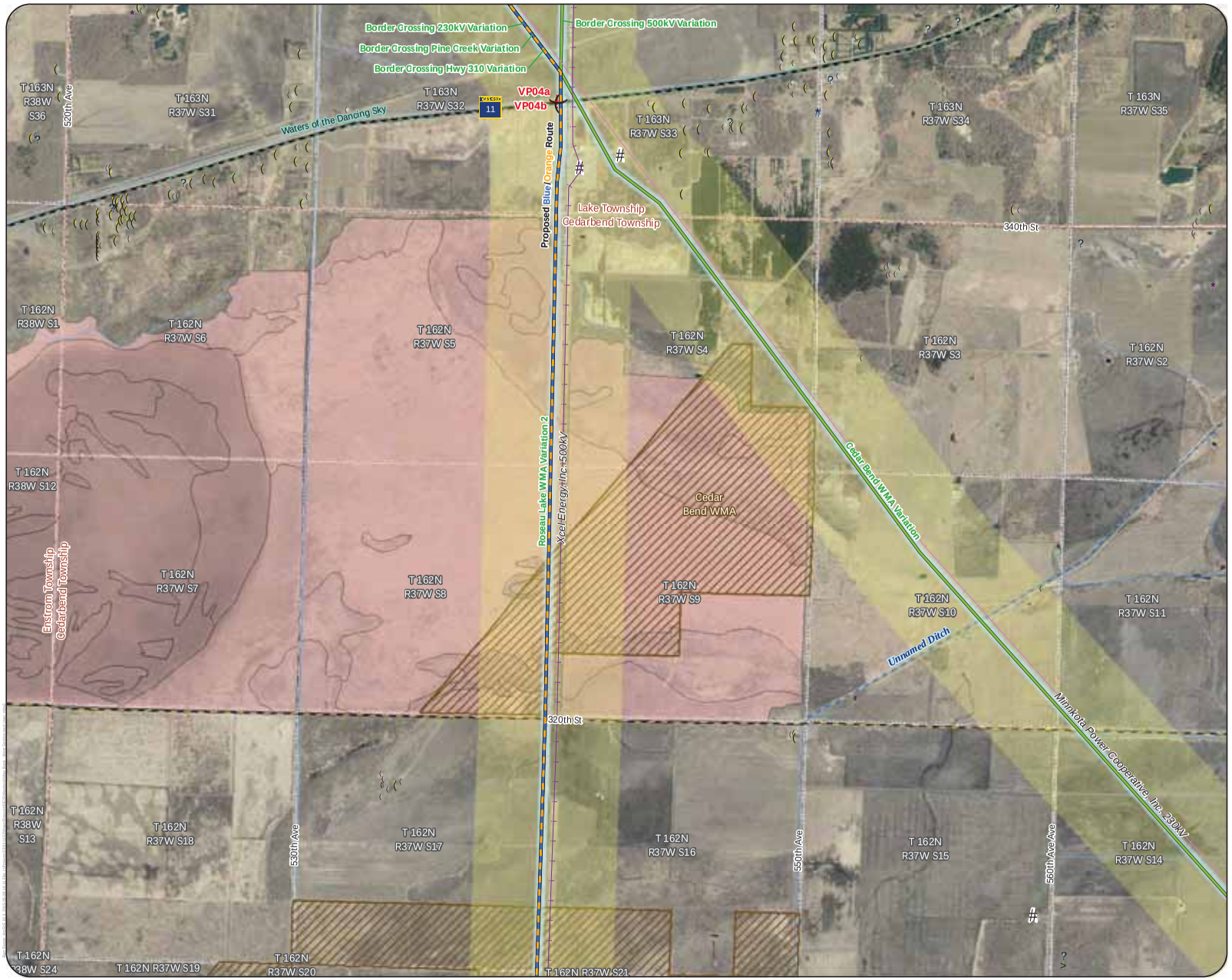
MPCA Database
- Tanks and Leaks

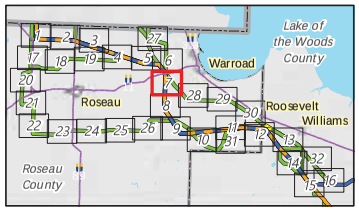
Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 6

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue/Orange Route

Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Visual Simulation Viewpoint
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- Native Plant Community (Data only available for Roseau County)
- Scenic Byway
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

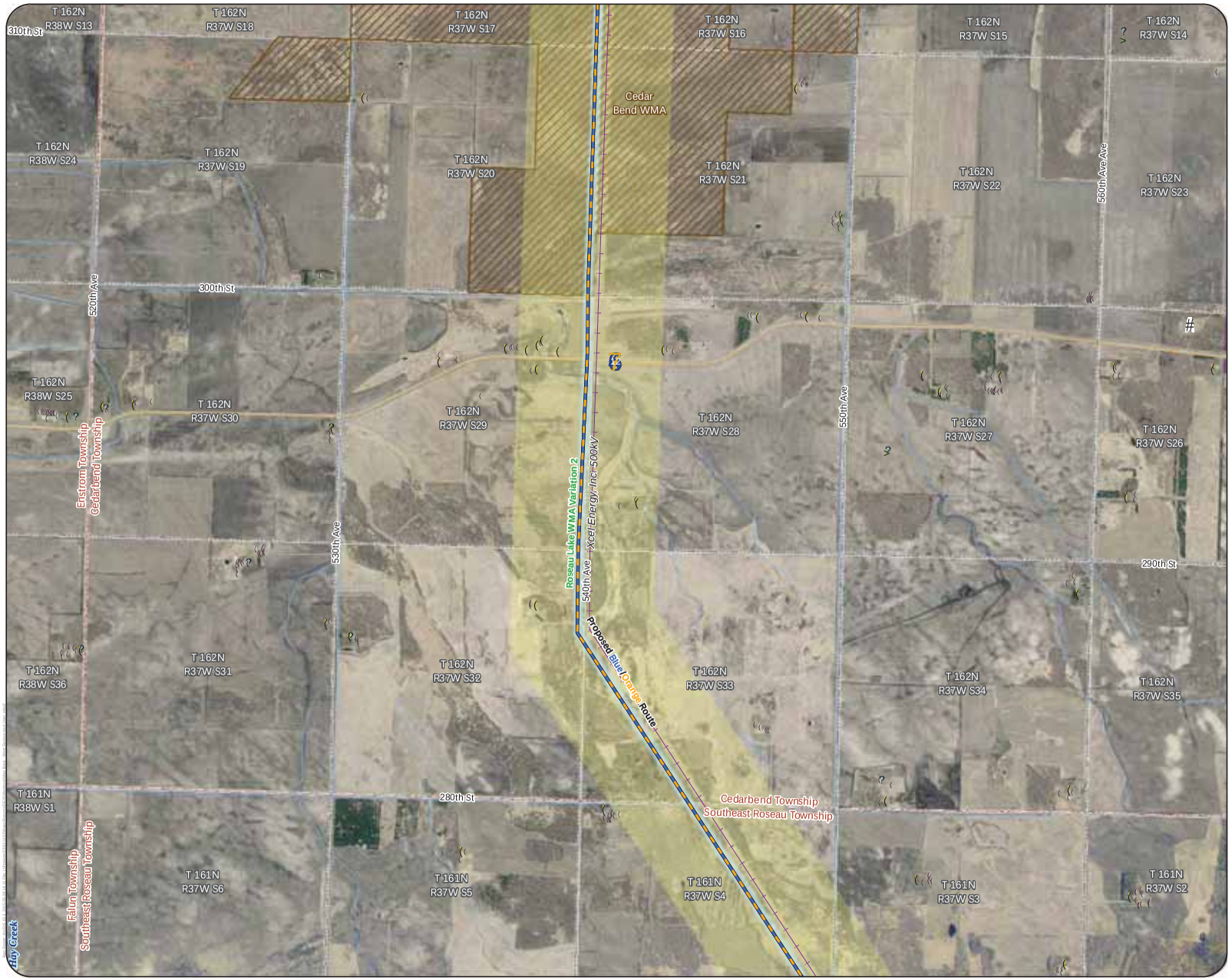
MPCA Database
- Hazardous Waste
- Tanks and Leaks

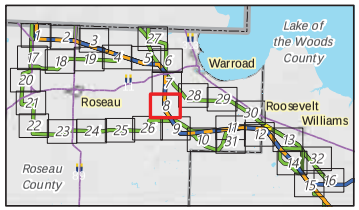
Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 7

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- USFWS Interest Lands
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 500 kV

Feet

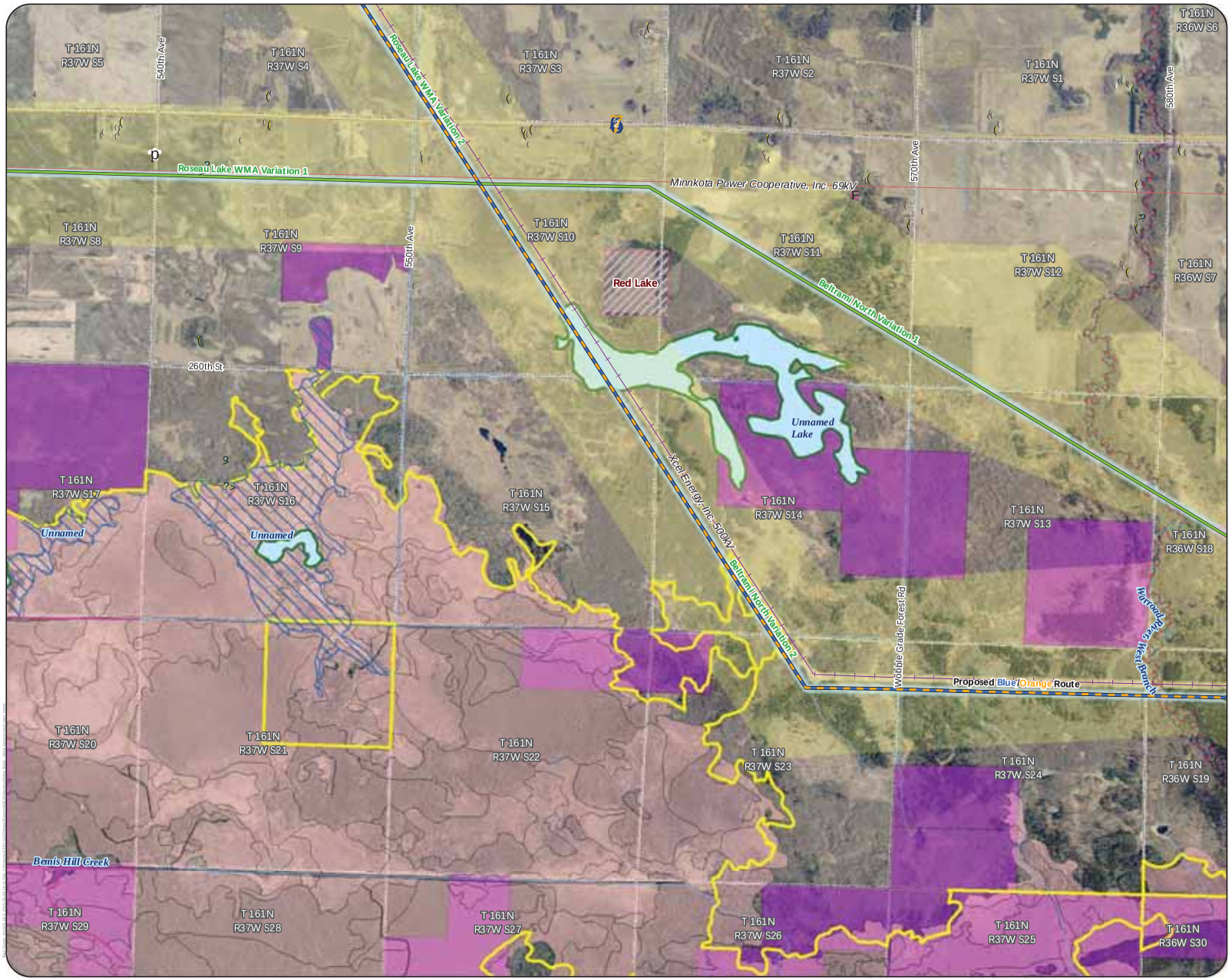
2,000 0 2,000

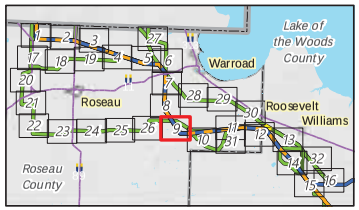
Appendix S - Map 8

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes
- Blue/Orange Route

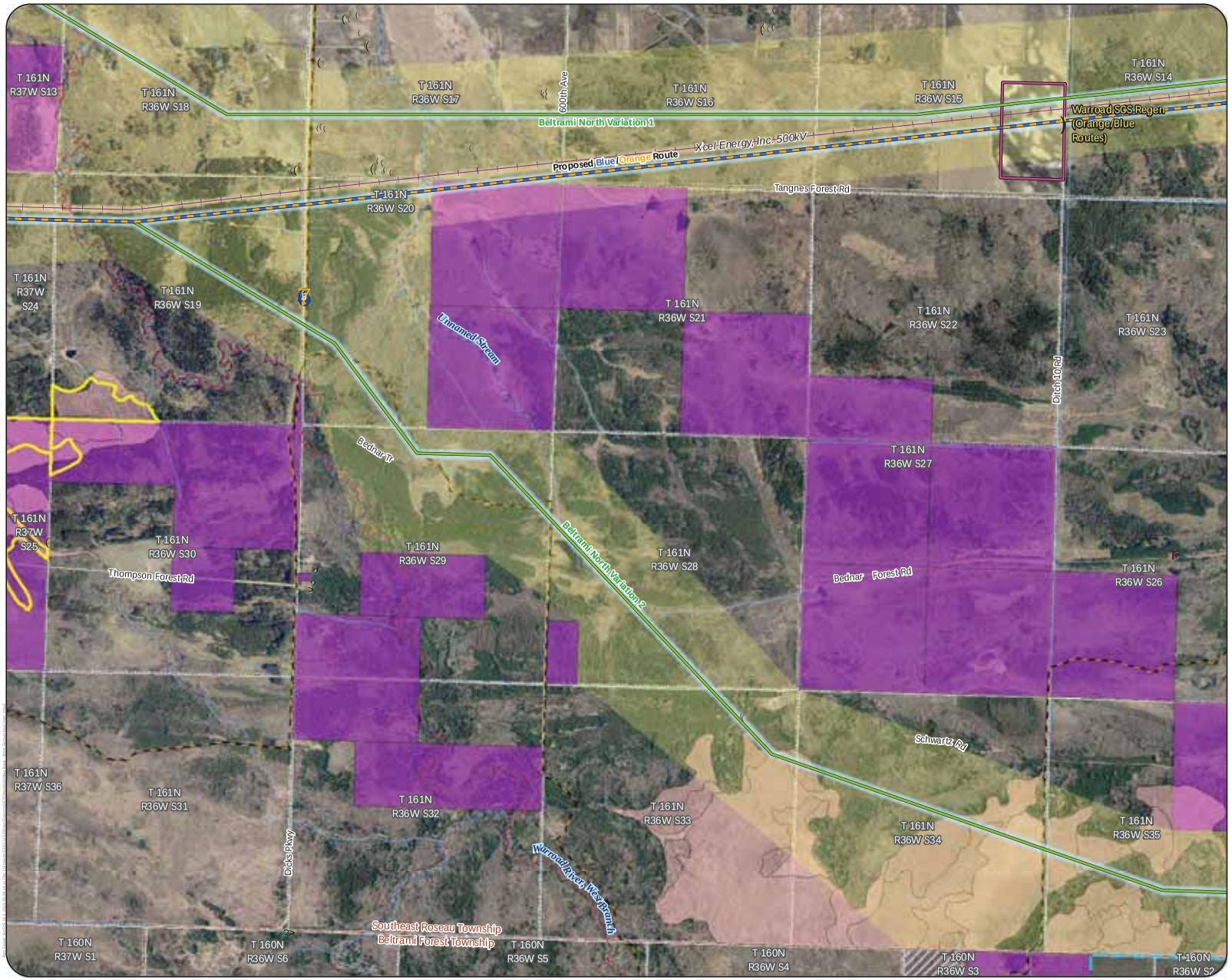
Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- Airstrip
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Trout Stream
- PWI Waterbody
- Shallow Lake
- High Conservation Value Forest
- Native Plant Community (Data only available for Roseau County)
- USFWS Interest Lands
- Indian Reservation Land
- Public Land Survey Section

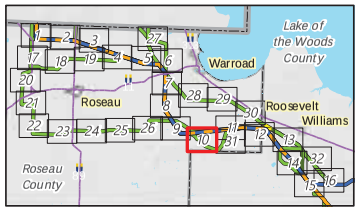
Existing Transmission Lines
- 69 or 115 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 9

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Regeneration Site

Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Proposed Series Compensation Station
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Preliminary Peatland SNA Watershed Protection Area
- High Conservation Value Forest
- Native Plant Community (Data only available for Roseau County)
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 500 kV

Feet

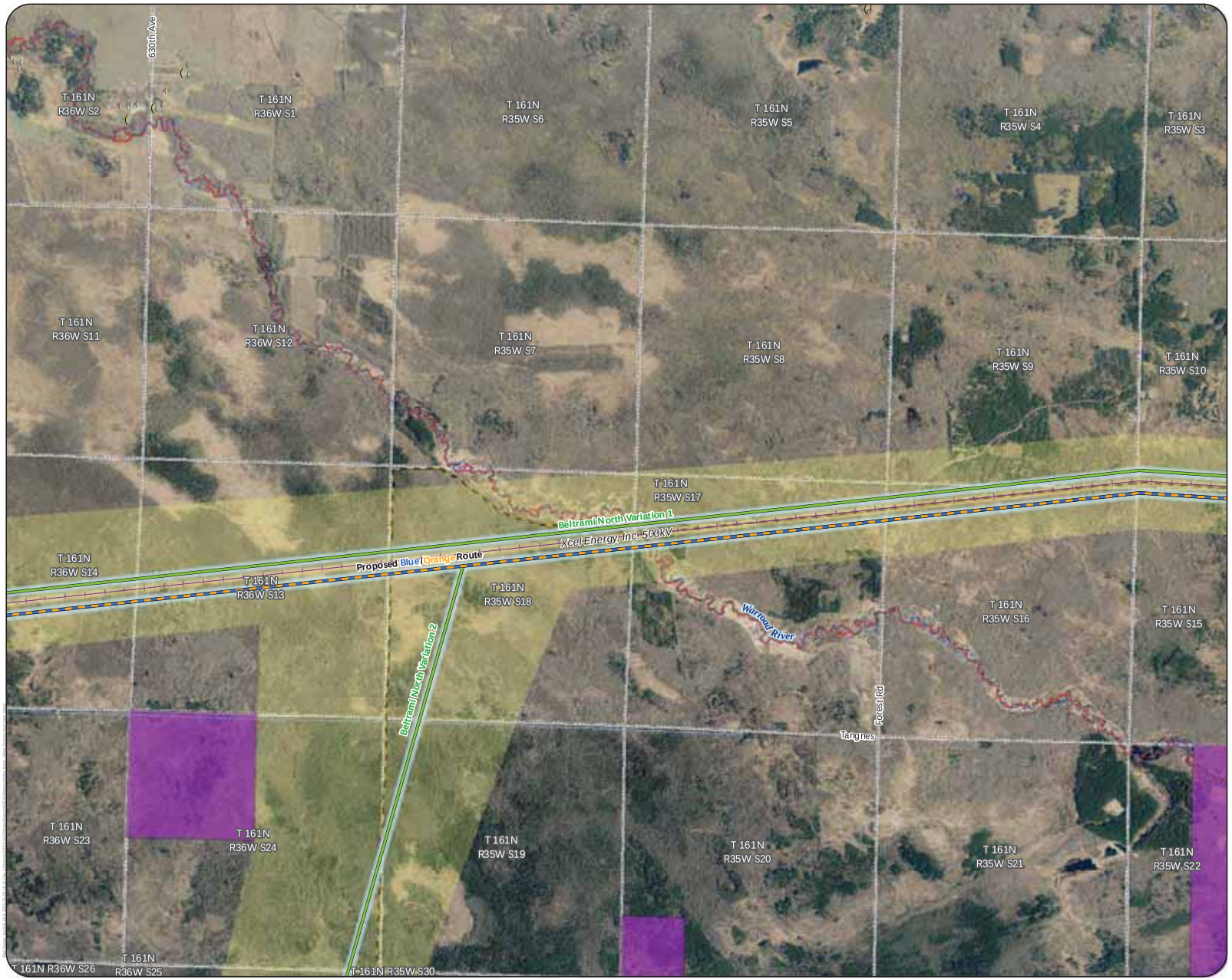
2,000 0 2,000

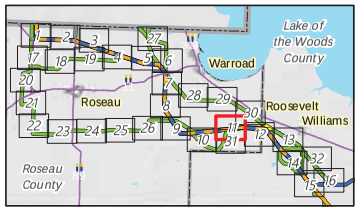
Appendix S - Map 10

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes
- Blue/Orange Route

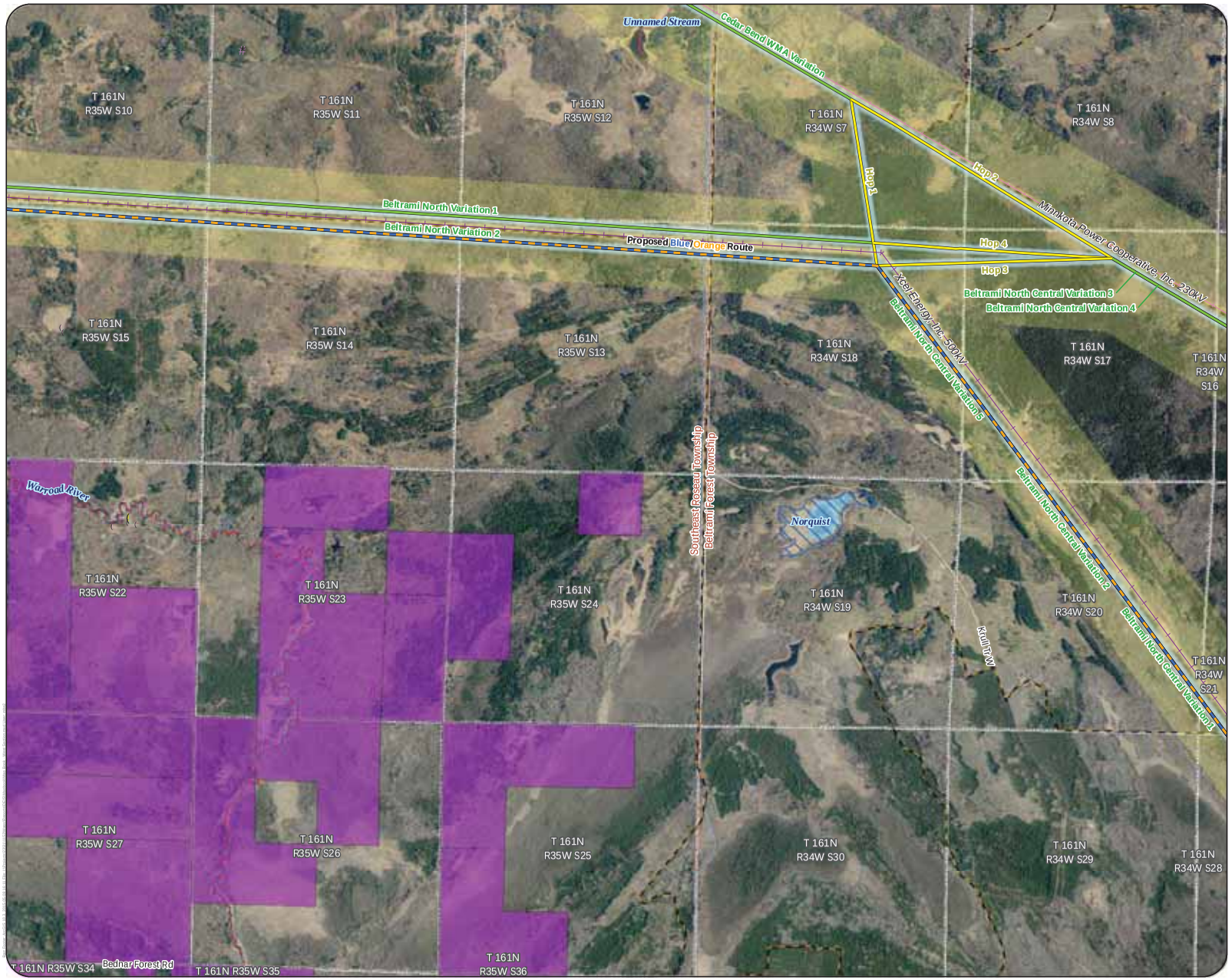
Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- USFWS Interest Lands
- Snowmobile Trail
- Public Land Survey Section

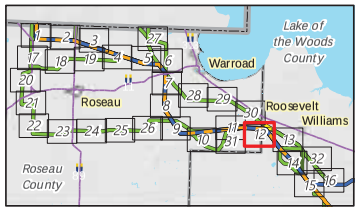
Existing Transmission Lines
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 11

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue/Orange Route

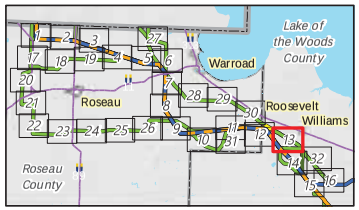
Alternatives
- Route Variation
- Route Variation Hop
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- USFWS Interest Lands
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 12

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue/Orange Route

Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- County Well Index
- NHD Watercourse
- PWI Watercourse
- Indian Reservation Land
- Scenic Byway
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

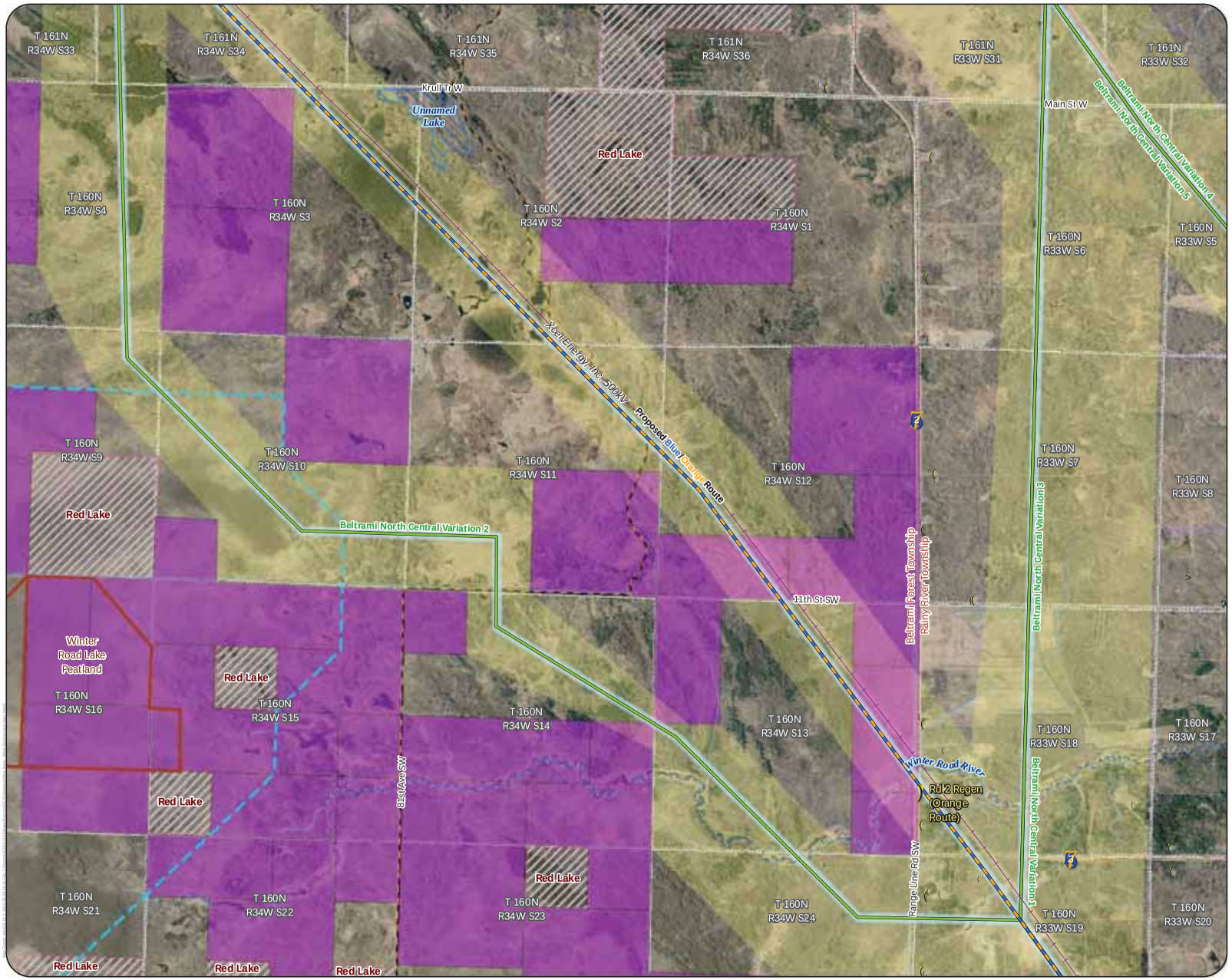
MPCA Database
- Hazardous Waste
- Investigation and Cleanup
- Tanks and Leaks
- Multiple Activities

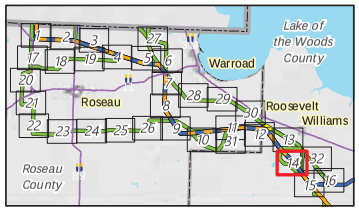
Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 13

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





- Proposed Regeneration Site

Proposed Routes
- Blue/Orange Route

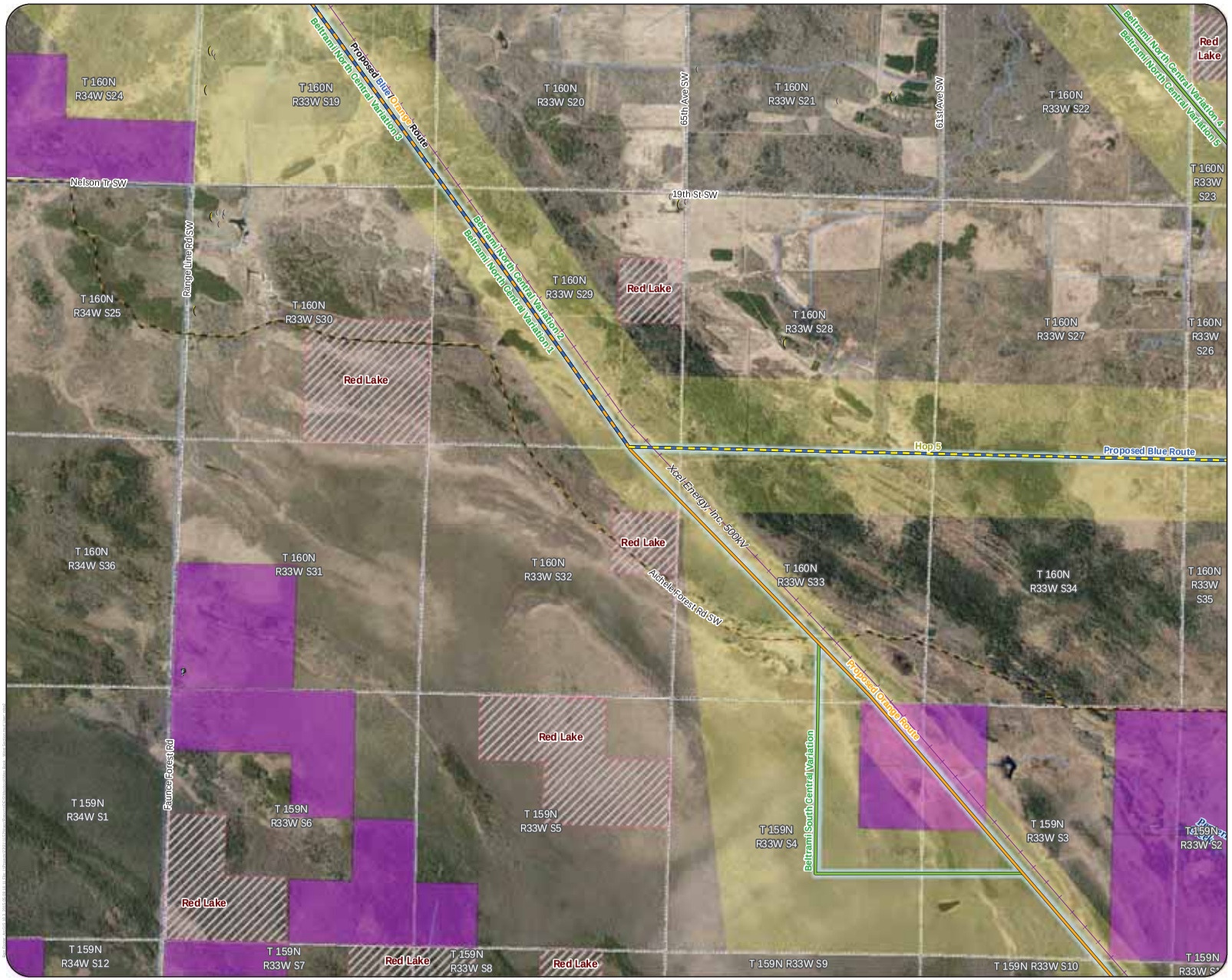
Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

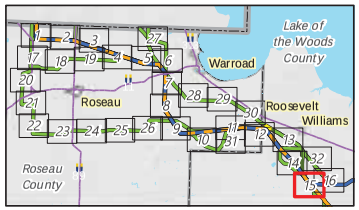
Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 14

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue Route
- Orange Route
- Blue/Orange Route

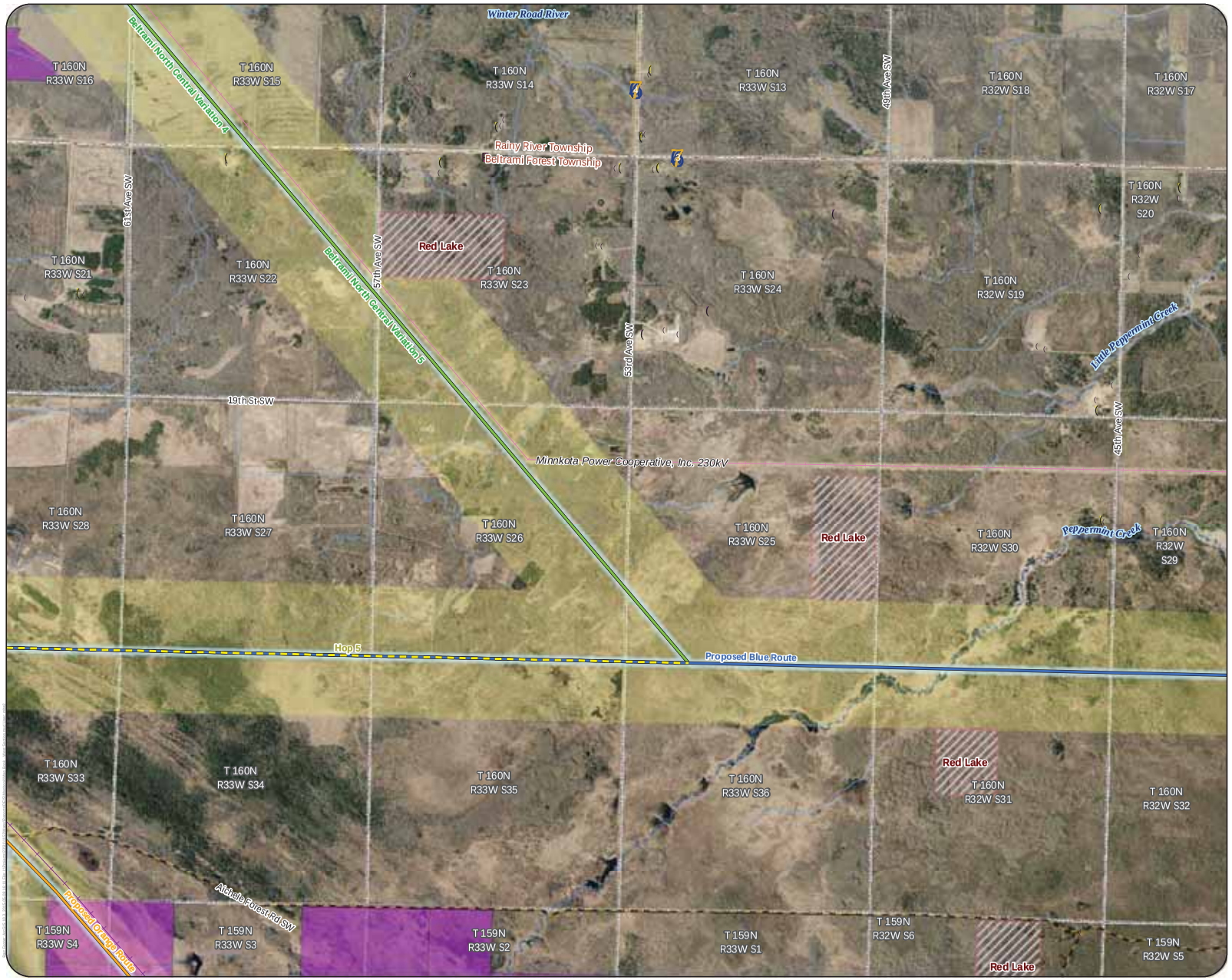
Alternatives
- Route Variation
- Route Variation Hop
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Public Land Survey Section

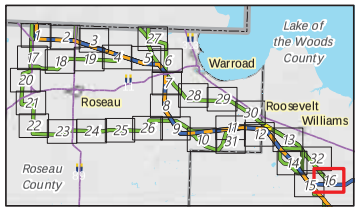
Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 15

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue Route
- Orange Route

Alternatives
- Route Variation
- Route Variation Hop
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- NHD Watercourse
- PWI Watercourse
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

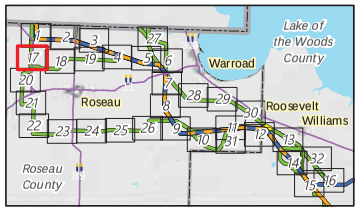
MPCA Database
- Multiple Activities

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 16

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Church
- County Well Index
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Wildlife Management Area (WMA)
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

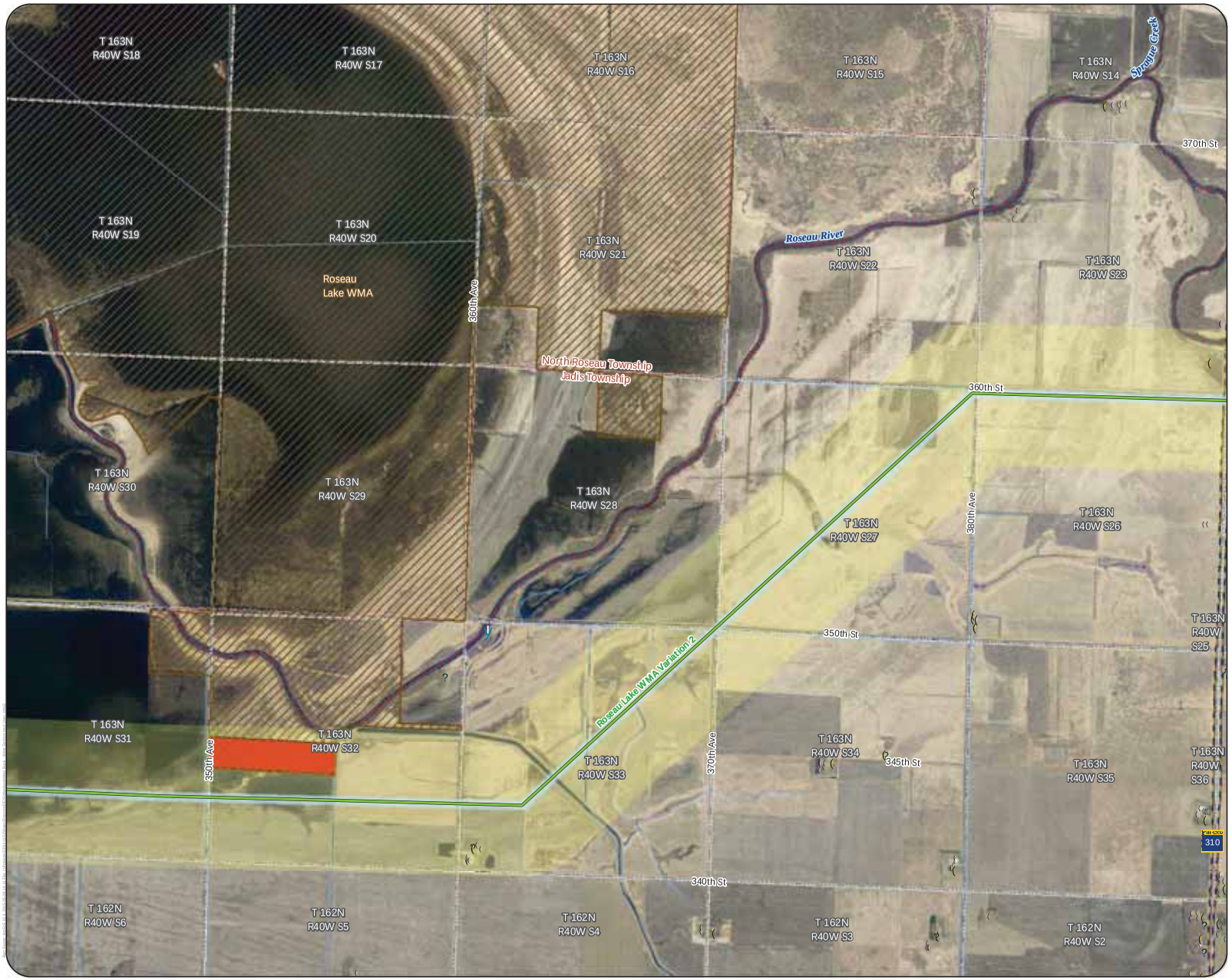
2,000 0 2,000

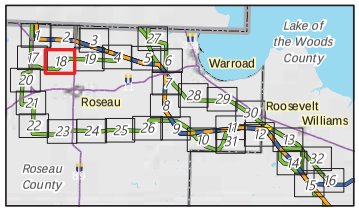
Appendix S - Map 17

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Wildlife Management Area (WMA)
- NAWCA Federal Aid Parcels
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

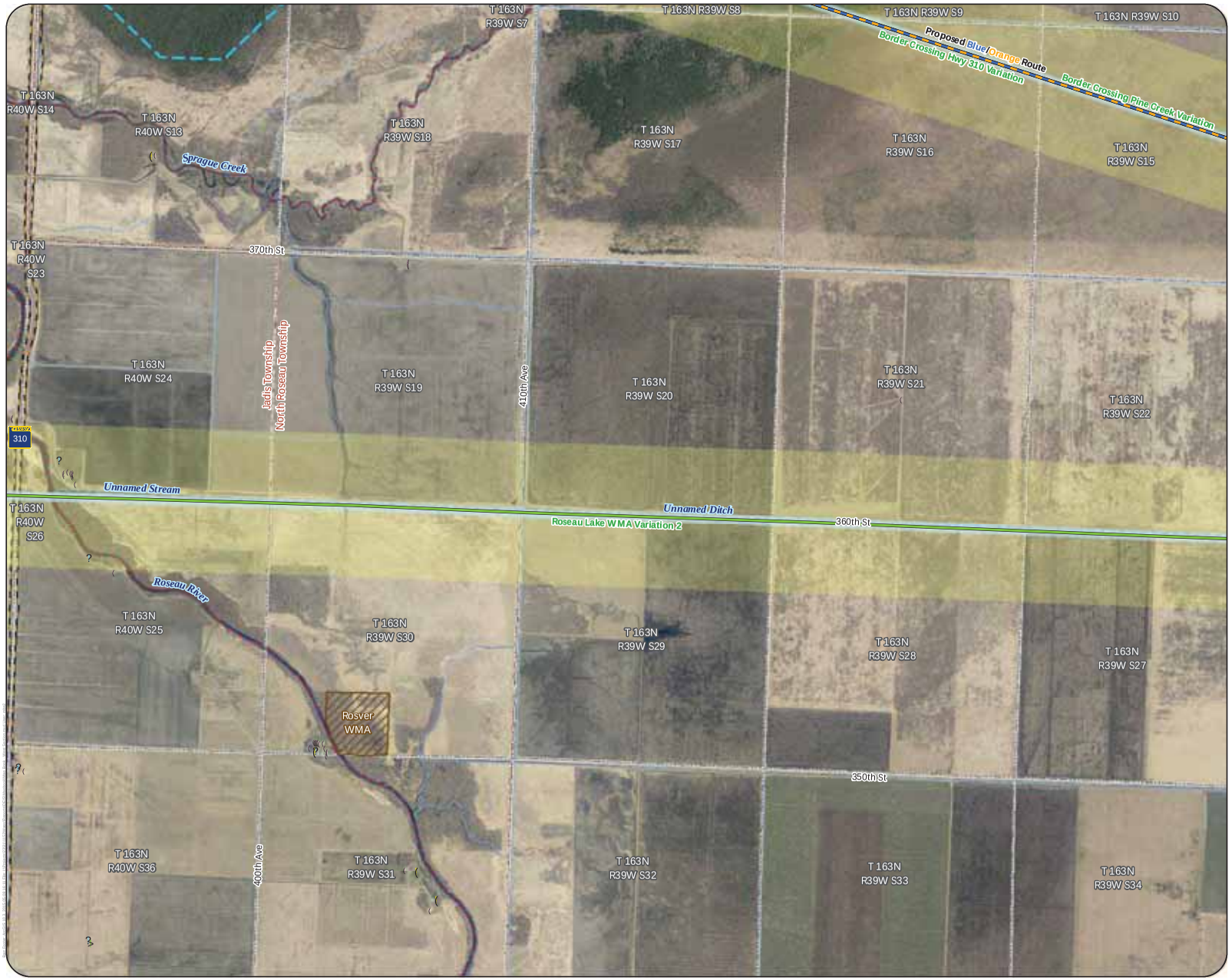
2,000 0 2,000

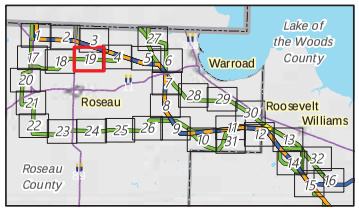
Appendix S - Map 18

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Wildlife Management Area (WMA)
- Preliminary Peatland SNA Watershed Protection Area
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

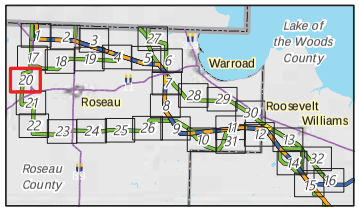
2,000 0 2,000

Appendix S - Map 19

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- Scenic Byway
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

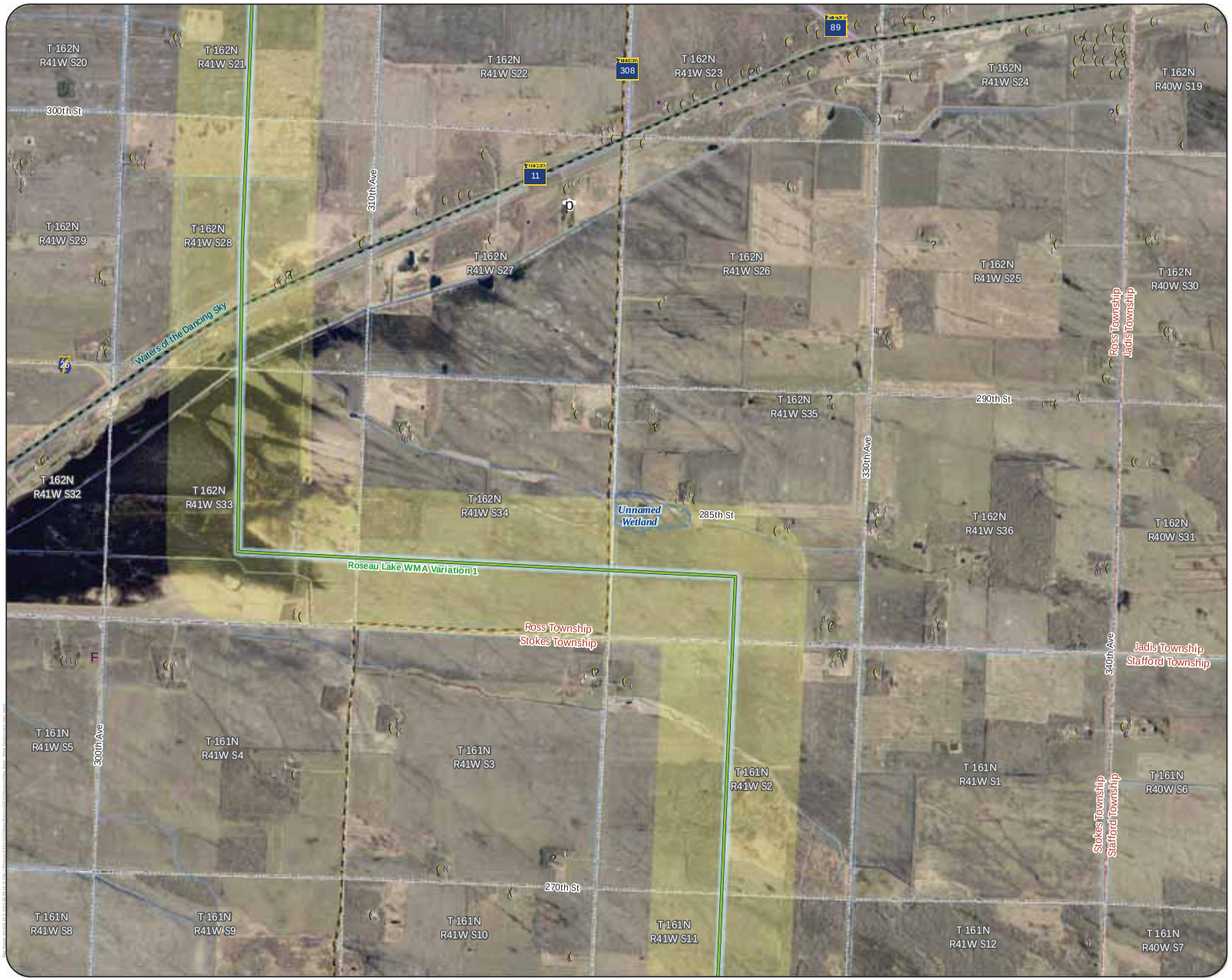
2,000 0 2,000

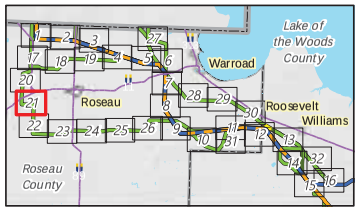
Appendix S - Map 20

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- Airstrip
- Aggregate Source Location
- County Well Index
- NHD Watercourse
- PWI Waterbody
- Scenic Byway
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste

Feet

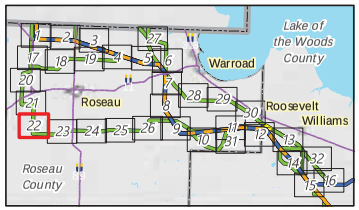
2,000 0 2,000

Appendix S - Map 21

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- USFWS Interest Lands
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

MPCA Database

- Tanks and Leaks

Existing Transmission Lines

- 69 or 115 kV

Feet

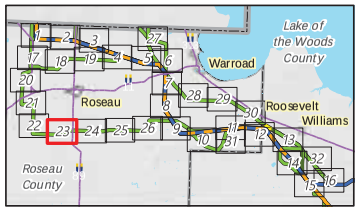
2,000 0 2,000

Appendix S - Map 22

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Snowmobile Trail
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV

Feet

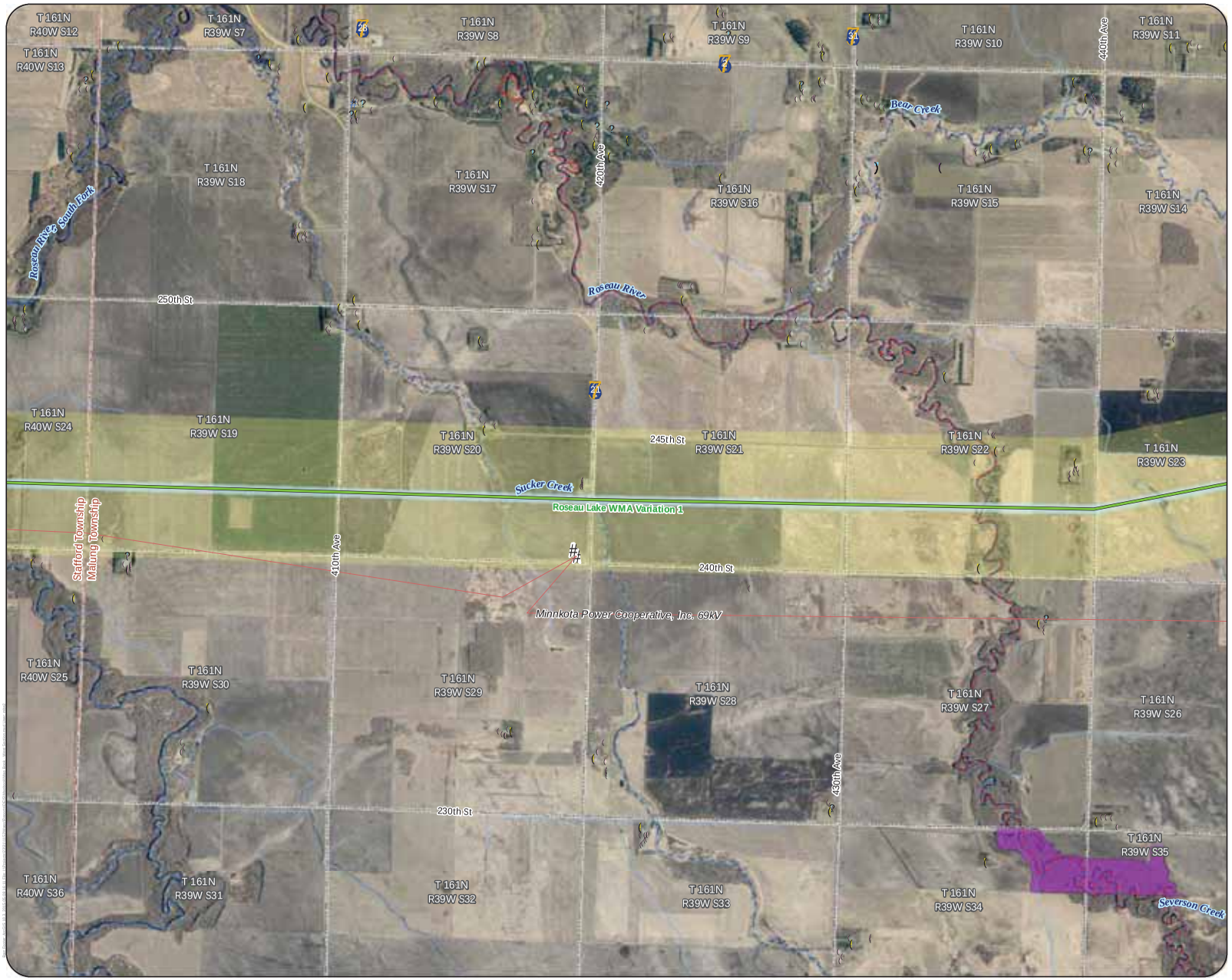
2,000 0 2,000

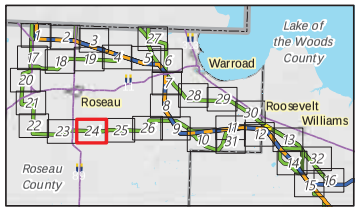
Appendix S - Map 23

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Communication Tower
- County Well Index
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- USFWS Interest Lands
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste
- Tanks and Leaks
- Multiple Activities

Existing Transmission Lines

- 69 or 115 kV

Feet

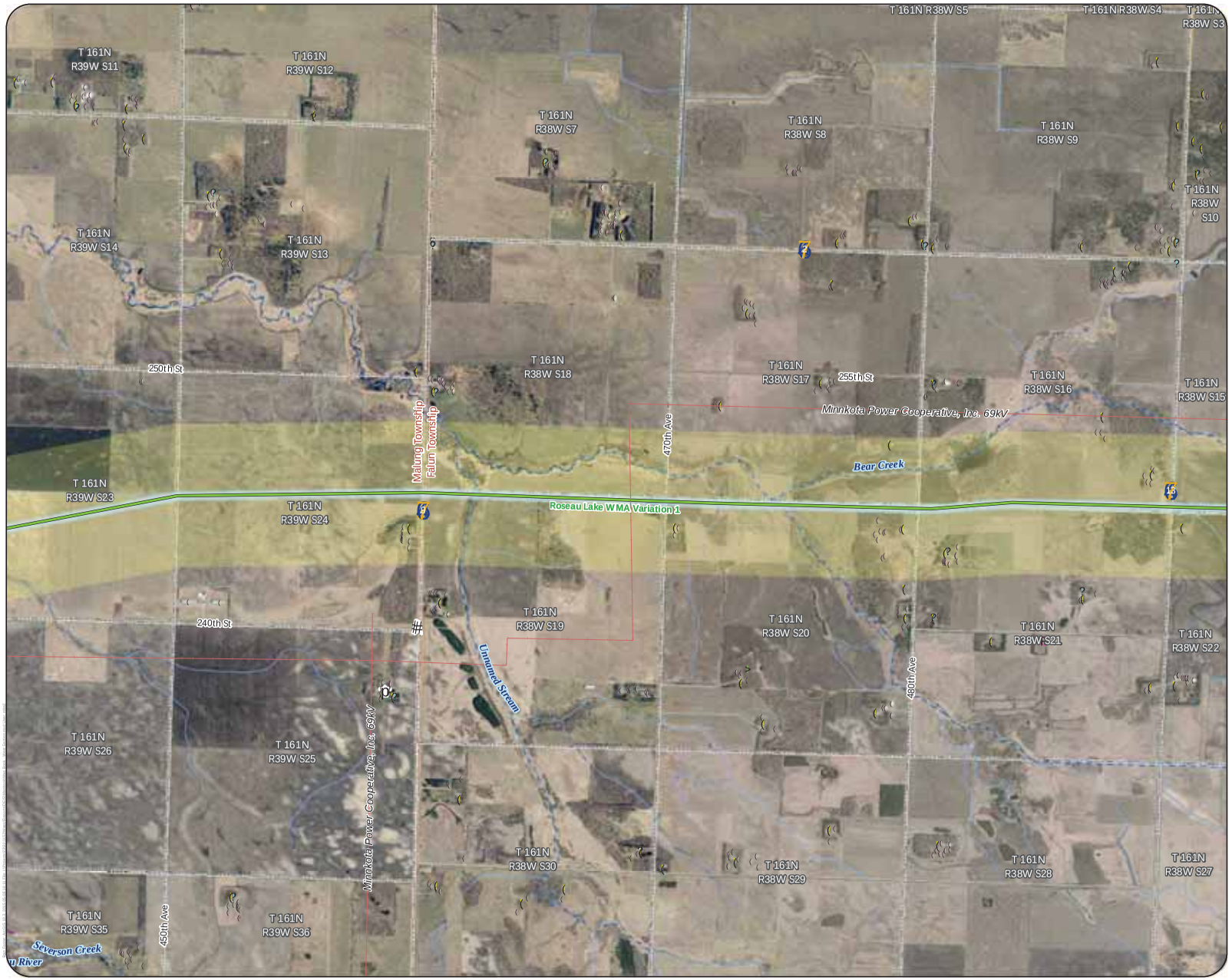
2,000 0 2,000

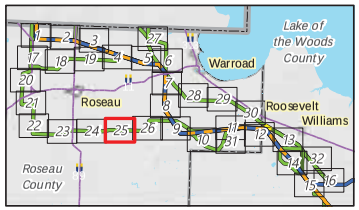
Appendix S - Map 24

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Church
- Cemetery
- Airstrip
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- USFWS Interest Lands
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV

Feet

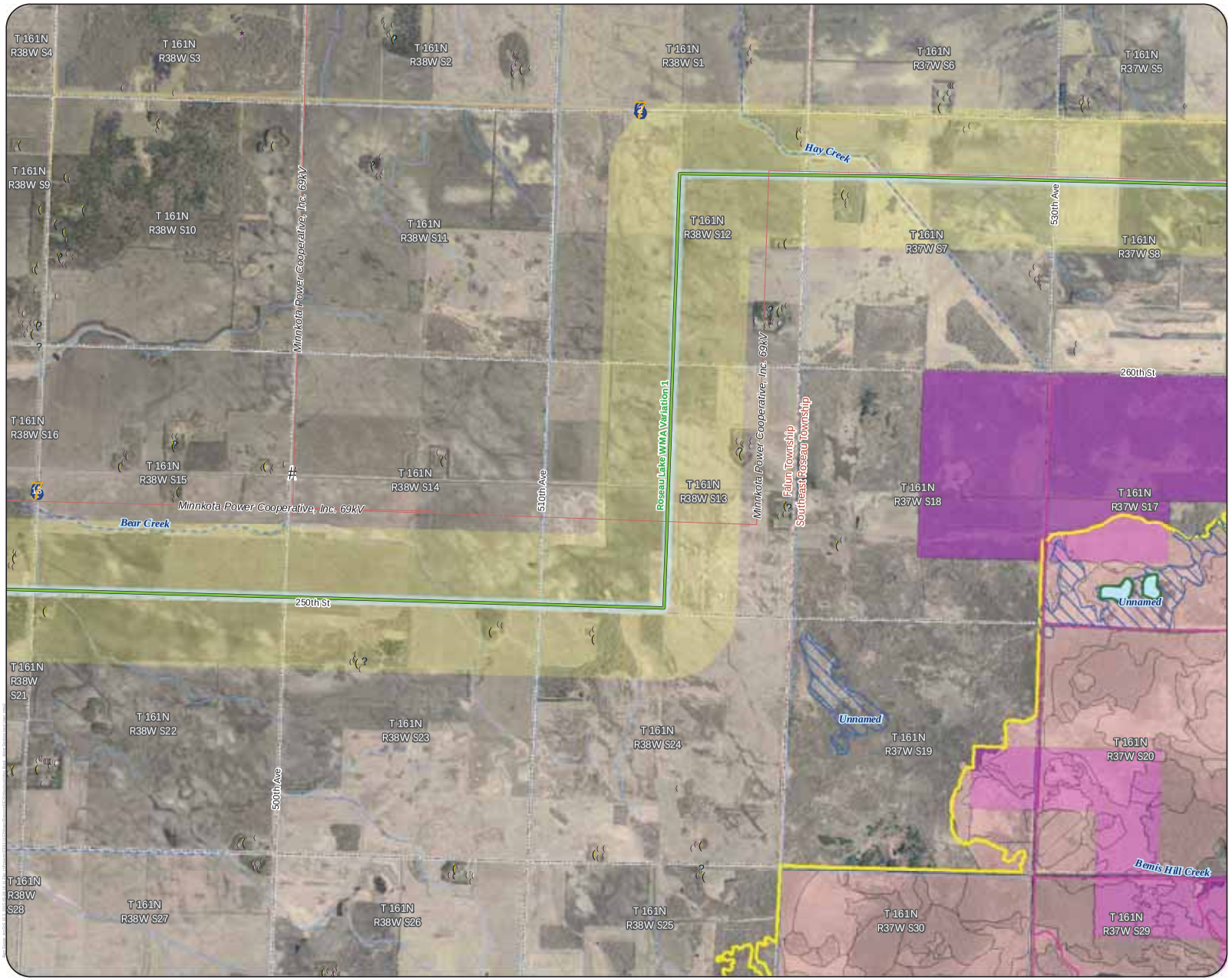
2,000 0 2,000

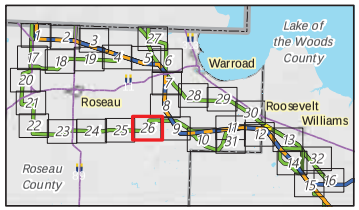
Appendix S - Map 25

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- NHD Watercourse
- PWI Watercourse
- Trout Stream
- PWI Waterbody
- Shallow Lake
- High Conservation Value Forest
- Native Plant Community (Data only available for Roseau County)
- USFWS Interest Lands
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV

Feet

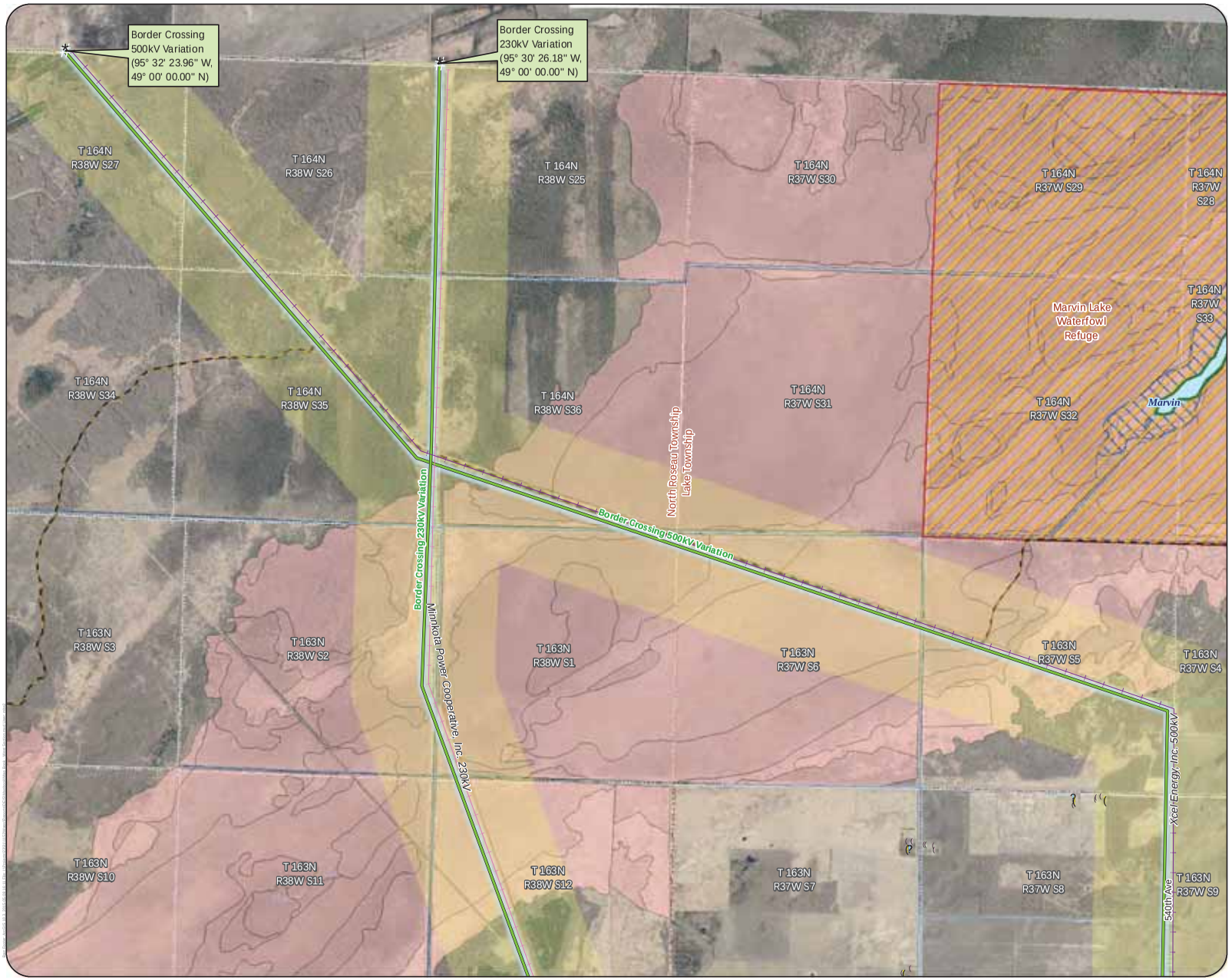
2,000 0 2,000

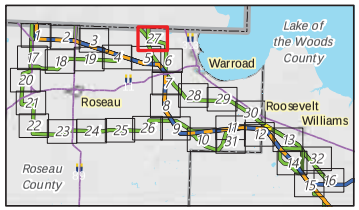
Appendix S - Map 26

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





* Border Crossing Point

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- NHD Watercourse
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- State Game Refuge
- Native Plant Community (Data only available for Roseau County)
- Snowmobile Trail
- Civil Township
- Public Land Survey Section
- County Boundary
- International Boundary

Existing Transmission Lines

- 230 kV
- 500 kV

Feet

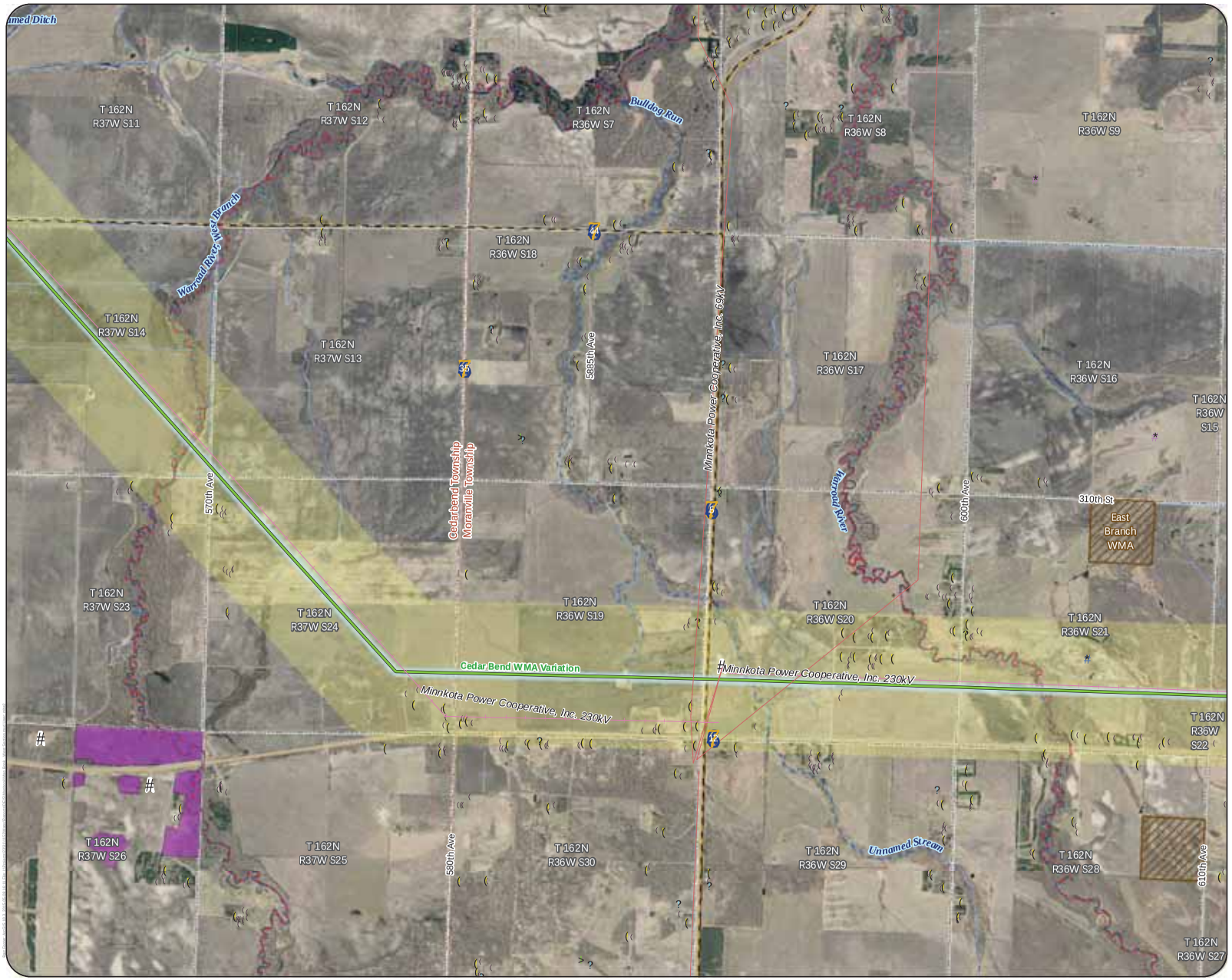
2,000 0 2,000

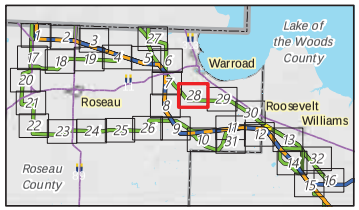
Appendix S - Map 27

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives
- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Wildlife Management Area (WMA)
- USFWS Interest Lands
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

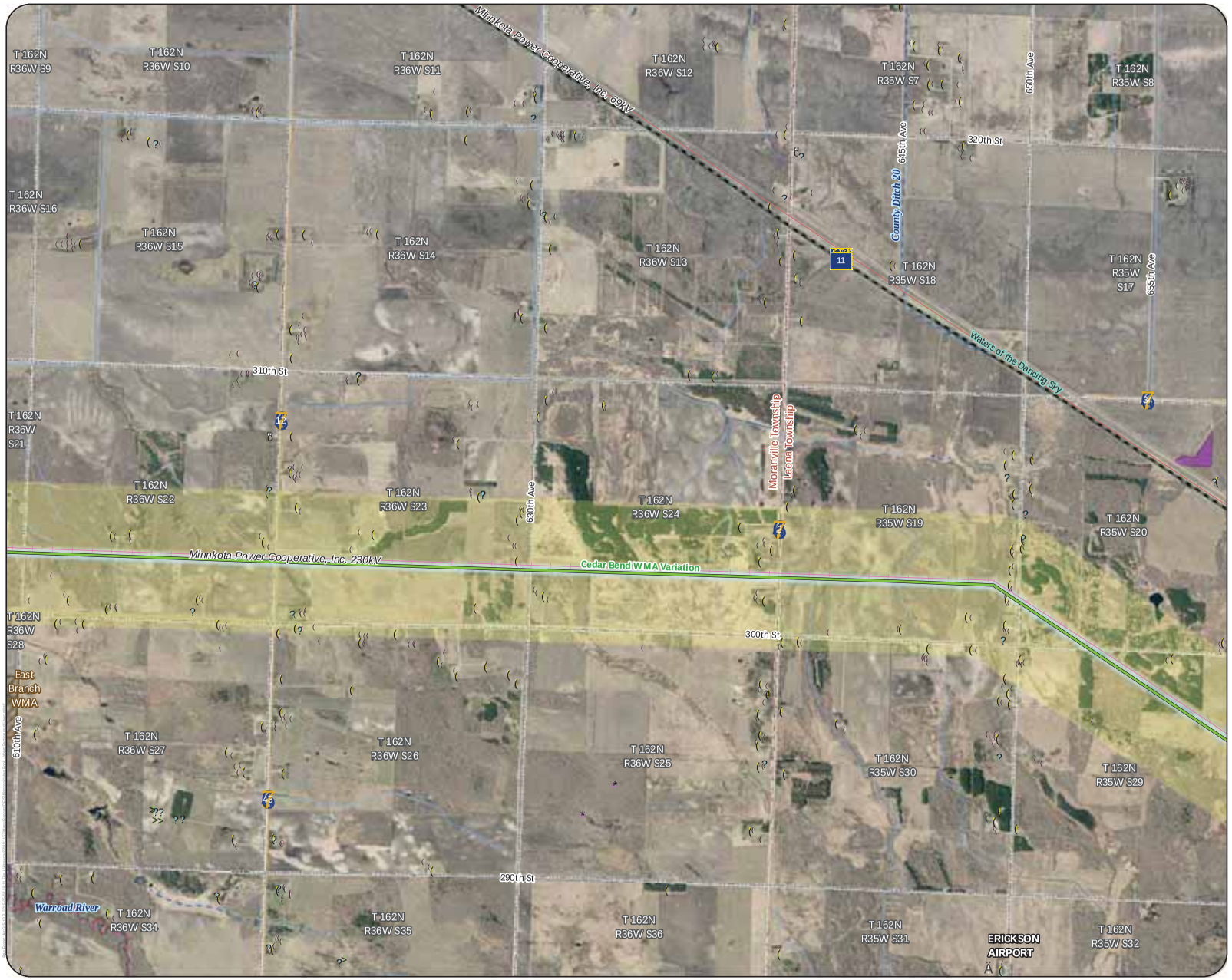
MPCA Database
- Tanks and Leaks

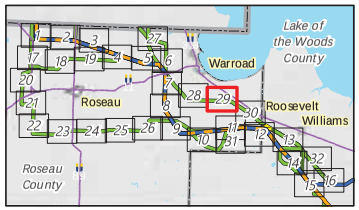
Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 28

MAP BOOK - WEST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Church
- Airport
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Wildlife Management Area (WMA)
- USFWS Interest Lands
- Scenic Byway
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

Feet

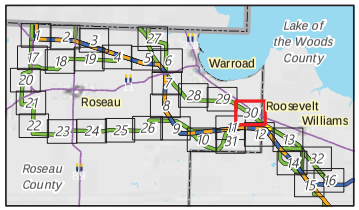
2,000 0 2,000

Appendix S - Map 29

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Scenic Byway
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database

- Tanks and Leaks
- Multiple Activities

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

Feet

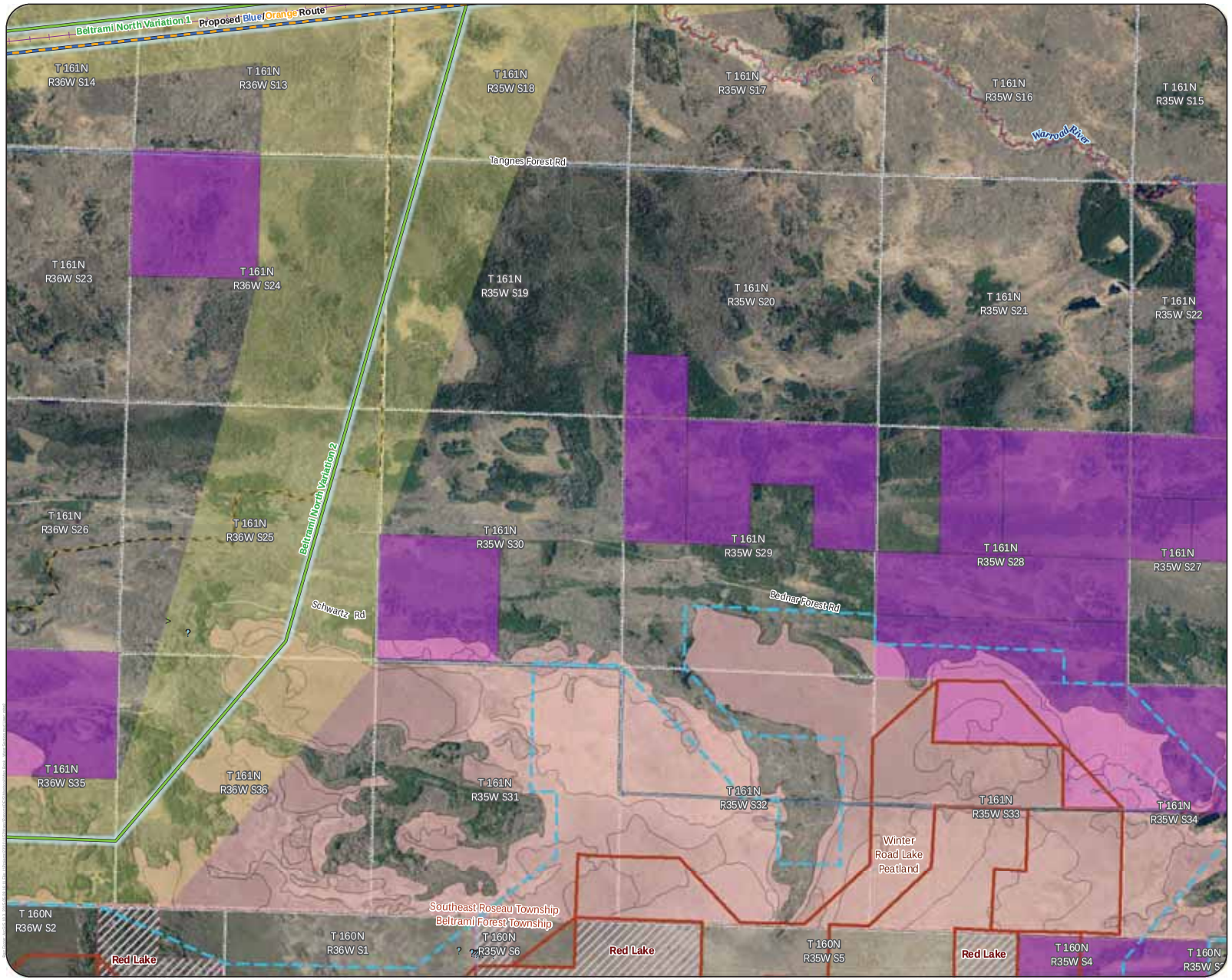
2,000 0 2,000

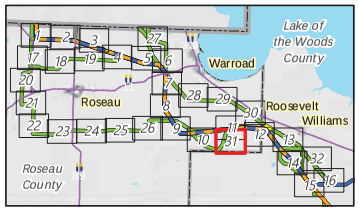
Appendix S - Map 30

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Blue/Orange Route

Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Native Plant Community (Data only available for Roseau County)
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 500 kV

Feet

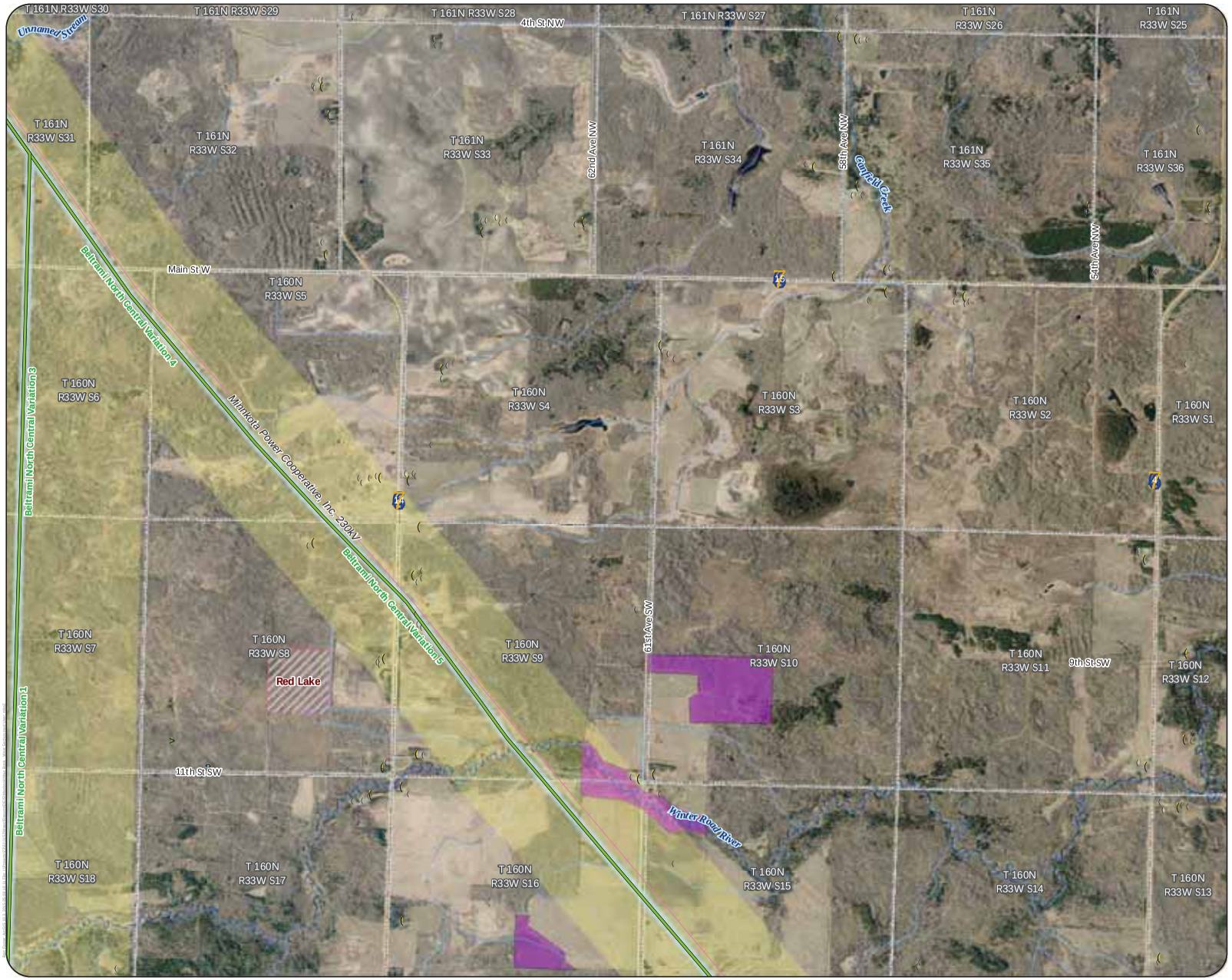
2,000 0 2,000

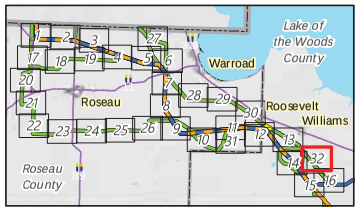
Appendix S - Map 31

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Right-of-Way
- Anticipated Route Width
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- USFWS Interest Lands
- Indian Reservation Land
- Public Land Survey Section

Existing Transmission Lines

- 230 kV

Feet

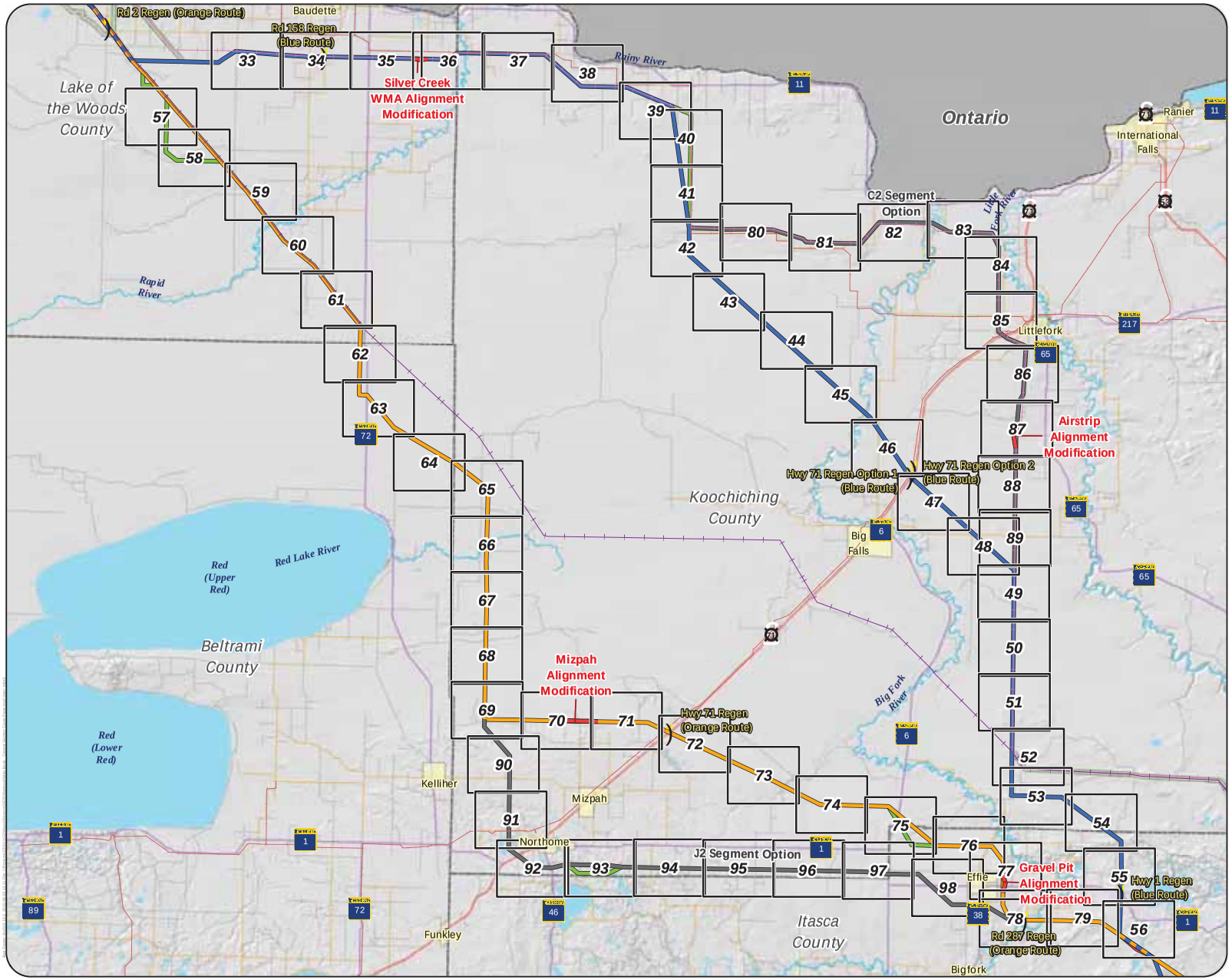
2,000 0 2,000

Appendix S - Map 32

MAP BOOK - WEST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Map Book Page

Proposed Regeneration Site

Proposed Routes

- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives

- Route Variation
- Alignment Modification

Existing Transmission Lines

- 69 or 115 kV
- 230 kV
- 500 kV

Streets and Highways

- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Municipal Boundary
- County Boundary

Miles

6.5 0 6.5

Appendix S - Central Section Cover

CENTRAL SECTION OVERVIEW

Great Northern Transmission Line

Final Environmental Impact Statement

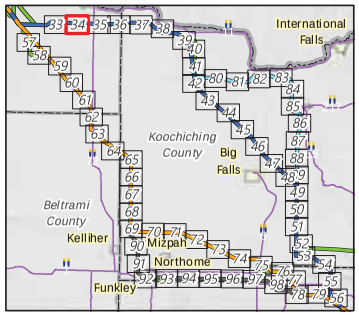
Proposed Routes
- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Trout Stream
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 33

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Public Land Survey Section

MPCA Database

- Multiple Activities

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

Feet

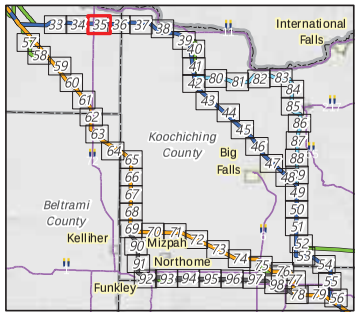
2,000 0 2,000

Appendix S - Map 34

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes
- Blue Route

Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- USFWS Interest Lands
- Indian Reservation Land
- Snowmobile Trail
- Public Land Survey Section

MPCA Database
- Multiple Activities

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 35

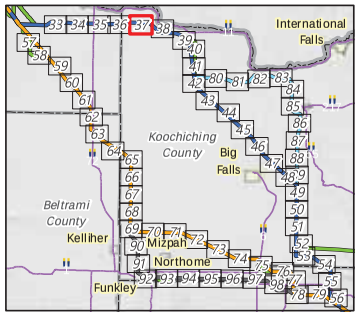
MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement

Appendix S - Map 36

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



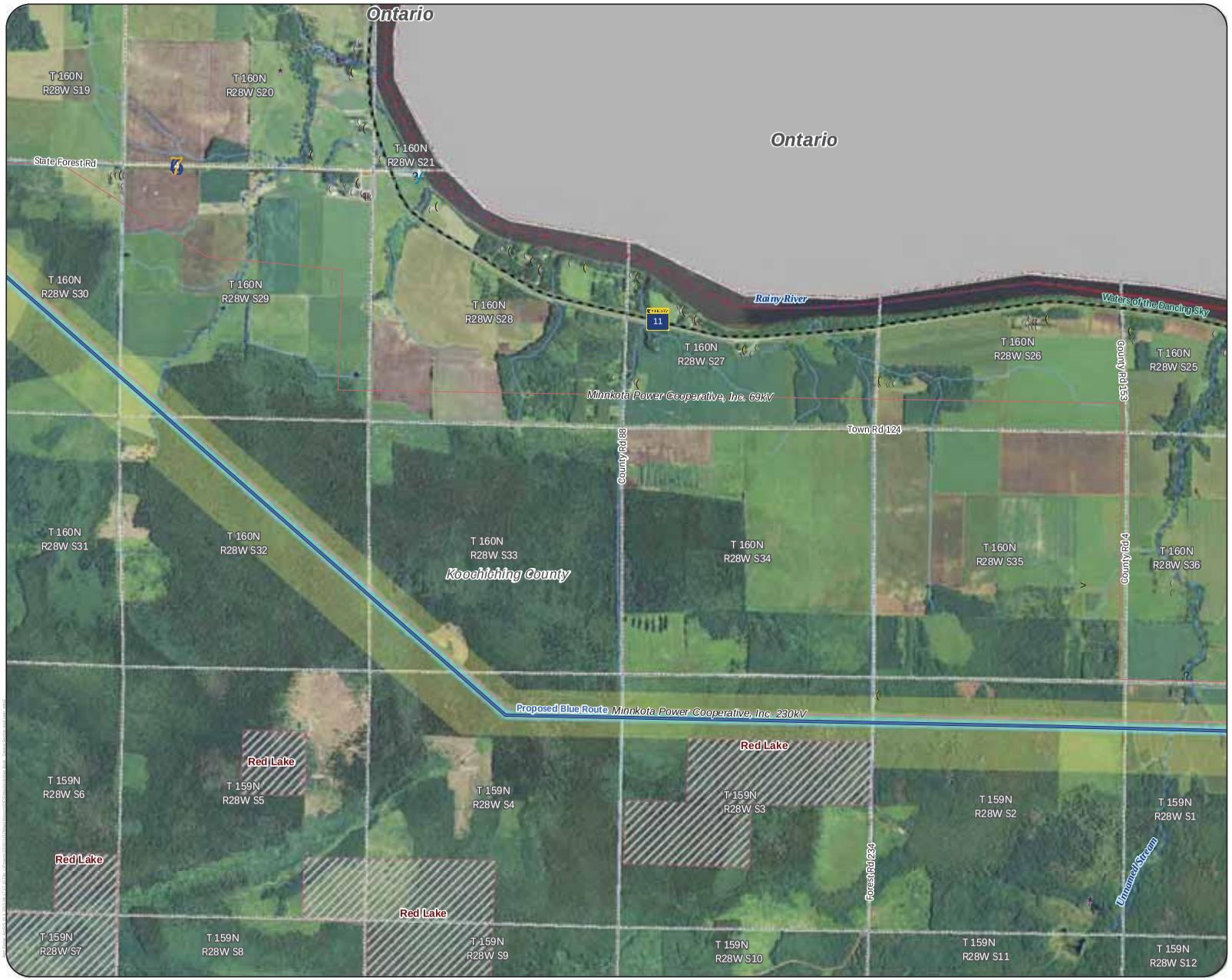
Proposed Routes
- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- NHD Watercourse
- PWI Watercourse
- Indian Reservation Land
- Public Land Survey Section

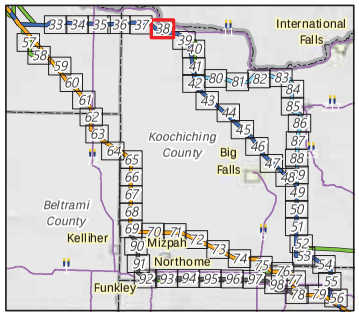
Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 37

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Indian Reservation Land
- Scenic Byway
- Civil Township
- Public Land Survey Section
- County Boundary
- International Boundary

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

Feet

2,000 0 2,000

Appendix S - Map 38

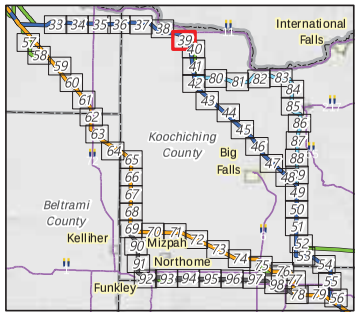
MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement

U.S. DEPARTMENT OF ENERGY

MINNESOTA DEPARTMENT OF COMMERCE



Proposed Routes
- Blue Route

Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Indian Reservation Land
- Scenic Byway
- Snowmobile Trail
- Public Land Survey Section

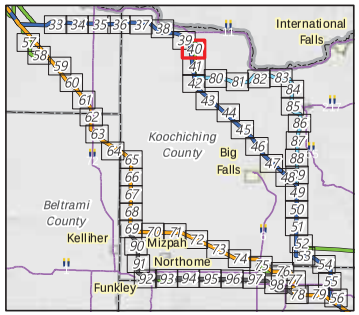
MPCA Database
- Hazardous Waste
- Tanks and Leaks
- Multiple Activities

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 39

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route

Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Snowmobile Trail
- Public Land Survey Section

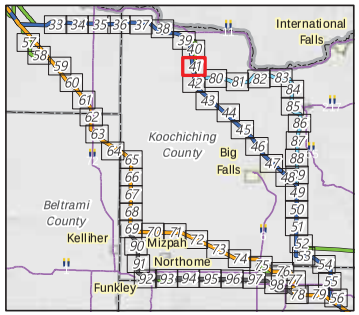
MPCA Database
- Multiple Activities

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 40

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route

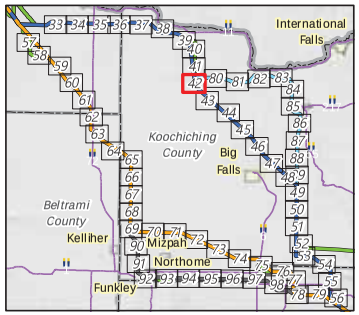
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- NHD Waterbody
- PWI Waterbody
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Snowmobile Trail
- Public Land Survey Section

Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 41

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route

Segment Options
- C2 Segment Option

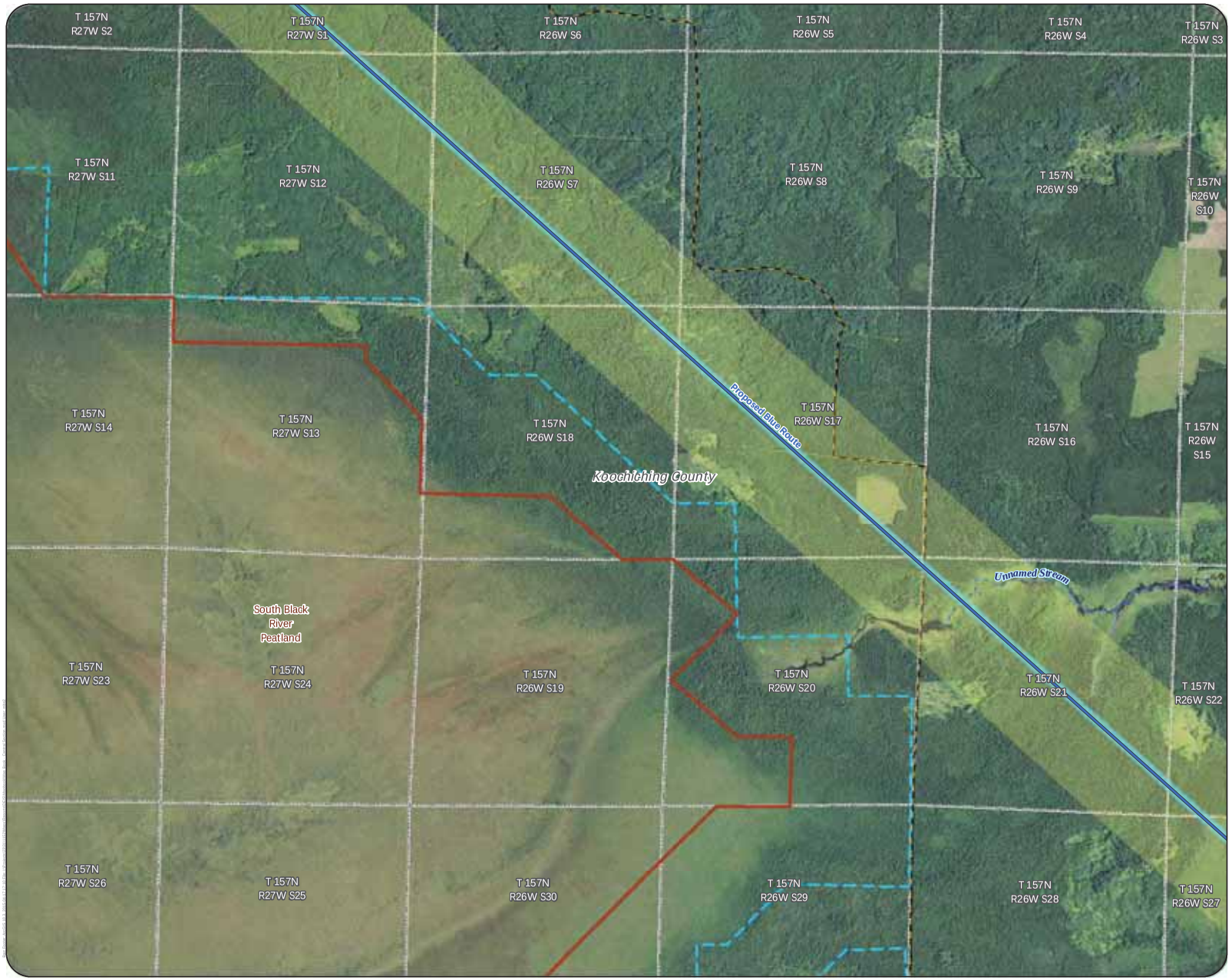
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Snowmobile Trail
- Public Land Survey Section

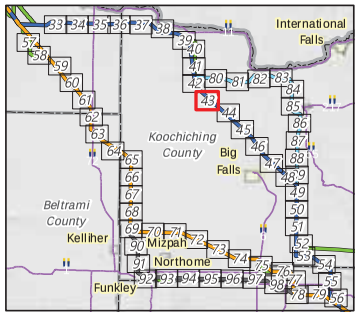
Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 42

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Snowmobile Trail
- Public Land Survey Section

Feet

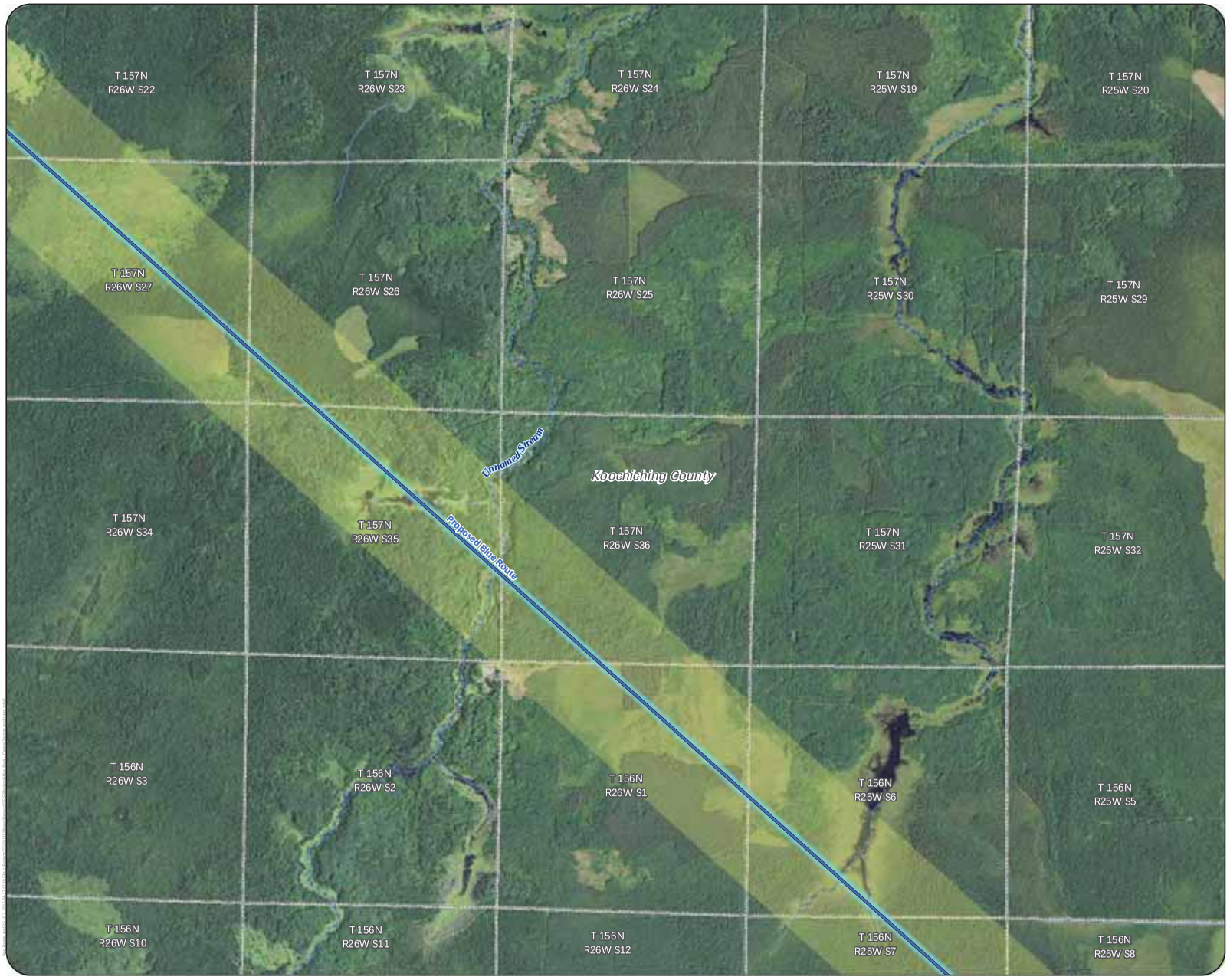
2,000 0 2,000

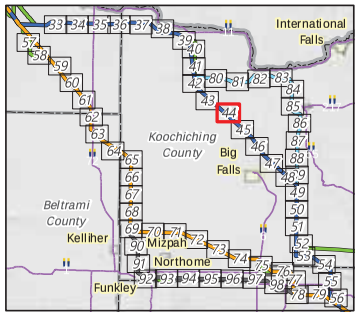
Appendix S - Map 43

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- NHD Watercourse
- PWI Watercourse
- Public Land Survey Section

Feet

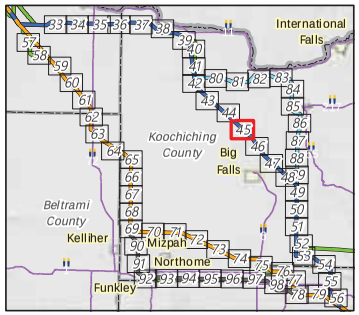
2,000 0 2,000

Appendix S - Map 44

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Aggregate Source Location
- Carry-In Water Access
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Civil Township
- Public Land Survey Section

N

Feet

2,000 0 2,000

Appendix S - Map 45

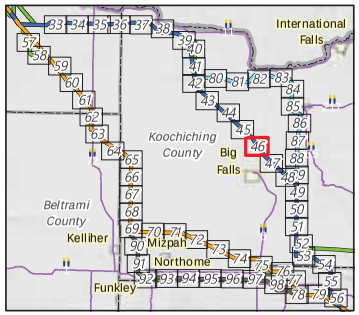
MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement

U.S. DEPARTMENT OF ENERGY

MINNESOTA DEPARTMENT OF COMMERCE



- Proposed Regeneration Site

Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Carry-In Water Access
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

MPCA Database

- Tanks and Leaks

Existing Transmission Lines

- 69 or 115 kV

Feet

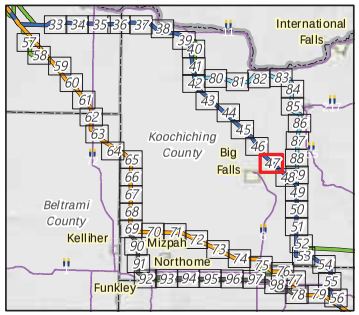
2,000 0 2,000

Appendix S - Map 46

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes
- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Airport
- NHD Watercourse
- PWI Watercourse
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- State Trail
- Public Land Survey Section

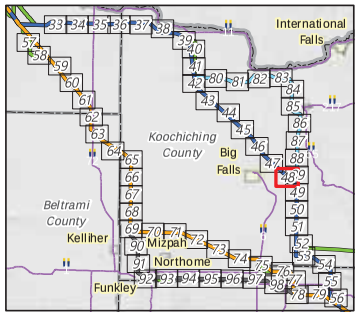
MPCA Database
- Hazardous Waste

Existing Transmission Lines
- 69 or 115 kV

Feet
2,000 0 2,000

Appendix S - Map 47

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route

Segment Options
- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 48

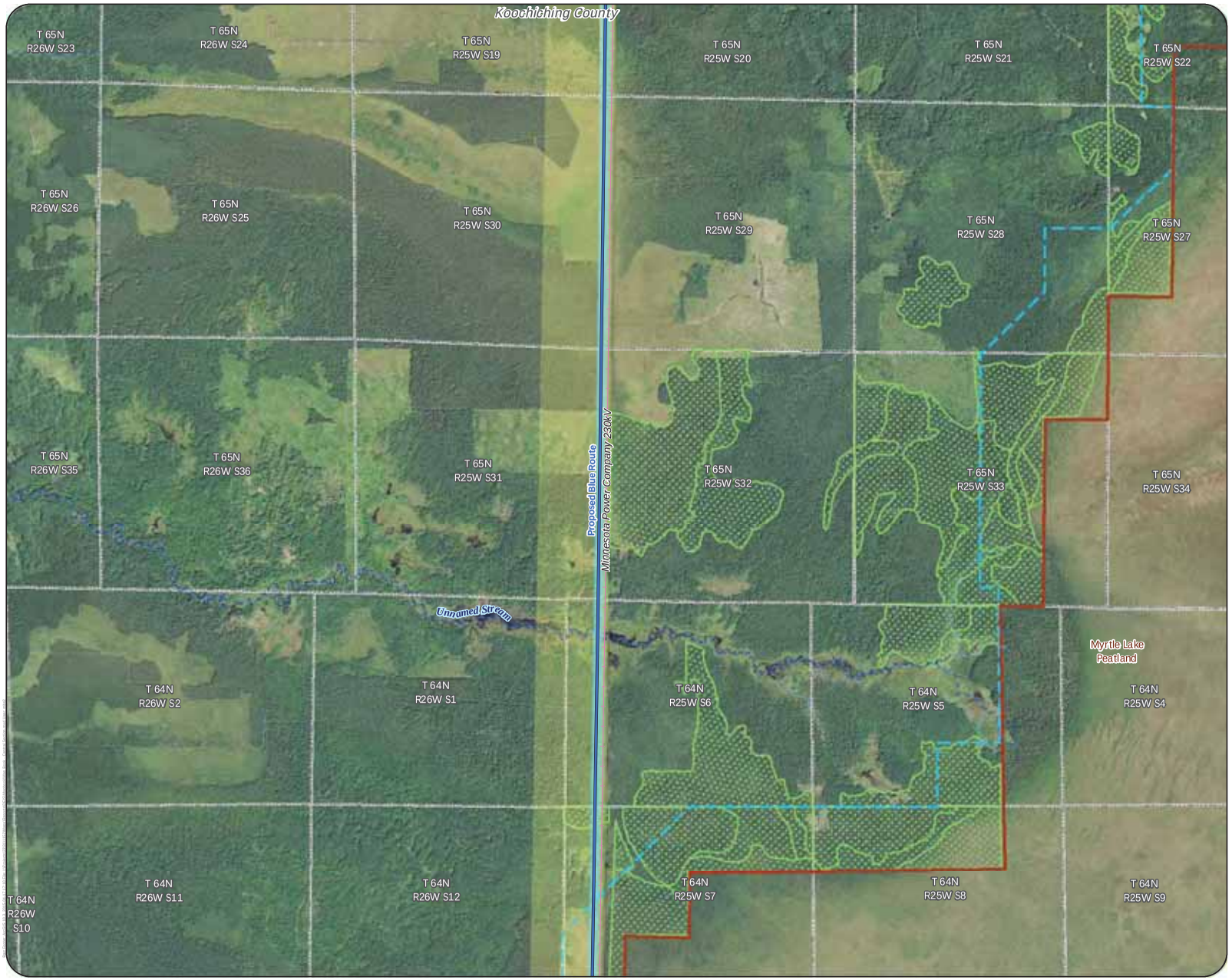
MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement

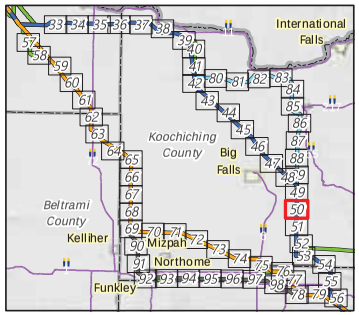
Appendix S - Map 49

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





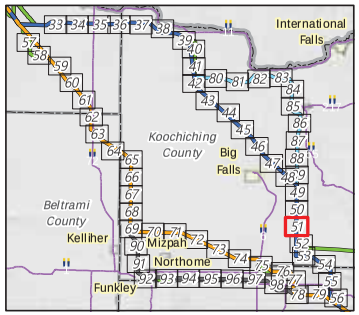
Proposed Routes
- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 50

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- NHD Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines

- 230 kV
- 500 kV

Feet

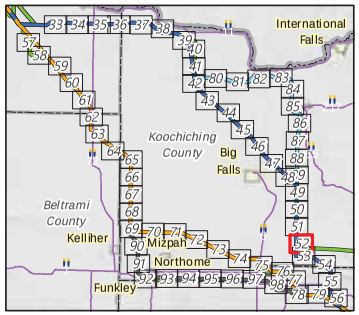
2,000 0 2,000

Appendix S - Map 51

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes
- Blue Route

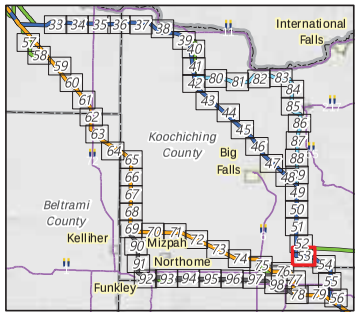
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 52

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route

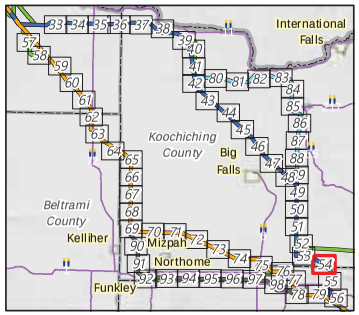
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Snowmobile Trail
- Public Land Survey Section

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 53

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

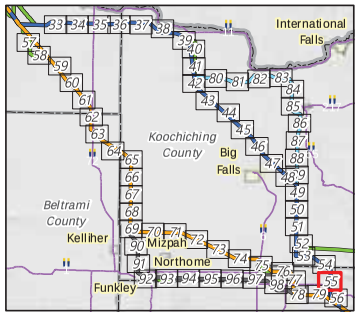
2,000 0 2,000

Appendix S - Map 54

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



- Proposed Regeneration Site

Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Ecologically Important Lowland Conifers
- Indian Reservation Land
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste
- Multiple Activities

Feet

2,000 0 2,000

Appendix S - Map 55

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement

U.S. DEPARTMENT OF ENERGY

MINNESOTA DEPARTMENT OF COMMERCE

Proposed Routes
- Blue Route
- Orange Route
- Blue/Orange Route

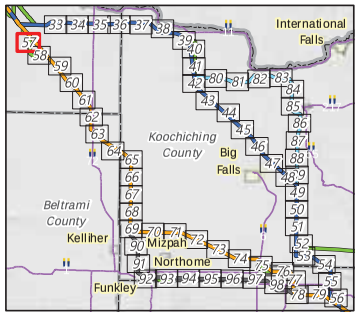
Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Carry-In Water Access
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Trout Lake
- Aquatic Management Area
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

MPCA Database
- Multiple Activities

Feet
2,000 0 2,000

Appendix S - Map 56

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Orange Route

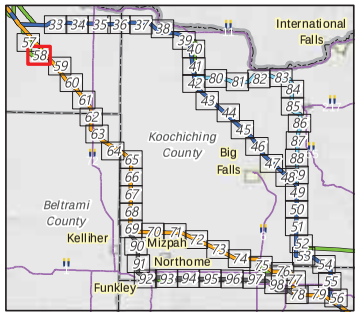
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- USFWS Interest Lands
- Indian Reservation Land
- Public Land Survey Section

Existing Transmission Lines
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 57

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Orange Route

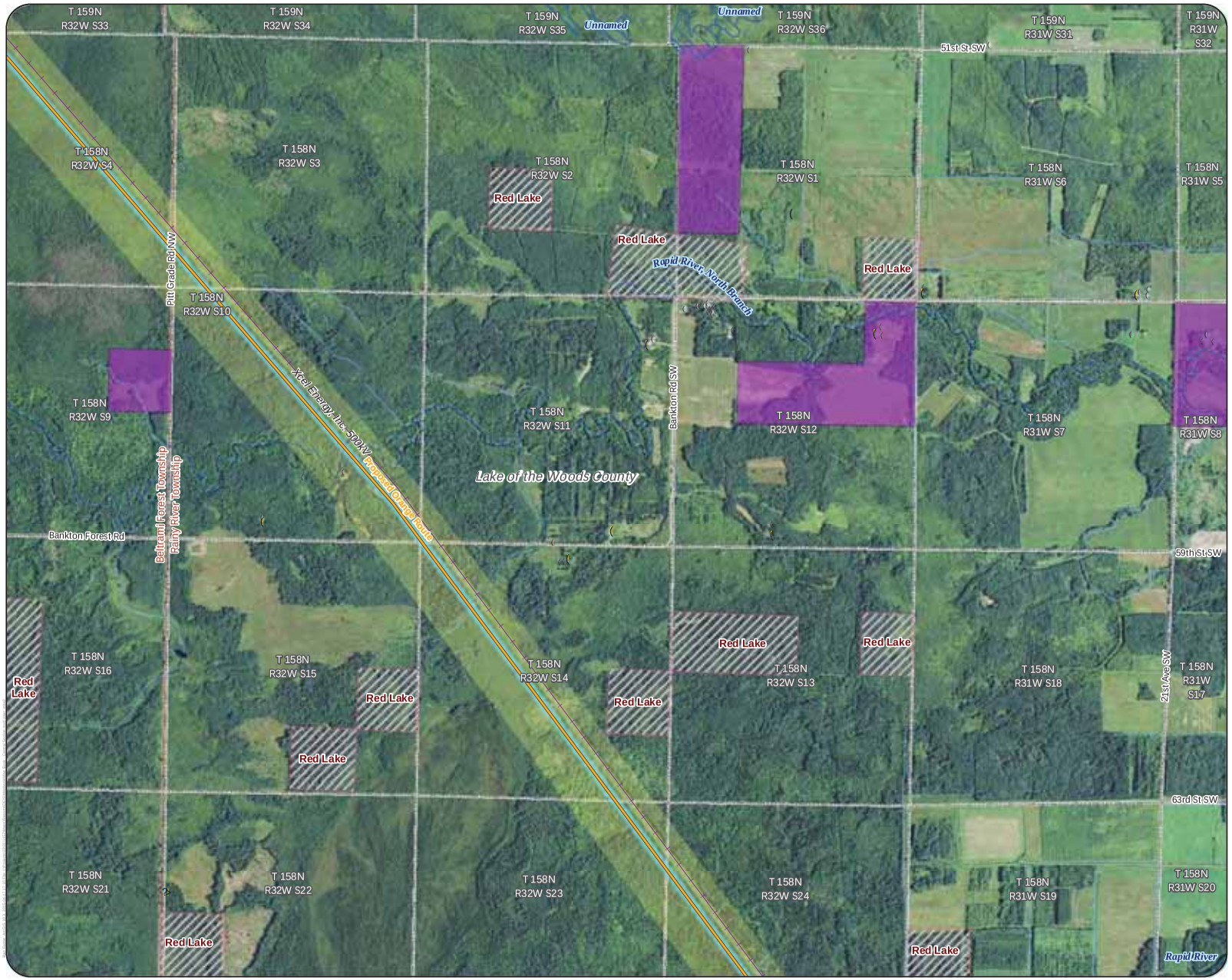
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- USFWS Interest Lands
- Indian Reservation Land
- Public Land Survey Section

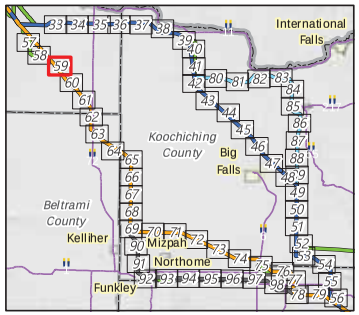
Existing Transmission Lines
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 58

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- USFWS Interest Lands
- Indian Reservation Land
- Civil Township
- Public Land Survey Section

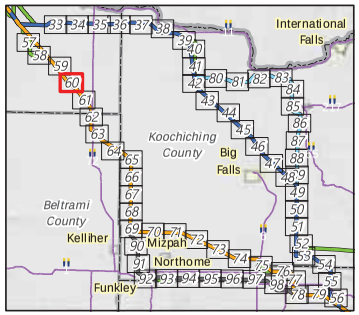
MPCA Database
- Multiple Activities

Existing Transmission Lines
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 59

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 500 kV

Feet

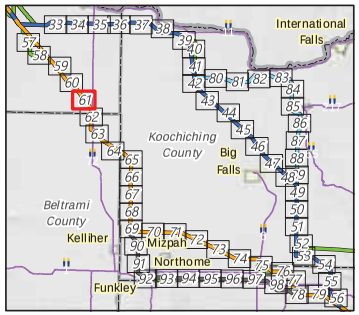
2,000 0 2,000

Appendix S - Map 60

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



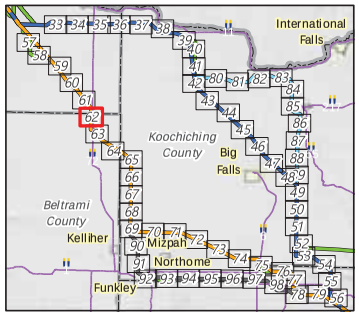
Proposed Routes
- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Wildlife Management Area (WMA)
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 61

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



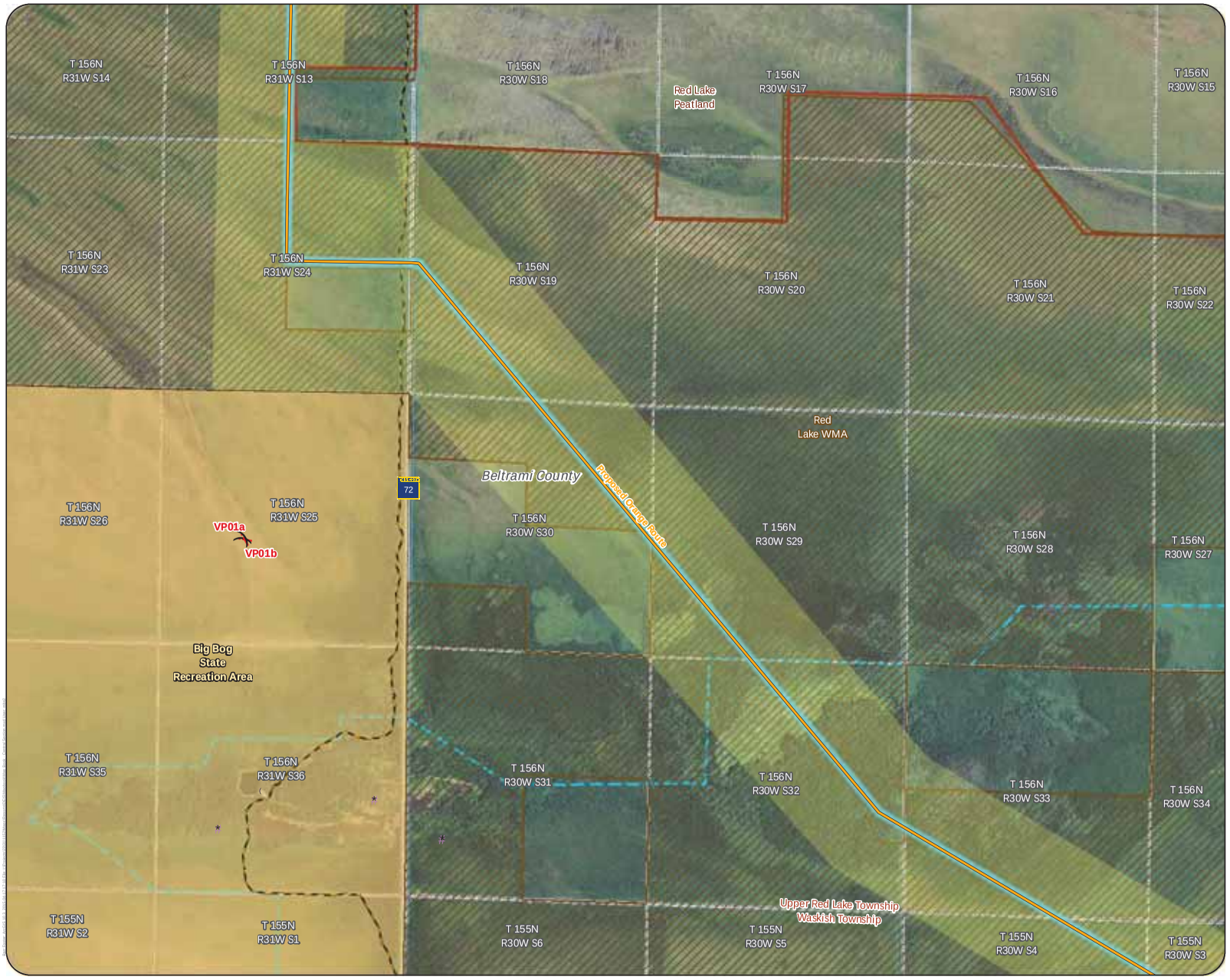
Proposed Routes
- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- NHD Watercourse
- Wildlife Management Area (WMA)
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

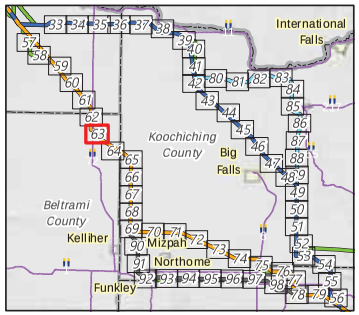
Existing Transmission Lines
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 62

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Visual Simulation Viewpoint
- Commercial or Non-Residential Structure
- Aggregate Source Location
- NHD Watercourse
- Wildlife Management Area (WMA)
- State Park
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

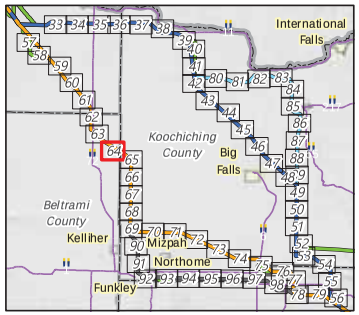
2,000 0 2,000

Appendix S - Map 63

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Commercial or Non-Residential Structure
- NHD Watercourse
- Wildlife Management Area (WMA)
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Civil Township
- Public Land Survey Section

Feet

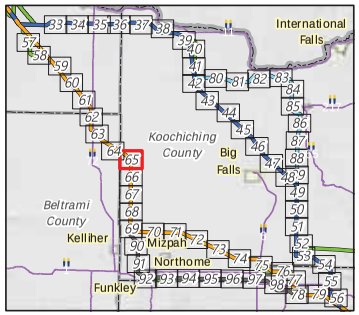
2,000 0 2,000

Appendix S - Map 64

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Commercial or Non-Residential Structure
- Approximate Calcareous Fen Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- Wildlife Management Area (WMA)
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 500 kV

Feet

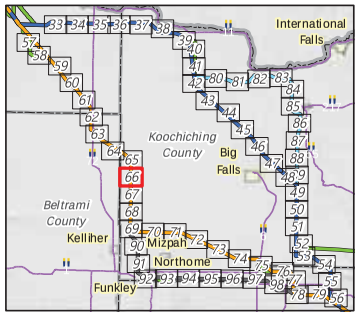
2,000 0 2,000

Appendix S - Map 65

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Approximate Calcareous Fen Location
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Civil Township
- Public Land Survey Section

Feet

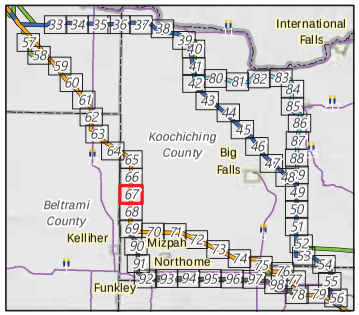
2,000 0 2,000

Appendix S - Map 66

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Preliminary Peatland SNA Watershed Protection Area
- Civil Township
- Public Land Survey Section

Feet

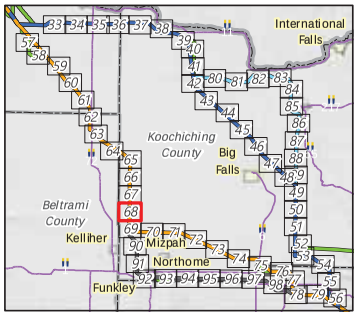
2,000 0 2,000

Appendix S - Map 67

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- NHD Watercourse
- PWI Watercourse
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

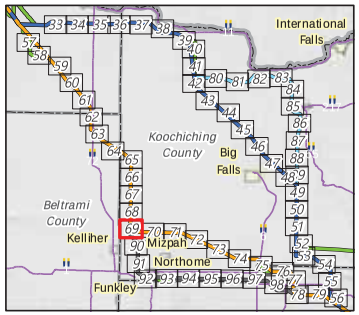
2,000 0 2,000

Appendix S - Map 68

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



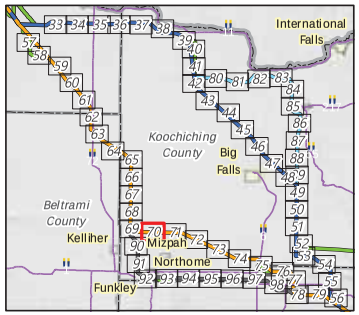
Proposed Routes
- Orange Route

Segment Options
- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Approximate Calcareous Fen Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet
2,000 0 2,000

Appendix S - Map 69

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes

- Orange Route

Alternatives

- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Public Land Survey Section

Feet

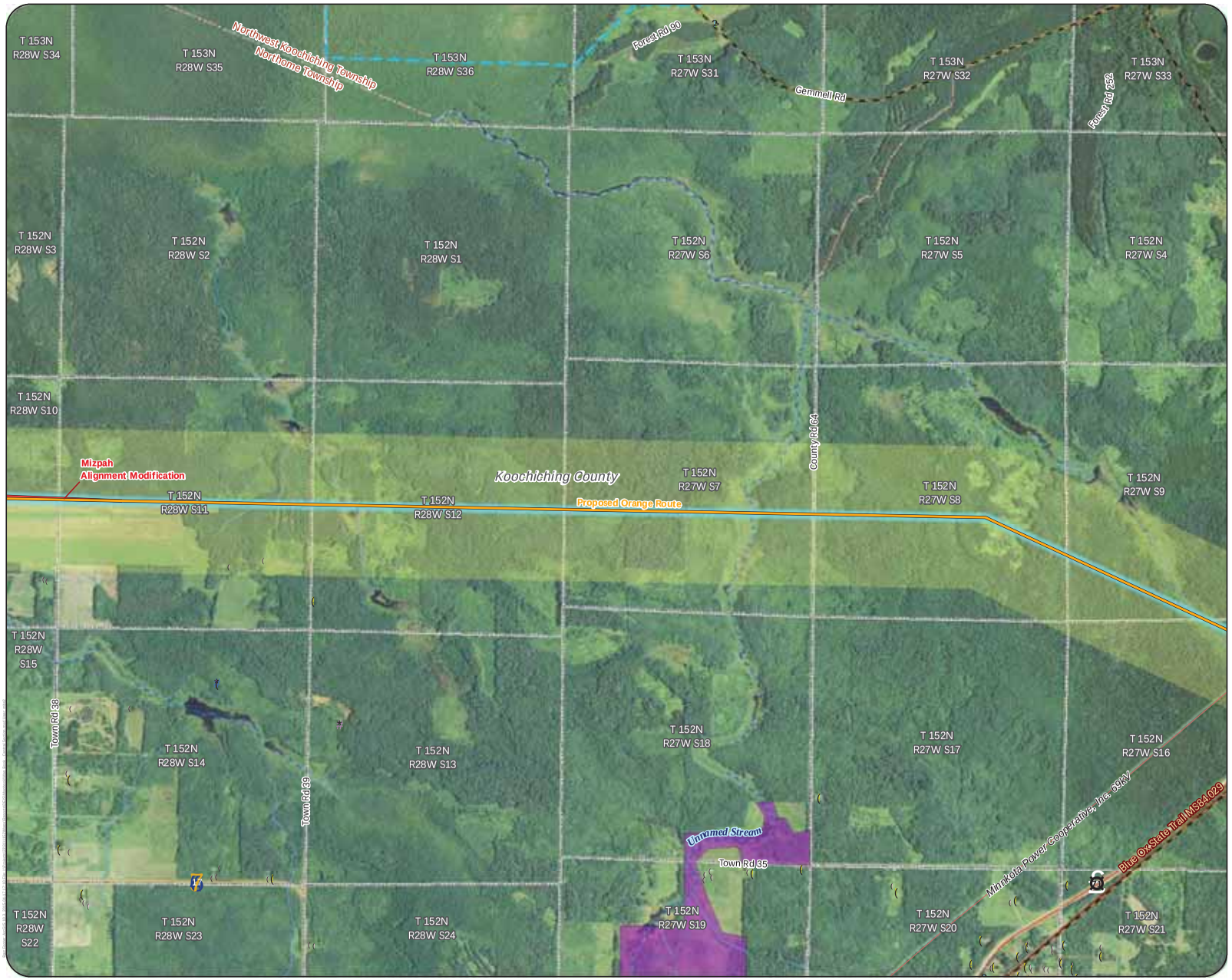
2,000 0 2,000

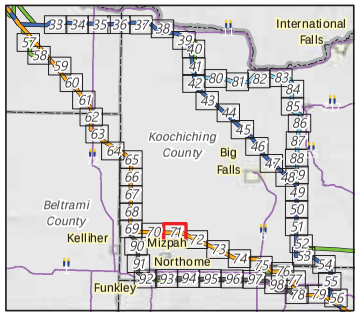
Appendix S - Map 70

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes
- Orange Route

Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Preliminary Peatland SNA Watershed Protection Area
- USFWS Interest Lands
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

MPCA Database
- Tanks and Leaks
- Multiple Activities

Existing Transmission Lines
- 69 or 115 kV

Feet

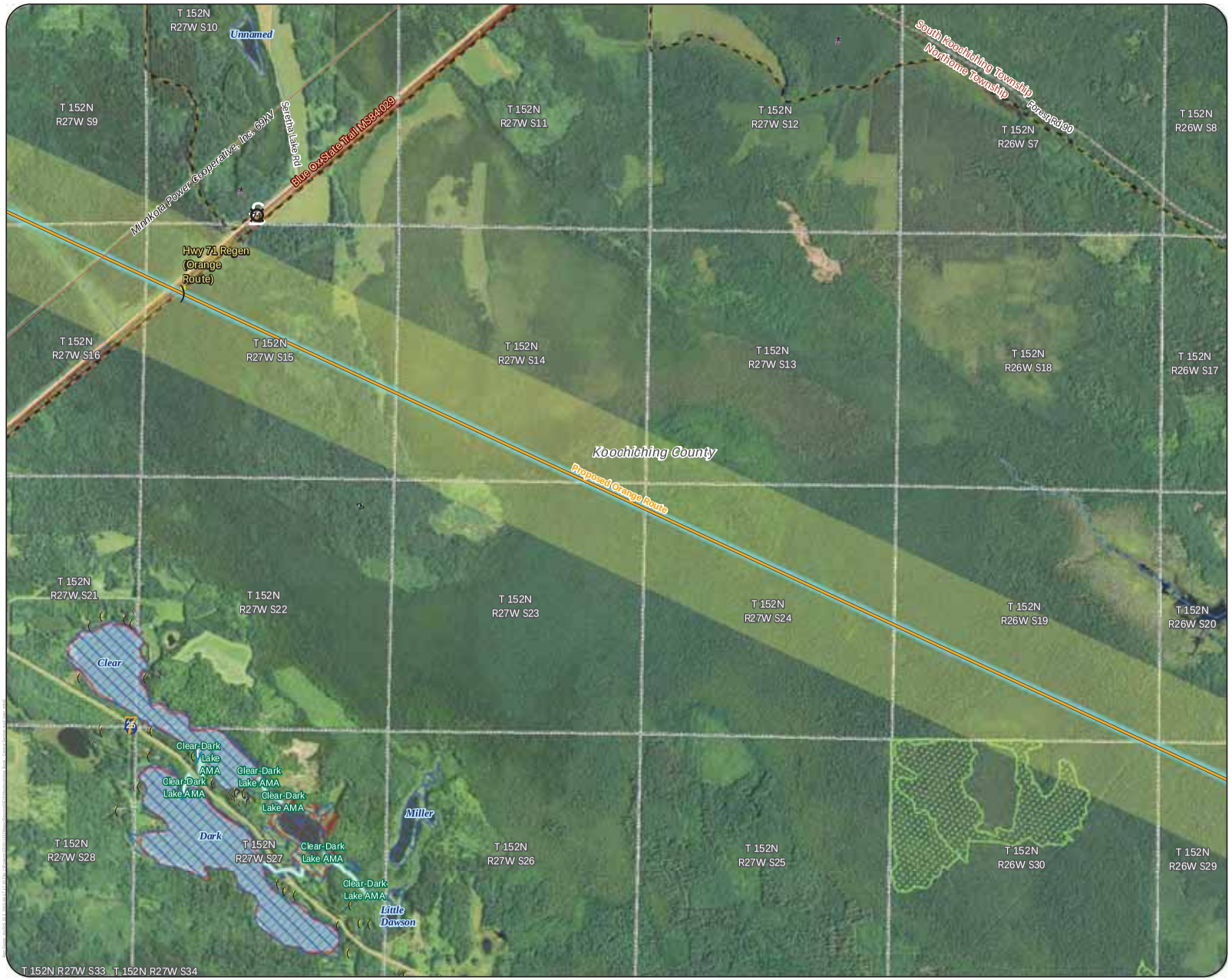
2,000 0 2,000

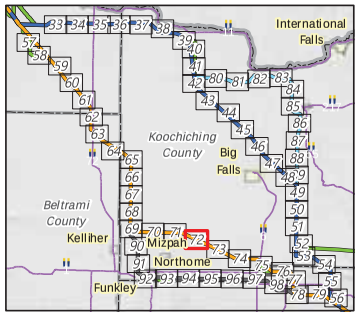
Appendix S - Map 71

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





- Proposed Regeneration Site

Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Aquatic Management Area
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV

Feet

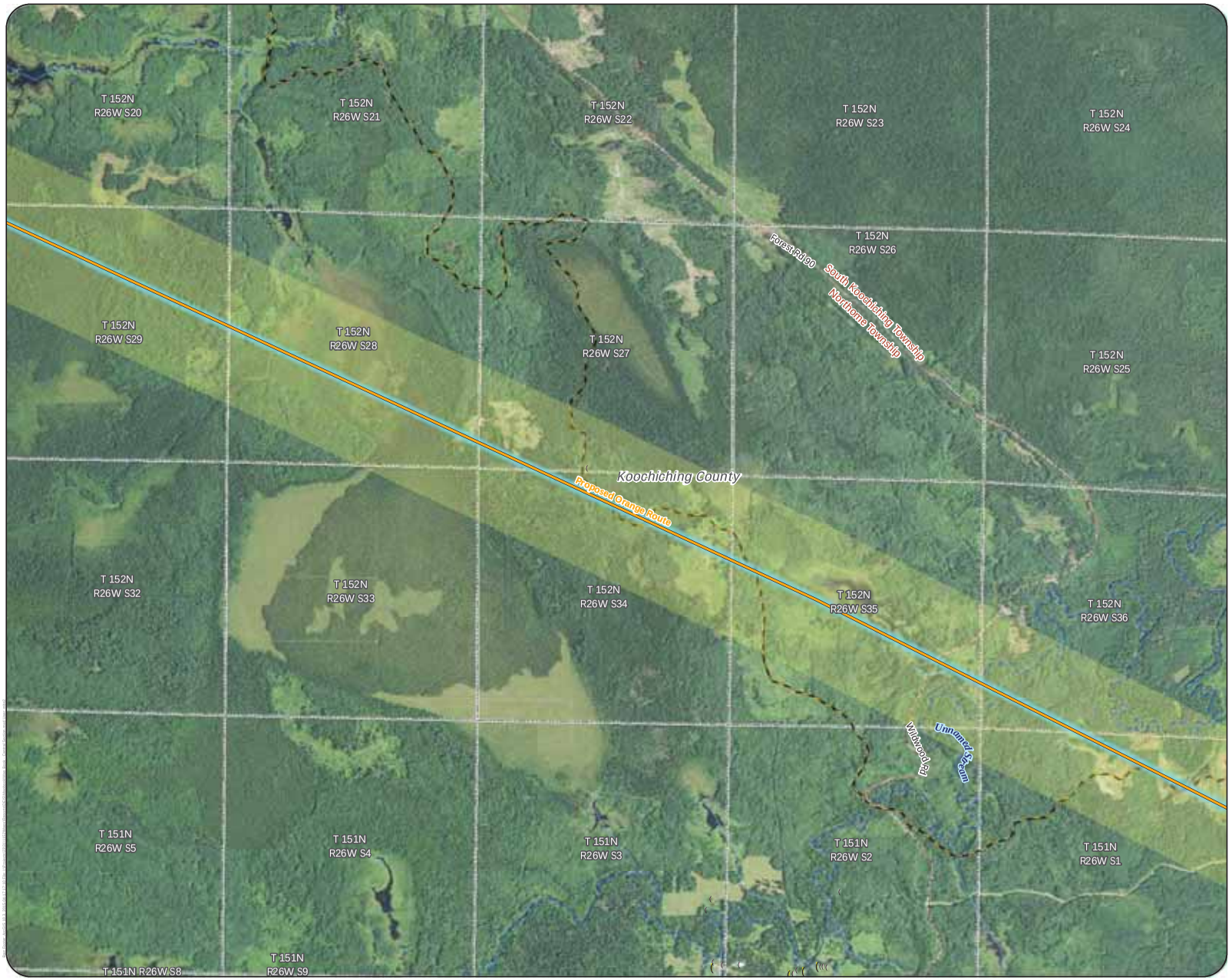
2,000 0 2,000

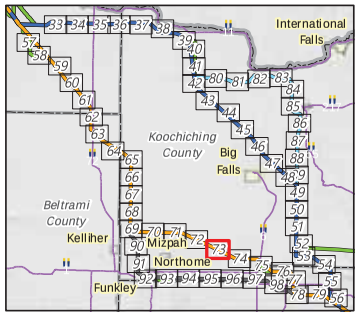
Appendix S - Map 72

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

N

Feet

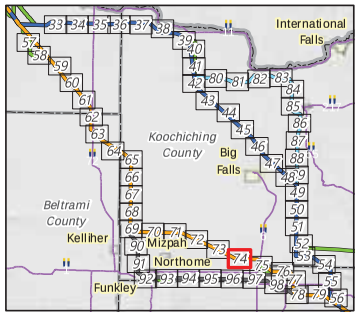
2,000 0 2,000

Appendix S - Map 73

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Aggregate Source Location
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Public Land Survey Section

Feet

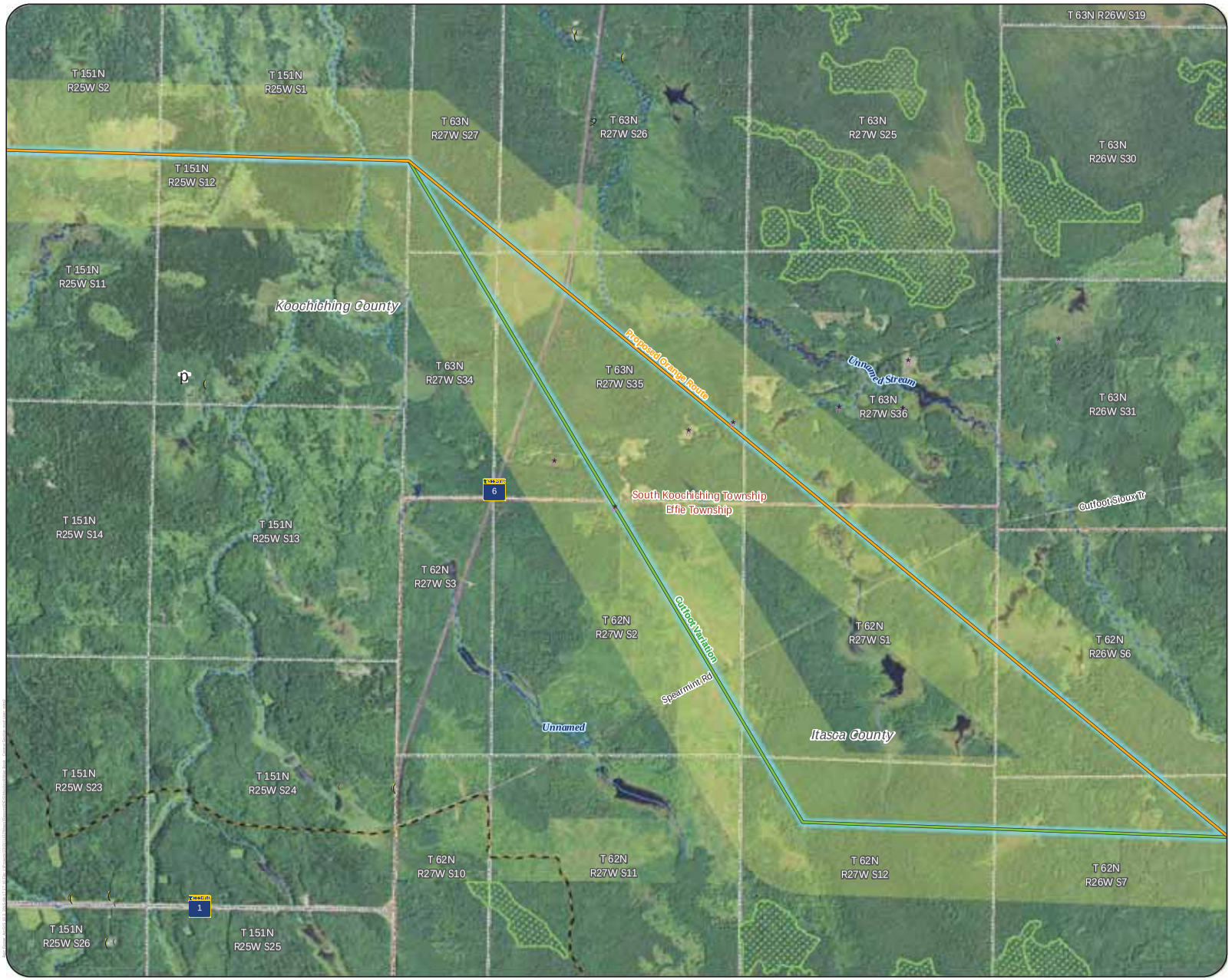
2,000 0 2,000

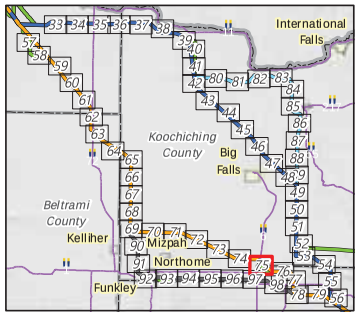
Appendix S - Map 74

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes

- Orange Route

Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Airstrip
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

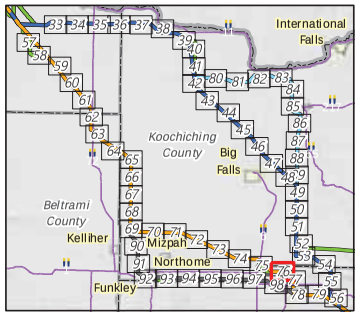
2,000 0 2,000

Appendix S - Map 75

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



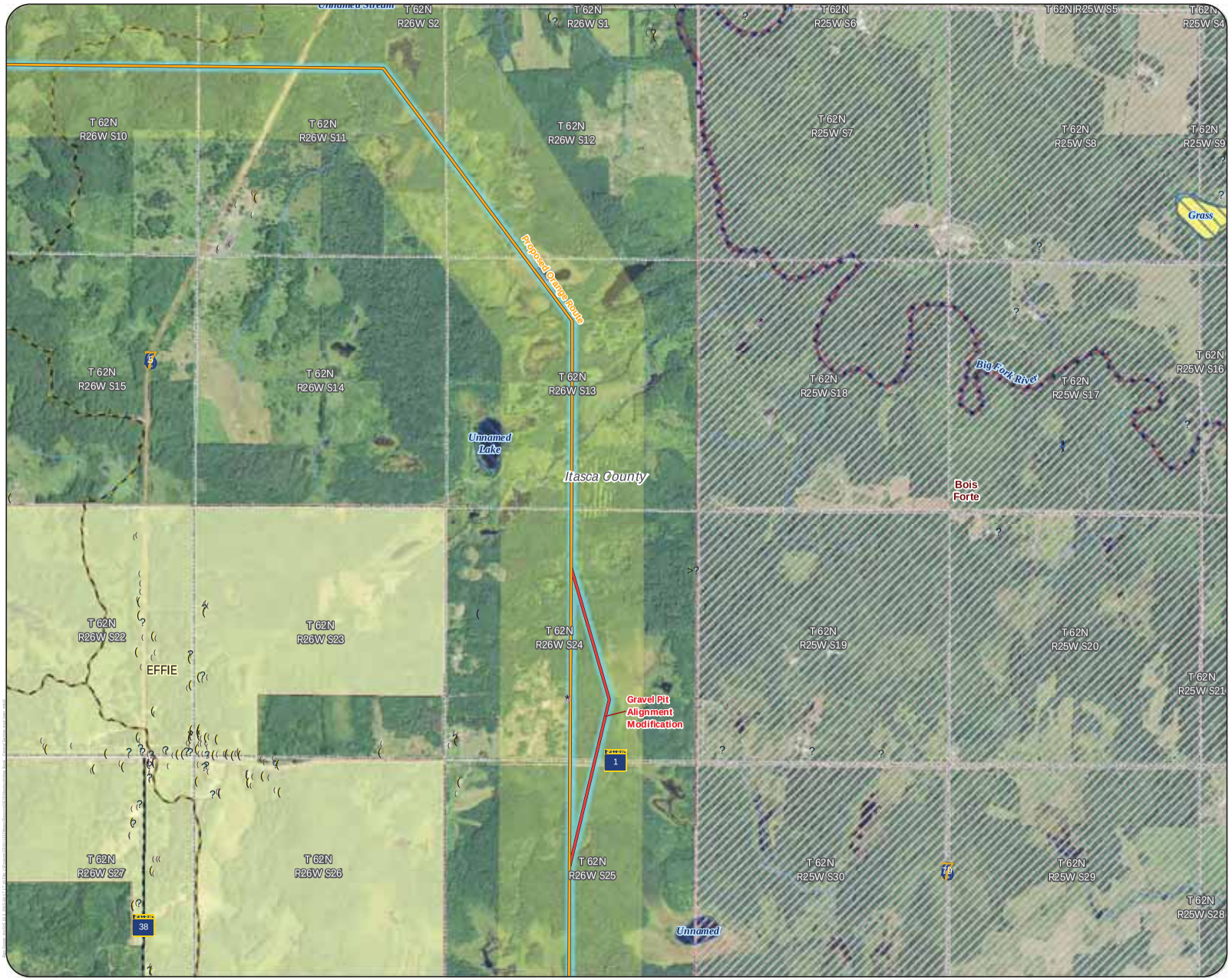
Proposed Routes
- Orange Route

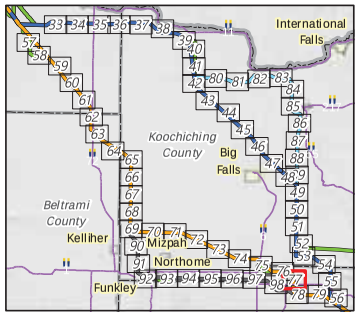
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- PWI Waterbody
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

Feet
2,000 0 2,000

Appendix S - Map 76

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Orange Route

Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- Wild Rice Lake
- Indian Reservation Land
- Scenic Byway
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database
- Hazardous Waste
- Tanks and Leaks
- Multiple Activities

Feet

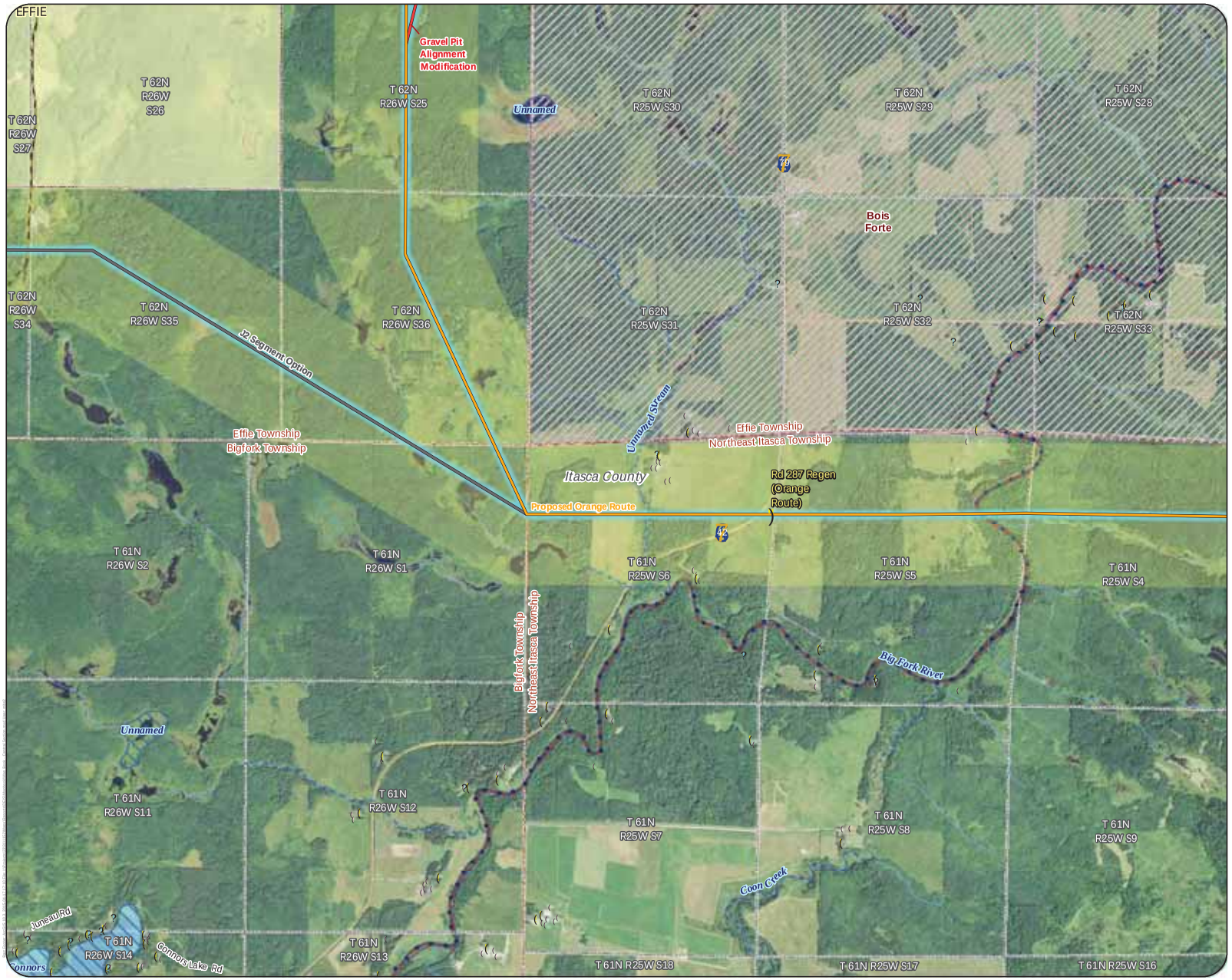
2,000 0 2,000

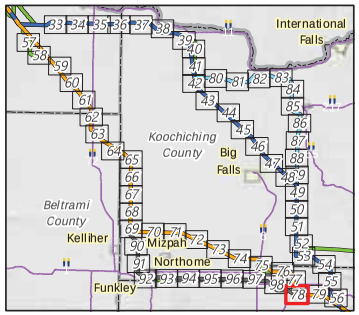
Appendix S - Map 77

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





- Proposed Regeneration Site

Proposed Routes
- Orange Route

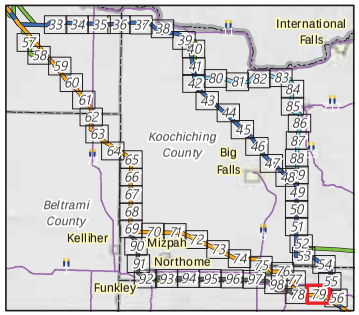
Segment Options
- J2 Segment Option

Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- Indian Reservation Land
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

Feet
2,000 0 2,000

Appendix S - Map 78

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes

- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Ecologically Important Lowland Conifers
- Indian Reservation Land
- Civil Township
- Public Land Survey Section

Feet

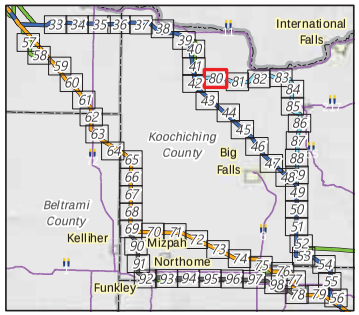
2,000 0 2,000

Appendix S - Map 79

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Communication Tower
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Indian Reservation Land
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

Feet

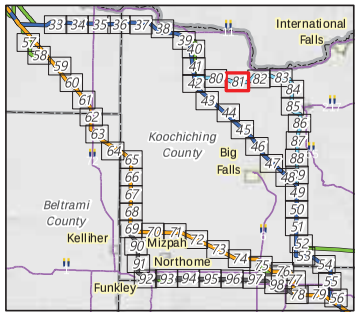
2,000 0 2,000

Appendix S - Map 80

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Public Land Survey Section

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

N

Feet

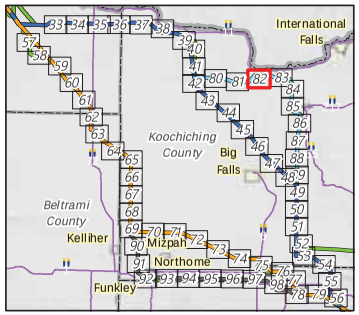
2,000 0 2,000

Appendix S - Map 81

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Church
- Cemetery
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Preliminary Peatland SNA Watershed Protection Area
- Ecologically Important Lowland Conifers
- Scenic Byway
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

MPCA Database

- Tanks and Leaks

Existing Transmission Lines

- 230 kV

Feet

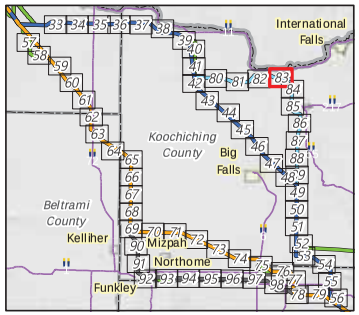
2,000 0 2,000

Appendix S - Map 82

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Ecologically Important Lowland Conifers
- Scenic Byway
- Snowmobile Trail
- Civil Township
- Public Land Survey Section
- County Boundary
- International Boundary

MPCA Database

- Multiple Activities

Existing Transmission Lines

- 230 kV

Feet

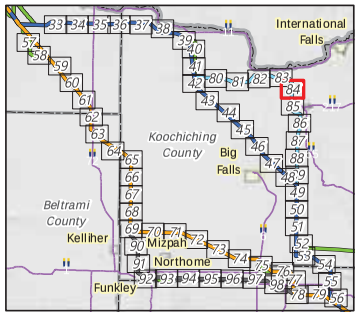
2,000 0 2,000

Appendix S - Map 83

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Church
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Snowmobile Trail
- Public Land Survey Section

MPCA Database

- Multiple Activities

Existing Transmission Lines

- 230 kV

Feet

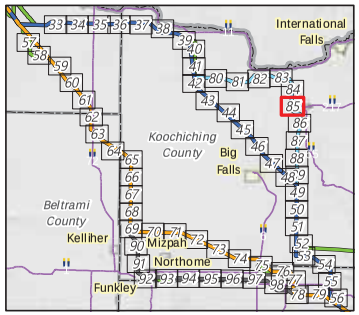
2,000 0 2,000

Appendix S - Map 84

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Airport
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Snowmobile Trail
- State Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste
- Tanks and Leaks
- Multiple Activities

Existing Transmission Lines

- 69 or 115 kV
- 230 kV

Feet

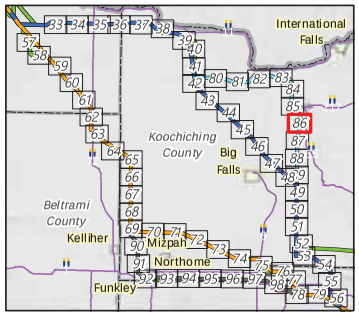
2,000 0 2,000

Appendix S - Map 85

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options
- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Water Trail
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

MPCA Database
- Multiple Activities

Existing Transmission Lines
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 86

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement

Segment Options
- C2 Segment Option

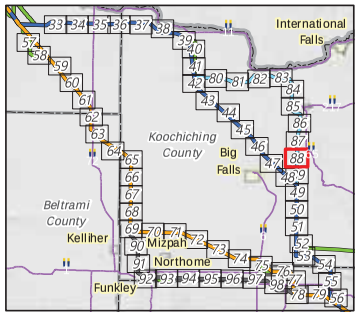
Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Airstrip
- Aggregate Source Location
- NHD Watercourse
- PWI Watercourse
- Ecologically Important Lowland Conifers
- Civil Township
- Public Land Survey Section

Existing Transmission Lines
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 87

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Segment Options

- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines

- 230 kV

Feet

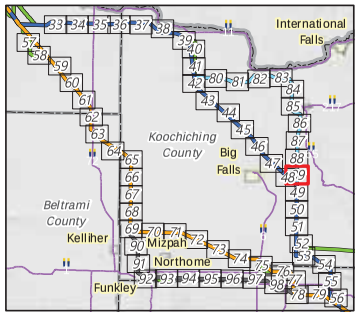
2,000 0 2,000

Appendix S - Map 88

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes
- Blue Route

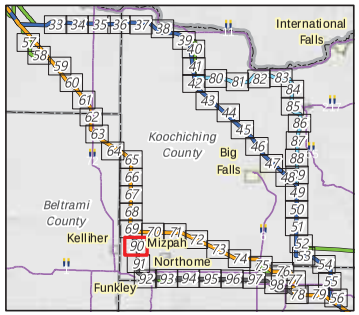
Segment Options
- C2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 89

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Segment Options

- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- Public Land Survey Section

Feet

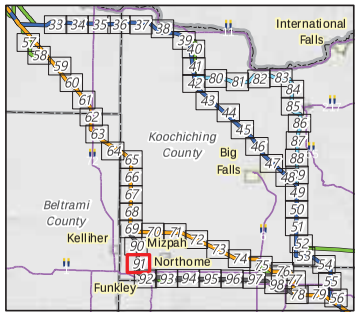
2,000 0 2,000

Appendix S - Map 90

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- Scenic Byway
- Snowmobile Trail
- State Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste
- Tanks and Leaks

Existing Transmission Lines

- 69 or 115 kV

Feet

2,000 0 2,000

Appendix S - Map 91

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement

U.S. DEPARTMENT OF ENERGY

MINNESOTA DEPARTMENT OF COMMERCE

Segment Options

- J2 Segment Option

Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- School
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Shallow Lake
- Aquatic Management Area
- Scenic Byway
- Snowmobile Trail
- State Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste
- Tanks and Leaks
- Multiple Activities

Feet

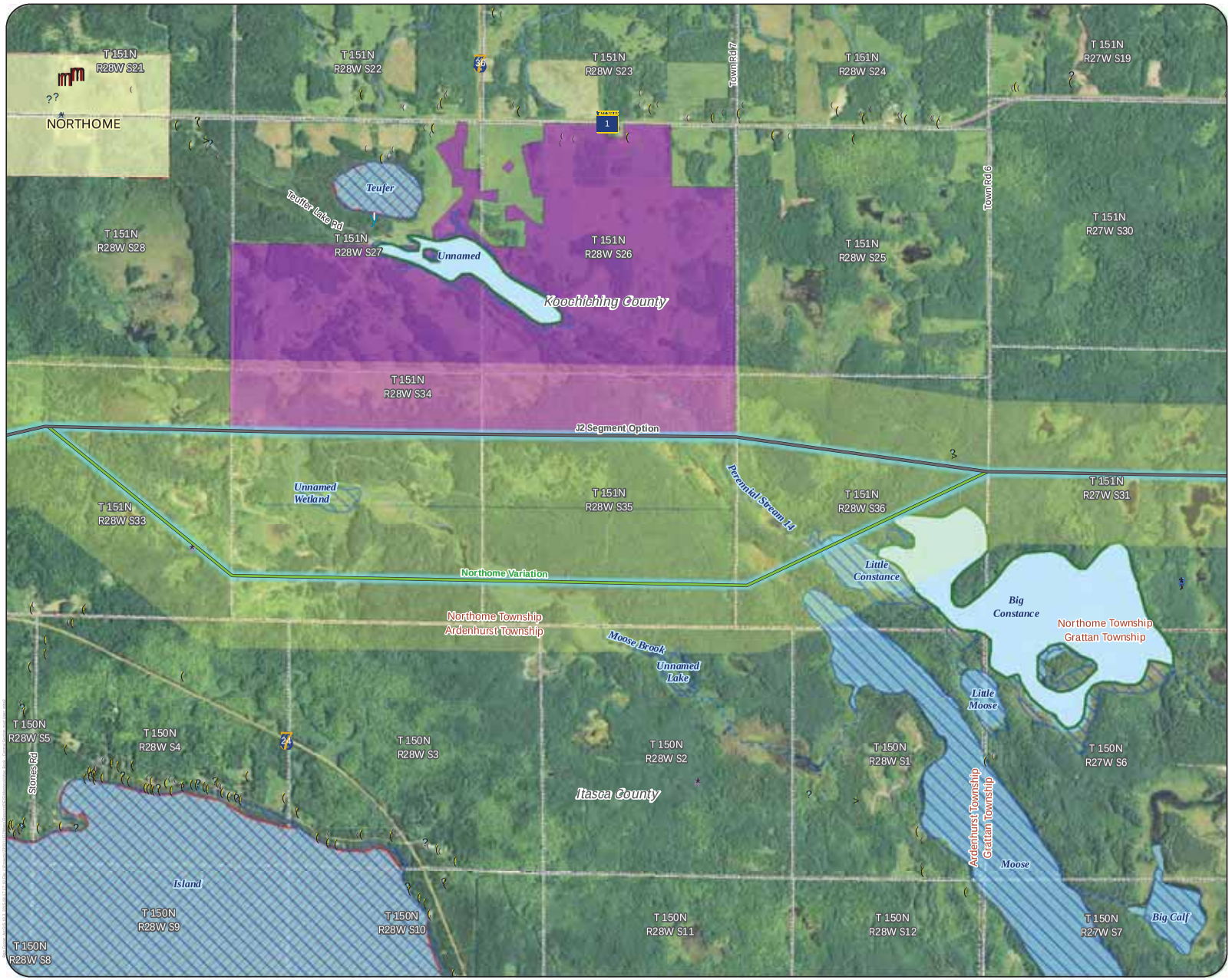
2,000 0 2,000

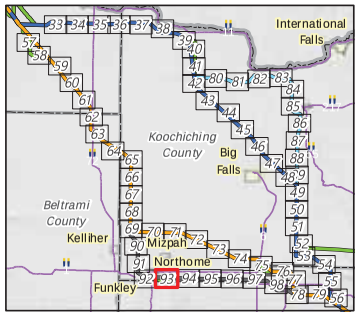
Appendix S - Map 92

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Segment Options
- J2 Segment Option

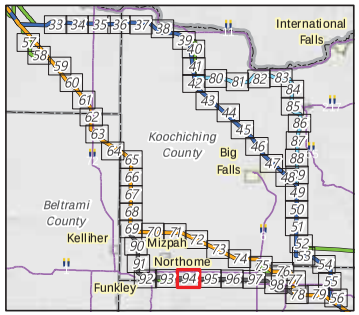
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- School
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Shallow Lake
- USFWS Interest Lands
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database
- Hazardous Waste
- Tanks and Leaks
- Multiple Activities

Feet
2,000 0 2,000

Appendix S - Map 93

MAP BOOK - CENTRAL SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Segment Options

- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Ecologically Important Lowland Conifers
- Civil Township
- Public Land Survey Section

Feet

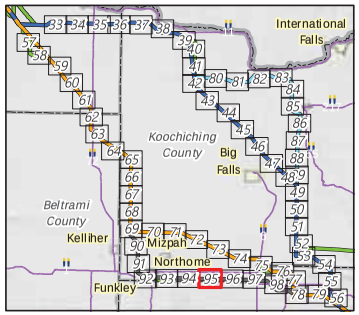
2,000 0 2,000

Appendix S - Map 94

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- Civil Township
- Public Land Survey Section

MPCA Database

- Multiple Activities

Feet

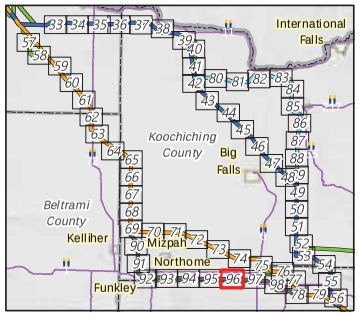
2,000 0 2,000

Appendix S - Map 95

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Civil Township
- Public Land Survey Section

Feet

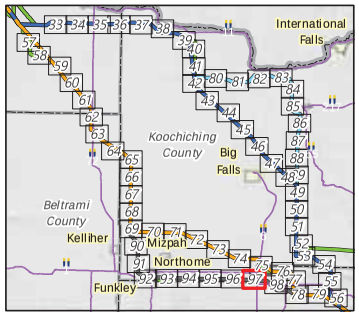
2,000 0 2,000

Appendix S - Map 96

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- J2 Segment Option

Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

Feet

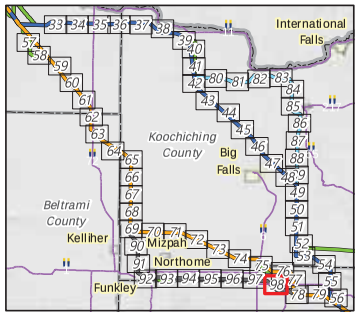
2,000 0 2,000

Appendix S - Map 97

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Segment Options

- J2 Segment Option
- Anticipated Route Width
- Anticipated Right-of-Way
- Visual Simulation Viewpoint
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- PWI Waterbody
- Ecologically Important Lowland Conifers
- Scenic Byway
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database

- Multiple Activities

Feet

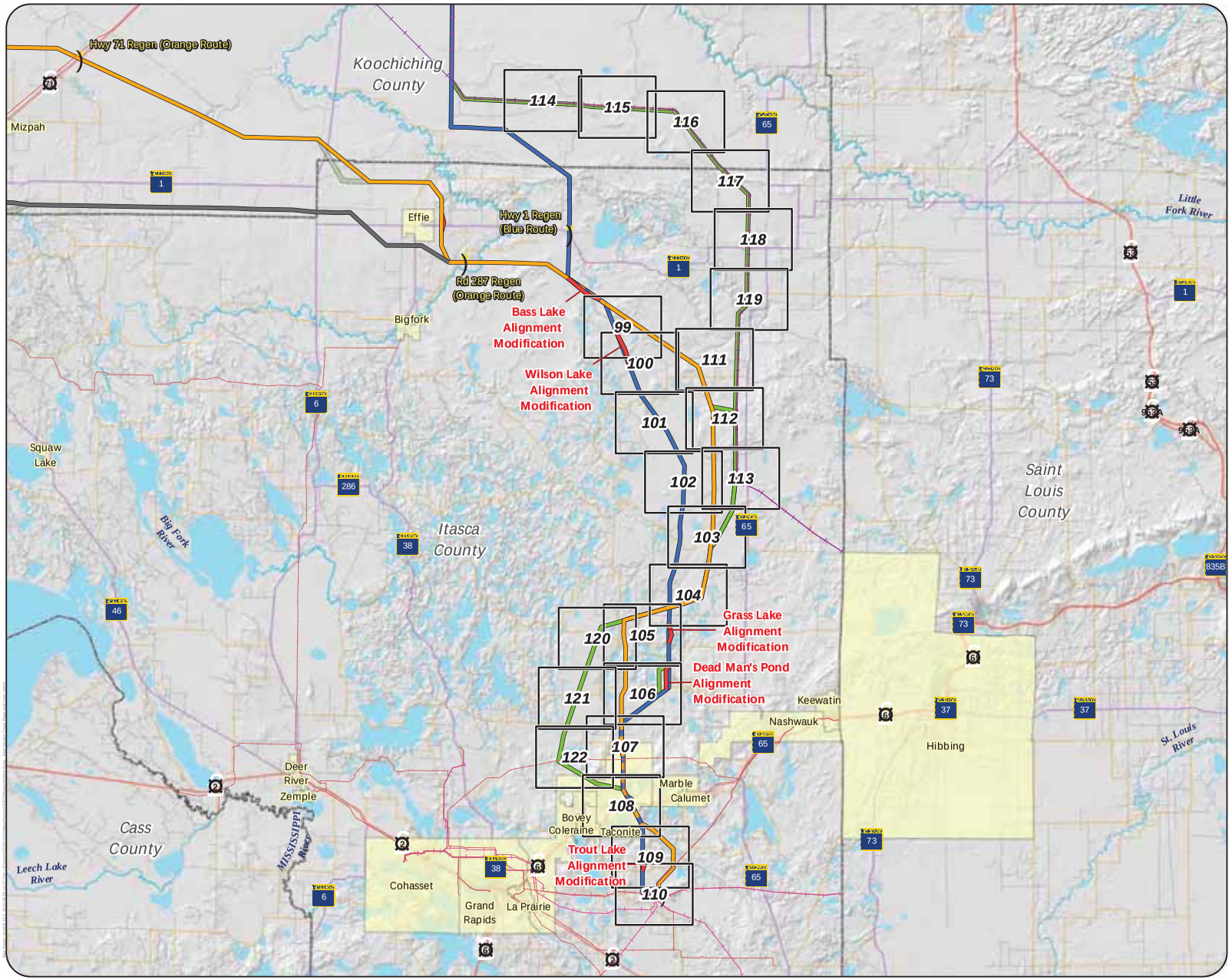
2,000 0 2,000

Appendix S - Map 98

MAP BOOK - CENTRAL SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



- Map Book Page
- Proposed Regeneration Site
- Proposed Iron Range 500 kV Substation

Proposed Routes
- Blue/Orange Route
- Blue Route
- Orange Route
- Segment Option

Alternatives
- Route Variation
- Alignment Modification

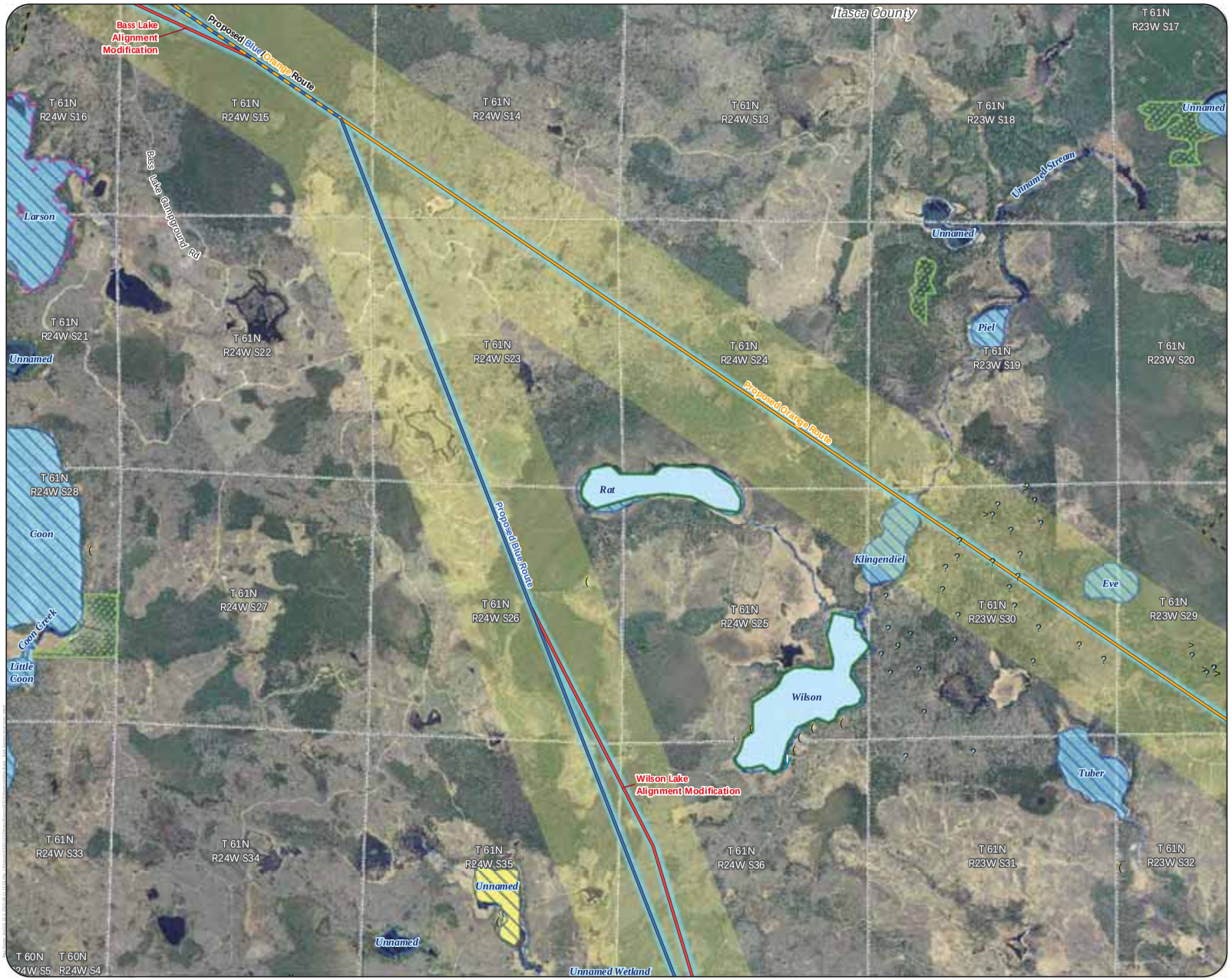
Existing Transmission Lines
- 69 or 115 kV
- 230 kV
- 500 kV

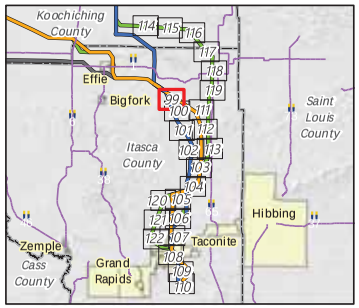
Streets and Highways
- US Highway
- State Trunk Highway
- County State Aid Highway
- Local Road
- Municipal Boundary
- County Boundary

Miles
6 0 6

Appendix S - East Section Cover

EAST SECTION OVERVIEW
Great Northern Transmission Line
Final Environmental Impact Statement





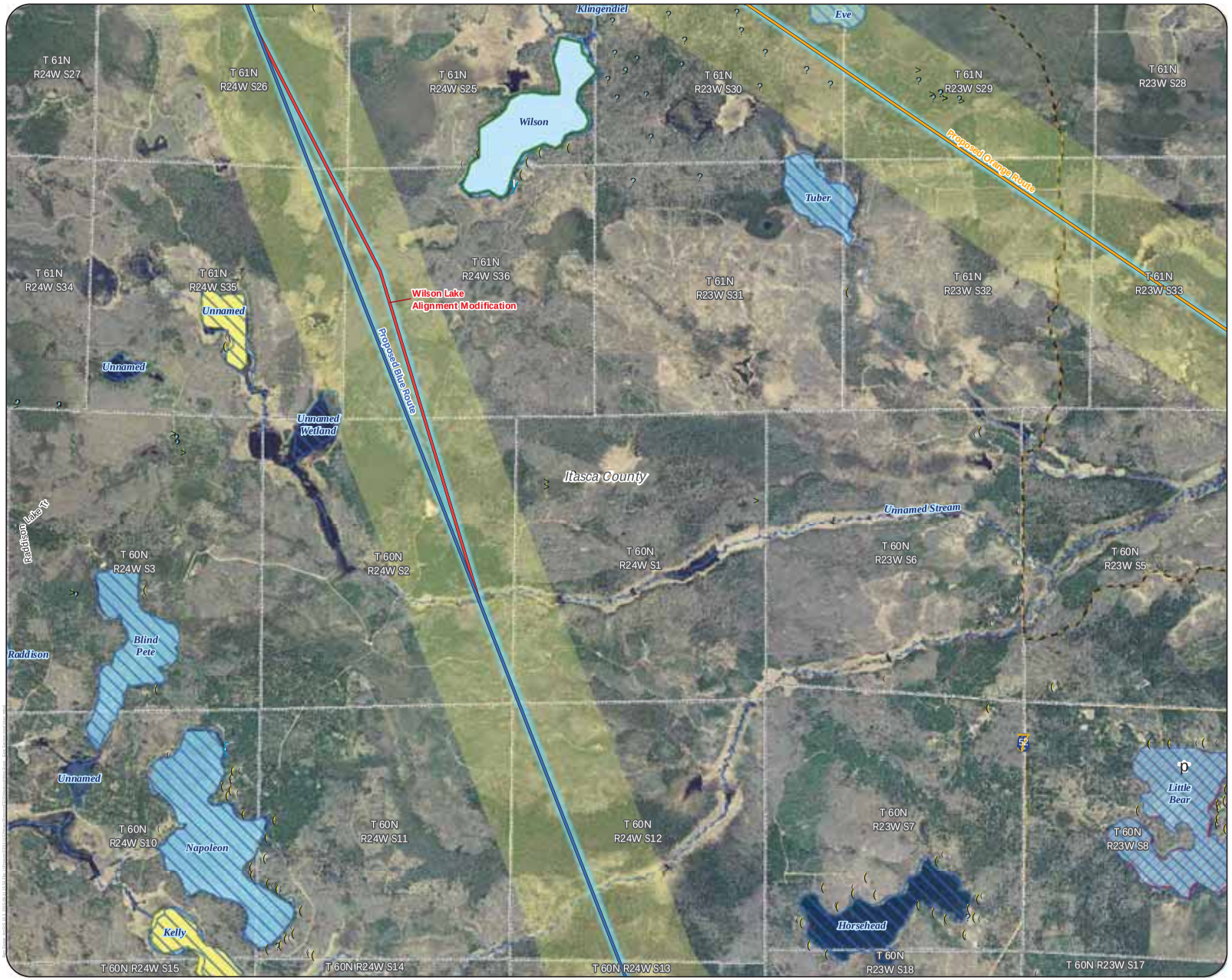
Proposed Routes
- Blue Route
- Orange Route
- Blue/Orange Route

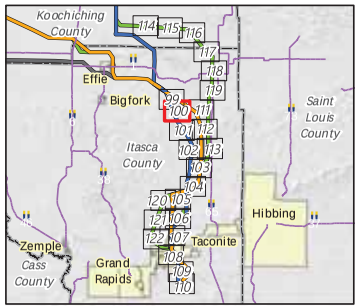
Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Wild Rice Lake
- Trout Lake
- Shallow Lake
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Public Land Survey Section

Feet
2,000 0 2,000

Appendix S - Map 99

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





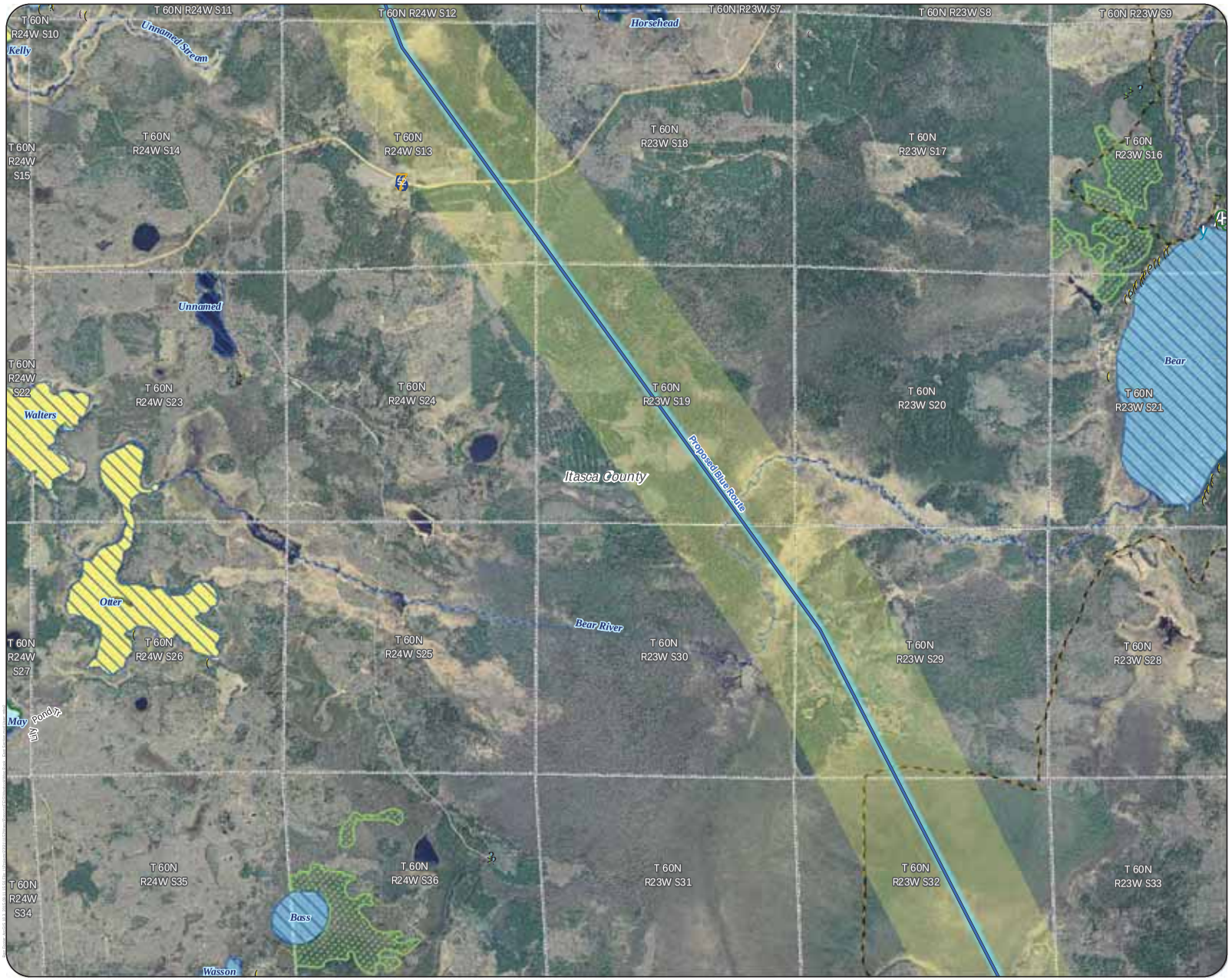
Proposed Routes
- Blue Route
- Orange Route

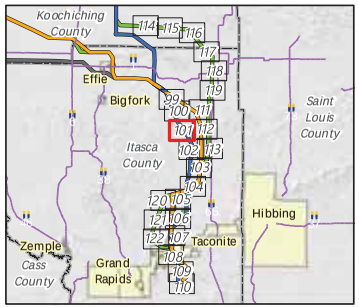
Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Airstrip
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Carry-In Water Access
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Shallow Lake
- Snowmobile Trail
- Public Land Survey Section

Feet
2,000 0 2,000

Appendix S - Map 100

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes

- Blue Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Forest Campground
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Wild Rice Lake
- Shallow Lake
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Public Land Survey Section

Feet

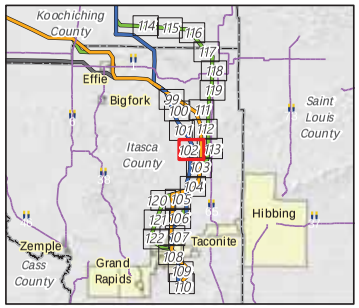
2,000 0 2,000

Appendix S - Map 101

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes

- Blue Route
- Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Snowmobile Trail
- State Trail
- Public Land Survey Section

Feet

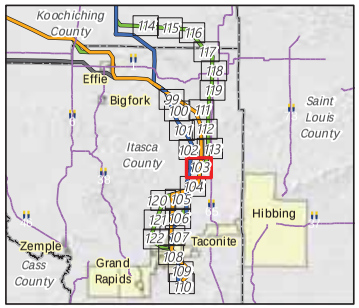
2,000 0 2,000

Appendix S - Map 102

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Proposed Routes
- Blue Route
- Orange Route

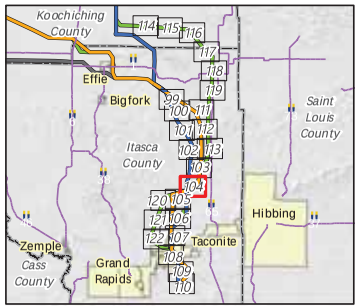
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Carry-In Water Access
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Shallow Lake
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

MPCA Database
- Multiple Activities

Feet
2,000 0 2,000

Appendix S - Map 103

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route
- Orange Route

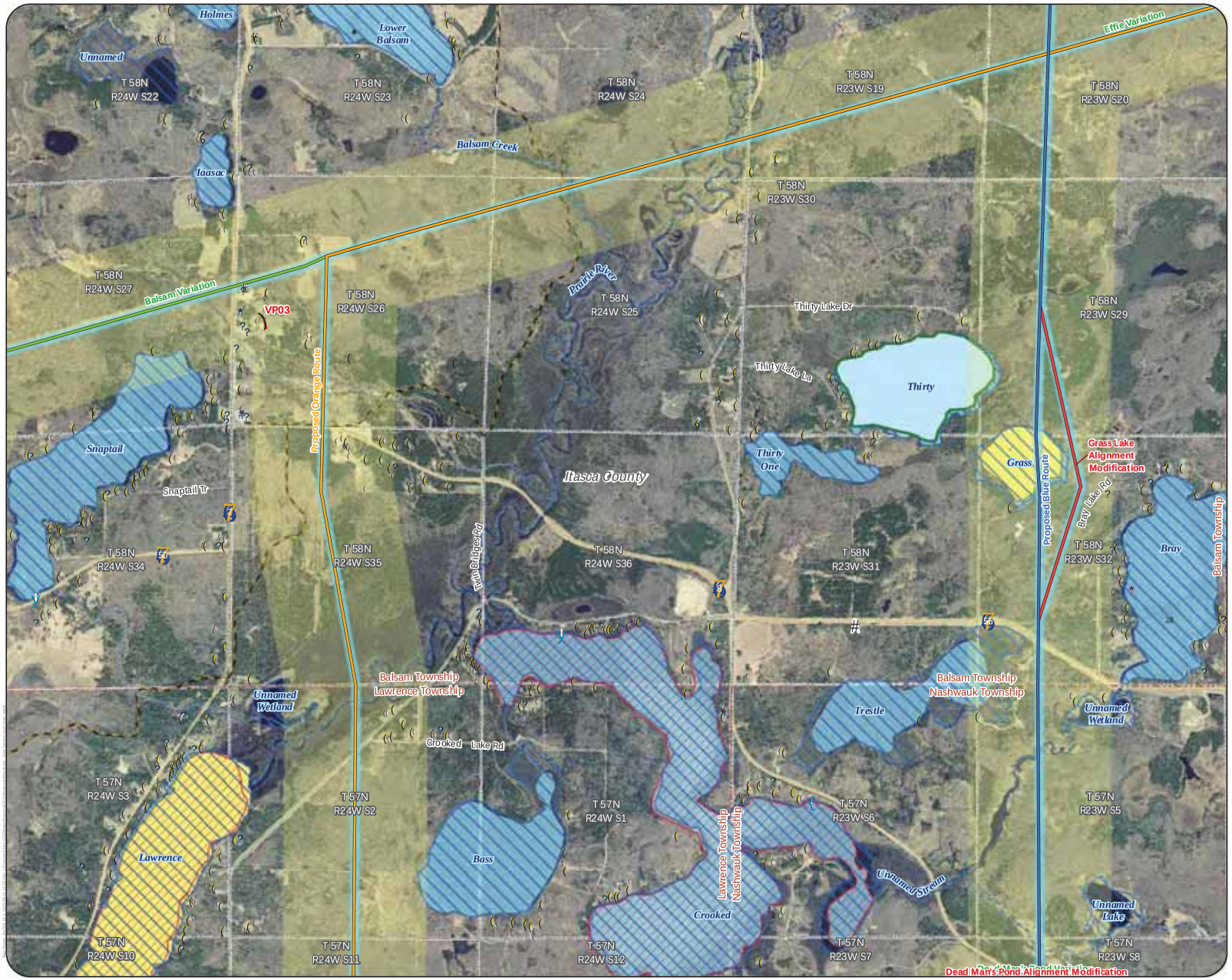
Alternatives
- Route Variation
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Wild Rice Lake
- Shallow Lake
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

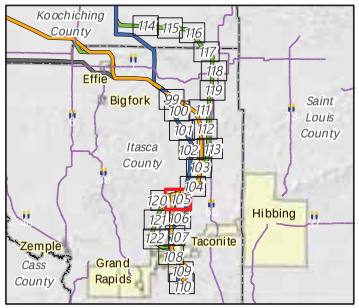
MPCA Database
- Hazardous Waste

Feet
2,000 0 2,000

Appendix S - Map 104

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue Route
- Orange Route

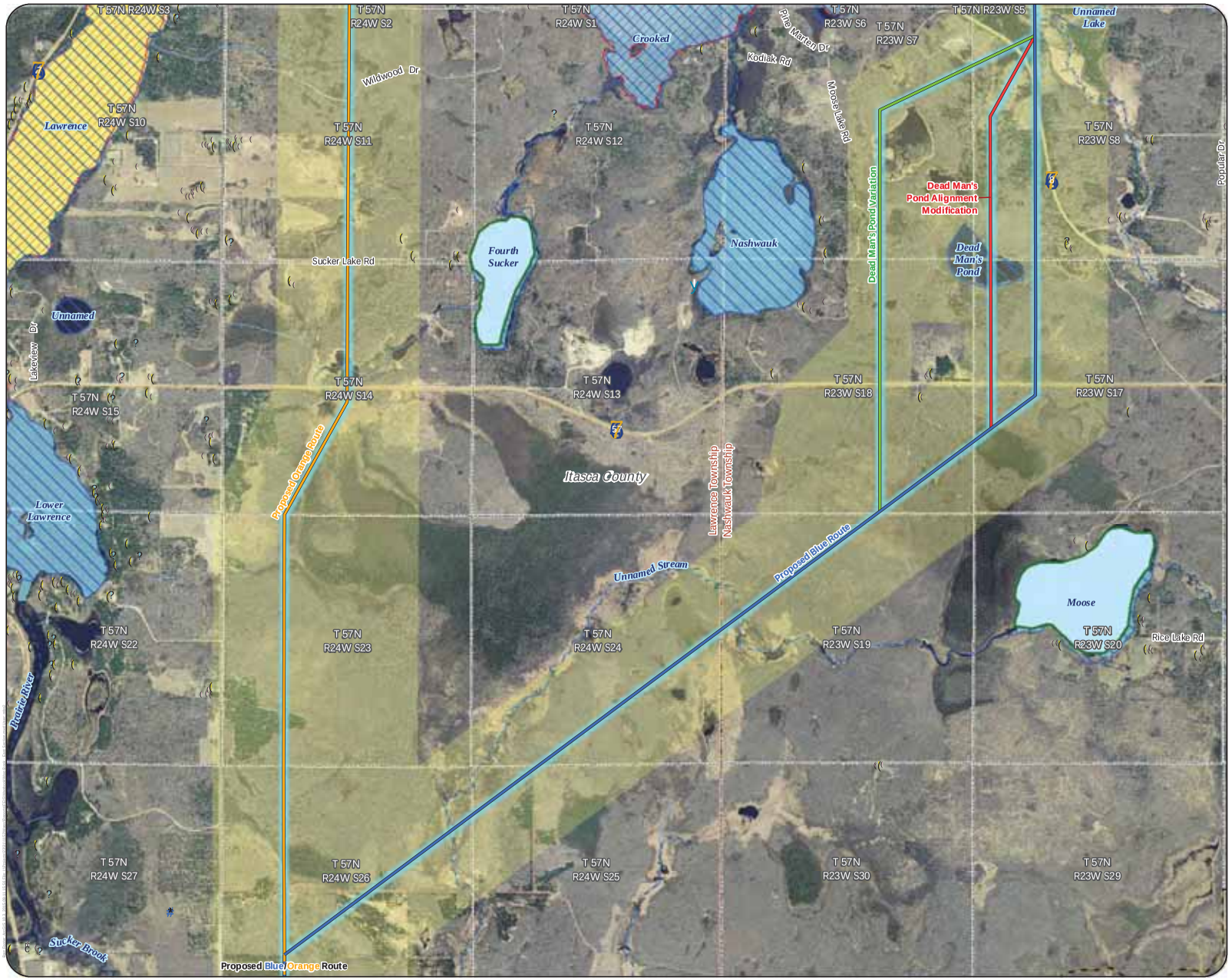
Alternatives
- Route Variation
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Visual Simulation Viewpoint
- Residences
- Commercial or Non-Residential Structure
- Church
- Aggregate Source Location
- Communication Tower
- County Well Index
- Carry-In Water Access
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Shallow Lake
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

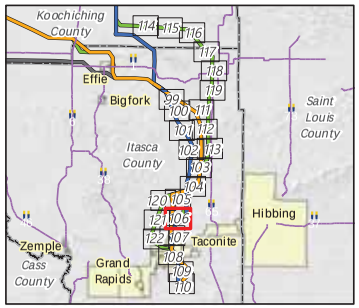
MPCA Database
- Tanks and Leaks
- Multiple Activities

Feet
2,000 0 2,000

Appendix S - Map 105

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue Route
- Orange Route
- Blue/Orange Route

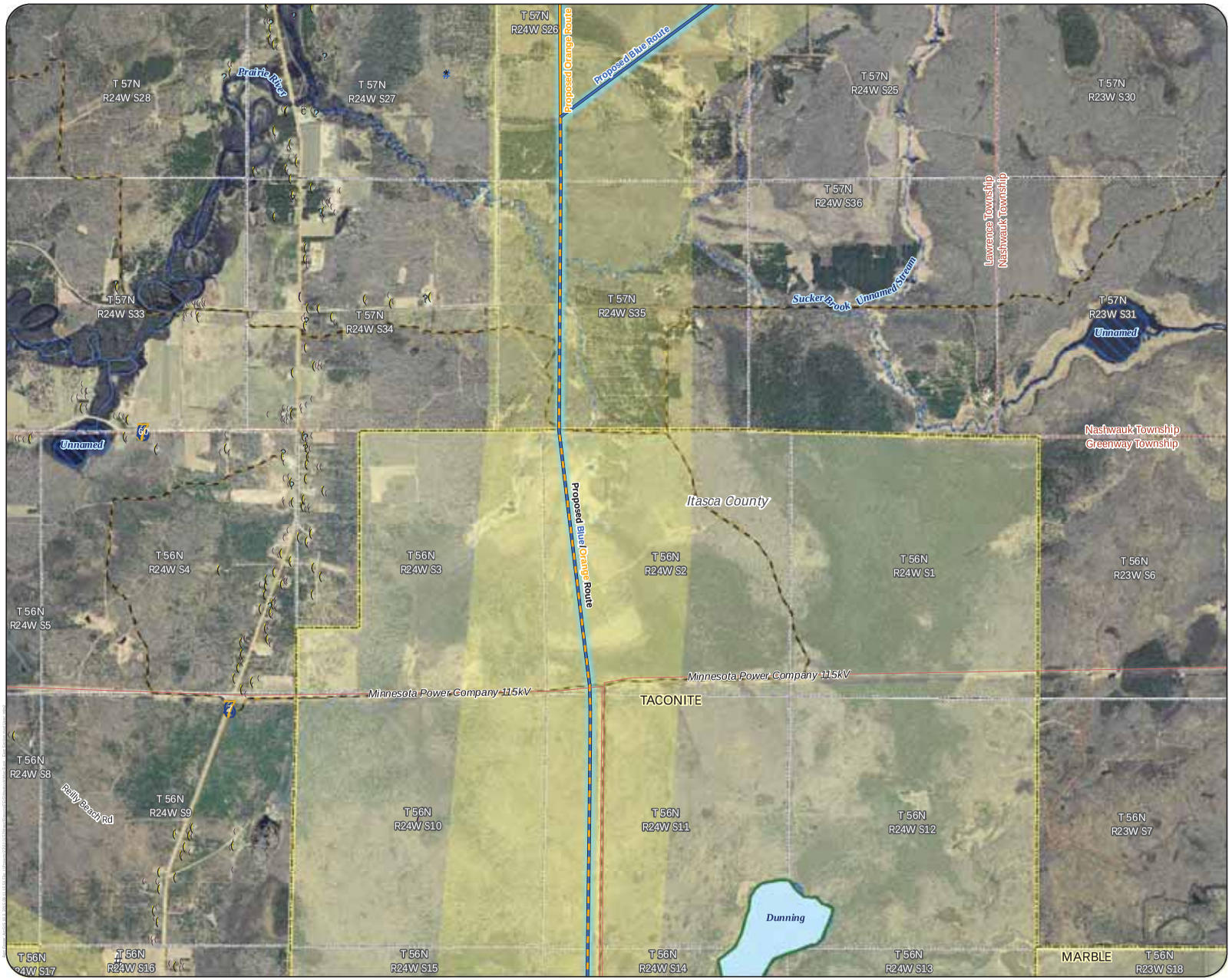
Alternatives
- Route Variation
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Church
- County Well Index
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Shallow Lake
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

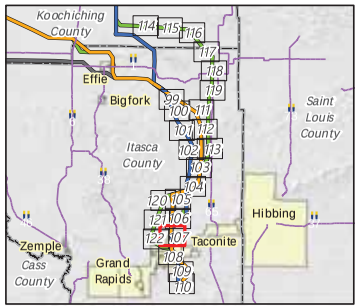
MPCA Database
- Tanks and Leaks

Feet
2,000 0 2,000

Appendix S - Map 106

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue Route
- Orange Route
- Blue/Orange Route
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Church
- Communication Tower
- County Well Index
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

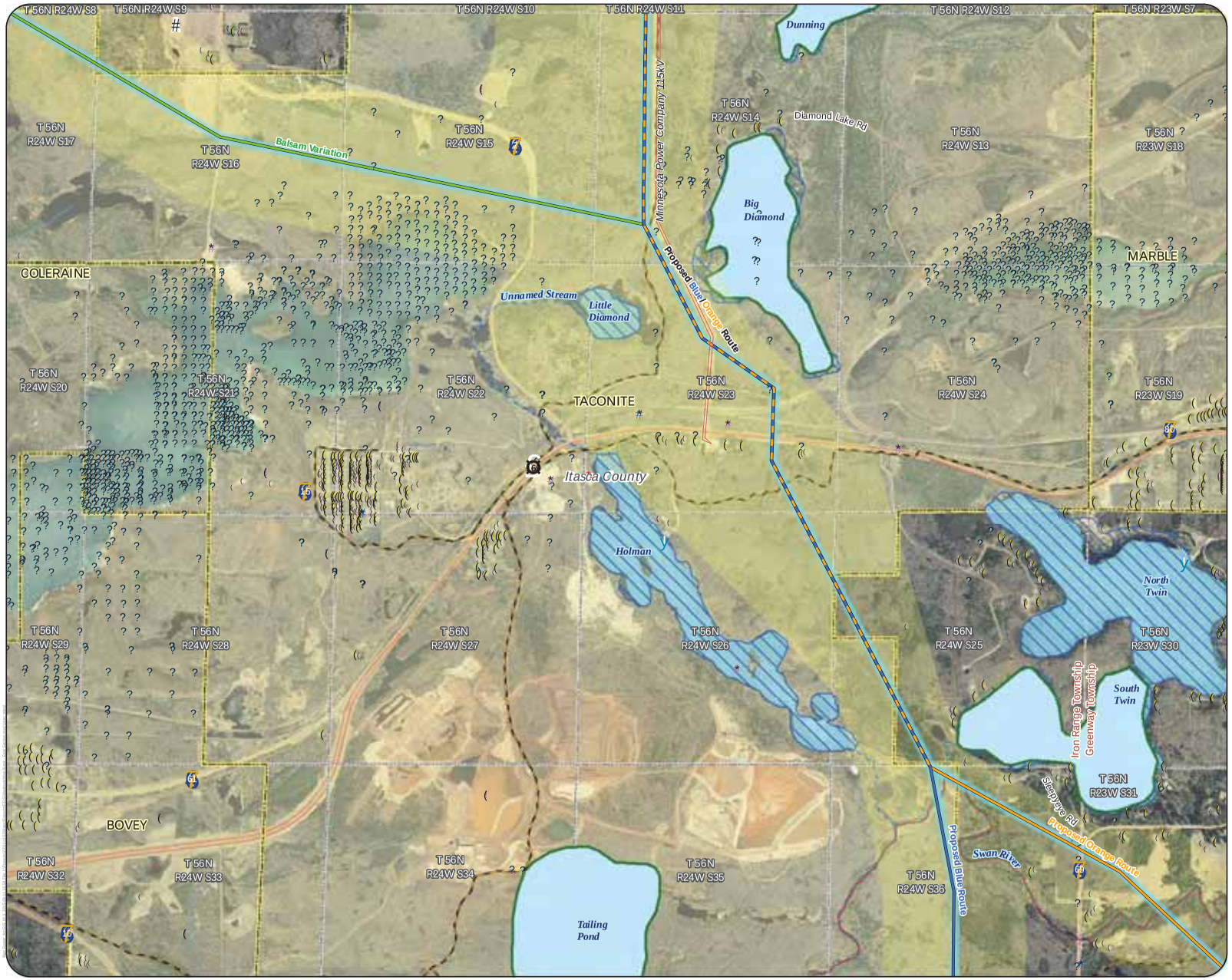
MPCA Database
- Tanks and Leaks
- Multiple Activities

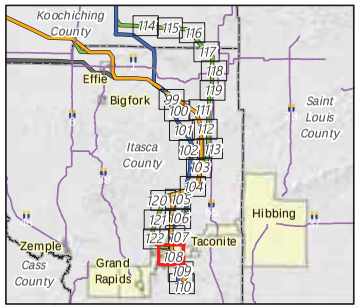
Existing Transmission Lines
- 69 or 115 kV

Feet
2,000 0 2,000

Appendix S - Map 107

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Blue Route
- Orange Route
- Blue/Orange Route

Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

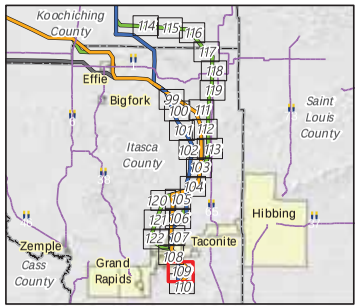
MPCA Database
- Hazardous Waste
- Investigation and Cleanup
- Tanks and Leaks
- Multiple Activities

Existing Transmission Line
- 69 or 115 kV

Feet
2,000 0 2,000

Appendix S - Map 108

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route
- Orange Route

Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- Snowmobile Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

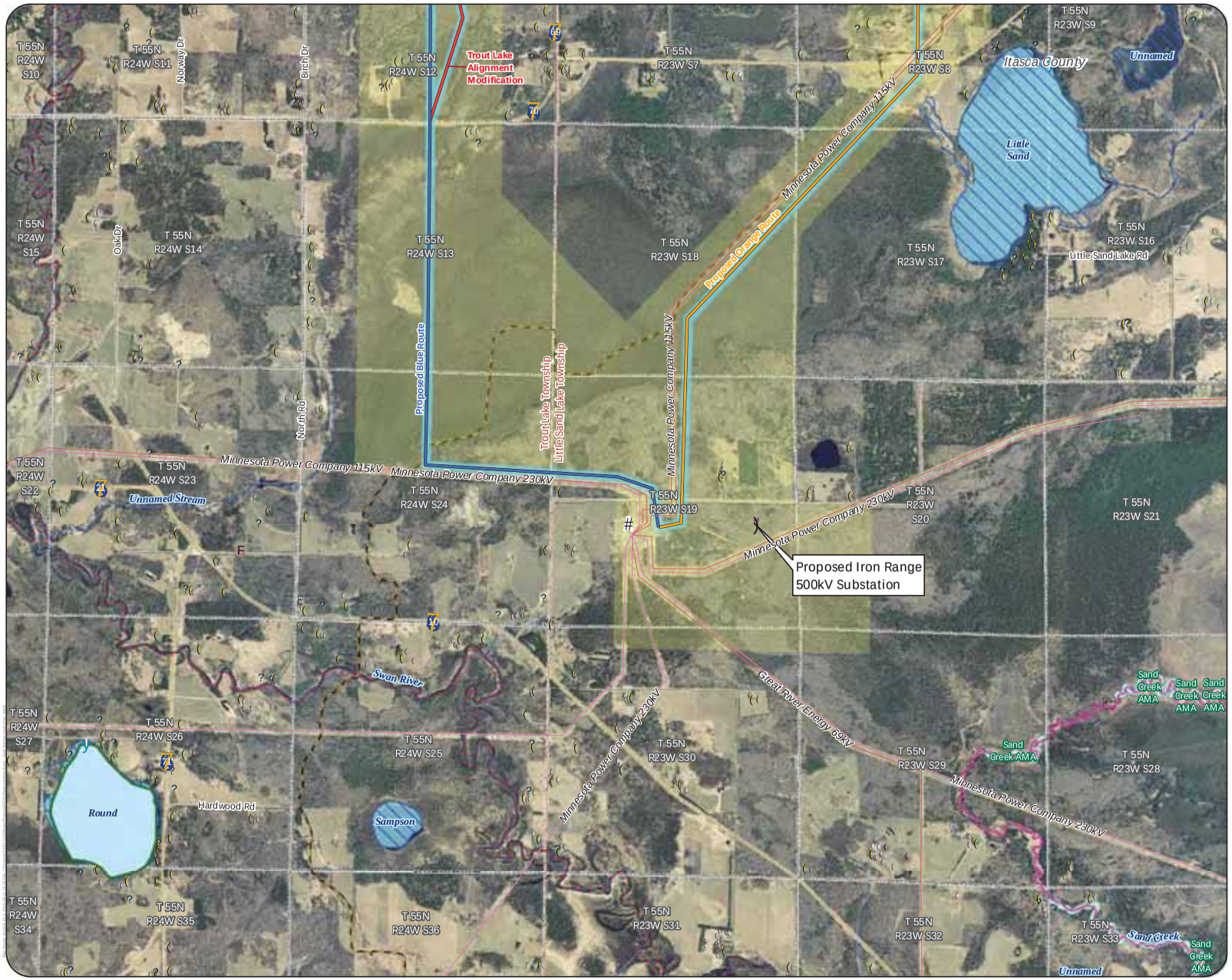
MPCA Database
- Tanks and Leaks
- Multiple Activities

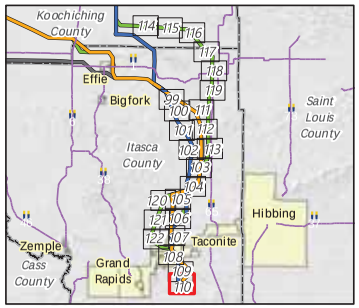
Existing Transmission Lines
- 69 or 115 kV

Feet
2,000 0 2,000

Appendix S - Map 109

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Iron Range 500 kV Substation

Proposed Routes
- Blue Route
- Orange Route

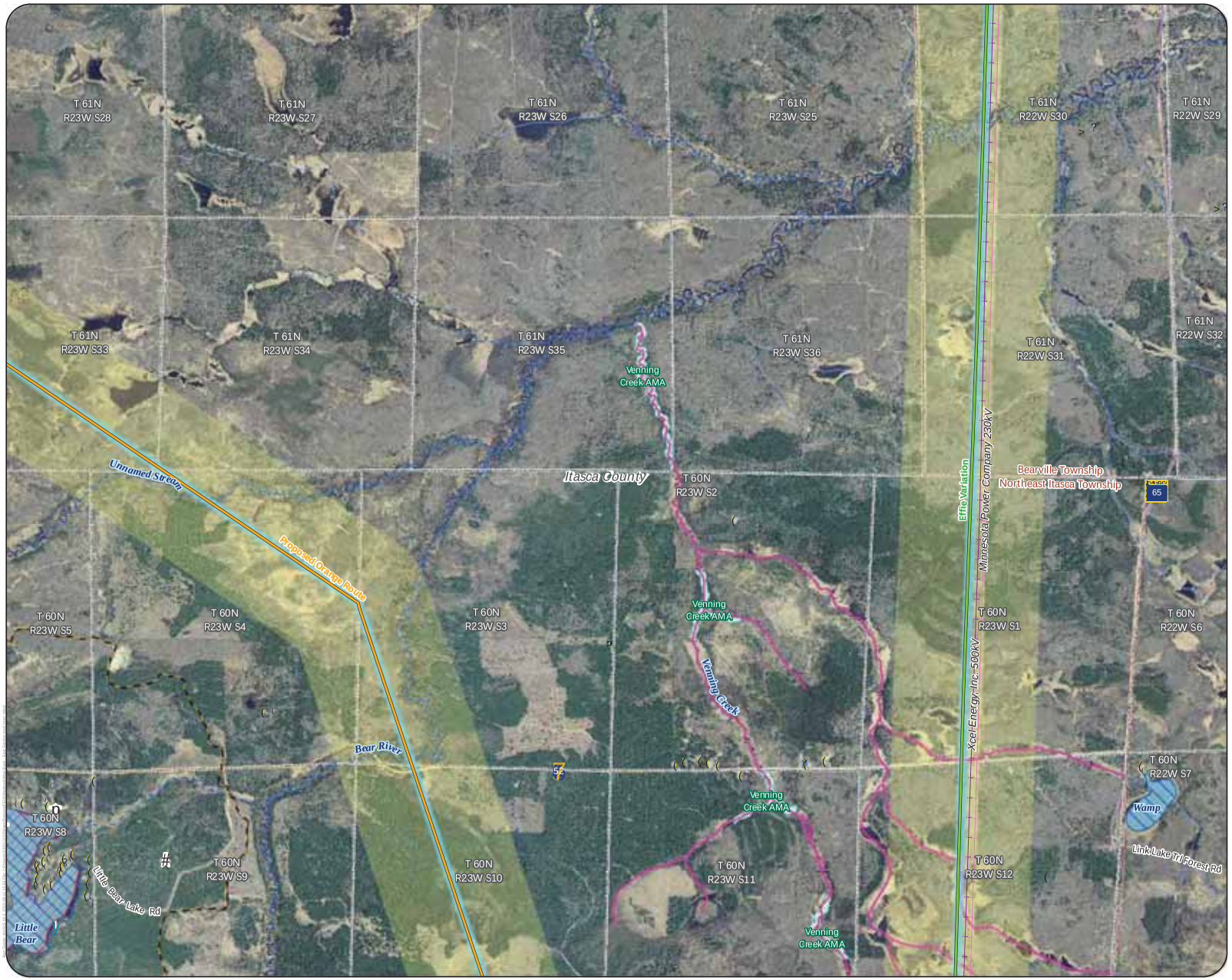
Alternatives
- Alignment Modification
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Church
- Cemetery
- Aggregate Source Location
- Communication Tower
- County Well Index
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- MPCA Impaired Stream
- Trout Stream
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- Aquatic Management Area
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

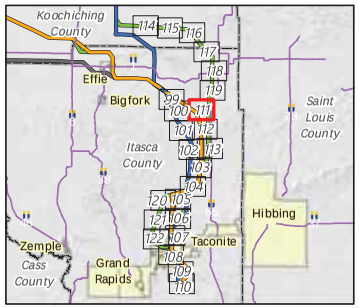
Existing Transmission Lines
- 69 or 115 kV
- 230 kV

Feet
2,000 0 2,000

Appendix S - Map 110

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Orange Route

Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Airstrip
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- Trout Stream
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Aquatic Management Area
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

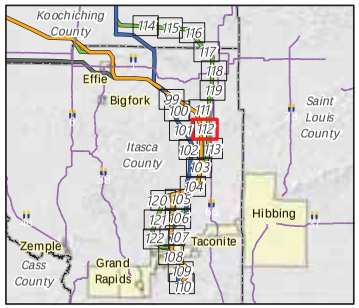
MPCA Database
- Tanks and Leaks
- Multiple Activities

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 111

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Orange Route

Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Forest Campground
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- Trout Stream
- NHD Waterbody
- PWI Waterbody
- Aquatic Management Area
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

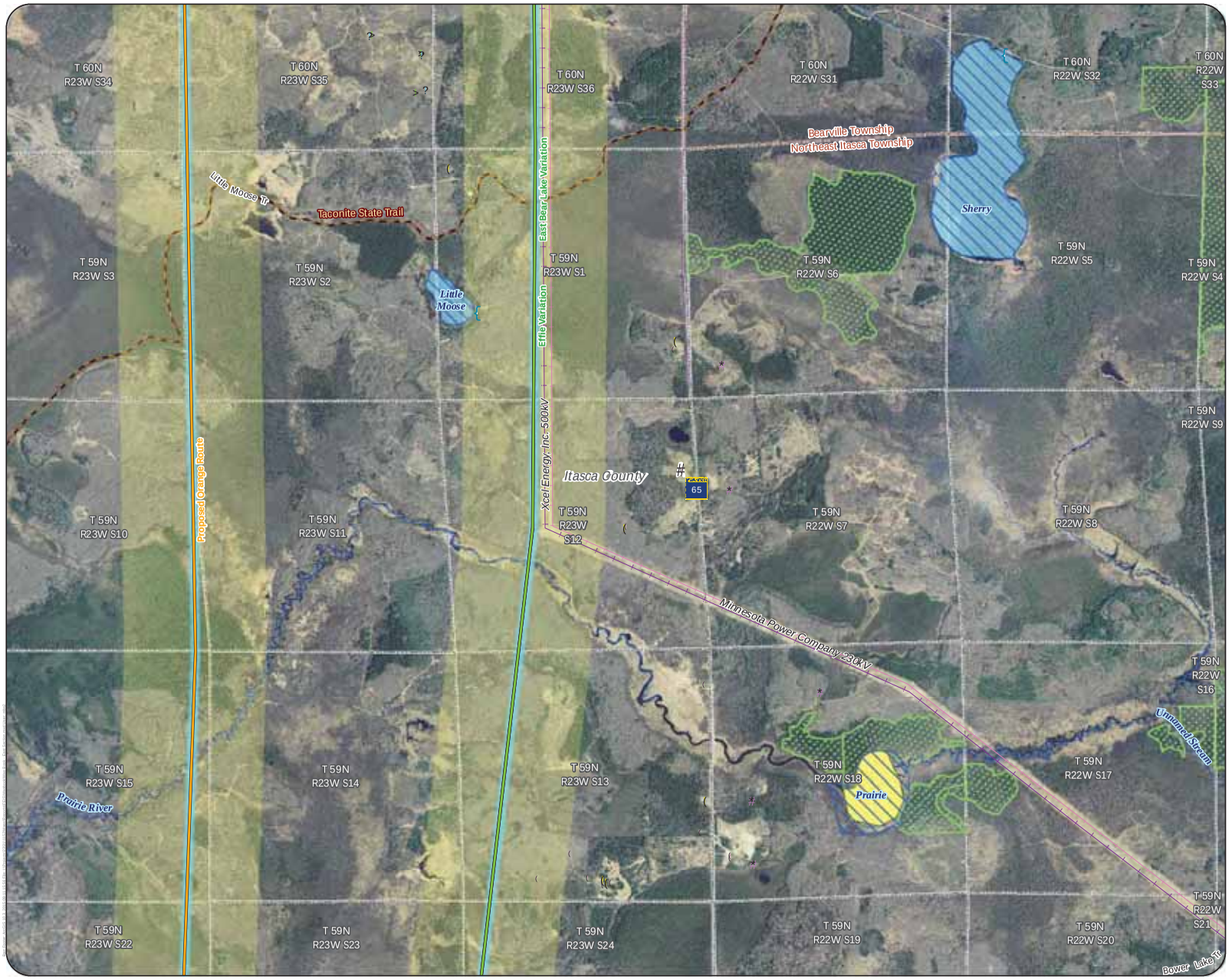
MPCA Database
- Multiple Activities

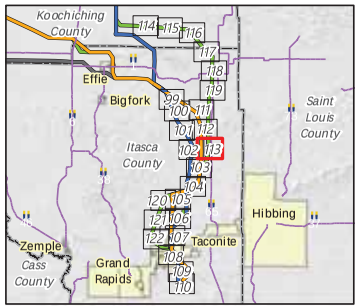
Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 112

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Proposed Routes
- Orange Route

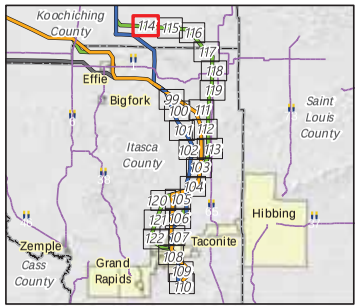
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Aggregate Source Location
- Communication Tower
- County Well Index
- Mineral Exploration or Engineering Drillhole
- Carry-In Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Wild Rice Lake
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 113

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Proposed Routes
- Blue Route

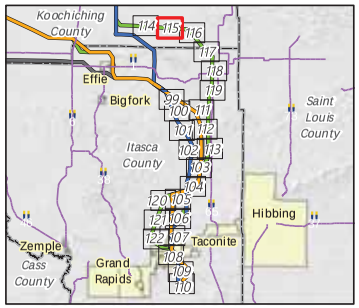
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 114

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Scientific and Natural Area (SNA)
- Preliminary Peatland SNA Watershed Protection Area
- Ecologically Important Lowland Conifers
- Public Land Survey Section

Existing Transmission Lines

- 230 kV
- 500 kV

Feet

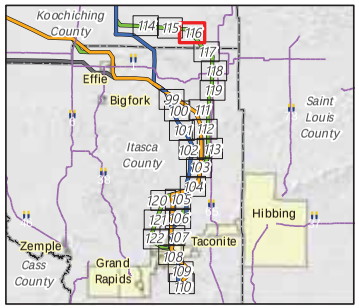
2,000 0 2,000

Appendix S - Map 115

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- County Well Index
- Mineral Exploration or Engineering Drillhole
- NHD Watercourse
- PWI Watercourse
- Trout Stream
- NHD Waterbody
- PWI Waterbody
- Public Land Survey Section

Existing Transmission Lines

- 230 kV
- 500 kV

Feet

2,000 0 2,000

Appendix S - Map 116

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement

U.S. DEPARTMENT OF ENERGY

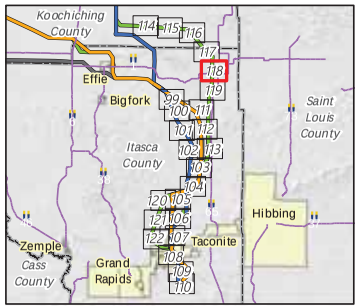
MINNESOTA DEPARTMENT OF COMMERCE

Appendix S - Map 117

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- School
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Forest Campground
- NHD Watercourse
- PWI Watercourse
- Trout Stream
- PWI Waterbody
- Aquatic Management Area
- State Game Refuge
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

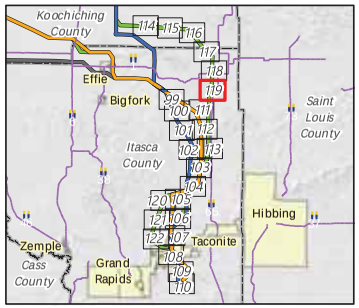
MPCA Database
- Tanks and Leaks

Existing Transmission Lines
- 230 kV
- 500 kV

Feet
2,000 0 2,000

Appendix S - Map 118

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement



Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Cemetery
- School
- Aggregate Source Location
- County Well Index
- Mineral Exploration or Engineering Drillhole
- State Forest Campground
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- State Game Refuge
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- Civil Township
- Public Land Survey Section

MPCA Database

- Hazardous Waste
- Multiple Activities

Existing Transmission Lines

- 230 kV
- 500 kV

Feet

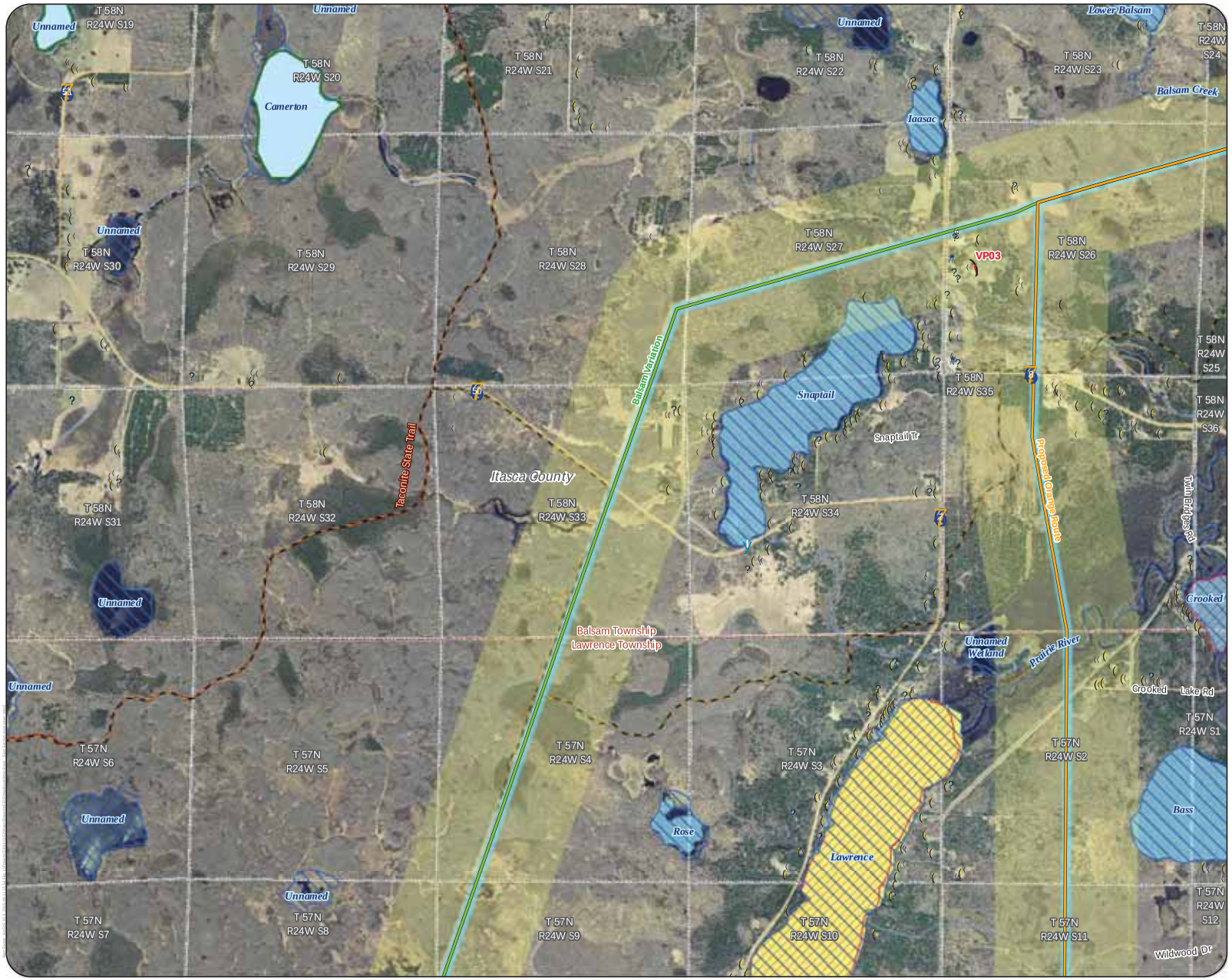
2,000 0 2,000

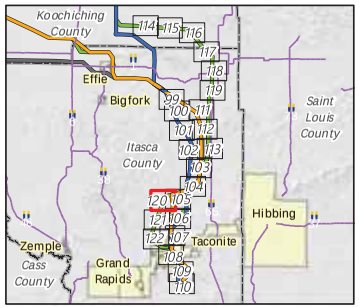
Appendix S - Map 119

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement





Proposed Routes
- Orange Route

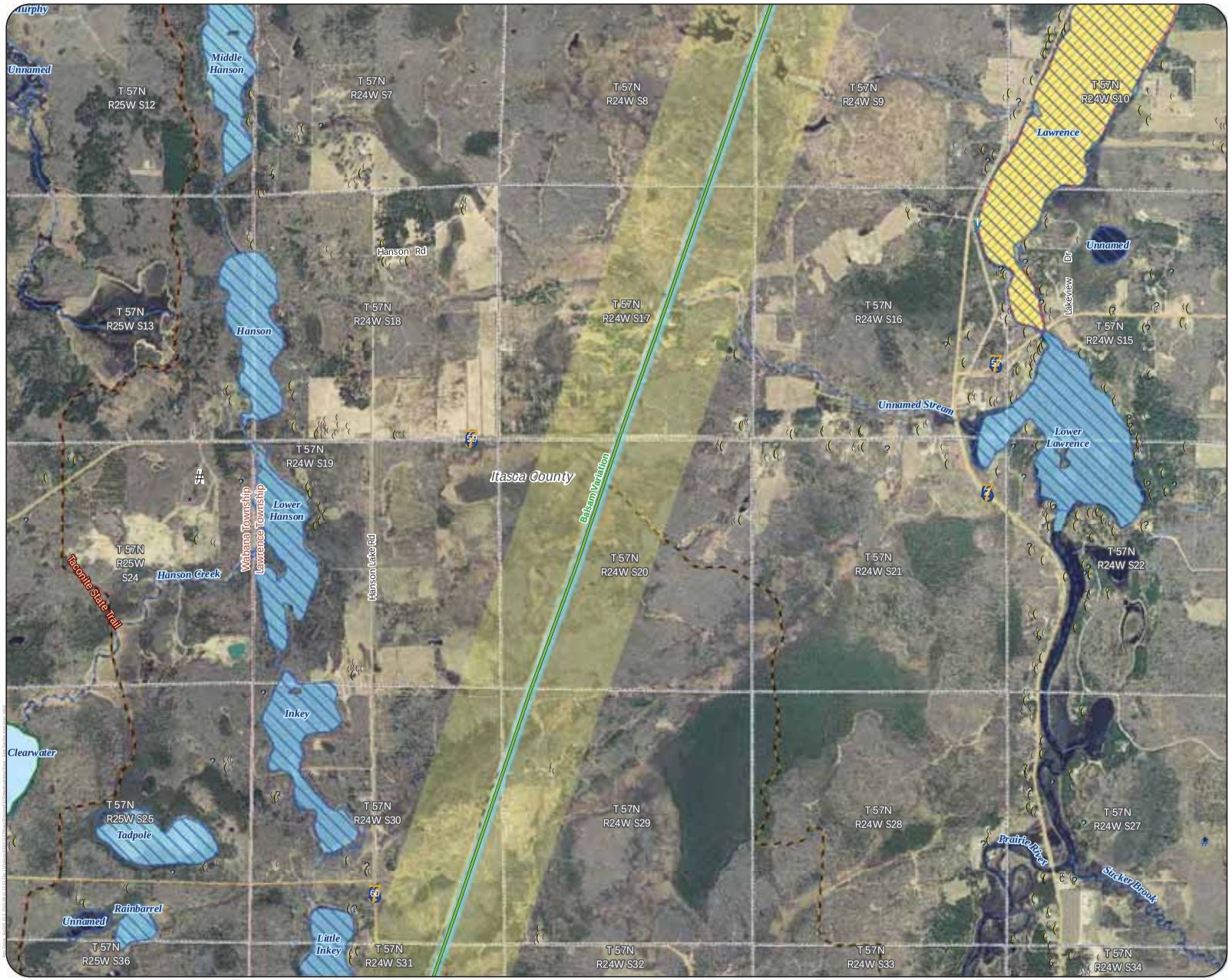
Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Visual Simulation Viewpoint
- Residences
- Commercial or Non-Residential Structure
- Church
- County Well Index
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Shallow Lake
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

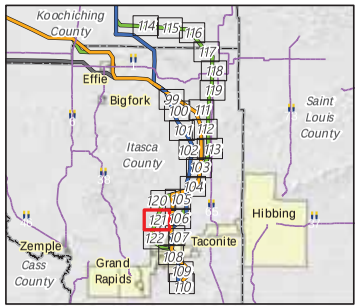
MPCA Database
- Tanks and Leaks
- Multiple Activities

Feet
2,000 0 2,000

Appendix S - Map 120

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement





Alternatives

- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Church
- Aggregate Source Location
- Communication Tower
- County Well Index
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- MPCA Impaired Waterbody
- Wild Rice Lake
- Shallow Lake
- Snowmobile Trail
- State Trail
- Civil Township
- Public Land Survey Section

MPCA Database

- Tanks and Leaks

Feet

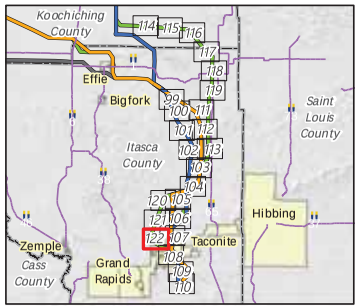
2,000 0 2,000

Appendix S - Map 121

MAP BOOK - EAST SECTION

Great Northern Transmission Line

Final Environmental Impact Statement



Alternatives
- Route Variation
- Anticipated Route Width
- Anticipated Right-of-Way
- Residences
- Commercial or Non-Residential Structure
- Communication Tower
- County Well Index
- Trailer Launch Water Access
- NHD Watercourse
- PWI Watercourse
- NHD Waterbody
- PWI Waterbody
- Shallow Lake
- Ecologically Important Lowland Conifers
- Snowmobile Trail
- State Trail
- Municipal Boundary
- Civil Township
- Public Land Survey Section

MPCA Database
- Hazardous Waste
- Multiple Activities

Existing Transmission Lines
- 69 or 115 kV

Feet
2,000 0 2,000

Appendix S - Map 122

MAP BOOK - EAST SECTION
Great Northern Transmission Line
Final Environmental Impact Statement

Appendix T

NEPA Disclosure Statements

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE
GREAT NORTHERN TRANSMISSION LINE PROJECT (GNTL)
ENVIRONMENTAL IMPACT STATEMENT

The Council on Environmental Quality (CEQ) Regulations at Title 40 of the *Code of Federal Regulations* (CFR) Section 1506.5(c), which have been adopted by the U.S. Department of Energy (10CFR Part 1021), require contractors who will prepare an environmental impact statement to execute a disclosure specifying that they have no financial or other interest in the outcome of the project.

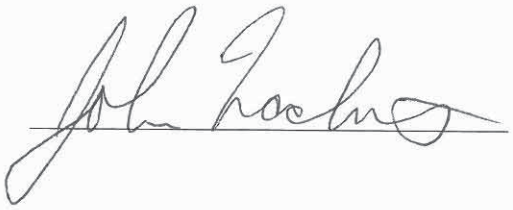
"Financial or other interest in the outcome of the project" is defined as any direct financial benefit such as a promise of future construction or design work on the project, as well as indirect financial benefits the contractor is aware of (e.g. if the project would aid proposals sponsored by the firm's other clients). It excludes any benefits such person or entity may enjoy in common with other electricity ratepayers in the same service territory.

In accordance with these requirements, Barr Engineering Co. shall complete this document. Barr Engineering Co., on behalf of itself, its subsidiaries and its employees, hereby certifies as follows, to the best of its knowledge as of the date set forth below:

(a) Barr Engineering Co. has no financial or other interest in the outcome of the project.

Certified by:

John Wachtler, Vice President, Principal in Charge
Name Title



Barr Engineering Co.
Company

6/20/2014
Date

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE
GREAT NORTHERN TRANSMISSION LINE PROJECT (GNTL)
ENVIRONMENTAL IMPACT STATEMENT

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In accordance with these requirements, H. John Mye shall complete this document. Ecology and Environment, Inc., on behalf of itself, its subsidiaries and its employees, hereby certifies as follows, to the best of its knowledge as of the date set forth below:

(a) Ecology and Environment, Inc. has no financial or other interest in the outcome of the project.

Certified by:

H. John Mye, Chief Financial Officer
Name Title

Ecology and Environment, Inc.
Company

06/17/14
Date

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE
GREAT NORTHERN TRANSMISSION LINE PROJECT (GNTL)
ENVIRONMENTAL IMPACT STATEMENT

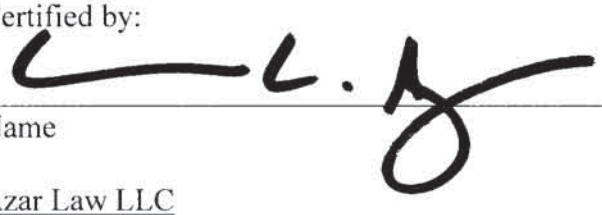
The Council on Environmental Quality (CEQ) Regulations at Title 40 of the *Code of Federal Regulations* (CFR) Section 1506.5(c), which have been adopted by the U.S. Department of Energy (10CFR Part 1021), require contractors who will prepare an environmental impact statement to execute a disclosure specifying that they have no financial or other interest in the outcome of the project.

"Financial or other interest in the outcome of the project" is defined as any direct financial benefit such as a promise of future construction or design work on the project, as well as indirect financial benefits the contractor is aware of (e.g. if the project would aid proposals sponsored by the firm's other clients). It excludes any benefits such person or entity may enjoy in common with other electricity ratepayers in the same service territory.

In accordance with these requirements, Lauren Azar shall complete this document.
Azar Law LLC, on behalf of itself, its subsidiaries and its employees, hereby certifies as follows, to the best of its knowledge as of the date set forth below:

(a) Azar Law LLC has no financial or other interest in the outcome of the project.

Certified by:



Name

Owner
Title

Azar Law LLC
Company

June 19, 2014
Date

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE
GREAT NORTHERN TRANSMISSION LINE PROJECT (GNTL)
ENVIRONMENTAL IMPACT STATEMENT

The Council on Environmental Quality (CEQ) Regulations at Title 40 of the *Code of Federal Regulations* (CFR) Section 1506.5(c), which have been adopted by the U.S. Department of Energy (10CFR Part 1021), require contractors who will prepare an environmental impact statement to execute a disclosure specifying that they have no financial or other interest in the outcome of the project.

"Financial or other interest in the outcome of the project" is defined as any direct financial benefit such as a promise of future construction or design work on the project, as well as indirect financial benefits the contractor is aware of (e.g. if the project would aid proposals sponsored by the firm's other clients). It excludes any benefits such person or entity may enjoy in common with other electricity ratepayers in the same service territory.

In accordance with these requirements, Rick Holton shall complete this document. Rick Holton, on behalf of itself, its subsidiaries and its employees, hereby certifies as follows, to the best of its knowledge as of the date set forth below:

(a) Rick Holton has no financial or other interest in the outcome of the project.

Certified by:

Frederick S. Holton

Frederick S. (Rick) Holton — Principal

Name — Title

Rick Holton

Company

June 19, 2014

Date

Appendix U

USFWS Information

United States Department of the Interior

FISH AND WILDLIFE SERVICE

5600 American Boulevard West, Suite 990
Bloomington, Minnesota 55437-1458

IN REPLY REFER TO:

AUG 10 2015

FWS/R3/ER15-306

Ms. Julie Ann Smith, Environmental Protection Specialist
Office of Electricity Delivery and Energy Reliability (OE–20)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Ms. Smith,

The Fish and Wildlife Service (Service) thanks the Department of Energy (DOE) for the opportunity to comment on the Draft Environmental Impact Statement for the Great Northern Transmission Line (GNTL, DOE/EIS 0499). The Service has been closely involved in this project for several years providing technical assistance regarding impacts of this project on important wildlife, resources, and habitat. The Service has submitted four letters to date on this project:

- March 4, 2014: From the Service to the Minnesota Department of Commerce.
- July 1, 2014: From the Service to Minnesota Power (the Applicant).
- August 11, 2014: From Department of Interior (Office of Environmental Policy and Compliance) to DOE (electronically submitted as a draft letter by the Service to DOE November 20, 2014 and again as a signed letter by the Service to DOE July 22, 2015 due to a clerical error).
- August 14, 2014: From the Service to DOE.

In all of these letters, the Service has stated that the GNTL (both construction and long-term use) has the potential to impact Service interest lands, threatened, endangered, or species of concern, migratory birds, bald and golden eagles, wetlands, and wildlife habitat. The Service has emphasized avoidance and minimization of impacts to these resources, as well as appropriate mitigation for impacts that cannot be practicably avoided. The Service continues to stand by these previous comments and recommendations. This letter serves to outline the Service's recommendations on route selection, alignment modification, and additional comments on avoiding and minimizing impacts to migratory birds, listed species, and wetland/vegetation resources. The Service has additionally included a path forward for minimization and mitigation of potential impacts to Service interest lands. The Service makes these recommendations pursuant to the National Wildlife Refuge

Administration Act (NWRA), Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Executive Order (E.O.) 13186, Department of Energy's Migratory Bird Program Partnership Agreement, Bald and Golden Eagle Protection Act (BGEPA), Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act), Federal Aid in Sport Fish Restoration Act (Dingell-Johnson Act), and Fish and Wildlife Act of 1956.

Route Recommendation and Avoidance of Service Interest Lands

The Service administers numerous tracts within the proposed GNTL routing options as part of the National Wildlife Refuge System (NWRS). Service administered and managed lands are acquired for the preservation of wildlife and their habitats. As stated in previous letters (see above), preservation and avoidance of impact to Service interest lands is one of the Service's highest priorities. The Service is supportive of both route alternatives and alignment modifications that maximize avoidance of Service interest lands. The Service favors a weighted tiered approach of avoidance, minimization, and mitigation of impacts.

The Service recommends the following routes and alignments be chosen for the final route selection:

- In the West section of the project, the Service recommends the selection of the Cedar Bend WMA variation, Hop 2 and the Beltrami North Central Variation 4. The Service believes the combination of these variations is the least impactful option with respect to wildlife, wetland, and forestry resources, as compared to the Applicant's preferred route outlined in the DEIS. Additionally, these variations will completely avoid all refuge impacts in the Western Section of this project. Our reasoning is as follows:
    - The Service prefers the Cedar Bend WMA Variation because:
        - It completely avoids Service interest lands and state Wildlife Management Areas (the Applicant-proposed route impacts 6 acres of Service Lands).
        - It impacts less state forest land and wetlands, fewer sites identified by the Minnesota Department of Natural Resources (MN DNR) as having Biodiversity Significance, High Conservation Value Forests, or Native Plant Communities, and fewer wildlife resources.
        - The impacts to listed species are similar to the Applicant's preferred route.
        - This variation will result in an overall shorter route and can be built within an existing ROW.

    - The Service prefers the Beltrami North Central Variation Routes 4 because:
        - It completely avoids Service interest lands (the Applicant-proposed route impacts 18 acres).
        - It impacts fewer rare (plant) species, fewer sites of Biodiversity Significance, fewer overall impacts to forestry, vegetation, wildlife, shrub wetlands, and rare features.

  - It impacts less State Forest and State Fee lands.
  - It impacts a similar (but slightly higher) acreage of National Wetland Inventory (NWI) Wetlands (305 vs. 272 acres of the Applicant-proposed route).
  - It can be built within the existing ROW (except for <1 mile stretch).
  - Impacts to federally listed wildlife resources are similar.
  - The Service acknowledges these variations will result in a slightly longer transmission line and will have a greater impact to water resources. Additionally, slightly more emergent and forested wetlands will be impacted (28 and 169 vs. 23 and 119 acres respectively).

- The Service then recommends adoption of the blue route (where Beltrami North Central Variation 4 connects to the Blue Route).
- In the Central Section of the project the Service recommends utilization of the Silver Creek WMA Alignment Modification to avoid Service interest lands (specifically the parcel located T-160, R-30, S-27)). The Service acknowledges this would create a new ROW and possible habitat fragmentation, but prefers this option to expanding the existing ROW on Service lands.
- The Service then recommends the Blue Route be followed to the terminus of the project.

These recommendations by the Service should be considered our strongest recommendation and highest priority; not just one in a series of equally weighted options.

Should the above recommendations not be chosen for the final route selection, the Service recommends the following:

- In the West Section: Should the Cedar Bend WMA variation and the Beltrami North Central Variation 4 not be selected, the Service recommends examining the side-by-side comparison of the preferred route with the Beltrami North Variations 1&2, and the preferred route with the Beltrami North Central Variations 1, 2, 3, and 5 (detailed in the DEIS) to determine the least environmentally impactful alternative. Consideration should be given to existing ROW corridors as well as minimization of impact to wetland and forest resources.
- In the Central Section: If the Orange Route is selected as the final route, the Service recommends examining the side-by-side comparison of the proposed Orange Route and the Beltrami South Central and Beltrami South variations to determine the least environmentally impactful alternative. Consideration should be given to existing ROW corridors as well as minimization of impact to wetland and forest resources.
- In the Central Section: If the Orange Route (with the J2 Segment Option) is selected as the final route, the Service recommends the adoption of the Northolm Variation to avoid impacts to Service interest lands. Because neither the J2 Segment nor the Northolm variation parallel existing corridors, the Service would prefer the Service lands not be impacted.

Appendix V

Draft Programmatic Agreement

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. DEPARTMENT OF ENERGY
AND
THE U.S. ARMY CORPS OF ENGINEERS
AND
THE MINNESOTA STATE HISTORIC PRESERVATION OFFICE
FOR
MANAGING HISTORIC PROPERTIES THAT MAY BE AFFECTED
BY THE
GREAT NORTHERN TRANSMISSION LINE PROJECT

WHEREAS, pursuant to the authority delegated by the President of the United States under Executive Order 10485, as amended by Executive Order 12038, the U.S. Department of Energy ("DOE") receives and considers applications for permits for the construction, operation, maintenance, and connection of facilities for the transmission of electric energy at the borders of the United States ("Presidential permit"); and

WHEREAS, Executive Order 10485, amended by Executive Order 12038, authorizes DOE to issue a Presidential permit if, *inter alia*, the issuance of the permit is found to be consistent with the public interest; and

WHEREAS, in deciding whether issuance of a Presidential permit is in the public interest, DOE determines the proposed project's impact on electric reliability as well as its potential environmental impacts, including potential impacts to cultural and historic resources; and

WHEREAS, Minnesota Power, an operating division of ALLETE, Inc., has applied to DOE's Office of Electricity Delivery and Energy Reliability for a Presidential Permit for the Great Northern Transmission Line Project ("Project") in accordance with the DOE's applicable administrative procedures at 10 CFR § 205.320 *et. seq*.; and

WHEREAS, the issuance of a Presidential permit by DOE for the border crossing indicates that there is no federal objection to the proposed international border crossing and Project, but does not mandate that the Project be undertaken; and

WHEREAS, the proposed Project consists of an approximately 220-mile, overhead, single-circuit 500 kV AC transmission line between the Minnesota - Manitoba border crossing northwest of Roseau, Minnesota, and terminating at the existing Blackberry 230/115 kV Substation near Grand Rapids, Minnesota; includes associated substation facilities and new transmission system modifications at the Blackberry Substation site, and construction of a new 500 kV Series Compensation Substation adjacent to and east of the existing Blackberry 230/115kV Substation; and ancillary facilities (such as temporary work areas, contractor yards, lay down areas, access roads, borrow and disposal sites); and

WHEREAS, Section 106 of the National Historic Preservation Act of 1966, as amended (16U.S.C. 470f) ("Section 106"), directs federal agencies to take into account the effects of their

undertakings on historic properties listed in or eligible for inclusion in the National Register of Historic Places ("National Register") and to afford the Advisory Council on Historic Preservation ("ACHP") a reasonable opportunity to comment; and

WHEREAS, the procedures set forth in 36 CFR Part 800 - Protection of Historic Properties define how federal agencies meet their statutory responsibilities pursuant to Section 106; and

WHEREAS, in considering whether issuance of a Presidential permit to Minnesota Power would be consistent with the public interest, the DOE has determined to treat the issuance of a Presidential permit for the proposed Project is an undertaking ("Undertaking,") as defined in 36 CFR § 800.16(y),; and

WHEREAS, construction of portions of the Project will also require authorization by the U.S. Army Corps of Engineers ("USACE") pursuant to Section 404 of the Clean Water Act of 1973 (33U.S.C. §1344), and of the Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C § 403), and the USACE and the DOE have agreed that the DOE is the lead federal agency for purposes of compliance with Section 106, in accordance with 36 CFR § 800.2(a)(2); and

WHEREAS, consistent with 36 CFR § 800.4(a) and 800.16(d), DOE has determined that the area of potential effects("APE") for this undertaking is defined to include all areas that could be directly or indirectly affected by construction and/or operation of the Project, including ground-disturbing activities associated with installation of the transmission line, construction of the converter station, and ancillary facilities (such as temporary work areas, contractor yards, laydown areas, and access roads), whether contiguous with the route or not; and

WHEREAS, consistent with 36 CFR § 800.4(a) and 800.16(d), DOE has determined that the APE for this undertaking includes a direct APE which encompasses the maximum width of a route alternative, an area approximately 3000-feet wide for initial identification and evaluation efforts; and

WHEREAS, the proposed Project will be constructed within a 200-foot right-of-way ("ROW") that is located within a 1000-3000 foot-wide route alternative; and

WHEREAS, the Minnesota Public Utilities Commission ("MN PUC") will select the final route alternative and proposed alignment and issue a Route Permit for the Project under the Minnesota Power Plant Siting Act ("PPSA"), and

WHEREAS, DOE has determined the direct APE will encompass the 200-foot wide ROW for detailed identification and evaluation efforts once the route for the proposed Project is determined by the MN PUC; and

WHEREAS, consistent with 36 CFR § 800.4(a) and 800.16(d), DOE has determined that the APE for this undertaking includes an indirect APE that will address the potential indirect visual effects of the undertaking, which will extend for a maximum of [one-quarter mile] on either side of the centerline (will vary with topography) of the proposed 200-foot ROW once the final alignment is established by the MN PUC; and

WHEREAS, the Project's APE generally includes the geographic area defined in the attached maps and may be further refined as a result of additional consultation and/or cultural resources investigations and/or engineering assessments; and

WHEREAS, the Project is located within the identified area of interest of federally recognized Indian tribes, and DOE invited the Assiniboine and Sioux Tribes of the Fort Peck Reservation; Bad River of Lake Superior Chippewa; the Bois Forte Band of Ojibwe; the Cheyenne River Sioux Tribe; the Crow Creek Sioux; the Flandreau Santee Sioux; the Fond du Lac Band of Lake Superior Chippewa; the Forest County Potawatomi Community; the Grand Portage Band of Ojibwe; the Hannahville Indian Community; the Keweenaw Bay Indian Communty; the Lac Courte Orilles Band of Lake Superior Chippewa; the Lac Vieux Band of Lake Superior Chippewa; the Leech Lake Band of Ojibwe; the Lower Brule Sioux; the Lower Sioux Tribe; Mille Lacs Band of Ojibwe; the Northern Arapaho Tribe; the Northern Cheyenne Nation; the Prairie Island Indian Community; the Shakopee Mdewakanton Sioux Community; the Sokaogon Chippewa Community; the Red Cliff Band of Lake Superior Chippewa; the Red Band of Chippewa Nation; the Rosebud Sioux Tribe; the Santee Sioux Nation; Sisseton-Wahpeton Oyate of Lake Traverse Reservation; the Spirit Lake Tribe; the Standing Rock Sioux Tribe; the Three Affiliated Tribes of Fort Berthold; the Turtle Mountain Band of Chippewa; the Upper Sioux Community; the Wahpekute Band of Dakota; the White Earth Band of Ojibwe; and the Yankton Sioux Tribe to participate in government-to-government consultation for the Project; and

WHEREAS, the DOE has consulted and continues to consult with the Assiniboine and Sioux Tribes of the Fort Peck Reservation; Bad River of Lake Superior Chippewa; the Bois Forte Band of Ojibwe; the Cheyenne River Sioux Tribe; the Crow Creek Sioux; the Flandreau Santee Sioux; the Leech Lake Band of Ojibwe; the Lower Brule Sioux; the Lower Sioux Tribe; Mille Lacs Band of Ojibwe; the Northern Arapaho Tribe; the Northern Cheyenne Nation; the Red Cliff Band of Lake Superior Chippewa; the Red Lake Band of Chippewa Nation; the Rosebud Sioux Tribe; the Santee Sioux Nation; Sisseton-Wahpeton Oyate of Lake Traverse Reservation; the Spirit Lake Tribe; the Standing Rock Sioux; the Turtle Mountain Band of Chippewa; the Wahpekute Band of Dakota; and the White Earth Band of Ojibwe on a government-to-government basis in accordance with 36 CFR § 800.2(c)(ii); and

WHEREAS, for the purposes of providing the public the opportunity to comment on the National Historic Preservation Act Section 106 Consultation process and in accordance with 36 CFR §800.3(b), DOE makes cultural resources reports and information, including any "adverse effect" determinations publicly available on the GNTL project EIS website (http://www.greatnortherneis.org); and

WHEREAS, the DOE has determined that its undertaking associated with the Project has the potential to adversely affect historic properties listed in or eligible for the National Register and has consulted with the ACHP, the USACE, the Minnesota State Historic Preservation Office (SHPO), federally recognized Indian tribes, additional consulting parties, and the public, pursuant to 36 CFR § 800.14 of the regulations implementing Section 106; and

WHEREAS, DOE is phasing identification and evaluation of historic properties and application of the criteria of adverse effects in accordance with 36 CFR § 800.4(b)(2) and 36 CFR § 800.5(a)(3), respectively, because the GNTL project alternatives consist of route corridors covering a large land area; and

WHEREAS, pursuant to 36 CFR § 800.14(b)(1)(ii) and § 800.14(b)(1)(v), DOE has elected to execute this Programmatic Agreement ("PA") because effects on historic properties cannot be fully determined prior to the undertaking and other circumstances warrant a departure from the normal Section 106 process; and

WHEREAS, for the purposes of this PA, Consulting Parties are parties that have consultative roles in the Section 106 consultation under 36 CFR §800.2; Signatories are parties with sole authority to execute, amend, or terminate this PA under 36 CFR §800.6(c)(1) and §800.14(b)(2)(iii); Invited Signatories are parties that sign this PA at the invitation of DOE under §800.6(c)(2) and by signing have the same rights with regard to seeking amendment or termination of this PA as other signatories except that refusal of any party invited to become a signatory to this PA does not invalidate this PA, as set forth in §800.6(c)(2)(i)-(iv); and

WHEREAS, pursuant to 36CFR §§ 800.2(c)(2), 800.6(c)(3), and 800.2(c)(4), the Red Lake Band of Chippewa Indians ("Red Lake Nation") and Minnesota Power have participated in consultation and have been asked to be Invited Signatories to this PA; and

WHEREAS, pursuant to 36CFR §§ 800.2(c)(2), 800.6(c)(3), and 800.2(c)(4), the Bois Forte Band of Chippewa Indians, and White Earth Band of Ojibwe, Leech Lake Band of Ojibwe, and Mille Lacs Band of Ojibwe have participated in consultation and have been asked to be Concurring Parties to this PA; and

WHEREAS, on January 14, 2015, DOE invited the ACHP to participate in consultation, in accordance with 36 CFR § 800.6(a)(1)(i)(C), providing the specific documentation; and

WHEREAS, the ACHP has elected to participate in consultation pursuant to36 CFR § 800.6(a)(1)(iii).

NOW, THEREFORE, the DOE, the USACE and the Minnesota SHPO (the "Signatory Parties") agree that the Project shall be administered and implemented in accordance with the following stipulations to satisfy the responsibilities of the DOE under Section 106 for all aspects of the Project.

STIPULATIONS

I. APPLICABILITY

DOE, USACE, and Minnesota Power and Red Lake Nation shall ensure that the following stipulations are carried out:

A. DOE, USACE, and SHPO will review the undertaking in accordance with the terms of this PA.

B. This PA will be in effect for a period of five (5) years from the date of its execution.

C. Six (6) months prior to the date on which the PA will expire; the DOE shall notify the Signatories, Invited Signatories and Consulting parties of the impending expiration. DOE, as appropriate, may consult with the signatory and consulting parties to reconsider the terms of the PA to amend it and shall notify the parties as to the course to be pursued.

D. This PA may be amended when such an amendment is agreed to in writing by all Signatories to this PA. The amendment will be effective on the date it is executed by all of the Signatories to this PA and filed with the ACHP.

E. DOE will send a copy of this PA to the ACHP upon execution.

II. CONDITIONS

This PA is prepared with reference to:

1. The ACHP's Section 106 Archaeological Guidance (1/1/2009);

2. The ACHP's February 23, 2007 *Policy Statement Regarding the Treatment of Burial Sites, Human Remains, and Funerary Objects*;

3. The ACHP's *Meeting the "Reasonable and Good Faith Effort" Identification Standard in Section 106 Review.*

3. The Native American Graves Protection and Repatriation Act of 1990(25 USC 3001 *et seq*.) (NAGPRA) and its implementing regulations at 43 CFR Part 10;[1]

4. Minnesota Statute 307.8, "Private Cemeteries Act", provisions established by the State Archaeologist and the Indian Affairs Council;

5. The Minnesota Historical Society's *SHPO Guidelines for History/Architecture Projects in Minnesota* (July 2009) and the Minnesota Historical Society's *SHPO Manual for Archaeological Projects in Minnesota* (July 2005);

[1]Pursuant to 43 CFR Part 10, NAGPRA applies to human remains, sacred objects, and items of cultural patrimony (described as "cultural items" in the statute) located on federal or tribal lands or in the possession and control of federal agencies or certain museums. The Project will not occupy federal or tribal lands. Notwithstanding the limits of NAGPRA's applicability, the principles described in NAGPRA and its implementing regulations will serve as guidance for MN Power's actions should remains or associated artifacts be identified as Native American, and to the extent such principles and procedures are consistent with any other applicable requirements.

6. *The Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44742, September 29, 1983), as amended and revised;

7. The DOE's *American Indian and Alaska Native Tribal Government Policy* (DOE 2006); and

8. DOE Policy 141.1: *Management of Cultural Resources*.

III. PROFESSIONAL STANDARDS

A. The identification, evaluation and other surveys and studies required under the terms of this PA will be carried out by or under the direct supervision of an individual who meets, or individuals who meet, at minimum, the professional qualification standards for Archaeology and/or Architectural Historian defined in the *Secretary of the Interior's Professional Qualification Standards* (48 FR 44738–44739, September 29, 1983).

IV. IDENTIFICATION AND EVALUATION

A. Level of Effort

1. In accordance with 36 CFR §800.4(a) through (c), DOE and USACE shall consult with SHPO, Minnesota Power, Red Lake Nation, THPO(s), participating tribes, and other consulting parties to ensure that the level of effort for the cultural resource survey (or surveys) that will be conducted to identify and evaluate historic properties, including those to which Indian tribes might attach religious or cultural significance, that may exist within the APE.

2. In implementing Stipulation III.B, DOE and USACE shall acknowledge the special expertise of Indian tribes in assessing the National Register eligibility of historic properties that may possess religious and cultural significance to them.

B. Identification of Historic Properties Within the APE for Visual Effects

DOE and USACE shall consult with the SHPO to determine the level of effort, including survey scope, methods and procedures, needed to identify National Register listed or eligible architectural resources in the visual APE which might be affected by the Project.

1. In determining the level of effort for survey, DOE and USACE shall take into account the influence of the existing topography, vegetation, landuse, with the recognition that, pursuant to 36 CFR §800.5(a), an adverse effect occurs when the integrity, specifically the setting and feeling, of one or more of the qualifying characteristics of a historic property is diminished.

2. Minnesota Power shall implement the level of effort for any identification survey once its scope, methods and procedures have been agreed upon by DOE, USACE and the SHPO. If the parties cannot reach agreement, the matter will be resolved in accordance with Stipulation XII.

3. Upon completion, Minnesota Power will describe the implementation of the survey in a draft report prepared pursuant to Stipulation XI.

C. Identification and Evaluation of Historic Properties Within the APE for Direct Effects

DOE and USACE shall consult with SHPO, Minnesota Power, Red Lake Nation, THPO(s), participating tribes, and other consulting parties to ensure that the level of effort for the identification survey meets the reasonable and good faith effort per 36 CFR 800.4(b)(1) and that identification will be in accordance with the *Secretary of the Interior's Standards and Guidelines for Identification*.

1. For those portions of the APE for direct effects lying within the exterior boundaries of Red Lake Reservation, DOE and USACE shall consult with Red Lake Nation in lieu of the SHPO in accordance with 36 CFR §800.3(c)(1).

2. DOE, USACE, Red Lake Nation, THPO(s) and participating tribes agree that the APE for Direct Effects may represent only a portion of a larger traditional landscape that is considered eligible for listing in the National Register for the purposes of Section 106 review under the terms of this PA. Traditional resources identified in the APE for Direct Effects by DOE, therefore, may be considered contributing to this eligible traditional landscape. Traditional resources that are part of this National Register eligible landscape will be treated in a manner that preserves their integrity and potential to contribute to the historic property.

3. DOE and USACE shall consider applicable guidance prepared by the SHPO, the ACHP, DOE, USACE, and the National Park Service as discussed in Stipulation II and be guided by the findings and recommendation of the *Great Northern Transmission Line Cultural Resources Phase 1A Report*.

4. DOE and USACE shall consult with the SHPO, Red Lake Nation, THPO(s) and participating tribes to determine the level of effort, including the scope, methods and procedures, of the survey or surveys to be conducted to identify National Register listed or eligible archeological sites and traditional resources in the APE for direct effects.

5. In determining level of effort, DOE and USACE will consult with SHPO, Red Lake Nation, THPO(s), and other participating tribes to ascertain that:

a. survey results of identification activities are integrated into the preservation planning process; and

b. identification activities include explicit procedures for record keeping and information distribution that takes into account the need to restrict certain information that may be sensitive to tribal culture or history.

6. The identification of direct effects effort will include:

a. an archaeological survey (Phase I, and recommendations for Phase II evaluation, if necessary);

b. an history architecture survey (Phase I and recommendations for Phase II survey, if necessary); and

c. an ethnographic, ethnohistoric, or traditional cultural properties study.

7. Minnesota Power shall implement the level of effort for the identification survey once its scope, methods and procedures have been agreed upon by DOE, USACE, the SHPO, and, as appropriate, THPO(s) and participating tribes. If the parties cannot reach agreement, the matter will be resolved in accordance with Stipulation XII.

8. Upon completion, the Minnesota Power will describe the implementation of the Survey(s) in a report prepared pursuant to Stipulation IV.F.

D. Evaluation

1. When applying the National Register criteria to identified architectural resources, DOE, USACE, and Minnesota Power shall consult with the SHPO. If Minnesota Power and the SHPO can agree on National Register eligibility, then the resource will be treated on the basis of that agreement. If the parties fail to reach agreement, Minnesota Power shall submit the matter to DOE and USACE for resolution in accordance with 36 CFR §800.4(c)(2).

2. When applying the National Register criteria to identified historic architectural, archeological and traditional resources located *off tribal lands,* Minnesota Power shall evaluate the historic properties and consult with the SHPO and participating tribes. If Minnesota Power, the SHPO, and participating tribes can agree on National Register eligibility, then the resource will be considered in accordance with this determination. If the parties fail to reach agreement, Minnesota Power shall submit them after to DOE and USACE for resolution in accordance with 36CFR§800.4(c)(2).

3. When applying the National Register criteria to identified archeological and traditional resources located *on tribal lands,* DOE, USACE, and Minnesota

Power shall consult with the SHPO and participating tribes. If Minnesota Power, the SHPO, and participating tribes can agree on National Register eligibility, then the resource will be considered in accordance with this determination. If the parties fail to reach agreement, Minnesota Power shall submit them after to DOE and USACE for resolution in accordance with 36CFR§800.4(c)(2).

4. In implementing Stipulation IV, DOE and USACE shall acknowledge the special expertise of Indian tribes in assessing the National Register eligibility of historic properties that may possess religious and cultural significance to them.

E. Avoidance

1. Prior to completing an evaluation in accordance with Stipulation IV.D, Minnesota Power may propose measures to avoid effects to identified archeological, architectural, or traditional resources.

2. Under the terms of this PA, avoidance of adverse effects is preferred.

3. DOE and USACE shall consult with the SHPO, Red Lake Nation, THPO(s) and participating Indian tribes to identify reasonable avoidance measures. Minnesota Power shall incorporate agreed upon measures into the Great Northern Transmission Line Project plans and specifications.

F. Reporting

1. The survey report(s) drafted in accordance with Stipulations IV.B and C shall include a map or maps showing the APE and ROW along with the location of identified archeological, architectural, or traditional resources, including any that are National Register listed or have been previously determined eligible.

2. The draft reports shall also contain recommendations regarding the National Register eligibility of identified resources; specify those resources for which additional study might be needed; and make recommendations regarding effects and those measures that might avoid, minimize or mitigate adverse effects.

3. Minnesota Power shall submit the draft report to DOE, USACE, Red Lake Nation, THPOs, and participating tribes for review. All parties shall have thirty (30) days from receipt to provide written comments to DOE and Minnesota Power on the findings and recommendations presented in the draft survey report.

4. DOE and Minnesota Power shall ensure that written comments submitted in a timely manner are taken into account in the preparation of the final report(s) and implementation of the terms of the PA.

5. Minnesota Power shall provide each federal agency, the SHPO, Red Lake Nation and participating parties with one (1) bound hard copy of the final survey report with unbound individual historic property inventory forms.

6. Red Lake Nation shall provide each federal agency, the SHPO, and Minnesota Power with one (1) unbound hard copy of their final survey report.

V. TREATMENT

A. If, through implementation of Stipulation IV historic properties are identified in the APE, DOE and USACE shall consult with the SHPO, Red Lake Nation, other THPO(s) and participating Indian tribes to apply the criteria of adverse effect in accordance with 36 CFR §800.5(a).

B. If historic properties will be adversely affected, DOE and USACE shall consult in accordance with 36 CFR §800.6(a) to identify appropriate measures that are in the public interest to avoid, minimize or mitigate adverse effects to historic properties, following public notification of an "adverse effect" determination. If National Register eligible archeological or traditional resources that are on tribal lands will be adversely affected, DOE and USACE shall consult with Red Lake Nation instead of SHPO in accordance with 36 CFR §800.3(c)(1).

C. When agreement between DOE, USACE, the SHPO, Red Lake Nation, THPO(s) and participating tribes can be reached on how to resolve the adverse effect, Minnesota Power shall prepare a Treatment Plan (Plan) describing the measures to be carried out, the manner in which they will be carried out, and a schedule for their implementation.

    1. In resolving adverse effects to National Register listed or eligible archeological sites, the federal agencies and consulting parties shall not be limited to the consideration of data recovery.

    2. When treatment measures include archeological data recovery, the Plan will identify the specific research questions to be addressed with an explanation of the irrelevance, the archeological methods to be used, and provisions for public interpretation and education subject to restrictions established by 36 CFR §800.6(a)(5).

    3. In resolving adverse effects to National Register eligible traditional cultural properties or those contributing to the traditional landscape identified in Stipulation IV.B, DOE shall take into account the recommendations of the Red Lake Nation Report and participating tribes.

D. Minnesota Power shall submit the Plan to DOE, USACE, Red Lake Nation, THPO(s) and the participating Indian tribes for review. These parties shall have thirty (30) days from receipt to submit a written review of the measures and terms

of the Plan. DOE and USACE shall ensure that the Plan which is implemented takes into account timely comments and recommendations submitted by the consulting parties.

E. If the agencies and consulting parties cannot agree on measures to resolve adverse effects, the dispute shall be resolved in accordance with Stipulation XII.

VI. TIMING

A. DOE and USACE shall ensure that the requirements of Stipulations IV and V are implemented prior to the start of Great Northern Transmission Line Project construction.

B. [OTHER TIMING CONSTRAINTS IDENTIFED THROUGH CONSULTATION OR DUE TO OTHER ENVIRONMENTAL CONCERNS (e.g., for threatened or endangered species]

VII. CURATION

A. Minnesota Power shall return all artifacts and materials recovered through implementation of the terms of this PA to the respective landowner. Prior to the return, Minnesota Power shall afford the landowner an opportunity to donate the artifacts and materials to Red Lake Nation or appropriate THPO(s) for curation of tribal archives.

B. Any artifacts, materials, or records removed from federal land that are not subject to the Native American Graves Protection and Repatriation Act (NAGPRA) or will be curated in accordance with 36 CFR Part 79, *"Curation of Federally-Owned and Administered Archaeological Collections."*

C. Artifacts and materials retrieved from *tribal lands* will be curated in accordance with appropriate THPO standards and policy.

VIII. CONSTRUCTION MONITORING

A. If determined as a treatment measure (Stipulation V), Minnesota Power will develop a Monitoring Plan for the monitoring of construction activities in close proximity to historic properties. Construction monitors (archaeological consultants or tribal) will be under the direct supervision of a professional who meets the SOI Professional Qualifications Standards for archaeology. Any unanticipated discoveries or effects will be treated in accordance with Stipulation X.

B. It is understood that Minnesota Power will permit Red Lake Nation or other construction monitors (archaeological or other tribal) to inspect construction in a manner that is both safe and unimpeded.

C. Costs associated with construction monitoring by contractors or Red Lake Nation will be the responsibility of Minnesota Power.

IX. CONFIDENTIALITY

DOE will protect information about historic properties of religious and cultural significance to Indian tribes, including location information or information provided by Indian tribes to assist in the identification of such properties, to the extent allowed by Section 304 of the National Historic Preservation Act [16 U. S. C. 470w3], 36 CFR §800.11(c) and other applicable laws, including Exemption 3 of the Freedom of Information Act [5 U.S.C. 552(b)].

X. POST-REVIEW UNANTICIPATED DISCOVERIES

A. If previously unidentified historic properties or unanticipated effects to historic properties are discovered during the Great Northern Transmission Line Project construction, the construction contractor shall immediately halt all activity within a one hundred (100) foot radius of the discovery, notify Minnesota Power of the discovery and implement interim measures to protect the discovery from looting and vandalism.

B. Immediately upon receipt of the notification required in Stipulation X.A, Minnesota Power shall ensure that construction activities have halted, inspect the construction site to determine the extent of the discovery, clearly mark the area of the discovery, implement additional measures, as appropriate, to protect the discovery from looting and vandalism, and notify DOE, SHPO, Red Lake and the following Indian tribes upon discovery: – **[TRIBES].**

C. Upon receipt of notification, DOE, as appropriate, shall treat the discovery in accordance with 36 CFR § 800.13(b)(3) and (c).

D. Treatment of Human Remains

1. When the unanticipated discovery contains human remains or funerary objects and is located on federal tribal lands, DOE shall comply with NAGPRA [25 U.S.C. 3001 et. seq.] and its implementing regulations (43 CFR Part 10). Minnesota Power will implement the procedures in Attachment A for inadvertent discoveries of NAGPRA human remains and cultural items on non-tribal federal lands.

2. Immediately following the discovery of human remains, Minnesota Power will notify Red Lake Nation and the following Indian tribes of the discovery**: [TRIBES]**

3. If the construction contractor for Minnesota Power believes that a discovery contains human remains and the discovery is not located on federal or tribal lands, the construction contractor shall comply with Stipulation X.A. Immediately upon receipt of such notification, Minnesota Power shall comply with the procedures required by Minnesota Statute 390.005.

    a. Minnesota Power shall notify the county coroner. Under the terms of this PA, Minnesota Power will also notify DOE, SHPO and consulting tribes of the discovery.

    b. If the unidentified human remains are found outside of platted, recorded, or identified cemeteries and in contexts which indicate antiquity of greater than fifty (50) years, the coroner shall notify the Minnesota Office of the State Archaeologist (OSA) and the Minnesota Indian Affairs Council in compliance with Section 307-08 of the Minnesota Private Cemeteries Act.

    c. Suspected human remains shall not be further disturbed or removed until disposition has been determined by the OSA and the Minnesota Indian Affairs Council consistent with the guidance titled *State Archaeologist's Procedures for Implementing Minnesota's Private Cemeteries Act*. (Anfinson, 2008).

F. At all times human remains must be treated with the utmost dignity and respect, and in a manner consistent with the ACHP's Policy Statement on the Treatment of Human Remains, Burial Sites and Funerary Objects (February 23, 2007).

G. Minnesota Power shall ensure that the requirements of Stipulation X are incorporated into all construction contracts.

XI. REPORTING

Quarterly following the execution of this PA until construction is complete, Minnesota Power shall submit a written report to DOE, USACE, SHPO, Red Lake Nation, THPO(s) and participating tribes describing progress on implementation of the terms of this PA.

A. At a minimum the report shall contain a summary of construction completed and underway during the period covered by the report and describe the location of this work.

B. If mitigation measures are implemented as part of a Treatment Plan, Minnesota Power will also describe any mitigation measures that have been implemented, the schedule for completion of mitigation, the treatment of any post-review discoveries pursuant to Stipulation X, any scheduling changes proposed, any problems encountered, and any disputes addressed pursuant to Stipulation XII in the report.

C. Minnesota Power may submit the report electronically to DOE, USACE, SHPO and consulting parties.

XII. DISPUTE RESOLUTION

A. If at any time during implementation of this PA, a Signatory, Invited Signatory, or Concurring parties object to any action or any failure to act pursuant to this PA, they may file written objections with the DOE.

1. The DOE will consult with the objecting party, and with other Signatory and/or Concurring parties as appropriate, to resolve the objection. The DOE may initiate on its own such consultation to resolve any of the DOE's objections to actions taken or products produced by any party pursuant to this PA.

2. If the DOE determines that the objection cannot be resolved through consultation alone, the DOE will forward all documentation relevant to the dispute to the ACHP and request that the ACHP comment. After receiving all pertinent documentation, the ACHP will either:

a) Provide the DOE with recommendations, which the DOE will take into account in reaching a final decision regarding the dispute; or

b) Notify the DOE that it will comment pursuant to 36 CFR § 800.7(c)(1) through (c)(3) and Section 110(l) of the National Historic Preservation Act of 1966, as amended, and proceed to comment.

3. The DOE will take into account any ACHP comments provided in response to such a request, with reference to the subject of the dispute, and will issue a decision on the matter. The DOE's responsibility to carry out all actions under this PA that are not the subject of dispute will remain unaffected.

XIII. DURATION, AMENDMENT, AND TERMINATION OF THIS PROGRAMMATIC AGREEMENT

A. This PA shall take effect on the date it has been fully executed by the Signatories to this PA and will remain in effect for a period of five (5) years.

B. Any amendments to this PA shall take effect on the dates they are fully executed by the Signatories to this PA and filed with the ACHP.

C. Any Signatory to this PA may propose that the PA be amended, whereupon the parties that have signed this PA shall consult to consider such an amendment. This PA is amended when such an amendment is agreed to in writing by all of those parties. The DOE or its

designess shall provide a copy of the amended PA to the ACHP within thirty (30) days of execution.

D. Any party that signs this PA may terminate this agreement by providing thirty (30) days written notice to the other signing parties, provided that the other signing parties are consulted during the thirty (30)-day notice period in order to seek agreement on amendments or other actions that would avoid termination. In the event of termination, the DOE will comply with 36 CFR Part 800 with regard to individual actions covered by this PA.

EXECUTION of this PA by the Signatories and implementation of the stipulations provided herein evidences that the DOE and USACE have taken into account the effects of this Project on historic properties and afforded the ACHP an opportunity to comment on those effects.

SIGNATORIES

MINNESOTA STATE HISTORIC PRESERVATION OFFICE

BY: DATE:

Name Barbara M. Howard
Title Deputy State Historic Preservation Officer

U.S. DEPARTMENT OF ENERGY

BY: DATE:

Name Meghan Conklin
Title Deputy Assistant Secretary
National Electricity Delivery Division
Office of Electricity Delivery and Energy Reliability

U.S. ARMY CORPS OF ENGINEERS

BY:

Name
Title

INVITED SIGNATORIES

MINNESOTA POWER

BY: DATE:

Name
Title

RED LAKE NATION

BY: DATE:

Name
Title

CONCURRING PARTIES

BOIS FORTE BAND OF OJIBWE

BY: DATE:

Name
Title

WHITE EARTH BAND OF OJIBWE

BY: DATE:

Name
Title

LEECH LAKE BAND OF OJIBWE

BY: DATE:

Name
Title

OTHER

BY: DATE:

Name
Title

OTHER

BY: DATE:

Name
Title

OTHER

BY: DATE:

Name
Title

OTHER

BY: DATE:

Name

Appendix W

Air Emissions Information

Appendix W

Air Emissions Information

Criteria Pollutant and Greenhouse Gas Emissions Analysis: Methodology

Construction activities associated with the proposed Project would result in short-term increases in air emissions as a result of the combustion of fossil fuels in construction equipment and vehicles, and from the fugitive dust emissions associated with site ground disturbance. In addition, the clearing of the ROW would require clearing of forest lands. Deforestation is another source of carbon dioxide (CO_2) to the atmosphere, because removing forests releases most of the stored carbon sink, either through burning or decay.

Construction of the proposed Project would take approximately four years, but activities would not occur at a single construction location for more than a year. Because specific scheduling and construction documentation have not yet been developed, annual emissions of criteria pollutants from construction of the proposed Project have been estimated using an average emissions per mile for typical construction based on a hypothetical 50-mile ROW project site, 1,000 acres of forest clearing, and a 20-acre substation (See Table 1.2). Assumptions for equipment use by activity are provided in Tables 4.1, 4.2, and 4.3. Construction emissions for the hypothetical project activities are provided for non-road equipment (See Tables 5.1, 5.2, 5.3, 5.4); on-road equipment (See Tables 6.1, 6.2, 6.3, 6.4, 7); and helicopter operations (See Table 8). A summary of total emissions by activity and average emission values for the hypothetical project is provided in Table 3.

The Applicant would use large equipment to clear trees and other vegetation and to level construction areas. Large cranes and flatbed trucks would be used to place transmission lines and substation components. Helicopters may be used to place lines and structures. Temporary concrete batch plants may be utilized to supply concrete for foundations. Equipment and material deliveries, the removal of waste, and worker activities and commuting would produce indirect emissions on paved and unpaved roads within the region of influence (ROI). Criteria pollutant and greenhouse gas (GHG) emission factors are based on the size and type of equipment, developed using the EPA's MOVES2014 modeling program for on-road and non-road equipment (See Tables 9 and 10 for emission factors). Helicopter emissions have been calculated using US Air Force helicopter emission factors (See Table 11). Fugitive dust emissions have been calculated using AP-42 Section 13.2 (See Tables 12.1 and 12.2). Concrete batch plant emissions have been calculated using AP-42 Section 11.12, Table 11.12-2 (See Table 12.3).

Total proposed Project construction emissions of nitrogen oxides (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$ and CO_2 have been calculated for the West, Central, and East sections and for each variation using the total mileage and forest removal areas for both the Proposed Blue Route and Proposed Orange Route (See Tables 1.1, 2, 2.1 and 2.2). The sum of each proposed route within a section is greater than the sum of the Proposed Blue Route and Route Orange Route, as a whole route, because there is some overlap between the sections.

The loss of carbon sink that results from the removed forest has been estimated using *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States* (See Table 13). The calculations assume the removal of "Northern Lake States Spruce-balsam Pine"

forests that are an average of 55 years old. Carbon sink is defined and reported as the total amount of carbon, in metric tons, and in the equivalent amount of CO_2 in metric tons, calculated using the atomic weight ratio of 12 for Carbon to 44 for CO_2. In addition to the loss of existing carbon sink, removal of forested land eliminates the CO_2 sink that would be provided by continued growth of trees in the forest.

Appendix W Construction Emission Calculations Great Northern Transmission Line, MN	
Table No.	**Title**
Table 1.1	Total Project Construction Emissions
Table 1.2	Summary of Construction Types Used to Estimate Construction Emissions
Table 2	Total Project Construction Emissions, By Route Variation
Table 2.1	Construction Emissions from Placement of Line and Structures on Existing or Cleared ROW
Table 2.2	Construction Emissions from Clearing Forest
Table 3	Construction Emissions by Activity, By Type of Construction Example
Table 4.1	Site Construction Equipment - Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)
Table 4.2	Site Construction Equipment - Clearing Forest (1000 acres example)
Table 4.3	Site Construction Equipment - Substation(40 acre example)
Table 5.1	Nonroad Equipment Exhaust Emissions - Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)
Table 5.2	Nonroad Equipment Exhaust Emissions - Clearing Forest (1000 acres example)
Table 5.3	Nonroad Equipment Exhaust Emissions - Converter Station Construction
Table 5.4	Nonroad Equipment Exhaust Emissions - Concrete Batch Plant
Table 6.1	On Road Construction Equipment - Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)
Table 6.2	On Road Construction Equipment - Clearing Forest (1000 acres example)
Table 6.3	On-Road Construction Equipment Exhaust Emissions - Converter Station Construction
Table 6.4	On-Road Construction Equipment Exhaust Emissions - Concrete Batch Plant
Table 7	On-Road Vehicle (Commuter Vehicles) Exhaust Emissions
Table 8	Helicopter Exhaust Emissions - Transmission Line Segment Construction
Table 9	Nonroad Equipment Exhaust Emission Factors - Koochiching County MN
Table 10	On-Road Vehicle Exhaust Emission Factors
Table 11	Helicopter Exhaust Emission Factors
Table 12.1	Fugitive Dust Emissions - Roads
Table 12.2	Fugitive Dust Emissions - General Construction Activities
Table 12.3	Fugitive Dust Emissions - Concrete Batch Plant
Table 13	Forest Carbon Sink Removed and Loss of Average Annual CO2 uptake emissions , All Route Variations

Table 1.1
Total Project Construction Emissions

			Emissions (tons)						Emissions (metric tons)
Route	**Miles of ROW**	**Acres of Forest Removal**	**NO_x**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
West Section									
Proposed Blue/Orange Route	108.4	1736.0	129.9	12.3	77.3	2.2	499.5	82.5	39626.2
Central Section									
Proposed Blue Route	109.8	1770.0	131.6	12.4	78.3	2.3	507.0	83.7	40147.0
Proposed Orange Route	105.4	1751.0	127.0	12.0	75.5	2.2	492.2	81.2	38708.4
East Section									
Proposed Blue Route	61.7	686.0	70.5	6.7	42.1	1.3	252.4	42.2	21635.2
Proposed Orange Route	66.5	682.0	75.4	7.1	45.1	1.4	266.1	44.6	23157.6
Total Route									
Proposed Blue Route	219.0	4829.0	277.2	26.1	164.1	4.5	1147.8	187.2	83981.2
Proposed Orange Route	220.0	4883.4	278.8	26.3	165.0	4.6	1156.5	188.5	84461.3
Substations		30.0	15.1	1.4	12.1	0.0	19.3	2.9	4589.1

Notes: The Sum of Section Route totals are greater than Total Route Totals because Section Routes overlap.

Emissions have been calculated using EPA's MOVES2014 Nonroad and Onroad emission factors for Koochiching, MN, 2018

Average emissions per mile or per acre for forest clearing are estimated using a hypothetical 50-mile ROW construction site. Refer to Appendix X.

Table 1.2
Summary of Construction Types Used to Estimate Construction Emissions
Great Northern Transmission Line, MN

Type of Construction	Parameters	Total	Units
Placement of Line and Structures on Existing or Cleared ROW (50 miles example project). Includes equipment material delivery, site preparation, tower foundations, tower placement, line placement, maintenance, and commuting vehicles	Total Mileage (for Construction Assumptions)	50.00	Miles
	Width of Construction (expanded and disturbed) ROW	200.00	feet
	Area of Impact	1209.12	acres
	Concrete Batch Plants	1.00	#
	Estimated Construction Time	12.00	months
Clearing of Forest. Includes forest removal equipment delivery and use, site preparation, removal of timber and debris, and communiting vehicles	Estimated length of ROW (assuming all forest cover)	42.00	Miles
	Width of Construction (New and disturbed) ROW	200.00	feet
	Area of Impact (Forest removal)	1000.00	acres
	Estimated Construction Time	12.00	months
Substation. Includes equipment material delivery, site preparation, equipment placement, line placement, maintenance, and commuting vehicles	Area of Impact	20.00	acres
	Estimated Construction Time	12.00	months

Table 2
Total Project Construction Emissions, By Route Variation

		Route Variation	Base Length	Total Forest	Construction Emissions							Construction GHG Emissions
		Unit	(mi)	Area (ac)	(tons)							(metric tons)
Section	Sect. #	Buffer (ft.)	100	100	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CO_2
West	1.1.1	Border Crossing Proposed Route	25.0	354	29.5	2.8	17.6	0.5	110.4	18.3	9929.3	9007.9
West	1.1.1	Border Crossing Pine Creek Variation	25.7	313	29.7	2.8	17.7	0.5	108.1	18.0	10029.1	9098.4
West	1.1.1	Border Crossing Hwy 310 Variation	18.6	239	21.7	2.0	12.9	0.4	79.6	13.3	7313.4	6634.7
West	1.1.1	Border Crossing 500kV Variation	10.1	143	11.8	1.1	7.1	0.2	44.4	7.4	3989.6	3619.4
West	1.1.1	Border Crossing 230kV Variation	8.2	99	9.4	0.9	5.6	0.2	34.3	5.7	3183.1	2887.7
West	1.1.2	Roseau Lake WMA Proposed Route	30.7	443	36.3	3.4	21.6	0.6	136.4	22.6	12218.0	11084.2
West	1.1.2	Roseau Lake WMA Variation 1	44.1	121	46.3	4.4	27.9	0.9	141.8	24.5	15847.9	14377.2
West	1.1.2	Roseau Lake WMA Variation 2	37.5	219	40.7	3.8	24.4	0.8	132.7	22.6	13855.5	12569.7
West	1.1.3	Cedar Bend WMA Proposed Route	24.7	433	30.0	2.8	17.8	0.5	117.6	19.4	10063.1	9129.2
West	1.1.3	Cedar Bend WMA Variation	19.6	209	22.3	2.1	13.4	0.4	79.3	13.3	7557.9	6856.5
West	1.1.3	Cedar Bend WMA Variation Hop 1	0.7	13	0.8	0.1	0.5	0.0	3.3	0.5	277.4	251.6
West	1.1.3	Cedar Bend WMA Variation Hop 2	1.2	25	1.5	0.1	0.9	0.0	6.2	1.0	509.4	462.2
West	1.1.3	Cedar Bend WMA Variation Hop 3	0.9	19	1.2	0.1	0.7	0.0	4.7	0.8	388.2	352.1
West	1.1.4	Beltrami North Proposed Route	16.5	295	20.1	1.9	11.9	0.3	79.1	13.0	6730.7	6106.1
West	1.1.4	Beltrami North Variation 1	15.8	283	19.2	1.8	11.4	0.3	75.9	12.5	6456.6	5857.4
West	1.1.4	Beltrami North Variation 2	19.7	356	24.0	2.3	14.3	0.4	94.9	15.6	8051.9	7304.7
West	1.1.4	Beltrami North Variation Hop 1	1.0	19	1.2	0.1	0.7	0.0	4.8	0.8	395.2	358.5
West	1.1.4	Beltrami North Variation Hop 2	0.9	19	1.2	0.1	0.7	0.0	4.7	0.8	388.2	352.1
West	1.1.5	Beltrami North Central Proposed Route	11.6	211	14.1	1.3	8.4	0.2	55.9	9.2	4738.6	4298.8
West	1.1.5	Beltrami North Central Variation Hop	3.5	46	4.1	0.4	2.4	0.1	15.0	2.5	1366.4	1239.6
West	1.1.5	Beltrami North Central Variation 1	13.7	219	16.4	1.5	9.7	0.3	63.0	10.4	5503.7	4993.0
West	1.1.5	Beltrami North Central Variation 2	12.6	225	15.3	1.4	9.1	0.3	60.4	9.9	5138.3	4661.4
West	1.1.5	Beltrami North Central Variation 3	12.2	184	14.5	1.4	8.6	0.3	55.0	9.1	4870.4	4418.4
West	1.1.5	Beltrami North Central Variation 4	13.5	193	16.0	1.5	9.5	0.3	59.9	9.9	5376.2	4877.3
West	1.1.5	Beltrami North Central Variation 5	15.0	227	17.8	1.7	10.6	0.3	67.8	11.2	6002.8	5445.7
Central	1.2.1	Pine Island Proposed Blue Route	109.8	1770	131.6	12.4	78.3	2.3	507.0	83.7	44253.7	40147.0
Central	1.2.1	Pine Island Proposed Orange Route	105.4	1751	127.0	12.0	75.5	2.2	492.2	81.2	42667.9	38708.4
Central	1.2.2	Beltrami South Central Proposed Route	1.2	29	1.6	0.1	0.9	0.0	6.6	1.1	522.6	474.1
Central	1.2.2	Beltrami South Central Variation	1.7	37	2.2	0.2	1.3	0.0	9.0	1.5	731.0	663.2
Central	1.2.3	Beltrami South Proposed Route	5.6	119	7.0	0.7	4.2	0.1	28.9	4.7	2348.9	2130.9
Central	1.2.3	Beltrami South Variation	7.5	148	9.3	0.9	5.5	0.2	37.6	6.2	3123.6	2833.8
Central	1.2.4	North Black River Proposed Route	8.4	156	10.3	1.0	6.1	0.2	40.9	6.7	3447.6	3127.7
Central	1.2.4	North Black River Variation	9.2	148	11.0	1.0	6.6	0.2	42.4	7.0	3701.4	3357.9
Central	1.2.5	C2 Proposed Route	32.8	541	39.5	3.7	23.5	0.7	152.9	25.2	13279.2	12046.9
Central	1.2.5	C2 Variation	46.0	919	57.1	5.4	33.9	0.9	231.1	37.8	19130.8	17355.5

		Route Variation	Base Length	Total Forest	Construction Emissions							Construction GHG Emissions
		Unit	(mi)	Area (ac)	(tons)							(metric tons)
Section	Sect. #	Buffer (ft.)	100	100	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CO_2
Central	1.2.6	J2 Proposed Route	42.2	531	49.0	4.6	29.2	0.9	179.3	29.9	16531.0	14996.9
Central	1.2.6	J2 Variation	45.2	414	50.7	4.8	30.4	0.9	175.7	29.6	17186.2	15591.4
Central	1.2.7	Northome Proposed Route	3.7	18	4.0	0.4	2.4	0.1	12.8	2.2	1368.9	1241.8
Central	1.2.7	Northome Variation	4.0	15	4.3	0.4	2.6	0.1	13.4	2.3	1464.1	1328.2
Central	1.2.8	Cutfoot Proposed Route	4.2	69	5.1	0.5	3.0	0.1	19.6	3.2	1704.7	1546.5
Central	1.2.8	Cutfoot Variation	4.8	51	5.4	0.5	3.2	0.1	19.3	3.2	1831.1	1661.2
East	1.3.1	Effie Proposed Blue Route	41.1	505	47.5	4.5	28.4	0.8	173.2	28.9	16049.8	14560.4
East	1.3.1	Effie Proposed Orange Route	44.6	478	50.7	4.8	30.4	0.9	180.6	30.2	17176.1	15582.2
East	1.3.1	Effie Variation	49.8	607	57.6	5.4	34.4	1.0	209.5	34.9	19445.8	17641.3
East	1.3.2	East Bear Lake Proposed Route	8.9	113	10.4	1.0	6.2	0.2	38.0	6.3	3498.8	3174.1
East	1.3.2	East Bear Lake Variation	10.5	111	12.0	1.1	7.2	0.2	42.4	7.1	4049.0	3673.2
East	1.3.3	Balsam Proposed Blue Route	12.9	94	14.2	1.3	8.5	0.3	47.7	8.1	4837.0	4388.1
East	1.3.3	Balsam Proposed Orange Route	13.7	109	15.2	1.4	9.1	0.3	51.5	8.7	5148.9	4671.1
East	1.3.3	Balsam Variation	17.8	168	20.0	1.9	12.0	0.4	69.8	11.7	6796.2	6165.6
East	1.3.4	Dead Man's Pond Proposed Route	2.2	17	2.4	0.2	1.5	0.0	8.2	1.4	826.3	749.6
East	1.3.4	Dead Man's Pond Variation	2.3	11	2.4	0.2	1.5	0.0	7.8	1.3	834.6	757.1
East	1.3.5	Blackberry Proposed Blue Route	5.4	70	6.3	0.6	3.8	0.1	23.3	3.9	2135.2	1937.1
East	1.3.5	Blackberry Proposed Orange Route	6.1	78	7.0	0.7	4.2	0.1	25.9	4.3	2375.1	2154.7
Central	1.4.2.1	Silver Creek WMA Alignment Modification		26	0.3	0.0	0.2	0.0	2.7	0.4	85.3	77.3
Central	1.4.2.2	Airstrip Alignment Modification		38	0.4	0.0	0.2	0.0	4.0	0.6	125.0	113.4
Central	1.4.2.3	Mizpah Alignment Modification		67	0.8	0.1	0.4	0.0	7.0	1.0	220.7	200.2
Central	1.4.2.4	Gravel Pit Alignment Modification		29	0.3	0.0	0.2	0.0	3.1	0.5	96.0	87.1
East	1.4.3.1	Bass Lake Alignment Modification		60	0.7	0.1	0.4	0.0	6.3	0.9	196.6	178.3
East	1.4.3.2	Wilson Lake Alignment Modification		59	0.7	0.1	0.4	0.0	6.2	0.9	193.8	175.8
East	1.4.3.3	Grass Lake Alignment Modification		32	0.4	0.0	0.2	0.0	3.3	0.5	104.7	95.0
East	1.4.3.4	Dead Man's Pond Alignment Modification		35	0.4	0.0	0.2	0.0	3.7	0.5	115.0	104.3
East	1.4.3.5	Trout Lake Alignment Modification		26	0.3	0.0	0.2	0.0	2.7	0.4	85.5	77.6
Total		**Proposed Blue Route**	**219.0**	**4829**	**277.2**	**26.1**	**164.1**	**4.5**	**1147.8**	**187.2**	**92571.9**	**83981.2**
Total		**Proposed Orange Route**	**220.0**	**4883**	**278.8**	**26.3**	**165.0**	**4.6**	**1156.5**	**188.5**	**93101.1**	**84461.3**
Substation		Iron Range 500 kV Substation		23	11.6	1.1	9.3	0.0	14.6	2.2	3871.5	3512.2
Substation		500 kV Series Compensation Station		6	3.0	0.3	2.4	0.0	4.1	0.6	1017.5	923.1
Substation		(3) Regeneration Stations		1	0.5	0.0	0.4	0.0	0.7	0.1	169.6	153.8
Substation		**Substations total**		**30**	**15.1**	**1.4**	**12.1**	**0.0**	**19.3**	**2.9**	**5058.6**	**4589.1**

Table 2.1
Construction Emissions from Placement of Line and Structures on Existing or Cleared ROW

		Route Variation	Base Length	Total Forest	Construction Emissions							Construction GHG Emissions
		Unit	(mi)	Area (ac)	(tons)							(metric tons)
Section	Sect. #	Buffer (ft.)	100	100	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CO_2
West	1.1.1	Border Crossing Proposed Route	25.0	354	25.5	2.4	15.4	0.5	73.2	12.8	8765.0	7951.6
West	1.1.1	Border Crossing Pine Creek Variation	25.7	313	26.2	2.5	15.8	0.5	75.2	13.2	8999.6	8164.4
West	1.1.1	Border Crossing Hwy 310 Variation	18.6	239	19.0	1.8	11.5	0.4	54.5	9.5	6527.3	5921.6
West	1.1.1	Border Crossing 500kV Variation	10.1	143	10.2	1.0	6.2	0.2	29.4	5.1	3519.3	3192.7
West	1.1.1	Border Crossing 230kV Variation	8.2	99	8.3	0.8	5.0	0.2	23.9	4.2	2857.5	2592.3
West	1.1.2	Roseau Lake WMA Proposed Route	30.7	443	31.3	3.0	18.9	0.6	89.9	15.7	10761.0	9762.4
West	1.1.2	Roseau Lake WMA Variation 1	44.1	121	45.0	4.2	27.2	0.9	129.1	22.6	15449.9	14016.1
West	1.1.2	Roseau Lake WMA Variation 2	37.5	219	38.2	3.6	23.1	0.8	109.7	19.2	13135.2	11916.3
West	1.1.3	Cedar Bend WMA Proposed Route	24.7	433	25.1	2.4	15.2	0.5	72.2	12.6	8638.9	7837.2
West	1.1.3	Cedar Bend WMA Variation	19.6	209	20.0	1.9	12.1	0.4	57.4	10.0	6870.5	6232.9
West	1.1.3	Cedar Bend WMA Variation Hop 1	0.7	13	0.7	0.1	0.4	0.0	2.0	0.3	234.6	212.8
West	1.1.3	Cedar Bend WMA Variation Hop 2	1.2	25	1.2	0.1	0.8	0.0	3.6	0.6	427.2	387.6
West	1.1.3	Cedar Bend WMA Variation Hop 3	0.9	19	0.9	0.1	0.6	0.0	2.7	0.5	325.7	295.4
West	1.1.4	Beltrami North Proposed Route	16.5	295	16.8	1.6	10.1	0.3	48.1	8.4	5760.4	5225.9
West	1.1.4	Beltrami North Variation 1	15.8	283	16.1	1.5	9.7	0.3	46.2	8.1	5525.8	5013.0
West	1.1.4	Beltrami North Variation 2	19.7	356	20.0	1.9	12.1	0.4	57.5	10.1	6881.0	6242.5
West	1.1.4	Beltrami North Variation Hop 1	1.0	19	1.0	0.1	0.6	0.0	2.8	0.5	332.7	301.8
West	1.1.4	Beltrami North Variation Hop 2	0.9	19	0.9	0.1	0.6	0.0	2.7	0.5	325.7	295.4
West	1.1.5	Beltrami North Central Proposed Route	11.6	211	11.8	1.1	7.1	0.2	33.8	5.9	4044.6	3669.2
West	1.1.5	Beltrami North Central Variation Hop	3.5	46	3.5	0.3	2.1	0.1	10.2	1.8	1215.1	1102.4
West	1.1.5	Beltrami North Central Variation 1	13.7	219	13.9	1.3	8.4	0.3	40.0	7.0	4783.4	4339.5
West	1.1.5	Beltrami North Central Variation 2	12.6	225	12.8	1.2	7.7	0.3	36.7	6.4	4398.2	3990.1
West	1.1.5	Beltrami North Central Variation 3	12.2	184	12.4	1.2	7.5	0.2	35.6	6.2	4265.2	3869.4
West	1.1.5	Beltrami North Central Variation 4	13.5	193	13.8	1.3	8.3	0.3	39.6	6.9	4741.4	4301.4
West	1.1.5	Beltrami North Central Variation 5	15.0	227	15.3	1.4	9.3	0.3	43.9	7.7	5256.2	4768.4
Central	1.2.1	Pine Island Proposed Blue Route	109.8	1770	111.8	10.6	67.7	2.2	321.1	56.2	38432.1	34865.6
Central	1.2.1	Pine Island Proposed Orange Route	105.4	1751	107.4	10.1	65.0	2.1	308.4	54.0	36908.8	33483.7
Central	1.2.2	Beltrami South Central Proposed Route	1.2	29	1.2	0.1	0.8	0.0	3.6	0.6	427.2	387.6
Central	1.2.2	Beltrami South Central Variation	1.7	37	1.8	0.2	1.1	0.0	5.1	0.9	609.3	552.8
Central	1.2.3	Beltrami South Proposed Route	5.6	119	5.7	0.5	3.4	0.1	16.4	2.9	1957.5	1775.8
Central	1.2.3	Beltrami South Variation	7.5	148	7.7	0.7	4.6	0.2	22.0	3.9	2636.8	2392.1
Central	1.2.4	North Black River Proposed Route	8.4	156	8.5	0.8	5.2	0.2	24.5	4.3	2934.5	2662.2
Central	1.2.4	North Black River Variation	9.2	148	9.4	0.9	5.7	0.2	26.9	4.7	3214.6	2916.3

		Route Variation	Base Length	Total Forest	Construction Emissions							Construction GHG Emissions
		Unit	(mi)	Area (ac)	(tons)							(metric tons)
Section	Sect. #	Buffer (ft.)	100	100	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CO_2
Central	1.2.5	C2 Proposed Route	32.8	541	33.5	3.2	20.2	0.7	96.1	16.8	11499.9	10432.7
Central	1.2.5	C2 Variation	46.0	919	46.9	4.4	28.4	0.9	134.6	23.5	16108.2	14613.4
Central	1.2.6	J2 Proposed Route	42.2	531	43.0	4.1	26.0	0.9	123.5	21.6	14784.5	13412.5
Central	1.2.6	J2 Variation	45.2	414	46.0	4.3	27.9	0.9	132.2	23.1	15824.6	14356.0
Central	1.2.7	Northome Proposed Route	3.7	18	3.8	0.4	2.3	0.1	10.9	1.9	1309.7	1188.1
Central	1.2.7	Northome Variation	4.0	15	4.1	0.4	2.5	0.1	11.8	2.1	1414.7	1283.4
Central	1.2.8	Cutfoot Proposed Route	4.2	69	4.3	0.4	2.6	0.1	12.3	2.2	1477.8	1340.6
Central	1.2.8	Cutfoot Variation	4.8	51	4.8	0.5	2.9	0.1	13.9	2.4	1663.3	1509.0
East	1.3.1	Effie Proposed Blue Route	41.1	505	41.9	4.0	25.3	0.8	120.2	21.0	14388.8	13053.6
East	1.3.1	Effie Proposed Orange Route	44.6	478	45.4	4.3	27.5	0.9	130.4	22.8	15604.0	14155.9
East	1.3.1	Effie Variation	49.8	607	50.8	4.8	30.7	1.0	145.8	25.5	17449.4	15830.1
East	1.3.2	East Bear Lake Proposed Route	8.9	113	9.1	0.9	5.5	0.2	26.1	4.6	3127.1	2836.9
East	1.3.2	East Bear Lake Variation	10.5	111	10.7	1.0	6.5	0.2	30.8	5.4	3683.9	3342.0
East	1.3.3	Balsam Proposed Blue Route	12.9	94	13.2	1.2	8.0	0.3	37.8	6.6	4527.8	4107.6
East	1.3.3	Balsam Proposed Orange Route	13.7	109	13.9	1.3	8.4	0.3	40.0	7.0	4790.4	4345.9
East	1.3.3	Balsam Variation	17.8	168	18.2	1.7	11.0	0.4	52.2	9.1	6243.7	5664.3
East	1.3.4	Dead Man's Pond Proposed Route	2.2	17	2.2	0.2	1.4	0.0	6.4	1.1	770.4	698.9
East	1.3.4	Dead Man's Pond Variation	2.3	11	2.3	0.2	1.4	0.0	6.7	1.2	798.4	724.3
East	1.3.5	Blackberry Proposed Blue Route	5.4	70	5.5	0.5	3.4	0.1	15.9	2.8	1905.0	1728.2
East	1.3.5	Blackberry Proposed Orange Route	6.1	78	6.2	0.6	3.7	0.1	17.7	3.1	2118.6	1922.0
Central	1.4.2.1	Silver Creek WMA Alignment Modification		26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Central	1.4.2.2	Airstrip Alignment Modification		38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Central	1.4.2.3	Mizpah Alignment Modification		67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Central	1.4.2.4	Gravel Pit Alignment Modification		29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East	1.4.3.1	Bass Lake Alignment Modification		60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East	1.4.3.2	Wilson Lake Alignment Modification		59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East	1.4.3.3	Grass Lake Alignment Modification		32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East	1.4.3.4	Dead Man's Pond Alignment Modification		35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East	1.4.3.5	Trout Lake Alignment Modification		26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total		**Proposed Blue Route**	**219.0**	**4829**	**223.1**	**21.1**	**135.0**	**4.4**	**640.7**	**112.1**	**76689.1**	**69572.3**
Total		**Proposed Orange Route**	**220.0**	**4883**	**224.2**	**21.2**	**135.6**	**4.4**	**643.7**	**112.6**	**77039.3**	**69890.0**
Substation		Iron Range 500 kV Substation	0.0	23	11.4	1.0	9.2	0.0	13.1	2.0	3824.8	3469.9
Substation		500 kV Seriec Compensation Station		6	3.0	0.3	2.4	0.0	3.4	0.5	997.8	905.2
Substation		(3) Regeneration Stations		1	0.5	0.0	0.4	0.0	0.6	0.1	166.3	150.9
Substation		**Substations total**		**30**	**14.9**	**1.4**	**12.0**	**0.0**	**17.1**	**2.6**	**4988.9**	**4525.9**

Table 2.2
Construction Emissions from Clearing Forest

		Route Variation	Base Length	Total Forest	Construction Emissions							Construction GHG Emissions
		Unit	(mi)	Area (ac)	(tons)							(metric tons)
Section	Sect. #	Buffer (ft.)	100	100	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CO_2
West	1.1.1	Border Crossing Proposed Route	25.0	354	4.0	0.37	2.13	0.01	37.2	5.5	1164.3	1056.3
West	1.1.1	Border Crossing Pine Creek Variation	25.7	313	3.5	0.33	1.88	0.01	32.9	4.9	1029.5	933.9
West	1.1.1	Border Crossing Hwy 310 Variation	18.6	239	2.7	0.25	1.44	0.01	25.1	3.7	786.1	713.1
West	1.1.1	Border Crossing 500kV Variation	10.1	143	1.6	0.15	0.86	0.00	15.0	2.2	470.3	426.7
West	1.1.1	Border Crossing 230kV Variation	8.2	99	1.1	0.10	0.60	0.00	10.4	1.5	325.6	295.4
West	1.1.2	Roseau Lake WMA Proposed Route	30.7	443	5.0	0.47	2.67	0.01	46.5	6.9	1457.0	1321.8
West	1.1.2	Roseau Lake WMA Variation 1	44.1	121	1.4	0.13	0.73	0.00	12.7	1.9	398.0	361.0
West	1.1.2	Roseau Lake WMA Variation 2	37.5	219	2.4	0.23	1.32	0.00	23.0	3.4	720.3	653.5
West	1.1.3	Cedar Bend WMA Proposed Route	24.7	433	4.8	0.45	2.61	0.01	45.5	6.7	1424.2	1292.0
West	1.1.3	Cedar Bend WMA Variation	19.6	209	2.3	0.22	1.26	0.00	21.9	3.2	687.4	623.6
West	1.1.3	Cedar Bend WMA Variation Hop 1	0.7	13	0.1	0.01	0.08	0.00	1.4	0.2	42.8	38.8
West	1.1.3	Cedar Bend WMA Variation Hop 2	1.2	25	0.3	0.03	0.15	0.00	2.6	0.4	82.2	74.6
West	1.1.3	Cedar Bend WMA Variation Hop 3	0.9	19	0.2	0.02	0.11	0.00	2.0	0.3	62.5	56.7
West	1.1.4	Beltrami North Proposed Route	16.5	295	3.3	0.31	1.78	0.01	31.0	4.6	970.3	880.2
West	1.1.4	Beltrami North Variation 1	15.8	283	3.2	0.30	1.70	0.01	29.7	4.4	930.8	844.4
West	1.1.4	Beltrami North Variation 2	19.7	356	4.0	0.37	2.14	0.01	37.4	5.5	1170.9	1062.2
West	1.1.4	Beltrami North Variation Hop 1	1.0	19	0.2	0.02	0.11	0.00	2.0	0.3	62.5	56.7
West	1.1.4	Beltrami North Variation Hop 2	0.9	19	0.2	0.02	0.11	0.00	2.0	0.3	62.5	56.7
West	1.1.5	Beltrami North Central Proposed Route	11.6	211	2.4	0.22	1.27	0.00	22.2	3.3	694.0	629.6
West	1.1.5	Beltrami North Central Variation Hop	3.5	46	0.5	0.05	0.28	0.00	4.8	0.7	151.3	137.3
West	1.1.5	Beltrami North Central Variation 1	13.7	219	2.4	0.23	1.32	0.00	23.0	3.4	720.3	653.5
West	1.1.5	Beltrami North Central Variation 2	12.6	225	2.5	0.24	1.35	0.01	23.6	3.5	740.0	671.4
West	1.1.5	Beltrami North Central Variation 3	12.2	184	2.1	0.19	1.11	0.00	19.3	2.9	605.2	549.0
West	1.1.5	Beltrami North Central Variation 4	13.5	193	2.2	0.20	1.16	0.00	20.3	3.0	634.8	575.9
West	1.1.5	Beltrami North Central Variation 5	15.0	227	2.5	0.24	1.37	0.01	23.8	3.5	746.6	677.3
Central	1.2.1	Pine Island Proposed Blue Route	109.8	1770	19.8	1.86	10.65	0.04	185.9	27.5	5821.6	5281.4
Central	1.2.1	Pine Island Proposed Orange Route	105.4	1751	19.6	1.84	10.54	0.04	183.9	27.2	5759.1	5224.7
Central	1.2.2	Beltrami South Central Proposed Route	1.2	29	0.3	0.03	0.17	0.00	3.0	0.5	95.4	86.5
Central	1.2.2	Beltrami South Central Variation	1.7	37	0.4	0.04	0.22	0.00	3.9	0.6	121.7	110.4
Central	1.2.3	Beltrami South Proposed Route	5.6	119	1.3	0.12	0.72	0.00	12.5	1.9	391.4	355.1
Central	1.2.3	Beltrami South Variation	7.5	148	1.7	0.16	0.89	0.00	15.5	2.3	486.8	441.6
Central	1.2.4	North Black River Proposed Route	8.4	156	1.7	0.16	0.94	0.00	16.4	2.4	513.1	465.5
Central	1.2.4	North Black River Variation	9.2	148	1.7	0.16	0.89	0.00	15.5	2.3	486.8	441.6
Central	1.2.5	C2 Proposed Route	32.8	541	6.1	0.57	3.26	0.01	56.8	8.4	1779.4	1614.2
Central	1.2.5	C2 Variation	46.0	919	10.3	0.96	5.53	0.02	96.5	14.3	3022.6	2742.1
Central	1.2.6	J2 Proposed Route	42.2	531	5.9	0.56	3.20	0.01	55.8	8.3	1746.5	1584.4

		Route Variation	Base Length	Total Forest	Construction Emissions							Construction GHG Emissions
		Unit	(mi)	Area (ac)	(tons)							(metric tons)
Section	Sect. #	Buffer (ft.)	100	100	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CO_2
Central	1.2.6	J2 Variation	45.2	414	4.6	0.43	2.49	0.01	43.5	6.4	1361.7	1235.3
Central	1.2.7	Northome Proposed Route	3.7	18	0.2	0.02	0.11	0.00	1.9	0.3	59.2	53.7
Central	1.2.7	Northome Variation	4.0	15	0.2	0.02	0.09	0.00	1.6	0.2	49.3	44.8
Central	1.2.8	Cutfoot Proposed Route	4.2	69	0.8	0.07	0.42	0.00	7.2	1.1	226.9	205.9
Central	1.2.8	Cutfoot Variation	4.8	51	0.6	0.05	0.31	0.00	5.4	0.8	167.7	152.2
East	1.3.1	Effie Proposed Blue Route	41.1	505	5.6	0.53	3.04	0.01	53.0	7.9	1661.0	1506.8
East	1.3.1	Effie Proposed Orange Route	44.6	478	5.3	0.50	2.88	0.01	50.2	7.4	1572.2	1426.3
East	1.3.1	Effie Variation	49.8	607	6.8	0.64	3.65	0.01	63.7	9.4	1996.5	1811.2
East	1.3.2	East Bear Lake Proposed Route	8.9	113	1.3	0.12	0.68	0.00	11.9	1.8	371.7	337.2
East	1.3.2	East Bear Lake Variation	10.5	111	1.2	0.12	0.67	0.00	11.7	1.7	365.1	331.2
East	1.3.3	Balsam Proposed Blue Route	12.9	94	1.1	0.10	0.57	0.00	9.9	1.5	309.2	280.5
East	1.3.3	Balsam Proposed Orange Route	13.7	109	1.2	0.11	0.66	0.00	11.4	1.7	358.5	325.2
East	1.3.3	Balsam Variation	17.8	168	1.9	0.18	1.01	0.00	17.6	2.6	552.6	501.3
East	1.3.4	Dead Man's Pond Proposed Route	2.2	17	0.2	0.02	0.10	0.00	1.8	0.3	55.9	50.7
East	1.3.4	Dead Man's Pond Variation	2.3	11	0.1	0.01	0.07	0.00	1.2	0.2	36.2	32.8
East	1.3.5	Blackberry Proposed Blue Route	5.4	70	0.8	0.07	0.42	0.00	7.4	1.1	230.2	208.9
East	1.3.5	Blackberry Proposed Orange Route	6.1	78	0.9	0.08	0.47	0.00	8.2	1.2	256.5	232.7
Central	1.4.2.1	Silver Creek WMA Alignment Modification		26	0.3	0.03	0.16	0.00	2.7	0.4	85.3	77.3
Central	1.4.2.2	Airstrip Alignment Modification		38	0.4	0.04	0.23	0.00	4.0	0.6	125.0	113.4
Central	1.4.2.3	Mizpah Alignment Modification		67	0.8	0.07	0.40	0.00	7.0	1.0	220.7	200.2
Central	1.4.2.4	Gravel Pit Alignment Modification		29	0.3	0.03	0.18	0.00	3.1	0.5	96.0	87.1
East	1.4.3.1	Bass Lake Alignment Modification		60	0.7	0.06	0.36	0.00	6.3	0.9	196.6	178.3
East	1.4.3.2	Wilson Lake Alignment Modification		59	0.7	0.06	0.35	0.00	6.2	0.9	193.8	175.8
East	1.4.3.3	Grass Lake Alignment Modification		32	0.4	0.03	0.19	0.00	3.3	0.5	104.7	95.0
East	1.4.3.4	Dead Man's Pond Alignment Modification		35	0.4	0.04	0.21	0.00	3.7	0.5	115.0	104.3
East	1.4.3.5	Trout Lake Alignment Modification		26	0.3	0.03	0.16	0.00	2.7	0.4	85.5	77.6
Total		**Proposed Blue Route**	**219.0**	**4829**	**54.0**	**5.07**	**29.06**	**0.11**	**507.1**	**75.1**	**15882.8**	**14408.9**
Total		**Proposed Orange Route**	**220.0**	**4883**	**54.6**	**5.13**	**29.39**	**0.11**	**512.8**	**75.9**	**16061.8**	**14571.3**
Substation		Iron Range 500 kV Substation	0.0	14	0.2	0.01	0.09	0.00	1.5	0.2	46.7	42.4
Substation		500 kV Series Compensation Station		6	0.1	0.01	0.04	0.00	0.6	0.1	19.7	17.9
Substation		(3) Regeneration Stations		1	0.0	0.00	0.01	0.00	0.1	0.0	3.3	3.0
Substation		**Substations total**		**21**	**0.2**	**0.02**	**0.13**	**0.00**	**2.2**	**0.3**	**69.7**	**63.3**

Table 3
Construction Emissions by Activity, By Type of Construction Example
Great Northern Transmission Line Project

Activity		Emissions (tons)							GHG Emissions (metric tons)	Reference
Miles or Acres	**Emission Source**	**NO_x**	**VOC**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CO_2**	**Table**
Placement of Line and Structures on Existing or Cleared ROW (50 miles example project)	Exhaust Emissions - Nonroad Equipment	30.07	3.17	17.11	0.05	2.07	1.83	8345.81	7571.32	T5.1
	Exhaust Emissions - On-Road Vehicle (Construction Vehicles)	4.39	0.23	1.60	0.01	0.14	0.13	1552.72	1408.63	T6.1
	Exhaust Emissions - On-Road Vehicles (Commuter Vehicles)	0.38	0.07	3.58	0.00	0.01	0.01	476.65	432.41	T7
	Exhaust Emissions - Helicopters	13.84	1.06	6.78	0.94	4.01	4.01	6640.17	6023.96	T8
	Fugitive Dust Emissions - Work Site	-	-	-	-	102.29	15.67	-	-	T12.1
	Fugitive Dust Emissions - Roads	-	-	-	-	36.36	3.69	-	-	T12.2
	Concrete Batch Plant: Exhaust Emissions - Nonroad Equipment	2.06	0.28	1.71	0.00	0.24	0.14	423.39	384.10	T5.4
	Concrete Batch Plant: Exhaust Emissions - On-Road Vehicles	0.21	0.01	0.05	0.00	0.01	0.01	70.19	63.67	T6.4
	Concrete Batch Plant: Fugitive Dust Emissions - Plant	-	-	-	-	0.20	0.02	-	-	T12.3
	Concrete Batch Plant: Fugitive Dust Emissions - Roads	-	-	-	-	0.94	0.09	-	-	T12.1
	Total	**50.94**	**4.81**	**30.83**	**1.01**	**146.29**	**25.60**	**17508.93**	**15884.10**	
50.0	**per Mile**	**1.02**	**0.10**	**0.62**	**0.02**	**2.93**	**0.51**	**350.18**	**317.68**	
Clearing of Forest.	Exhaust Emissions - Nonroad Equipment	7.91	0.87	3.69	0.01	0.61	0.49	2083.28	1889.95	T5.2
	Exhaust Emissions - On-Road Vehicle (Construction Vehicles)	3.14	0.15	0.99	0.01	0.10	0.09	1027.45	932.11	T6.2
	Exhaust Emissions - On-Road Vehicles (Commuter Vehicles)	0.14	0.03	1.34	0.00	0.01	0.00	178.31	161.77	T7.2
	Exhaust Emissions - Helicopters	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Fugitive Dust Emissions - Work Site					84.60	12.96			T12.2
	Fugitive Dust Emissions - Roads					19.69	1.99			T12.1
	Total	**11.19**	**1.05**	**6.02**	**0.02**	**105.01**	**15.55**	**3289.05**	**2983.82**	
1000.0	**per Acre**	**0.01**	**0.00**	**0.01**	**0.00**	**0.11**	**0.02**	**3.29**	**2.98**	
Converter Station	Exhaust Emissions - Nonroad Equipment	7.17	0.73	5.17	0.01	0.44	0.43	2178.53	1976.36	T5.3
	Exhaust Emissions - On-Road Vehicle (Construction Vehicles)	2.63	0.15	1.70	0.01	0.08	0.08	999.93	907.13	T6.3
	Exhaust Emissions - On-Road Vehicles (Commuter Vehicles)	0.12	0.02	1.11	0.00	0.00	0.00	147.45	133.77	T7.3
	Fugitive Dust Emissions - Work Site	-	-	-	-	1.69	0.26	-	-	T12.2
	Fugitive Dust Emissions - Roads	-	-	-	-	9.19	0.95	-	-	T12.1
	Total	**9.91**	**0.90**	**7.98**	**0.02**	**11.41**	**1.72**	**3325.91**	**3017.26**	
20.00	**per Acre**	**0.50**	**0.05**	**0.40**	**0.00**	**0.57**	**0.09**	**166.30**	**150.86**	

Table 4.1
Site Construction Equipment - Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)

Equipment Type	Equipment Description	ROW Clearing	Access Roads & Pads	Foundation Constr.	Tower Lacing (assembly)	Tower Setting (erection)	Wire Stringing	Restoration	Supervision	Materials Mngmt	Mechanic & Equipment Mngmt	Refueling	Watering & Dust Control	Blasting	Construction Insp.	Materials Testing	ENV Compliance	Surveyors	Sanitation/ Cleanup	Total
		No. of Crews:																		
		2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	-
		Quantity of Equipment:																		
Non-Road Equipment	3-Drum Puller (Heavy)						2													**2**
	3-Drum Puller (Medium)						2													**2**
	Air Compressor				2						2									**4**
	All Terrain Vehicle (ATV)																	2		**2**
	Backhoe		2																2	**4**
	Bobcat		2	2																**4**
	Bulldozer (D-8 Cat or Equivalent)	2	2				2													**6**
	Chipper	2																		**2**
	Crane (30-ton)						2													**2**
	Crane (Rubber-Tired)				2															**2**
	(Heavy)						2													**2**
	Double Bull-Wheel Tensioner (Light)						2													**2**
	Drill Rig			2																**2**
	Excavator	2	2	0																**4**
	Feller Buncher	2																		**2**
	Flail mower or Bush hog	2																		**2**
	Fork Lift									2										**2**
	Generator			1	2	1														**4**
	Hydra-Ax or Mulcher	2																		**2**
	Loader	2	1	1				2												**6**
	Motor Grader		2					2												**4**
	Office Trailer								2											**2**
	Plate Compactor			2																**2**
	Road Sweeper																		2	**2**
	Roller Compactor		2																	**2**
	Scraper		2																	**2**
	Single-Drum Puller (Large)						2													**2**
	Skidder	2																		**2**
	Wagon Drill																			**0**
	Wire Reel Trailer																			**0**
	Total Non-road																			**76**
On-Road Vehicles	Boom Truck									2										**2**
	Concrete Truck			2																**2**
	Crane (20-ton)			2		2	2													**6**
	Cranes (120- to 300-ton)					0														**0**
	Dump Truck		1	1						1									2	**5**
	Fuel Truck											2								**2**
	Mechanics' Truck										2									**2**
	Pick-up Truck	2	2	2	2	2	2	2	2	2				0	2	2	2	2	2	**28**
	Splicing Truck						2													**2**
	Steel Haul Truck									2										**2**
	Truck (1-ton)			1		1	1													**3**
	Truck (2-ton)				1	1	1													**3**
	Truck (5-ton)						0													**0**
	Water Truck		2										2							**4**
	Total On-road																			**61**
Helicopters	Helicopter (Small)						1													**1**
	Helicopter (Large)					1														**1**
	Total All Equipment	18	20	16	9	8	23	6	4	9	4	2	2	0	2	2	2	4	8	**139**

Table 4.2

Site Construction Equipment - Clearing Forest (1000 acres example)

Equipment Type	Equipment Description	ROW Clearing	Access Roads & Pads	Foundation Const.	Tower Lacing (assembly)	Tower Setting (erection)	Wire Stringing	Restoration	Supervision	Materials Mngmt	Mechanic & Equipment Mngmt	Refueling	Watering & Dust Control	Blasting	Construction Insp.	Materials Testing	ENV Comp.	Surveyors	Sanitation / Cleanup	Total
		No. of Crews:																		
		2	2	2	2	2	2	2	2	2	2	2	2	0	5	5	3	3	5	-
		Quantity of Equipment:																		
Non-Road Equipment	3-Drum Puller (Heavy)																			**0**
	3-Drum Puller (Medium)																			**0**
	Air Compressor										2									**2**
	All Terrain Vehicle (ATV)																	2		**2**
	Backhoe																		2	**2**
	Bobcat																			**0**
	Equivalent)	1																		**1**
	Chipper	1																		**1**
	Crane (30-ton)																			**0**
	Crane (Rubber-Tired)																			**0**
	Tensioner (Heavy)																			**0**
	Tensioner (Light)																			**0**
	Drill Rig																			**0**
	Excavator	1																		**1**
	Feller Buncher	1																		**1**
	Flail mower or Bush hog	1																		**1**
	Fork Lift									2										**2**
	Generator																			**0**
	Hydra-Ax or Mulcher	1																		**1**
	Loader	1																		**1**
	Motor Grader																			**0**
	Office Trailer								2											**2**
	Plate Compactor																			**0**
	Road Sweeper																		2	**2**
	Roller Compactor																			**0**
	Scraper																			**0**
	Single-Drum Puller (Large)																			**0**
	Skidder	1																		**1**
	Wagon Drill																			**0**
	Wire Reel Trailer																			**0**
	Total Non-road																			**20**
On-Road Vehicles	Boom Truck									2										**2**
	Concrete Truck																			**0**
	Crane (20-ton)																			**0**
	Cranes (120- to 300-ton)																			**0**
	Dump Truck									2									2	**4**
	Fuel Truck											2								**2**
	Mechanics' Truck										2									**2**
	Pick-up Truck	1							2	2				0	2	2	2	2	2	**15**
	Splicing Truck																			**0**
	Steel Haul Truck									5										**5**
	Truck (1-ton)																			**0**
	Truck (2-ton)																			**0**
	Truck (5-ton)																			**0**
	Water Truck												2							**2**
	Total On-road																			**32**
Helicopters	Helicopter (Small)																			**0**
	Helicopter (Large)																			**0**
	Total All Equipment	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**13**	**4**	**2**	**2**	**0**	**2**	**2**	**2**	**4**	**8**	**52**

Table 4.3
Site Construction Equipment - Substation(40 acre example)

Equipment Type	Equipment Description	Site Mngmt	Surveyors	Site Develop.	Fence Installation	Equipment Footings	Cable Trench, Conduits, Grounding	Steel Structures, Electrical Equip.	Control Bldg. and Wiring	Traffic Control	Construction Insp.	Materials Testing	Total
		Quantity of Equipment:											
Non-Road Equipment	Air Compressor				0	1	0	1	1				**3**
	All Terrain Vehicle (ATV)	1											**1**
	Bobcat\Skid Loader				1	1	0	0					**2**
	Boom Lift							2	2				**4**
	Bulldozer (D-8 Cat or Equivalent)			1	1								**2**
	Bulldozer (D-4 Cat or Equivalent)			1	1								**2**
	Concrete Line Pump				1	1							**2**
	Excavator Mini					1	1						**2**
	Excavator 100 Series			1		1	1						**3**
	Excavator 300 Series			1		1	1						**3**
	Forklift (Telescopic)				3	1		1					**5**
	Generator	1				1		1					**3**
	Wheel Loader (5 CY)			3		1							**4**
	Loader Backhoe	1		1	1	1	1						**5**
	Motor Grader			1		1	1						**3**
	Office Trailer	5		0		0		0					**5**
	Plate Compactor			1		1	1						**3**
	Road Sweeper			1									**1**
	Scraper			1									**1**
	Trencher						1		1				**2**
	Articulated Dump Truck			1									**1**
	Vibratory Compactor			1		1	1						**3**
	Total Off-Road												**60**
On-Road Vehicles	Concrete Truck				1	1							**2**
	Concrete Pump Truck					1							**1**
	Crane (15-ton Boom Truck)					0		1					**1**
	Crane (30-ton)					0		1					**1**
	Crane (120- to 300-ton)					1		1	1				**3**
	Dump Truck			1		1							**2**
	Fuel Truck			1		1		0					**2**
	Welder Truck							1					**1**
	Lowboy Truck			1		1							**2**
	Mechanics' Truck			1		1							**2**
	Pick-up Truck	1	1	3	1	1	1	1	1	1	1	1	**13**
	Splicing Truck								1				**1**
	Truck (1-ton)				1	1	1	1		1			**5**
	Truck (2-ton)						1	1	1				**3**
	Utility Van		1	1					1				**3**
	Water Truck			1									**1**
	Total On-road												**43**
	Total	**9**	**2**	**23**	**11**	**22**	**11**	**12**	**9**	**2**	**1**	**1**	**103**

Table 5.1
Nonroad Equipment Exhaust Emissions - Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)

Equipment Type	Fuel Type	Total No. of Units	Daily Operation per Unit (hrs/day)	Total Working Days per Unit	Equipment Engine Size (hp)	Load Factor	Total Equipment Hourly Usage (hrs)	Emissions (tons)							Emission Factor Reference
								NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
3-Drum Puller (Heavy)	Diesel	2	8	260	240	21%	4,160	0.4	0.0	0.1	0.0	0.0	0.0	120.7	Other Construction Equipment
3-Drum Puller (Medium)	Diesel	2	8	260	160	21%	4,160	0.3	0.0	0.1	0.0	0.0	0.0	71.1	Other Construction Equipment
Air Compressor	Diesel	4	7	260	197	59%	7,280	2.1	0.2	0.5	0.0	0.1	0.1	611.1	Air Compressors
All Terrain Vehicle (ATV)	Diesel	2	8	260	22	21%	4,160	0.1	0.0	0.1	0.0	0.0	0.0	14.2	Specialty Vehicle Carts
Backhoe	Diesel	4	9	260	106	59%	9,360	2.0	0.4	2.6	0.0	0.4	0.2	390.2	Tractors/Loaders/Backhoes
Bobcat	Diesel	4	7	260	49	59%	7,280	0.9	0.1	0.5	0.0	0.1	0.1	147.8	Skid Steer Loaders
Bulldozer (D-8 Cat or Equivalent)	Diesel	6	6	260	305	59%	9,360	4.3	0.4	1.8	0.0	0.3	0.3	1388.6	Crawler Tractors/Dozers
Chipper	Diesel	2	8	260	85	59%	4,160	0.8	0.1	0.4	0.0	0.1	0.1	134.6	Chippers/Stump Grinders
Crane (30-ton)	Diesel	2	8	260	152	43%	4,160	0.4	0.0	0.1	0.0	0.0	0.0	151.9	Cranes
Crane (Rubber-Tired)	Diesel	2	8	260	235	43%	4,160	0.7	0.1	0.1	0.0	0.0	0.0	248.7	Cranes
Double Bull-Wheel Tensioner (Heavy)	Diesel	2	8	260	130	21%	4,160	0.3	0.0	0.1	0.0	0.0	0.0	71.1	Other Construction Equipment
Double Bull-Wheel Tensioner (Light)	Diesel	2	8	260	85	21%	4,160	0.2	0.0	0.2	0.0	0.0	0.0	48.3	Other Construction Equipment
Drill Rig	Diesel	2	8	260	325	43%	4,160	3.2	0.2	0.9	0.0	0.1	0.1	467.5	Bore/Drill Rigs
Excavator	Diesel	4	8	260	159	59%	8,320	0.7	0.1	0.3	0.0	0.1	0.1	399.3	Excavators
Feller Buncher	Diesel	2	8	260	243	59%	4,160	1.1	0.1	0.4	0.0	0.1	0.1	339.1	Feller/Bunch/Skidders
Flail mower or Bush hog	Diesel	2	6	260	50	21%	3,120	0.1	0.0	0.0	0.0	0.0	0.0	19.1	Front Mowers
Fork Lift	Diesel	2	8	260	300	59%	4,160	1.0	0.1	0.3	0.0	0.1	0.1	332.4	Rough Terrain Forklifts
Generator	Diesel	4	10	260	43	59%	10,400	1.3	0.1	0.4	0.0	0.1	0.1	180.1	Generator Sets
Hydra-Ax or Mulcher	Diesel	2	8	260	210	59%	4,160	1.1	0.1	0.4	0.0	0.1	0.1	339.1	Other Construction Equipment
Loader	Diesel	6	9	260	369	21%	14,040	2.9	0.2	1.2	0.0	0.2	0.2	731.0	Rubber Tire Loaders
Motor Grader	Diesel	4	10	260	297	59%	10,400	1.6	0.2	0.5	0.0	0.1	0.1	838.7	Graders
Office Trailer	Diesel	2	18	260	43	59%	9,360	1.2	0.1	0.4	0.0	0.1	0.1	162.1	Generator Sets
Plate Compactor	Gasoline	2	8	260	7.9	43%	4,160	0.0	0.1	4.4	0.0	0.0	0.0	17.0	Plate Compactors
Road Sweeper	Diesel	2	6	260	50	43%	3,120	0.2	0.0	0.0	0.0	0.0	0.0	38.1	Sweepers/Scrubbers
Roller Compactor	Diesel	2	8	260	133	43%	4,160	0.4	0.0	0.2	0.0	0.0	0.0	139.8	Rollers
Scraper	Diesel	2	6	260	407	59%	3,120	1.5	0.1	0.6	0.0	0.1	0.1	459.8	Scrapers
Single-Drum Puller (Large)	Diesel	2	10	260	210	21%	5,200	0.5	0.1	0.2	0.0	0.0	0.0	150.9	Other Construction Equipment
Skidder	Diesel	2	8	260	182	59%	4,160	0.8	0.1	0.3	0.0	0.1	0.1	333.7	Rubber Tire Loaders
Wagon Drill	Diesel	0	6	260	450	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Bore/Drill Rigs
Wire Reel Trailer	Diesel	0	2	260	450	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
Total		**76**						**30**	**3**	**17**	**0.05**	**2.1**	**1.8**	**8,346**	**-**

Note:Conservatively assumes all equipment works each day, 5 days per week for a year

Table 5.2
Nonroad Equipment Exhaust Emissions - Clearing Forest (1000 acres example)

Equipment Type	Fuel Type	Total No. of Units	Daily Operation per Unit (hrs/day)	Total Working Days per Unit	Equipment Engine Size (hp)	Load Factor	Total Equipment Hourly Usage (hrs)	Emissions (tons)							Emission Factor Reference
								NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
3-Drum Puller (Heavy)	Diesel	0	8	260	240	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
3-Drum Puller (Medium)	Diesel	0	8	260	160	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
Air Compressor	Diesel	2	7	260	197	59%	3,640	1.0	0.1	0.2	0.0	0.0	0.0	305.5	Air Compressors
All Terrain Vehicle (ATV)	Diesel	2	8	260	22	21%	4,160	0.1	0.0	0.1	0.0	0.0	0.0	14.2	Specialty Vehicle Carts
Backhoe	Diesel	2	9	260	106	59%	4,680	1.0	0.2	1.3	0.0	0.2	0.1	195.1	Tractors/Loaders/Backhoes
Bobcat	Diesel	0	7	260	49	59%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Skid Steer Loaders
Bulldozer (D-8 Cat or Equivalent)	Diesel	1	6	260	305	59%	1,560	0.7	0.1	0.3	0.0	0.0	0.0	231.4	Crawler Tractors/Dozers
Chipper	Diesel	1	8	260	85	59%	2,080	0.4	0.0	0.2	0.0	0.0	0.0	67.3	Chippers/Stump Grinders
Crane (30-ton)	Diesel	0	8	260	152	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Cranes
Crane (Rubber-Tired)	Diesel	0	8	260	235	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Cranes
Double Bull-Wheel Tensioner (Light)	Diesel	0	8	260	130	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
Drill Rig	Diesel	0	8	260	85	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
Excavator	Diesel	0	8	260	325	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Bore/Drill Rigs
Feller Buncher	Diesel	1	8	260	159	59%	2,080	0.2	0.0	0.1	0.0	0.0	0.0	99.8	Excavators
Flail mower or Bush hog	Diesel	1	8	260	243	59%	2,080	0.6	0.1	0.2	0.0	0.0	0.0	169.5	Feller/Bunch/Skidders
Fork Lift	Diesel	1	6	260	50	21%	1,560	0.1	0.0	0.0	0.0	0.0	0.0	9.5	Front Mowers
Generator	Diesel	2	8	260	300	59%	4,160	1.0	0.1	0.3	0.0	0.1	0.1	332.4	Rough Terrain Forklifts
Hydra-Ax or Mulcher	Diesel	0	10	260	43	59%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Generator Sets
Loader	Diesel	1	8	260	210	59%	2,080	0.6	0.1	0.2	0.0	0.0	0.0	169.5	Other Construction Equipment
Motor Grader	Diesel	1	9	260	369	21%	2,340	0.5	0.0	0.2	0.0	0.0	0.0	121.8	Rubber Tire Loaders
Office Trailer	Diesel	0	10	260	297	59%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Graders
Plate Compactor	Diesel	2	18	260	43	59%	9,360	1.2	0.1	0.4	0.0	0.1	0.1	162.1	Generator Sets
Road Sweeper	Gasoline	0	8	260	7.9	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Plate Compactors
Roller Compactor	Diesel	2	6	260	50	43%	3,120	0.2	0.0	0.0	0.0	0.0	0.0	38.1	Sweepers/Scrubbers
Scraper	Diesel	0	8	260	133	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Rollers
Single-Drum Puller (Large)	Diesel	0	6	260	407	59%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Scrapers
Skidder	Diesel	0	10	260	210	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
Wagon Drill	Diesel	1	8	260	182	59%	2,080	0.4	0.0	0.1	0.0	0.0	0.0	166.9	Rubber Tire Loaders
Wagon Drill	Diesel	0	6	260	450	43%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Bore/Drill Rigs
Wire Reel Trailer	Diesel	0	2	260	450	21%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Other Construction Equipment
Total		**20**						**8**	**1**	**4**	**0.01**	**0.6**	**0.5**	**2,083**	**-**

Note: Conservatively assumes all equipment works each day, 5 days per week for a year

Table 5.3
Nonroad Equipment Exhaust Emissions - Converter Station Construction

Equipment Type	Fuel Type	Total No. of Units	Daily Operation per Unit (hrs/day)	Total Working Days per Unit	Equipment Engine Size (hp)	Load Factor	Total Equipment Hourly Usage (hrs)	Emissions (tons)							Emission Factor Reference
								NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
Air Compressor	Diesel	3	6	130	197	59%	2,340	0.66	0.07	0.15	0.00	0.03	0.03	196.42	Air Compressors
All Terrain Vehicle (ATV)	Diesel	1	5	130	22	21%	650	0.02	0.00	0.02	0.00	0.00	0.00	2.21	Specialty Vehicle Carts
Bobcat\Skid Loader	Diesel	2	6	130	49	59%	1,560	0.19	0.02	0.11	0.00	0.02	0.02	31.66	Skid Steer Loaders
Boom Lift	Diesel	4	6	130	110	43%	3,120	0.20	0.02	0.07	0.00	0.01	0.01	66.62	Rough Terrain Forklifts
Bulldozer (D-8 Cat or Equivalent)	Diesel	2	8	130	305	59%	2,080	0.96	0.09	0.39	0.00	0.06	0.06	308.57	Crawler Tractors/Dozers
Bulldozer (D-4 Cat or Equivalent)	Diesel	2	8	130	85	59%	2,080	0.27	0.02	0.11	0.00	0.02	0.02	86.00	Crawler Tractors/Dozers
Concrete Line Pump	Diesel	2	6	130	40	59%	1,560	0.07	0.01	0.02	0.00	0.00	0.00	21.19	Other Construction Equipment
Excavator Mini	Diesel	2	8	130	20	59%	2,080	0.02	0.00	0.01	0.00	0.00	0.00	12.56	Excavators
Excavator 100 Series	Diesel	3	8	130	81	59%	3,120	0.13	0.02	0.05	0.00	0.01	0.01	76.29	Excavators
Excavator 300 Series	Diesel	3	8	130	115	59%	3,120	0.19	0.03	0.08	0.00	0.02	0.02	108.31	Excavators
Forklift (Telescopic)	Diesel	5	8	130	100	59%	5,200	0.41	0.04	0.14	0.00	0.03	0.03	138.50	Rough Terrain Forklifts
Generator	Diesel	3	6	130	43	59%	2,340	0.29	0.02	0.10	0.00	0.02	0.02	40.52	Generator Sets
Wheel Loader (5 CY)	Diesel	4	8	130	300	59%	4,160	1.97	0.15	0.81	0.00	0.11	0.11	494.74	Rubber Tire Loaders
Loader Backhoe	Diesel	5	8	130	80	21%	5,200	0.22	0.02	0.09	0.00	0.01	0.01	72.02	Tractors/Loaders/Backhoes
Motor Grader	Diesel	3	6	130	297	59%	2,340	0.35	0.05	0.11	0.00	0.02	0.02	188.72	Graders
Office Trailer	Diesel	5	10	130	43	21%	6,500	0.29	0.02	0.10	0.00	0.02	0.02	40.07	Generator Sets
Plate Compactor	Gasoline	3	6	130	7.9	43%	2,340	0.02	0.05	2.47	0.00	0.00	0.00	9.55	Plate Compactors
Road Sweeper	Diesel	1	4	130	50	43%	520	0.03	0.00	0.00	0.00	0.00	0.00	6.35	Sweepers/Scrubbers
Scraper	Diesel	1	8	130	407	59%	1,040	0.49	0.04	0.20	0.00	0.03	0.03	153.27	Scrapers
Trencher	Diesel	2	8	130	80	21%	2,080	0.07	0.01	0.02	0.00	0.00	0.00	20.11	Other Construction Equipment
Roller Compactor	Diesel	3	8	130	133	43%	3,120	0.29	0.03	0.12	0.00	0.03	0.03	104.85	Rollers
Total		**59**						**7.17**	**0.73**	**5.17**	**0.01**	**0.44**	**0.43**	**2178.53**	-

Note: Conservatively assumes all equipment works each day, 5 days per week for 1/2 a year

Table 5.4
Nonroad Equipment Exhaust Emissions - Concrete Batch Plant

Equipment Type	Fuel Type	Total No. of Units	Daily Operation per Unit (hrs/day)	Total Working Days per Unit	Equipment Engine Size (hp)	Load Factor	Total Equipment Hourly Usage (hrs)	Emissions (tons)							Emission Factor Reference
								NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
Generator	Diesel	1	6	260	43	59%	1,560	0.20	0.02	0.06	0.00	0.01	0.01	27.02	Generator Sets
Wheel Loader (5 CY)	Diesel	1	6	260	300	59%	1,560	0.74	0.06	0.30	0.00	0.04	0.04	185.53	Rubber Tire Loaders
Office Trailer	Diesel	1	6	260	43	21%	1,560	0.07	0.01	0.02	0.00	0.00	0.00	9.62	Generator Sets
Backhoe	Diesel	1	6	260	450	43%	1,560	1.05	0.20	1.32	0.00	0.19	0.08	201.23	Tractors/Loaders/Backhoes
Total								**2.06**	**0.280**	**1.71**	**0.0027**	**0.245**	**0.140**	**423**	**-**

Note: Conservatively assumes all equipment works each day, 5 days per week for one year

Table 6.1
On Road Construction Equipment - Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)

Vehicle	Fuel	Equipment Engine Size (hp)	Load (%)	No. of Units	Round Trips per Day per Unit	Total Round Trips per Day	Travel Distance per Roundtrip		Total Working Days per Unit	Total VMT for Construction Period			Emissions (tons)						
							Paved Roads	Unpaved Roads		Paved Roads	Unpaved Roads	Total	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Boom Truck	Diesel	355	21	2	2	4	22.5	7.5	260	23,400	7,800	31,200	0.17	0.01	0.04	0.0005	0.005	0.005	56
Concrete Truck	Diesel	450	59	2	4	8	45	15	260	93,600	31,200	124,800	0.67	0.03	0.15	0.0020	0.020	0.018	224
Crane (20-ton)	Diesel	235	43	6	1	6	22.5	7.5	260	35,100	11,700	46,800	0.25	0.01	0.06	0.0007	0.007	0.007	84
Cranes (120- to 300-ton)	Diesel	245	43	0	1	0	0.05	0.45	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Dump Truck	Diesel	455	21	5	4	20	22.5	7.5	260	117,000	39,000	156,000	0.84	0.03	0.19	0.0024	0.025	0.023	279
Fuel Truck	Diesel	450	21	2	4	8	30	10	260	62,400	20,800	83,200	0.45	0.02	0.10	0.0013	0.013	0.012	149
Mechanics' Truck	Diesel	400	43	2	2	4	26.25	8.75	260	27,300	9,100	36,400	0.04	0.01	0.07	0.0002	0.002	0.002	22
Pick-up Truck	Diesel	400	43	28	1	28	30	10	260	218,400	72,800	291,200	0.31	0.04	0.46	0.0016	0.012	0.011	189
Splicing Truck	Diesel	400	21	2	1	2	0.1	0.9	260	52	468	520	0.001	0.0001	0.001	0.00000	0.00003	0.00002	0
Steel Haul Truck	Diesel	455	43	2	4	8	30	10	260	62,400	20,800	83,200	0.56	0.02	0.13	0.0014	0.019	0.017	157
Truck (1-ton)	Diesel	400	43	3	4	12	22.5	7.5	260	70,200	23,400	93,600	0.10	0.02	0.17	0.0005	0.005	0.004	57
Truck (2-ton)	Diesel	400	43	3	4	12	22.5	7.5	260	70,200	23,400	93,600	0.50	0.02	0.11	0.0015	0.015	0.014	168
Truck (5-ton)	Diesel	325	43	0	4	0	22.5	7.5	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Water Truck	Diesel	325	21	4	6	24	7.5	7.5	260	46,800	46,800	93,600	0.50	0.02	0.11	0.0015	0.015	0.014	168
Total				**61**						**826,852**	**307,268**	**1,134,120**	**4**	**0.23**	**1.6**	**0.01**	**0.14**	**0.13**	**1,553**

Note: Conservatively assumes all equipment works each day, 5 days per week

Totals for paved and unpaved roads used for fugitive dust calculations in Table 12.1

Table 6.2
On Road Construction Equipment - Clearing Forest (1000 acres example)

Vehicle	Fuel	Equipment Engine Size (hp)	Load (%)	No. of Units	Round Trips per Day per Unit	Total Round Trips per Day	Travel Distance per Roundtrip		Total Working Days per Unit	Total VMT for Construction Period			Emissions (tons)						
							Paved Roads	Unpaved Roads		Paved Roads	Unpaved Roads	Total	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Boom Truck	Diesel	355	21	2	2	4	22.5	7.5	260	23,400	7,800	31,200	0.17	0.01	0.04	0.0005	0.005	0.005	56
Concrete Truck	Diesel	450	59	0	4	0	45	15	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Crane (20-ton)	Diesel	235	43	0	1	0	22.5	7.5	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Cranes (120- to 300-ton)	Diesel	245	43	0	1	0	0.05	0.45	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Dump Truck	Diesel	455	21	4	4	16	22.5	7.5	260	93,600	31,200	124,800	0.67	0.03	0.15	0.0020	0.020	0.018	224
Fuel Truck	Diesel	450	21	2	4	8	30	10	260	62,400	20,800	83,200	0.45	0.02	0.10	0.0013	0.013	0.012	149
Mechanics' Truck	Diesel	400	43	2	2	4	26.25	8.75	260	27,300	9,100	36,400	0.04	0.01	0.07	0.0002	0.002	0.002	22
Pick-up Truck	Diesel	400	43	15	1	15	30	10	260	117,000	39,000	156,000	0.17	0.02	0.25	0.0009	0.006	0.006	101
Splicing Truck	Diesel	400	21	0	1	0	0.1	0.9	260	0	0	0	0.000	0.0000	0.000	0.00000	0.00000	0.00000	0
Steel Haul Truck	Diesel	455	43	5	4	20	30	10	260	156,000	52,000	208,000	1.40	0.06	0.32	0.0034	0.047	0.043	392
Truck (1-ton)	Diesel	400	43	0	4	0	22.5	7.5	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Truck (2-ton)	Diesel	400	43	0	4	0	22.5	7.5	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Truck (5-ton)	Diesel	325	43	0	4	0	22.5	7.5	260	0	0	0	0.00	0.00	0.00	0.0000	0.000	0.000	0
Water Truck	Diesel	325	21	2	6	12	7.5	7.5	260	23,400	23,400	46,800	0.25	0.01	0.06	0.0007	0.007	0.007	84
Total				**32**						**503,100**	**183,300**	**686,400**	**3**	**0.15**	**1.0**	**0.01**	**0.10**	**0.09**	**1,027**

Note: Conservatively assumes all equipment works each day, 5 days per week

Totals for paved and unpaved roads used for fugitive dust calculations in Table 12.1

Table 6.3
On-Road Construction Equipment Exhaust Emissions - Converter Station Construction

Vehicle	Fuel	Equipment Engine Size (hp)	Load (%)	No. of Units	Round Trips per Day per Unit	Total Round Trips per Day	Travel Distance per Roundtrip		Total Working Days per Unit	Total VMT for Construction Period			Emissions (tons)						
							Paved Roads	Unpaved Roads		Paved Roads	Unpaved Roads	Total	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Concrete Truck	Diesel	450	59%	2	5	10	28.5	1.5	260	74,100	3,900	78,000	0.419	0.017	0.096	0.00122	0.01244	0.01144	140
Concrete Pump Truck	Diesel	450	59%	1	1	1	28.5	1.5	260	7,410	390	7,800	0.042	0.0017	0.010	0.00012	0.00124	0.00114	14.0
Crane (15-ton Boom Truck)	Diesel	215	43%	1	1	1	28.5	1.5	260	3,705	195	3,900	0.021	0.0009	0.005	0.00006	0.00062	0.00057	7.0
Crane (30-ton)	Diesel	235	43%	1	1	1	28.5	1.5	260	3,705	195	3,900	0.021	0.0009	0.005	0.00006	0.00062	0.00057	7.0
Crane (120- to 300-ton)	Diesel	245	43%	3	1	3	28.5	1.5	260	22,230	1,170	23,400	0.126	0.0052	0.0287	0.00037	0.00373	0.00343	41.9
Dump Truck	Diesel	455	21%	2	6	12	28.5	1.5	260	88,920	4,680	93,600	0.502	0.0208	0.115	0.00146	0.01492	0.01373	167.7
Fuel Truck	Diesel	450	21%	2	2	4	28.5	1.5	260	29,640	1,560	31,200	0.167	0.007	0.038	0.00049	0.00497	0.00458	56
Welder Truck	Diesel	300	43%	1	2	2	28.5	1.5	260	14,820	780	15,600	0.017	0.0026	0.028	0.00008	0.00077	0.00071	9.6
Lowboy Truck	Diesel	455	21%	2	6	12	28.5	1.5	260	88,920	4,680	93,600	0.502	0.021	0.115	0.00146	0.01492	0.01373	168
Mechanics' Truck	Diesel	400	43%	2	2	4	28.5	1.5	260	29,640	1,560	31,200	0.035	0.0051	0.056	0.00017	0.00153	0.00141	19.2
Pick-up Truck	Gasoline	400	43%	13	2	26	28.5	1.5	260	192,660	10,140	202,800	0.083	0.015	0.724	0.00058	0.00247	0.00219	87
Splicing Truck	Diesel	400	21%	1	1	1	28.5	1.5	260	7,410	390	7,800	0.009	0.0013	0.014	0.00004	0.00038	0.00035	4.8
Truck (1-ton)	Diesel	300	43%	5	4	20	28.5	1.5	260	148,200	7,800	156,000	0.173	0.026	0.282	0.00084	0.00767	0.00706	95.8
Truck (2-ton)	Diesel	400	43%	3	2	6	28.5	1.5	260	44,460	2,340	46,800	0.251	0.0104	0.057	0.00073	0.00746	0.00686	83.8
Utility Van	Diesel	300	43%	3	2	6	28.5	1.5	260	44,460	2,340	46,800	0.052	0.008	0.084	0.00025	0.00230	0.00212	28.7
Water Truck	Diesel	400	21%	1	5	5	28.5	1.5	260	37,050	1,950	39,000	0.209	0.0087	0.048	0.00061	0.00622	0.00572	69.9
Total										**837,330**	**44,070**	**881,400**	**2.6**	**0.15**	**1.7**	**0.009**	**0.08**	**0.08**	**1,000**

Note: Conservatively assumes all equipment works each day, 5 days per week

Totals for paved and unpaved roads used for fugitive dust calculations in Table 12.1

Table 6.4
On-Road Construction Equipment Exhaust Emissions - Concrete Batch Plant

Vehicle	Fuel	Equipment Engine Size (hp)	No. of Units	Round Trips per Day per Unit	Total Round Trips per Day	Travel Distance per Roundtrip		Total Working Days per Unit	Total VMT for Construction Period			Emissions (tons)						
						Paved Roads	Unpaved Roads		Paved Roads	Unpaved Roads	Total	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Concrete Redi-Mix Truck	Diesel	400	4	1	4	45	15	120	21,600	7,200	28,800	0.15	0.006	0.035	0.0005	0.0046	0.0042	52
Dump Truck	Diesel	450	1	1	1	22.5	7.5	120	2,700	900	3,600	0.02	0.001	0.004	0.00006	0.0006	0.0005	6
Pick-up Truck	Diesel	400	1	1	1	30	10	120	3,600	1,200	4,800	0.01	0.001	0.008	0.00003	0.0002	0.0002	3
Bulk Cement Tanker Truck	Diesel	450	1	1	1	30	10	120	3,600	1,200	4,800	0.03	0.001	0.007	0.00008	0.0011	0.0010	9
Total									**31,500**	**10,500**	**42,000**	**0.21**	**0.009**	**0.055**	**0.0006**	**0.006**	**0.006**	**70**

Note: Conservatively assumes all equipment works each day, 5 days per week

Totals for paved and unpaved roads used for fugitive dust calculations in Table 12.1

Table 7
On-Road Vehicle (Commuter Vehicles) Exhaust Emissions

Construction Activity	Total Days	# Workers	VMT/ worker/ day	Daily Totals (VMT/day)		Construction Totals (VMT)			Emissions[a] (tons)						
				Paved Roads	Unpaved Roads	Paved Roads	Unpaved Roads	TOTAL	NOx	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Replacement of Line and Structures on Existing ROW (50 Mile ROW Example)	260	139	35	4622	243	1,201,655	63,245	1,264,900	0.383	0.067	3.58	0.0032	0.0139	0.0123	477
Site Construction Equipment - Clearing Forest (1000 acres example)	260	52	35	1729	91	449,540	23,660	473,200	0.143	0.025	1.34	0.0012	0.0052	0.0046	178
Converter Station Construction	260	43	35	1430	75	371,735	19,565	391,300	0.119	0.021	1.11	0.0010	0.0043	0.0038	147

Notes: Commuter vehicles include 50% passenger cars and 50% passenger trucks.
One worker, one commute per piece of equipment estimated in Table 4.1-4,3, 5 days per week for a year
5% of commute will be on unpaved roads for fugitive dust calculations in Table 12.1

Table 8 Helicopter Exhaust Emissions - Transmission Line Segment Construction												
Aircraft	Engine	No. of Engines	Days of Operation	Mode	Engine Setting	Mode Duration (hrs/day)	Total Emissions (tons)					
							NO_x	VOC	CO	SO_2	PM	CO_2
Helicopter (Small)	T400-CP-400	1	260	Idle Out	Ground Idle	0.058	0.003	0.011	0.031	0.001	0.002	4
				Climb Out	Cruise	0.11	0.006	0.017	0.062	0.001	0.003	7
				Work	Military	7.67	1.383	0.051	0.745	0.147	0.626	1035
				Approach	Cruise	0.11	0.039	0.001	0.004	0.003	0.015	21
				Idle In	Ground Idle	0.058	0.003	0.011	0.031	0.001	0.002	4
				Subtotal		**8.00**	**1.434**	**0.091**	**0.873**	**0.152**	**0.647**	**1071**
Helicopter (Large)	T700-GE-700	2	260	Idle Out	Ground Idle	0.058	0.006	0.114	0.107	0.001	0.003	7
				Climb Out	Flight Max	0.11	0.106	0.005	0.074	0.007	0.018	52
				Work	Overspeed	9.67	12.113	0.726	5.553	0.770	3.288	5430
				Approach	Flight Max	0.11	0.171	0.008	0.061	0.010	0.052	73
				Idle In	Ground Idle	0.058	0.006	0.114	0.107	0.001	0.003	7
				Subtotal		**10.00**	**12.402**	**0.967**	**5.903**	**0.790**	**3.363**	**5569**
Total						**-**	**14**	**1**	**7**	**1**	**4**	**6,640**

Table 9
Nonroad Equipment Exhaust Emission Factors - Koochiching County MN

Equipment Type	Fuel Type	Equipment Engine Size (hp)	Emission Factor (gm/hp-hr per hour)							Emission Factor Reference
			NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2	
3-Drum Puller (Heavy)	Diesel	240	1.72	0.17	0.58	0.003	0.11	0.11	522	Other Construction Equipment
3-Drum Puller (Medium)	Diesel	160	1.65	0.17	0.68	0.003	0.15	0.15	461	Other Construction Equipment
Air Compressor	Diesel	197	2.20	0.22	0.49	0.004	0.10	0.09	655	Air Compressors
All Terrain Vehicle (ATV)	Diesel	22	5.74	1.50	6.27	0.005	0.89	0.86	668	Specialty Vehicle Carts
Backhoe	Diesel	100	3.16	0.61	3.97	0.004	0.56	0.25	605	Tractors/Loaders/Backhoes
Bobcat	Diesel	49	3.92	0.45	2.16	0.004	0.36	0.34	637	Skid Steer Loaders
Bulldozer (D-8 Cat or Equivalent)	Diesel	305	2.33	0.21	0.95	0.004	0.14	0.14	748	Crawler Tractors/Dozers
Chipper	Diesel	85	3.44	0.37	1.92	0.004	0.33	0.32	585	Chippers/Stump Grinders
Crane (30-ton)	Diesel	152	1.48	0.16	0.42	0.003	0.10	0.10	507	Cranes
Crane (Rubber-Tired)	Diesel	235	1.45	0.16	0.32	0.003	0.06	0.06	537	Cranes
Double Bull-Wheel Tensioner (Heavy)	Diesel	130	2.04	0.21	0.84	0.003	0.19	0.18	568	Other Construction Equipment
Double Bull-Wheel Tensioner (Light)	Diesel	85	2.23	0.23	2.08	0.004	0.27	0.26	590	Other Construction Equipment
Drill Rig	Diesel	325	4.97	0.34	1.45	0.004	0.22	0.21	729	Bore/Drill Rigs
Excavator	Diesel	159	0.81	0.13	0.33	0.003	0.07	0.07	464	Excavators
Feller Buncher	Diesel	243	1.70	0.17	0.58	0.003	0.11	0.11	516	Other Construction Equipment
Flail mower or Bush hog	Diesel	50	3.04	0.15	0.55	0.003	0.08	0.08	528	Other Construction Equipment
Fork Lift	Diesel	300	1.22	0.13	0.41	0.002	0.08	0.08	410	Rough Terrain Forklifts
Generator	Diesel	43	4.49	0.36	1.47	0.005	0.28	0.27	619	Generator Sets
Hydra-Ax or Mulcher	Diesel	210	1.97	0.20	0.67	0.003	0.13	0.12	597	Other Construction Equipment
Loader	Diesel	369	2.43	0.19	0.99	0.004	0.14	0.14	610	Rubber Tire Loaders
Motor Grader	Diesel	297	0.78	0.11	0.24	0.002	0.04	0.04	418	Graders
Office Trailer	Diesel	43	4.49	0.36	1.47	0.005	0.28	0.27	619	Generator Sets
Plate Compactor	Gasoline	7.9	2.61	5.43	282.28	0.015	0.12	0.11	1,090	Plate Compactors
Road Sweeper	Diesel	50	2.73	0.12	0.24	0.003	0.03	0.03	515	Sweepers/Scrubbers
Roller Compactor	Diesel	133	1.47	0.17	0.63	0.003	0.15	0.14	533	Rollers
Scraper	Diesel	407	1.79	0.16	0.73	0.003	0.11	0.10	557	Scrapers
Single-Drum Puller (Large)	Diesel	210	1.97	0.20	0.67	0.003	0.13	0.12	597	Other Construction Equipment
Skidder	Diesel	182	1.72	0.20	0.58	0.004	0.11	0.10	678	Rubber Tire Loaders
Wagon Drill	Diesel	450	3.59	0.25	1.05	0.003	0.16	0.15	527	Bore/Drill Rigs
Wire Reel Trailer	Diesel	450	2.69	0.19	1.15	0.003	0.16	0.15	527	Other Construction Equipment

Source: Emission Factors from MOVES2014, NONROAD modeling of Koochinching County, MN, 2018

Notes: Nonroad only outputs THC, so THC assumed equivalent to VOC

Table 10 On-Road Vehicle Exhaust Emission Factors								
		Emission Factor[(1)] (g/VMT)						
Vehicle Type	Fuel Type	NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Passenger Car	Gasoline	0.18	0.03	1.89	0.002	0.01	0.01	293.16
Passenger Truck	Gasoline	0.37	0.07	3.24	0.003	0.01	0.01	390.55
Passenger Truck	Diesel	0.96	0.13	1.45	0.005	0.04	0.03	588.17
Light Commercial Truck	Diesel	1.01	0.15	1.64	0.005	0.04	0.04	557.29
Combination Short-Haul Truck	Diesel	4.87	0.20	1.11	0.014	0.14	0.13	1625.08
Combination Long-Haul Truck	Diesel	6.09	0.26	1.40	0.015	0.20	0.19	1708.15

(1) Emission factors for EPA MOVES2014, modeling of Koochinching County, MN, 2018

Table 11

Helicopter Exhaust Emission Factors

Engine	Engine Setting	Fuel Flow (lb/hr)	Emission Factor (lb/1000 lb of fuel) (1), (2), (3)						Emission Factor (lb/hr)					
			NO_x	VOC	CO	SO_2	PM	CO_2	NO_x	VOC	CO	SO_2	PM	CO_2
T400-CP-400	Ground Idle	138	3.05	10.42	29.78	0.52	1.48	3667	0.42	1.438	4.11	0.072	0.20	506
	Flight Idle	143	3.08	8.65	30.71	0.52	1.26	3667	0.44	1.237	4.39	0.074	0.18	524
	Cruise	283	4.90	0.18	2.64	0.52	2.22	3667	1.39	0.051	0.75	0.147	0.63	1038
	Military	412	6.68	0.13	0.75	0.52	2.60	3667	2.75	0.054	0.31	0.214	1.07	1511
T700-GE-700	Ground Idle	133	2.78	56.67	53.18	0.52	1.48	3667	0.37	7.537	7.07	0.069	0.20	488
	Flight Idle	500	7.56	0.37	5.25	0.52	1.26	3667	3.78	0.185	2.63	0.260	0.63	1833
	Flight Max	589	8.18	0.49	3.75	0.52	2.22	3667	4.82	0.289	2.21	0.306	1.31	2160
	Overspeed	706	8.61	0.39	3.09	0.52	2.60	3667	6.08	0.275	2.18	0.367	1.84	2589

Source: United States Air Force IERA. 2002. Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations. IERA-RS-BR-SR-2001-0010. January

(1) SO2 emission factor calculated by assuming sulfur content of fuel of 0.026% by weight.

(2) PM and HAP emission factors for T400-CP-400 engine based on PM and HAP emission factors listed for T700-GE-700 engine.

(3) CO2 emission factors calculated by multiplying ratio of CO2 to C (44/12) by 1,000.

Table 12.1 Fugitive Dust Emissions - Roads							
				Emission Factor[(1)] (lb/VMT)		Emissions (tons)	
Construction Activity	Vehicle Type	Road Type	Total Mileage (VMT)	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Placement of Line and Structures on Existing or Cleared ROW	Construction Vehicles	Paved	826,852	0.0068	0.0007	2.8	0.3
		Unpaved	307,268	0.16	0.016	24.4	2.4
	Commuter Vehicles	Paved	1,201,655	0.0068	0.0007	4.1	0.4
		Unpaved	63,245	0.16	0.016	5.0	0.5
	Total					**36.4**	**3.7**
Clearing Forest	Construction Vehicles	Paved	503,100	0.01	0.001	1.7	0.2
		Unpaved	183,300	0.16	0.016	14.6	1.5
	Commuter Vehicles	Paved	449,540	0.01	0.001	1.5	0.2
		Unpaved	23,660	0.16	0.016	1.9	0.2
	Total					**19.7**	**2.0**
Converter Station	Construction Vehicles	Paved	837,330	0.0068	0.0007	2.9	0.3
		Unpaved	44,070	0.16	0.016	3.5	0.3
	Commuter Vehicles	Paved	371,735	0.0068	0.0007	1.3	0.1
		Unpaved	19,565	0.16	0.016	1.6	0.2
	Total					**9.2**	**1.0**
Concrete Batch Plant	-	Paved	31,500	0.01	0.001	0.1	0.0
		Unpaved	10,500	0.16	0.016	0.83	0.08
	Total					**0.9**	**0.1**

(1) Derivation table below.

Paved Roads - Emission Factor Derivation Table

$E = (k(s/12)0.65(W/3)1.5-C)$	AP-42 Section 13.2.1 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k = particle size multiplier
sL = road surface silt loading (g/m2)
W = average vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	lb/VMT	0.016	0.0024	Table 13.2-1.1
Silt Loading, sL	g/m2	0.6	0.6	Table 13.2.1-3
Emission factor, C	lb/VMT	0.00047	0.00036	Table 13.2.1-2

Unpaved Roads - Emission Factor Derivation

$E = k(s/12)a(W/3)b$	AP-42 Section 13.2.2 (11/06 version)

Controlled E = E * ((100-CE)/100)

where:

E = particulate emission factor (lb/VMT)
k, a, b = empirical constants for industrial roads
s = surface material silt content (%)
W = average vehicle weight (tons)

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	**tons**	4	4	Assumption
Constant, k	lb/VMT	1.5	0.15	Table 13.2.2-2
Constant, a		0.9	0.9	Table 13.2.2-2
Constant, b		0.45	0.45	Table 13.2.2-2
Silt content, s	%	4	4	Unpaved Road Surface Material Silt Content Values Used in the 1999 NEI
Control Efficiency, CE	**%**	75	75	Assumption based on regular watering

Table 12.2 Fugitive Dust Emissions - General Construction Activities						
Construction Activity	Disturbance[1] (acres)	Duration of Activity (months)	Emission Factor[2] (ton/acre/month)		Emissions (tons)	
			PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Placement of Line and Structures on Existing or Cleared ROW	60.46	12	0.141	0.0216	102.3	15.7
Cleared Forest	50.00	12	0.141	0.0216	84.6	13.0
Converter Station	1.00	12	0.141	0.0216	1.7	0.3

(1) Area of disturbance is listed as estimated average disturbance area, assumed to be 5% of total disturbed area

(2) See emission factor derivation table below.

Emission Factor Derivation Table

Parameter			Units	TSP [3]	PM_{10}[4]	$PM_{2.5}$[5]
Uncontrolled Emission Factor [3] (based on 30 days/month)			ton/acre/month	1.2	0.56	0.086
Controlled Emission Factor [6] (based on 30 days/month)			ton/acre/month	0.3	0.141	0.0216

(3) Emission factor from AP-42 Section 13.2.3 for TSP.

(4) PM10 emission factor calculated by multiplying TSP emission factor by 0.42 (ratio of PM10 to PM30 in AP-42 Section 13.2.4)

(5) PM2.5 emission factor calculated by multiplying TSP emission factor by 0.072 (ratio of PM2.5 to PM30 in AP-42 Section 13.2.4)

(6) Assume 75% dust control factor based on watering.

Table 12.3 Fugitive Dust Emissions - Concrete Batch Plant					
Emission Source	Material	Material Throughput (tons)	PM_{10} Emission Factor[(1)] (lb/ton)	Emissions[(2)] (tons)	
				PM_{10}	$PM_{2.5}$
Cement Unloading to Silo	Cement	3,030	0.00034	0.0005	0.000052
Cement Supplement Unloading to Silo	Cement Supplement	450	0.0049	0.0011	0.00011
Mixer Loading	Cement & Cement Supplement	3,480	0.0184	0.032	0.0032
Truck Loading	Cement & Cement Supplement	3,480	0.098	0.1705	0.01705
TOTAL				**0.20**	**0.020**

(1) Emission Factors from AP-42 Section 11.12, Table 11.12-2. Assuming Default Emission controls per AP-42 Section 11.12

(2) PM2.5 emissions assumed to be 10% of PM10 emissions.

Material Data

Parameter	Material Throughput (tons)
Concrete[(3)]	24,832
Course Aggregate[(4)]	11,509
Sand[(4)]	8,812
Cement[(4)]	3,030
Cement Supplement[(4)]	450

(3) Based on production of 12,800 cubic yards of concrete and wet concrete density of 1.94 tons/cubic yard (2,300 kg/m3).

(4) Based on average material composition in AP-42 Section 11.12.

Table 13
Forest Carbon Sink Removed and Loss of Average Annual CO2 uptake emissions , All Route Variations
Great Northern Transmission Line Project

Route Variation	Total Acres Forest within 1500 ft Buffer (only within 100 ft will be removed)	Acres of Forest Land Removed 100ft Buffer	% Removed	C/CO_2e Sink Removed Calculations			Average Annual CO_2 uptake emission factors (CO_2)/acre[2]	Annual Reduction in CO2 uptake (MT CO_2/ year)
				Mean Carbon density (Total nonsoil) at age of forest years (Average MT/acre)[1]	Total Carbon Sink Removed MT Carbon	Total Carbon Sink Removed MT CO_2		
Border Crossing Proposed Route	5836.74	354	6.07%	45.3	16,036.2	58,853	2.37	838
Border Crossing Pine Creek Variation	5249.16	313	5.96%	45.3	14,178.9	52,037	2.37	741
Border Crossing Hwy 310 Variation	4455.97	239	5.36%	45.3	10,826.7	39,734	2.37	566
Border Crossing 500kV Variation	2796.1	143	5.11%	45.3	6,477.9	23,774	2.37	339
Border Crossing 230kV Variation	1896	99	5.22%	45.3	4,484.7	16,459	2.37	234
Roseau Lake WMA Proposed Route	7340.2	443	6.04%	45.3	20,067.9	73,649	2.37	1,049
Roseau Lake WMA Variation 1	2615.04	121	4.63%	45.3	5,481.3	20,116	2.37	286
Roseau Lake WMA Variation 2	4259.87	219	5.14%	45.3	9,920.7	36,409	2.37	518
Cedar Bend WMA Proposed Route	8033.66	433	5.39%	45.3	19,614.9	71,987	2.37	1,025
Cedar Bend WMA Variation	4176.5	209	5.00%	45.3	9,467.7	34,746	2.37	495
Cedar Bend WMA Variation Hop 1	405.82	13	3.20%	45.3	588.9	2,161	2.37	31
Cedar Bend WMA Variation Hop 2	604.54	25	4.14%	45.3	1,132.5	4,156	2.37	59
Cedar Bend WMA Variation Hop 3	502.12	19	3.78%	45.3	860.7	3,159	2.37	45
Beltrami North Proposed Route	5961.19	295	4.95%	45.3	13,363.5	49,044	2.37	698
Beltrami North Variation 1	5392.49	283	5.25%	45.3	12,819.9	47,049	2.37	670
Beltrami North Variation 2	7189.81	356	4.95%	45.3	16,126.8	59,185	2.37	843
Beltrami North Variation Hop 1	507.94	19	3.74%	45.3	860.7	3,159	2.37	45
Beltrami North Variation Hop 2	502.12	19	3.78%	45.3	860.7	3,159	2.37	45
Beltrami North Central Proposed Route	4305.51	211	4.90%	45.3	9,558.3	35,079	2.37	499
Beltrami North Central Variation Hop	1421.43	46	3.24%	45.3	2,083.8	7,648	2.37	109
Beltrami North Central Variation 1	5005.19	219	4.38%	45.3	9,920.7	36,409	2.37	518
Beltrami North Central Variation 2	4653.29	225	4.84%	45.3	10,192.5	37,406	2.37	533
Beltrami North Central Variation 3	4460.42	184	4.13%	45.3	8,335.2	30,590	2.37	436
Beltrami North Central Variation 4	4674.42	193	4.13%	45.3	8,742.9	32,086	2.37	457
Beltrami North Central Variation 5	5219.19	227	4.35%	45.3	10,283.1	37,739	2.37	537
Pine Island Proposed Blue Route	38203.29	1770	4.63%	45.3	80,181.0	294,264	2.37	4,190
Pine Island Proposed Orange Route	37684.73	1751	4.65%	45.3	79,320.3	291,106	2.37	4,145
Beltrami South Central Proposed Route	599	29	4.84%	45.3	1,313.7	4,821	2.37	69
Beltrami South Central Variation	778.03	37	4.76%	45.3	1,676.1	6,151	2.37	88
Beltrami South Proposed Route	2185.38	119	5.45%	45.3	5,390.7	19,784	2.37	282
Beltrami South Variation	2887.65	148	5.13%	45.3	6,704.4	24,605	2.37	350
North Black River Proposed Route	3190.65	156	4.89%	45.3	7,066.8	25,935	2.37	369
North Black River Variation	3296.35	148	4.49%	45.3	6,704.4	24,605	2.37	350
C2 Proposed Route	11921.63	541	4.54%	45.3	24,507.3	89,942	2.37	1,281
C2 Variation	16120.7	919	5.70%	45.3	41,630.7	152,785	2.37	2,175
J2 Proposed Route	15110.07	531	3.51%	45.3	24,054.3	88,279	2.37	1,257
J2 Variation	15860.45	414	2.61%	45.3	18,754.2	68,828	2.37	980
Northome Proposed Route	1417.5	18	1.27%	45.3	815.4	2,993	2.37	43
Northome Variation	1553.8	15	0.97%	45.3	679.5	2,494	2.37	36
Cutfoot Proposed Route	1651.52	69	4.18%	45.3	3,125.7	11,471	2.37	163
Cutfoot Variation	1875.06	51	2.72%	45.3	2,310.3	8,479	2.37	121
Effie Proposed Blue Route	14722.47	505	3.43%	45.3	22,876.5	83,957	2.37	1,195
Effie Proposed Orange Route	15801.32	478	3.03%	45.3	21,653.4	79,468	2.37	1,131
Effie Variation	17696.3	607	3.43%	45.3	27,497.1	100,914	2.37	1,437
East Bear Lake Proposed Route	3382.14	113	3.34%	45.3	5,118.9	18,786	2.37	267
East Bear Lake Variation	3909.32	111	2.84%	45.3	5,028.3	18,454	2.37	263
Balsam Proposed Blue Route	4540.96	94	2.07%	45.3	4,258.2	15,628	2.37	223
Balsam Proposed Orange Route	4828.18	109	2.26%	45.3	4,937.7	18,121	2.37	258
Balsam Variation	6189.32	168	2.71%	45.3	7,610.4	27,930	2.37	398
Dead Man's Pond Proposed Route	903.82	17	1.88%	45.3	770.1	2,826	2.37	40
Dead Man's Pond Variation	924.75	11	1.19%	45.3	498.3	1,829	2.37	26
Blackberry Proposed Blue Route	2004.22	70	3.49%	45.3	3,171.0	11,638	2.37	166
Blackberry Proposed Orange Route	1982.51	78	3.93%	45.3	3,533.4	12,968	2.37	185
Silver Creek WMA Alignment Modification	538.17	26	4.83%	45.3	1,177.8	4,323	2.37	62
Airstrip Alignment Modification	712.91	38	5.33%	45.3	1,721.4	6,318	2.37	90
Mizpah Alignment Modification	1047.23	67	6.40%	45.3	3,035.1	11,139	2.37	159
Gravel Pit Alignment Modification	582.97	29	4.97%	45.3	1,313.7	4,821	2.37	69
Bass Lake Alignment Modification	1045.95	60	5.74%	45.3	2,718.0	9,975	2.37	142
Wilson Lake Alignment Modification	1023.82	59	5.76%	45.3	2,672.7	9,809	2.37	140
Grass Lake Alignment Modification	546.32	32	5.86%	45.3	1,449.6	5,320	2.37	76
Dead Man's Pond Alignment Modification	684.1	35	5.12%	45.3	1,585.5	5,819	2.37	83
Trout Lake Alignment Modification	525.03	26	4.95%	45.3	1,177.8	4,323	2.37	62
Proposed Blue Route	71398.45	4828.5	6.76%	45.3	218,731.1	802,743	2.37	11,430
Proposed Orange Route	72228.92	4883.4	6.76%	45.3	221,218.0	811,870	2.37	11,560

(1) Smith et al. 2006, Spruce-Balsam Pine Northern Lake States, Table A11

(2) Net annual stock change in live tree carbon between year 25 and 45, which is from the difference in stocks divided by the length of the interval between stocks x total acres

Appendix X

Relative Merits Tables

West Section [1], [2]			Border Crossing					
Factor	Element	Indicator	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations, low-income populations	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population, employment, taxes and revenue generated, housing availability	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.

West Section [1], [2]			Border Crossing					
Factor	Element	Indicator	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas, state trails, scenic byways, and snowmobile and water trails)	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Human settlement	**Aesthetics**	Proximity to residences (Count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	2--2--4	2--3--5	0--0--2	0--0--3	0--1--5	Border Crossing Hwy 310 Variation would pass by the least number of residences within 1,500 feet of the anticipated alignment. Border Crossing 500kV Variation and Border Crossing 230kV Variation would parallel an existing transmission line for their entire lengths.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data						Border Crossing Pine Creek Variation would cross the most private land. An airstrip would be located within 1,500 feet from the anticipated alignment for the Border Crossing Hwy 310 Variation.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)						An airstrip would be located within 1,500 feet from the anticipated alignment for the Border Crossing Hwy 310 Variation.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 608 (436--172)	Total: 624 (381--243)	Total: 453 (300--153)	Total: 244 (131--113)	Total: 199 (97--102)	Border Crossing Pine Creek Variation would cross the most private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.

West Section [1], [2]			Border Crossing					
Factor	Element	Indicator	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Border Crossing Variation Area for details					There would be no differences in the impacts for the alternatives.
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 110 (3--4--103)	Total: 171 (3--4--164)	Total: 96 (3--4--89)	Total: 85 (9--0--76)	Total: 77 (5--<0.5--72)	Border Crossing Pine Creek Variation would cross the most farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	394	339	294	120	96	Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation would cross the most state forest land.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	0--0	0--0	0--0	0--0	0--0	No active or expired mineral lease lands or aggregate resources are present in the ROW of any alternative.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources						Border Crossing Pine Creek Variation and Border Crossing 500kV Variation would cross sections identified as containing known archaeological resources; the other alternatives do not cross any of these sections. There is one historic architectural site within 1,500 feet of the Border Crossing Hwy 310 Variation.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	1--2	0--0	1--1	0--0	Border Crossing Pine Creek Variation and Border Crossing 500kV Variation would cross sections identified as containing known archaeological sites; the other alternatives do any cross any of these sections.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--0--0	0--1--1	0--0--0	0--0--0	There is one historic architectural site within 1,500 feet of the Border Crossing Hwy 310 Variation. The other alternatives do not have any known historic architectural sites within 1 mile.

West Section [1], [2]			Border Crossing					
Factor	Element	Indicator	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Natural environment	Water resources	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands						Border Crossing Pine Creek Variation would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned. Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation ROWs would have areas of FEMA-designated floodplain that cannot be spanned. All alternatives would cross wetlands that are too large to span. Proposed Border Crossing-Blue/Orange Route has the most total wetland and the most forested wetland, requiring the most forested wetland type conversion. Border Crossing 500kV Variation would cross the most shrub wetland, requiring the most shrub wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 19 (2--17) (0)	Total: 25 (3--22) (0)	Total: 17 (2--15) (0)	Total: 7 (0--7) (0)	Total: 9 (0--9) (0)	Border Crossing Pine Creek Variation would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 334 (329--5)	Total: 343 (343--0)	Total: 213 (213--0)	Total: 0	Total: 0	Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation ROWs would cross areas of FEMA-designated floodplain that cannot be spanned; the Border Crossing 500kV Variation and Border Crossing Hwy 310 Variation would not cross floodplain.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	94	94	93	107	49	Border Crossing 500kV Variation would cross the most shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	150	96	65	30	23	Proposed Border Crossing-Blue/Orange Route would cross the most forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	464	415	310	172	102	All alternatives would cross wetlands that are too large to span. Proposed Border Crossing-Blue/Orange Route has the most total wetland.
Natural environment	Vegetation	Cover type (acres of forested land cover in ROW)	411	369	288	184	125	Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation cross the most forested land cover. These alternatives parallel minimal existing corridor.

West Section [1], [2]			Border Crossing					
Factor	Element	Indicator	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Natural environment	Wildlife	Proximity to wildlife resources - Wildlife Management Areas, Grassland Bird Conservation Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW), Gray Owl Management Area (count in 0-1,500 feet)	Acres: 25--81--0 Count: 0--0	Acres: 25--81--0 Count: 0--0	Acres: 0--81--0 Count: 0--1	Acres: 0--0--0 Count: 0--0	Acres: 0--0--0 Count: 0--0	Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation cross a WMA and/or Grassland Bird Conservation Areas. Border Crossing Hwy 310 Variation has a Gray Owl Management Area located within 1,500 feet, but none of this area is within the ROW.
Rare and unique natural resources	Federal and state listed species	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)						Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation have a NHIS record for a federal candidate species (Sprague's pipit) within 1 mile. Proposed Border Crossing-Blue/Orange Route and Border Crossing Pine Creek Variation have the most NHIS records within 1 mile, including records of state threatened or endangered species.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile)	1	1	1	0	0	Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation have a NHIS record for a federal candidate species (Sprague's pipit) within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	14	10	5	3	1	Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation have the most NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	4	3	2	0	0	Proposed Border Crossing-Blue/Orange Route has the most threatened or endangered NHIS records within 1 mile, followed by the Border Crossing Pine Creek Variation and the Border Crossing Hwy 310 Variation.

West Section [1], [2]			Border Crossing					
Factor	Element	Indicator	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNA), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands						Proposed Border Crossing-Blue/Orange Route would be located within 1,500 feet of an SNA. Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation would cross SNA WPAs. Proposed Border Crossing-Blue/Orange Route would cross the most MBS Sites of Biodiversity Significance, including those ranked outstanding or high, followed by the Border Crossing Pine Creek Variation and Border Crossing Hwy 310 Variation. Proposed Border Crossing-Blue/Orange Route would cross through the most MnDNR High Conservation Value Forest areas, followed by the Border Crossing Pine Creek Variation and the Border Crossing Hwy 310 Variation. Proposed Border Crossing-Blue/Orange Route would cross the most MBS native plant communities, followed by the Border Crossing Pine Creek Variation and the Border Crossing Hwy 310 Variation. Only the Border Crossing 230 kV Variation would avoid MBS native plant communities with a conservation status ranks of S2 or S3. Border Crossing 500 kV would parallel an existing corridor through these native plant communities.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (Count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	1--178	0--123	0--97	0--0	0--0	Proposed Border Crossing-Blue/Orange Route would be located within 1,500 feet of an SNA. The Proposed Border Crossing-Blue/Orange Route, Border Crossing Pine Creek Variation, and Border Crossing Hwy 310 Variation would cross SNA WPAs.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance - (total acres within ROW)	381	326	265	162	91	Proposed Border Crossing-Blue/Orange Route would cross the most MBS Sites of Biodiversity Significance, followed by the Border Crossing Pine Creek Variation and Border Crossing Hwy 310 Variation.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance - Rank Outstanding + High (acres within ROW)	124	69	73	62	42	Proposed Border Crossing-Blue/Orange Route would cross the most MBS Sites of Biodiversity Significance ranked outstanding or high. Border Crossing Pine Creek Variation and Border Crossing Hwy 310 Variation would cross more MBS Sites of Biodiversity Significance ranked outstanding or high than the other two alternatives.

West Section [1], [2]			Border Crossing					
Factor	**Element**	**Indicator**	Proposed Border Crossing-Blue/Orange Route	Border Crossing Pine Creek Variation	Border Crossing Hwy 310 Variation	Border Crossing 500kV Variation	Border Crossing 230kV Variation	NOTES
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	82--0	27--0	29--0	0--0	0--0	Proposed Border Crossing-Blue/Orange Route would cross through the most MnDNR High Conservation Value Forest areas, followed by the Border Crossing Pine Creek Variation and the Border Crossing Hwy 310 Variation.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	124	68	69	60	34	Proposed Border Crossing-Blue/Orange Route would cross the most MBS native plant communities, followed by the Border Crossing Pine Creek Variation and the Border Crossing Hwy 310 Variation. The Border Crossing 230kV Variation and Border Crossing 500kV Variation would parallel existing corridor through these communities.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (acres of conservation status rank S2 and S3 communities in ROW)	22	16	20	29	0	All alternatives other than the Border Crossing 230 kV Variation would cross MBS native plant communities with a conservation status ranks of S2 or S3. Border Crossing 500kV Variation would parallel existing corridor through these communities.
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	30	32	34	100	100	Border Crossing 230kV Variation and Border Crossing 500kV Variation parallel existing transmission line, roadway, and/or trail corridors for their entire lengths. The other alternatives would parallel existing corridors for approximately one-third of their lengths.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	-	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$29,012,219	$29,292,118	$21,144,610	$11,512,144	$9,862,110	The alternatives cost less than the Proposed Border Crossing-Blue/Orange Route .

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

West Section [1], [2]			Roseau Lake WMA				Cedar Bend WMA		
Factor	Element	Indicator	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations, low-income populations	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population, employment, taxes and revenue generated, housing availability	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.

West Section [1], [2]			Roseau Lake WMA				Cedar Bend WMA		
Factor	Element	Indicator	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas, state trails, scenic byways, and snowmobile and water trails)	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	**Aesthetics**	Proximity to residences (Count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	2--5--13	3--19--50	0--8--23	Roseau Lake WMA Variation 1 would pass by the most residences within 1,500 feet of the anticipated alignment. Roseau Lake WMA Variation 1 parallels the least amount of existing transmission line corridor.	0--5--11	16--52--101	Cedar Bend WMA Variation 1 would pass by more residences within 1,500 feet of the anticipated alignment. Both alternatives parallel transmission line corridors for their entire lengths.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data				Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 would cross the most private land.			Proposed Blue/Orange Route would cross USFWS Interest Lands, while Cedar Bend WMA Variation would not. Cedar Bend WMA Variation would cross more private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)				There are no land use compatibility issues identified for the alternatives.			Proposed Blue/Orange Route would cross USFWS Interest Lands (6 acres), while the Cedar Bend WMA Variation would not. Crossing this land would require obtaining a provisional special use permit for construction from the USFWS.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 746 (453--293)	Total: 1,070 (6--1,064)	Total: 910 (145--765)	Roseau Lake WMA Variation 1 and 2 would cross the most private land.	Total: 599 (441--158)	Total: 476 (84--392)	Cedar Bend WMA Variation would cross more private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.

West Section [1], [2]			Roseau Lake WMA				Cedar Bend WMA		
Factor	Element	Indicator	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Roseau Lake WMA Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cedar Bend WMA Variation Area for details		There would be no differences in the impacts for the alternatives.
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 184 (18--23--143)	Total: 493 (84--21--388)	Total: 412 (33--23--356)	Roseau Lake WMA Variations 1 and 2 would cross the most amount of farmland.	Total: 101 (15--18--68)	Total: 192 (25--6--161)	All alternatives would cross a relatively similar amount of farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	334	6	52	Proposed Blue/Orange Route would cross more state forest land, followed by Roseau Lake WMA Variation 2.	372	78	Proposed Blue/Orange Route would cross more state forest land.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	0--0	0--0	0--0	No active or expired/terminated mineral lease lands or aggregate resources are present in the ROW of any alternative.	97--0	0--0	Proposed Blue/Orange Route would cross expired/terminated mineral lease lands; Cedar Bend WMA Variation would not cross any mineral lease lands.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources				Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 would cross sections identified as containing known archaeological sites.			Cedar Bend WMA Variation would cross more sections identified as containing known archaeological sites. There are 8 historic architectural sites within 1 mile of the Cedar Bend WMA Variation, but none in the ROW.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--3	0--3	Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 would cross sections identified as containing known archaeological sites and have historic architectural sites present within 1 mile.	0--0	1--2	Cedar Bend WMA Variation would cross sections identified as containing known archaeological sites, while the Proposed Blue/Orange Route would not.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--1--1	0--1--2	Roseau Lake WMA Variation 1 and Roseau Lake WMA Variation 2 have historic architectural sites present within 1 mile.	0--0--0	0--0--8	Cedar Bend WMA Variation has 8 historic architectural sites within 1 mile; no historic architectural sites have been identified within 1 mile of the Proposed Blue/Orange Route.

West Section (1), (2)			Roseau Lake WMA				Cedar Bend WMA		
Factor	Element	Indicator	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Natural environment	Water resources	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands				All alternatives would cross relatively similar numbers of watercourses/waterbodies, which are expected to be spanned. All alternatives would cross relatively similar areas of FEMA-designated floodplain areas that are too large to span. All alternatives would cross wetlands that are too large to span. Proposed Blue/Orange Route has the most total wetland. Proposed Blue/Orange Route would also have the most forested and shrub wetland; therefore, it would require the most wetland type conversion.			Both alternatives have the same number of crossings of watercourses and waterbodies, which are expected to be spanned. Cedar Bend WMA would cross floodplain that cannot be spanned. Proposed Blue/Orange Route would not cross floodplain. Both alternatives would cross wetlands that are too large to span. Proposed Blue/Orange Route has the most total wetland. Proposed Blue/Orange Route would also have the most forested and shrub wetland; therefore, it would require the most wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 25 (2--23) (0)	Total: 48 (10--38) (0)	Total: 36 (3--33) (0)	All alternatives would cross relatively similar numbers of watercourses/waterbodies.	Total: 16 (4--12) (0)	Total: 16 (5--11) (0)	Both alternatives have same number of crossings, all of which are expected to be spanned.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 321 (321--0)	Total: 202 (200--2)	Total: 307 (304--3)	All alternatives would cross relatively similar areas of FEMA-designated floodplain areas that are too large to span.	Total: 0	Total: 32 (32--0)	Cedar Bend WMA would cross floodplain that cannot be spanned. Proposed Blue/Orange Route would not cross floodplain.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	136	21	88	Proposed Blue/Orange route would cross the most shrub wetland.	128	14	Proposed Blue/Orange route would cross the most shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	132	35	53	Proposed Blue/Orange Route would cross the most forested wetland.	253	95	Proposed Blue/Orange Route would cross the most forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	547	102	272	All alternatives would cross wetlands that are too large to span. Proposed Blue/Orange Route has the most total wetland.	466	154	Both alternatives would cross wetlands that are too large to span. Proposed Blue/Orange Route has the most total wetland.
Natural environment	Vegetation	Cover type (acres of forested land cover in ROW)	515	156	275	Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 would cross the most forested land cover.	543	266	Proposed Blue/Orange Route would cross more forested land cover.

West Section [1], [2]			Roseau Lake WMA				Cedar Bend WMA		
Factor	**Element**	**Indicator**	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Natural environment	**Wildlife**	Proximity to wildlife resources - Wildlife Management Areas, Grassland Bird Conservation Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW), Gray Owl Management Area (count in 0-1,500 feet)	Acres: 69--131--0 Count: 0--0	Acres: 0--40--0 Count: 0--0	Acres: 44--220--0 Count: 0--0	Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 cross a WMA and more acres of Grassland Bird Conservation Area.	Acres: 44--50--0 Count: 1--0	Acres: 0--10--0 Count: 0--0	Proposed Blue/Orange Route crosses a WMA, more acres of Grassland Bird Conservation Area, and crosses a shallow lake.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)				Proposed Blue/Orange Route has a NHIS record for a federal candidate species (Sprague's pipit; also state-endangered) within 1 mile. Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 have a state-threatened species documented within 1 mile.			There are no federally-listed species identified for these alternatives. Proposed Blue/Orange Route has more NHIS records within 1 mile, including threatened NHIS records.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile)	1	0	0	Proposed Blue/Orange Route has a NHIS record for a federal candidate species (Sprague's pipit) within 1 mile.	0	0	There are no federally-listed species identified for these alternatives.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	7	4	5	All alternatives have a relatively similar number of NHIS records within 1 mile of them.	6	1	Proposed Blue/Orange Route has more NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	2	0	1	Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 have threatened or endangered NHIS records within 1 mile. One of the 2 records for the Proposed Blue/Orange Route is the Sprague's pipit (state endangered), which is also accounted for above under Federally listed species.	2	0	Proposed Blue/Orange Route has 2 threatened NHIS records within 1 mile.

West Section [1], [2]			Roseau Lake WMA				Cedar Bend WMA		
Factor	Element	Indicator	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Rare and unique natural resources	State rare communities	Summary - proximity to Scientific and Natural Areas (SNA), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands				Proposed Blue/Orange Route would be located close to an SNA, but not within 1,500 feet. Proposed Blue/Orange Route would cross the most acres of SNA WPAs than the variations. Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 would cross the most acres of MBS Sites of Biodiversity Significance, including those ranked outstanding or high. Proposed Blue/Orange Route would cross the most acres of High Conservation Value Forest. Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 would cross the most MBS native plant communities, including those with conservation status ranks of S2 and S3.			Proposed Blue/Orange Route would cross more MBS Sites of Biodiversity Significance (including outstanding or high rank), High Conservation Value Forest, and more MBS native plant communities, including communities with a conservation status rank of S2 and S3.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (Count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--117	0--6	0--6	Proposed Blue/Orange Route would be located close to an SNA, but not within 1,500 feet. Proposed Blue/Orange Route would cross the most acres of SNA WPAs than the variations.	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; neither alternative would cross an SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance - (total acres within ROW)	404	14	153	Proposed Blue/Orange Route would cross the most acres of MBS Sites of Biodiversity Significance, followed by Roseau Lake WMA Variation 2.	454	112	Proposed Blue/Orange Route would cross more MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance - Rank Outstanding + High (acres within ROW)	107	7	77	Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 would cross the most acres of MBS Sites of Biodiversity Significance ranked outstanding or high.	43	0	Proposed Blue/Orange Route would cross MBS Sites of Biodiversity Significance ranked outstanding or high rank, while the Cedar Bend WMA Variation would not cross any of these sites.

West Section [1], [2]			Roseau Lake WMA				Cedar Bend WMA		
Factor	**Element**	**Indicator**	Proposed Blue/Orange Route	Roseau Lake WMA Variation 1	Roseau Lake WMA Variation 2	NOTES	Proposed Blue/Orange Route	Cedar Bend WMA Variation	NOTES
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	22--0	6--0	6--0	Proposed Blue/Orange Route would cross the most acres of High Conservation Value Forest.	8--0	0--0	Proposed Blue/Orange Route would cross High Conservation Value Forest; the Cedar Bend WMA Variation does not cross any of these areas.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	107	5	75	Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 would cross the most MBS native plant communities.	43	0	Proposed Blue/Orange Route would cross MBS native plant communities; the Cedar Bend WMA Variation does not cross any of these communities.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (acres of conservation status rank S2 and S3 communities in ROW)	39	0	22	Proposed Blue/Orange Route and Roseau Lake WMA Variation 2 would cross the most MBS native plant communities with conservation status ranks of S2 and S3.	22	0	Proposed Blue/Orange Route would cross MBS native plant communities with conservation status ranks of S2 and S3; the Cedar Bend WMA Variation does not cross any of these communities.
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	52	11	43	Roseau Lake WMA Variation 1 would parallel the least existing transmission line, roadway, and/or trail corridor.	100	100	Both alternatives parallel existing transmission line, roadway, and/or trail corridors for their entire lengths.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$33,247,089	$57,086,075	$46,162,144	The cost of the alternatives are more than 20% above the cost of the Proposed Blue/Orange Route.	$27,197,650	ranges from $22,860,378 to $23,172,312	The range of cost for the Cedar Bend WMA Variation is less than the cost of the Proposed Blue/Orange Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations, low-income populations	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population, employment, taxes and revenue generated, housing availability	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas, state trails, scenic byways, and snowmobile and water trails)	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Human settlement	**Aesthetics**	Proximity to residences (Count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--2--3	0--0--6	0--0--1	Beltrami North Variation 1 would pass by the most residences within 1,500 feet of the anticipated alignment.	1--2--3	0--0--2	1--1--2	1--1--4	3--5--10	2--4--8	Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would pass by the most residences within 1,500 feet of the anticipated alignment. Beltrami North Central Variation 4 would parallel existing corridor for more of its length than Beltrami North Central Variation 5.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data				Proposed Blue/Orange Route would cross USFWS Interest Lands, while the other alternatives would not. Beltrami North Variation 1 would cross more private land.							Proposed Blue/Orange Route and Beltrami North Central Variation 2 would cross USFWS Interest Lands (18 acres and 1 acre, respectively). Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would cross the most private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)				The Proposed Blue/Orange Route would cross USFWS Interest Lands (6 acres), while the other alternatives would not. Crossing this land would require obtaining a provisional special use permit for construction from the USFWS.							Proposed Blue/Orange Route would cross USFWS Interest Lands (18 acres) but would parallel an existing transmission line corridor. Beltrami North Central Variation 2 would cross USFWS land (1 acre) and not parallel existing corridor. Crossing this land would require obtaining a provisional special use permit for construction from the USFWS.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 400 (364--36)	Total: 383 (297--86)	Total: 477 (450--27)	Beltrami North Variation 1 would cross the most private land.	Total: 281 (213--68)	Total: 332 (217--115)	Total: 305 (246--59)	Total: 296 (184--112)	Total: 329 (178--151)	Total: 365 (210--155)	Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would cross the most private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Beltrami North Variation Area for details			There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami North Central Variation Area for details						There would be no differences in the impacts for the alternatives.
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 27 (0--0--27)	Total: 27 (8--0--19)	Total: 27 (<0.5--0--27)	All alternatives would cross a relatively similar amount of farmland.	Total: 6 (0--6--0)	Total: 5 (0--5--0)	Total: 0 (0--0--0)	Total: 5 (0--5--0)	Total: 39 (6--20--13)	Total: 39 (6--20--13)	Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would cross the most farmland. Beltrami North Central Variation 4 would parallel existing transmission line, roadway, or trail corridor for 92% of its length.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	372	291	462	All alternatives would cross a relatively similar amount of state forest land.	224	237	255	184	178	230	All alternatives would cross similar amounts of state forest. The Proposed Blue/Orange Route and Beltrami North Central Variation 4 would parallel the most existing transmission line, roadway, or trail corridor.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	97--0	97--0	152--0	All alternatives would cross a relatively similar amount of expired/terminated mineral lease lands.	0--0	0--0	0--0	0--0	0--0	0--0	No active or expired/terminated mineral lease lands or aggregate resources are present in the ROW of any alternative.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources				Beltrami North Variation 2 crosses near more sections identified as containing known archaeological sites. There are 2 historic architectural sites within 1 mile of Beltrami North Variation 2.							There are no known archaeological sites that would be affected by the alternatives. Beltrami North Central Variation 4 and Beltrami North Central Variation 5 have one historic architectural site within 1 mile.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--0	1--2	Beltrami North Variation 2 crosses near sections identified as containing known archaeological sites; the other alternatives do not cross known archaeological sites.	0--0	0--0	0--0	0--0	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--0--0	0--0--2	Beltrami North Variation 2 has 2 historic architectural sites within 1 mile; the other alternatives do not have known historic architectural sites within 1 mile.	0--0--0	0--0--0	0--0--0	0--0--0	0--0--1	0--0--1	Beltrami North Central Variation 4 and Beltrami North Central Variation 5 have one historic architectural site within 1 mile.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Natural environment	Water resources	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands				All alternatives would cross relatively similar numbers of watercourses/waterbodies. None of the alternatives would cross FEMA-designated floodplain. All alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.							All alternatives would cross relatively similar numbers of watercourses/waterbodies. All alternatives would cross relatively similar small areas of FEMA-designated floodplain that are expected to be spanned. All alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 11 (4--7) (0)	Total: 13 (9--4) (0)	Total: 15 (3--12) (0)	All alternatives would cross relatively similar numbers of watercourses/waterbodies.	Total: 5 (0--5) (0)	Total: 7 (3--4) (0)	Total: 6 (1--5) (0)	Total: 6 (2--4) (0)	Total: 9 (2--7) (0)	Total: 10 (3--7) (0)	All alternatives would cross relatively similar numbers of watercourses/waterbodies.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 0	Total: 0	Total: 0	None of the alternatives would cross FEMA-designated floodplains.	Total: 1 (1--0)	Total: 2 (2--0)	Total: 2 (2--0)	Total: 2 (2--0)	Total: 2 (2--0)	Total: 2 (2--0)	All alternatives would cross relatively similar small areas of FEMA-designated floodplain that are expected to be spanned.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	87	99	128	All alternatives would cross relatively similar areas of shrub wetland.	130	97	118	115	108	90	All alternatives would cross relatively similar areas of shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	213	185	217	All alternatives would cross relatively similar areas of forested wetland.	119	191	147	154	169	205	All alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	323	294	391	All alternatives would cross relatively similar areas of total wetland that are too large to span.	272	314	291	282	305	337	All alternatives would cross relatively similar areas of total wetland that are too large to span.
Natural environment	Vegetation	Cover type (acres of forested land cover in ROW)	389	367	473	All alternatives would cross a relatively similar amount of forested land cover. The Beltrami North Variation 2 parallels the least amount of existing transmission line, roadway, or trail corridor.	277	323	303	287	306	342	All alternatives would cross a relatively similar amount of forested land cover. The Proposed Blue/Orange Route and Beltrami North Central Variation 4 would parallel the most existing transmission line, roadway, or trail corridor.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Natural environment	Wildlife	Proximity to wildlife resources - Wildlife Management Areas, Grassland Bird Conservation Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW), Gray Owl Management Area (count in 0-1,500 feet)	Acres: 0--0--0 Count: 1--0	Acres: 0--0--0 Count: 0--0	Acres: 0--0--23 Count: 1--0	Beltrami North Variation 2 would cross an Important Bird Area. Both the Proposed Blue/Orange Route and the Beltrami North Variation 1 cross a shallow lake but would parallel an existing corridor in this area.	Acres: 0--0--117 Count: 0--0	Acres: 0--0--31 Count: 0--0	Acres: 0--0--157 Count: 0--0	Acres: 0--0--31 Count: 0--0	Acres: 0--0--33 Count: 0--0	Acres: 0--0--33 Count: 0--0	Proposed Blue/Orange Route and Beltrami North Central Variation 2 cross more of the Big Bog Important Bird Area. The Proposed Blue/Orange Route would parallel existing corridor through this area while Beltrami North Central Variation 2 would not parallel existing corridor.
Rare and unique natural resources	Federal and state listed species	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)				There are no federally-listed species identified for these alternatives. Beltrami North Variation 2 has more NHIS records, including records of state threatened and/or endangered species, within 1 mile.							There are no federally-listed species identified for these alternatives. Beltrami North Central Variation 1 has the most NHIS records within 1 mile. All alternatives (except Beltrami North Central Variation 4) have threatened and endangered NHIS records within 1 mile.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile)	0	0	0	There are no federally-listed species identified for these alternatives.	0	0	0	0	0	0	There are no federally-listed species identified for these alternatives.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	6	3	22	Beltrami North Variation 2 has the most NHIS records within 1 mile.	9	12	5	5	0	7	Beltrami North Central Variation 1 has the most NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	2	0	7	Beltrami North Variation 2 has the most NHIS records of threatened and/or endangered species within 1 mile.	2	3	2	2	0	1	All alternatives (except Beltrami North Central Variation 4) have threatened and endangered NHIS records within 1 mile.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNA), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands				Beltrami North Variation 2 would cross the most MBS Sites of Biodiversity Significance ranked outstanding or high, followed by Beltrami North Variation 1. Both the Proposed Blue/Orange Route and Beltrami North Variation 2 would cross High Conservation Value Forest. Beltrami North Variation 2 would cross MBS native plant communities, including communities with a conservation status rank of S2 and S3, while the other alternatives would not cross any MBS native plant communities.							Beltrami North Central Variation 2 would cross a SNA WPA. Proposed Blue/Orange Route and Beltrami North Central Variation 2 would cross the most MBS Sites of Biodiversity Significance ranked outstanding or high. Proposed Blue/Orange Route and Beltrami North Central Variation 4 would parallel the most existing transmission line, roadway, or trail corridor.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (Count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; none of the alternatives would cross a SNA WPA.	0--0	0--0	0--23	0--0	0--0	0--0	Beltrami North Central Variation 2 would cross a SNA WPA, while the other alternatives do not cross a SNA or SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance - (total acres within ROW)	369	276	460	All alternatives would cross relatively similar amounts of MBS Sites of Biodiversity Significance.	145	97	174	105	102	94	All alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance. The Proposed Blue/Orange Route and Beltrami North Central Variation 4 would parallel the most existing transmission line, roadway, or trail corridor.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance - Rank Outstanding + High (acres within ROW)	0	6	30	Beltrami North Variation 2 would cross the most MBS Sites of Biodiversity Significance ranked outstanding or high.	101	15	115	15	0	0	Proposed Blue/Orange Route and Beltrami North Central Variation 2 would cross the most MBS Sites of Biodiversity Significance ranked outstanding or high; these alternatives would parallel existing corridor through these areas. Beltrami North Central Variation 4 and Beltrami North Central Variation 5 would not cross MBS Sites of Biodiversity Significance ranked outstanding or high.

West Section [1], [2]			Beltrami North				Beltrami North Central						
Factor	Element	Indicator	Proposed Blue/Orange Route	Beltrami North Variation 1	Beltrami North Variation 2	NOTES	Proposed Blue/Orange Route	Beltrami North Central Variation 1	Beltrami North Central Variation 2	Beltrami North Central Variation 3	Beltrami North Central Variation 4	Beltrami North Central Variation 5	NOTES
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	8--0	0--0	8--0	Proposed Blue/Orange Route and Beltrami North Variation 2 each cross eight acres of High Conservation Value Forest. Both alternatives would cross along the edge, while paralleling an existing corridor.	0--0	0--0	0--0	0--0	0--0	0--0	There are no known High Conservation Value Forests that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	0	0	30	Beltrami North Variation 2 would cross MBS native plant communities, while the other alternatives would not cross these communities.	0	0	0	0	0	0	No MBS native plant community data are available for this area.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (acres of conservation status rank S2 and S3 communities in ROW)	0	0	8	Beltrami North Variation 2 would cross MBS native plant communities with conservation status ranks of S2 and S3, while the alternatives would not cross these communities.	0	0	0	0	0	0	No MBS native plant community data are available for this area.
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	100	72	53	All alternatives would parallel existing transmission line, roadway, and/or trail corridor for at least one-half of their length.	100	48	49	70	92	70	Beltrami North Central Variation 1 and Beltrami North Central Variation 2 would parallel the least existing transmission line, roadway, and/or trail corridor.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	-	-	-	-	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$18,984,370	ranges from $18,741,668 to $19,591,668	$24,571,721	The maximum cost for the Beltrami North Variation 1 is within 20% of the cost of the Proposed Blue/Orange Route. The cost of the Beltrami North Variation 2 is more than 20% above the cost of the Proposed Blue/Orange Route.	$12,574,123	ranges from $14,038,602 to $14,368,602	$14,478,550	ranges from $16,155,266 to $18,393,663	ranges from $17,168,969 to $25,069,516	ranges from $16,966,730 to $22,958,880	The maximum cost for the Beltrami North Central Variation 1 and Beltrami North Central Variation 2 are within 20% of the cost of the Proposed Blue/Orange Route. The cost of the Beltrami North Central Variation 3, Beltrami North Central Variation 4, and Beltrami North Central Variation 5 are more than 20% above the cost of the Proposed Blue/Orange Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

Central Section [1], [2]			**Pine Island**			**Beltrami South Central**		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas (SNAs), state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			Pine Island			Beltrami South Central		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Human settlement	**Aesthetics**	Proximity to residences (count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	1--9--14	0--0--2	Proposed Blue Route would pass by more residences within 1,500 feet of the anticipated alignment. Proposed Orange Route passes near the Big Bog Recreation Area, but is not visible.	0--0--0	0--0--0	No residences are present within 1,500 feet of the anticipated alignment for either alternative.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data			Proposed Blue Route and Proposed Orange Route would cross USFWS Interest Lands (8 acres and 16 acres, respectively), but the Proposed Blue Route could avoid it by using the Silver Creek Alignment Modification. Proposed Orange Route passes near the Big Bog Recreation Area, but is not visible. Proposed Blue Route crosses more private land than the Proposed Orange Route.			Proposed Orange Route would cross USFWS Interest Lands (16 acres), while the Beltrami South Central Variation would not. Neither alternative would cross private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)			Proposed Blue Route and Proposed Orange Route would cross USFWS Interest Lands (8 acres and 16 acres, respectively), but the Proposed Blue Route could avoid it by using the Silver Creek Alignment Modification. Proposed Orange Route passes near the Big Bog Recreation Area, but is not visible.			Proposed Orange Route would cross USFWS Interest Lands (16 acres), while the Beltrami South Central Variation would not. Crossing this land would require obtaining a provisional special use permit for construction from the USFWS.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 2,661 (2,099--562)	Total: 2,556 (2,310--246)	Proposed Blue Route crosses more private land than the Proposed Orange Route.	Total: 30 (30--0)	Total: 43 (43--0)	Neither alternative would cross private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Pine Island Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Beltrami South Central Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			**Pine Island**			**Beltrami South Central**		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 666 (70--289--307)	Total: 693 (70--120--503)	Proposed Blue Route and Proposed Orange Route would cross a relatively similar amounts of farmland.	Total: 0 (0--0--0)	Total: 0 (0--0--0)	Neither alternative would cross farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	2,291	1,980	Proposed Blue Route and Proposed Orange Route would cross relatively similar amounts of state forest land.	30	43	Both alternatives cross relatively similar amounts of state forest land. Proposed Orange Route parallels existing corridor for its entire length.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	1,205--0	370--2	Proposed Blue Route would cross more expired/terminated mineral lease lands. Proposed Orange route would pass in close proximity to more aggregate resources.	0--0	0--0	No active or expired/terminated mineral lease lands or aggregate resources are present in the ROW of any alternative.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources			Proposed Blue Route would cross a section identified as containing known archaeological resources; Proposed Orange Route does not cross any of these sections. Proposed Orange Route has more historic architectural sites within 1 mile than the Proposed Blue Route.			There are no known archaeological or historic architectural resources that would be affected by the alternatives.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--1	0--0	Proposed Blue Route would cross a section identified as containing known archaeological sites; the Proposed Orange Route does not cross any of these sections.	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--2--2	0--0--7	Proposed Orange Route has more historic architectural sites within 1 mile than the Proposed Blue Route.	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by the alternatives.

Central Section [1], [2]			**Pine Island**			**Beltrami South Central**		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands			Proposed Blue Route and Proposed Orange Route would cross similar numbers of watercourses/ waterbodies; however, the Proposed Blue Route would cross one trout stream. All crossings are expected to be spanned, although clearing vegetation adjacent to trout streams could result in increased water temperature, potentially resulting in less suitable trout habitat. Both alternatives would cross relatively similar areas of FEMA-designated floodplain areas that cannot be spanned. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.			There are no differences between the alternatives for crossing watercourses, waterbodies, and floodplains. Proposed Orange Route and Beltrami South Central Variation would cross wetlands that are too large to span. Proposed Orange Route and Beltrami South Central Variation would cross relatively similar areas of wetlands that are too large to span would result in relatively similar areas of forest wetland type conversion. Beltrami South Central Variation would have the most shrub wetland; therefore, would require the most shrub wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 66 (18--48); (1)	Total: 71 (25--46); (0)	Proposed Blue Route and Proposed Orange Route would cross similar numbers of watercourses/waterbodies; however, the Proposed Blue Route would cross one trout stream. All crossings are expected to be spanned, though clearing vegetation adjacent to trout streams could result in increased water temperature, potentially resulting in less suitable trout habitat.	Total: 0	Total: 0	There are no differences between the alternatives.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 20 (20--0)	Total: 11 (11--0)	Both alternatives would cross relatively similar areas of FEMA-designated floodplain areas that are too large to span;	Total: 0	Total: 0	There are no differences between the alternatives.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	657	774	Both alternatives would cross relatively similar areas of shrub wetland.	8	28	Beltrami South Central Variation would cross the most shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	1,240	1,039	Both alternatives would cross relatively similar areas of forested wetland.	20	11	Both alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	2,102	1,875	Both alternatives would cross relatively similar areas of total wetland that are too large to span.	30	43	Both alternatives would cross relatively similar areas of total wetland that are too large to span.

Central Section [1], [2]			Pine Island			Beltrami South Central		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	2,554	2,520	Proposed Blue Route and Proposed Orange Route would cross a relatively similar amount of forested land cover.	30	43	Both alternatives would cross a relatively similar amounts of forested land cover. Proposed Orange Route parallels existing corridor for its entire length.
Natural environment	**Wildlife**	Proximity to wildlife resources - Wildlife Management Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW)	49--1,405--0	274--1,722--0	Both alternatives would cross a WMA and Important Bird Area. Proposed Orange Route would cross a greater portion of these areas.	0--30--0	0--43--0	Both alternatives would cross a relatively similar amount of Important Bird Area. Proposed Orange Route parallels existing corridor for its entire length.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)			There are no federally-listed species identified for these alternatives. Both alternatives would cross critical habitat designated for gray wolf. Proposed Orange Route has more threatened and endangered NHIS records within 1 mile.			There are no federally-listed species identified for these alternatives. Both alternatives have the same number of NHIS records within 1 mile.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--60	0--85	Both alternatives would cross relatively similar amounts of critical habitat designated for gray wolf.	0--0	0--0	There are no federally-listed species identified for these alternatives. Neither alternative would cross critical habitat designated for gray wolf.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	16	21	Both alternatives have a relatively similar number of NHIS records within 1 mile.	8	8	Both alternatives have the same number of NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	2	6	The Proposed Orange Route has more threatened and endangered NHIS records within 1 mile.	3	3	Both alternatives have the same number of threatened and endangered NHIS records within 1 mile.

Central Section [1], [2]			**Pine Island**			**Beltrami South Central**		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands			Proposed Blue Route and Proposed Orange Route would have an SNA within 1,500 feet; however, the Proposed Blue Route would parallel an existing corridor in this area, while the Proposed Orange Route would not. Proposed Orange Route would cross more SNA WPAs. Proposed Blue Route would cross more Ecologically Important Lowland Conifer Areas.			Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance. Proposed Orange Route would parallel existing corridor for its entire length.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	1--125	1--247	Proposed Blue Route would have 100 acres of a SNA within 1,500 feet and the Proposed Orange Route would have 50 acres of a SNA within 1,500 feet; neither alternative has an SNA within its ROW. Proposed Blue Route would parallel an existing corridor in this area, while the Proposed Orange Route would require new corridor. Proposed Orange Route would cross more acres of SNA WPAs.	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	1,514	1,639	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.	30	43	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--29	0--5	Proposed Blue Route would cross more Ecologically Important Lowland Conifer Areas.	0--0	0--0	There are no known Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	-	-	No MBS native plant community data are available for this area.	-	-	No MBS native plant community data are available for this area.

Central Section [1], [2]			Pine Island			Beltrami South Central		
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	NOTES	Proposed Orange Route	Beltrami South Central Variation	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	40	23	Both alternatives would parallel existing transmission line, roadway, and/or trail corridor.	100	0	Proposed Orange Route would parallel an existing transmission line, roadway, and/or trail corridor for the entire length. Beltrami South Central Variation would not parallel any corridors.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$118,546,237	ranges from $112,884,087 to $118,876,237	The cost of the alternative is within 20% of the cost of the Proposed Blue Route.	$1,214,573	$3,440,123	The cost of the alternative is more than 20% above the cost of the Proposed Orange Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

Central Section [1], [2]			**Beltrami South**			**North Black River**		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas (SNAs), state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			Beltrami South			North Black River		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Human settlement	**Aesthetics**	Proximity to residences (count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--0--0	0--0--0	No residences are present within 1,500 feet of the anticipated alignment for either alternative.	0--0--1	3--4--5	North Black River Variation would pass by more residences within 1,500 feet of the anticipated alignment. North Black River would parallel existing transmission line corridor for its entire length.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data			Beltrami South Variation would avoid USFWS Interest Lands. It is unknown whether the anticipated alignment of the Proposed Orange Route would impact USFWS Interest Lands; land surveys would need to be completed to determine impacts. Beltrami South Variation would cross more private land.			North Black River Variation would cross more private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)			Beltrami South Variation would avoid USFWS Interest Lands. It is unknown whether the anticipated alignment of the Proposed Orange Route would impact USFWS land; land surveys would need to be completed to determine impacts.			There are no land use compatibility issues identified for the alternatives.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 136 (136--0)	Total: 183 (181--2)	Beltrami South Variation would cross more private land.	Total: 204 (184--20)	Total: 223 (158--65)	North Black River Variation would cross more private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Beltrami South Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the North Black River Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			**Beltrami South**			**North Black River**		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 0 (0--0--0)	Total: 0 (0--0--0)	Neither alternative would cross farmland.	Total: 41 (0--29--12)	Total: 64 (0--14--50)	Both alternatives would cross a relatively similar amount of farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	136	183	Both alternatives cross relatively similar amounts of state forest land. Proposed Orange Route would parallel an existing transmission line corridor for its entire length.	188	156	Both alternatives would cross a relatively similar amount of state forest land. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	58--0	287--0	Beltrami South Variation crosses more expired/terminated mineral lease lands.	405--0	362--0	Both alternatives would cross a relatively similar amount of expired/terminated mineral lease lands. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources			There are no known archaeological and historic architectural resources that would be affected by the alternatives.			There are no known archaeological and historic architectural resources that would be affected by the alternatives.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by the alternatives.	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by the alternatives.

Central Section [1], [2]			**Beltrami South**			**North Black River**		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands			There are no differences between the alternatives for crossing watercourses, waterbodies, or floodplains. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.			There would be no differences between the alternatives for crossing watercourses, waterbodies, and floodplains. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 0	Total: 0	There are no differences between the alternatives.	Total: 4 (0--4) (0)	Total: 4 (0--4) (0)	There are no differences between the alternatives.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 0	Total: 0	There are no differences between the alternatives.	Total: 0	Total: 0	There are no differences between the alternatives.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	40	20	Both alternatives would cross relatively similar areas of shrub wetland.	72	83	Both alternatives would cross relatively similar areas of shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	93	160	Both alternatives would cross relatively similar areas of forested wetland.	113	73	Both alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	136	183	Both alternatives would cross relatively similar areas of total wetland that are too large to span.	193	198	Both alternatives would cross relatively similar areas of total wetland that are too large to span.

Central Section [1], [2]			**Beltrami South**			**North Black River**		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	135	183	Both alternatives would cross relatively similar amounts of state forest land. Proposed Orange Route would parallel an existing transmission line corridor for its entire length.	204	197	Both alternatives would cross a relatively similar amount of forested land cover. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Natural environment	**Wildlife**	Proximity to wildlife resources - Wildlife Management Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW)	0--136--0	0--183--0	Both alternatives would cross a relatively similar amount of Important Bird Area. Proposed Orange Route would parallel existing corridor for its entire length.	0--191--0	0--214--0	Both alternatives would cross a relatively similar amount of Important Bird Area. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)			There are no federally-listed species identified for these alternatives. Both alternatives cross minimal amounts of critical habitat designated for gray wolf, with Beltrami South Variation crossing slightly more than the Proposed Orange Route. Beltrami South Variation has more NHIS records within 1 mile, including a NHIS record for a threatened species.			There are no federally-listed species identified for these alternatives. The alternatives avoid critical habitat designated for gray wolf. There are no documented NHIS records within 1 mile of these alternatives.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--1	0--3	There are no federally-listed species identified for these alternatives. The alternatives cross minimal amounts of critical habitat designated for gray wolf, with Beltrami South Variation crossing slightly more than the Proposed Orange Route.	0--0	0--0	There are no federally-listed species identified for these alternatives. Neither alternative would cross critical habitat designated for gray wolf.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	1	4	Beltrami South Variation has more NHIS records within 1 mile.	0	0	There are no NHIS records within 1 mile of these alternatives.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	0	1	Beltrami South Variation has one threatened NHIS record within 1 mile.	0	0	No threatened or endangered NHIS records have been documented within 1 mile of either alternative.

Central Section [1], [2]			**Beltrami South**			**North Black River**		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands			Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance. Proposed Orange Route would parallel an existing transmission line corridor for its entire length.			Both alternatives would cross a relatively similar amount of a SNA WPA and MBS Sites of Biodiversity Significance. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA WPA.	0--86	0--94	Both alternatives would cross a relatively similar amount of a SNA WPA. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	120	161	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance. The Proposed Orange Route would parallel an existing transmission line corridor for its entire length.	165	109	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance. North Black River Variation would parallel an existing transmission line corridor for its entire length.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--0	0--0	There are no known Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.	0--0	0--0	There are no known Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	-	-	No MBS native plant communities data are available for this area.	-	-	No MBS native plant community data are available for this area.

Central Section [1], [2]			**Beltrami South**			**North Black River**		
Factor	**Element**	**Indicator**	Proposed Orange Route	Beltrami South Variation	NOTES	Proposed Blue Route	North Black River Variation	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	100	0	Proposed Orange Route would parallel an existing transmission line, roadway, and/or trail corridor for the entire length. Beltrami South Variation would not parallel any corridors.	0	100	North Black River Variation would parallel an existing transmission line, roadway, and/or trail corridor for its entire length. Proposed Blue Route would not parallel any corridors.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$5,805,518	$9,925,396	The cost of the alternative is more than 20% above the cost of the Proposed Orange Route.	$9,893,560	$10,552,560	The cost of the alternative is within 20% of the cost of the Proposed Blue Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

Central Section [1], [2]			**C2 Segment Option**			**J2 Segment Option**		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas (SNAs), state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			**C2 Segment Option**			**J2 Segment Option**		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Human settlement	**Aesthetics**	Proximity to residences (count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--0--0	4--14--29	C2 Segment Option Variation would pass by more residences within 1,500 feet of the anticipated alignment. C2 Segment Option Variation would parallel existing transmission line corridor for the majority of its length.	0--0--0	1--5--6	J2 Segment Option Variation would pass by more residences within 1,500 feet of the anticipated alignment.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data			C2 Segment Option Variation would pass near an airstrip, but could avoid potential impacts by using the Airstrip Alignment Modification. C2 Segment Option Variation would cross more private land.			J2 Segment Option Variation would cross USFWS Interest Lands (28 acres) and would cross more private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)			C2 Segment Option Variation would pass near an airstrip, but could avoid potential impacts by using the Airstrip Alignment Modification			J2 Segment Option Variation would cross USFWS Interest Lands (28 acres), while the Proposed Orange Route would not. Crossing this land would require obtaining a provisional special use permit for construction from the USFWS.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 797 (731--66)	Total: 1,116 (654--462)	C2 Segment Option Variation would cross more private land.	Total: 1,024 (945--79)	Total: 1,096 (867--229)	J2 Segment Option Variation would cross more private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the C2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health in the J2 Segment Option Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			**C2 Segment Option**			**J2 Segment Option**		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 172 (2--78--92)	Total: 326 25--177--124	Both alternatives would cross farmland. C2 Segment Option Variation would parallel existing transmission line corridor for the majority of its length, while the Proposed Blue Route would not parallel any existing corridor.	Total: 494 (61--60--373)	Total: 700 (159--241--300)	Both alternatives would cross a relatively similar amount of farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	797	274	Proposed Blue Route would cross more state forest land.	851	715	Both alternatives would cross a relatively similar amount of state forest land.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	16--0	67--0	C2 Segment Option Variation would cross more expired/terminated mineral lease lands.	82--2	73--1	Both alternatives would cross a relatively similar amount of expired/terminated mineral lease lands. The Proposed Orange Route would pass by more aggregate resources.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources			There are no known archaeological and historic architectural resources that would be affected by the alternatives.			J2 Segment Option Variation has more historic architectural sites within 1 mile than the Proposed Orange Route. There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by the alternatives.	0--0--2	0--2--7	J2 Segment Option Variation has more historic architectural sites within 1 mile than the Proposed Orange Route.

Central Section [1], [2]			**C2 Segment Option**			**J2 Segment Option**		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands			Proposed Blue Route would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned. Proposed Blue Route and the C2 Segment Option Variation cross FEMA-designated floodplain areas, C2 Segment Option Variation would cross the most floodplain. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.			Both alternatives would cross relatively similar numbers of watercourses/waterbodies, all of which are expected to be spanned. Proposed Orange Route would cross FEMA-designated floodplains; however the areas are small and would be spanned. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 17 (5--12) (0)	Total: 8 (3--5) (0)	Proposed Blue Route would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned.	Total: 30 (6--24) (0)	Total: 39 (3--36) (0)	Both alternatives would cross relatively similar numbers of watercourses/waterbodies.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 8 (8--0)	Total: 28 (28--0)	Proposed Blue Route and the C2 Segment Option Variation cross FEMA-designated floodplain areas large enough that they cannot be spanned; C2 Segment Option Variation would cross the most floodplain.	Total: 3 (3--0)	Total: 0	Proposed Orange Route would cross FEMA-designated floodplains; however the areas are small and are expected to be spanned.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	80	175	C2 Segment Option Variation would cross the most shrub wetland.	96	97	Both alternatives would cross relatively similar areas of shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	633	585	Both alternatives would cross relatively similar areas of forested wetland.	388	215	Both alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	728	829	Both alternatives would cross relatively similar areas of total wetland that are too large to span.	509	353	Both alternatives would cross relatively similar areas of total wetland that are too large to span.

Central Section [1], [2]			**C2 Segment Option**			**J2 Segment Option**		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	789	1,080	Both alternatives would cross a relatively similar amount of forested land cover. C2 Segment Option Variation would parallel existing transmission line corridors for most of its length, while the Proposed Blue Route would not parallel any existing corridor.	1,007	1,063	Both alternatives would cross a relatively similar amount of forested land cover.
Natural environment	**Wildlife**	Proximity to wildlife resources - Wildlife Management Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW)	0--469--0	0--406--0	Both alternatives would cross a relatively similar amount of Important Bird Area. C2 Segment Option Variation would parallel existing transmission line corridors for most of its length, while the Proposed Blue Route would not parallel any existing corridor.	0--262--0	0--72--0	Proposed Orange Route would cross more Important Bird Area.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)			There are no federally-listed species identified for these alternatives. Both alternatives would cross the same amount of critical habitat designated for gray wolf. Both alternatives have the same number of NHIS records within 1 mile; however, the C2 Segment Option Variation has a NHIS record for a state-threatened species.			There are no federally-listed species identified for these alternatives. Proposed Orange Route crosses more critical habitat designated for gray wolf. Proposed Orange Route has more NHIS records within 1 mile. Proposed Orange Route has 2 threatened NHIS records within 1 mile.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--32	0--32	There are no federally-listed species identified for these alternatives. The alternatives would cross a relatively similar amount of critical habitat designated for gray wolf.C2 Segment Option Variation would parallel an existing transmission line corridor for most of its length.	0--42	0--13	There are no federally-listed species identified for these alternatives. Proposed Orange Route crosses more critical habitat designated for gray wolf.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	4	4	Both alternatives have the same number of NHIS records within 1 mile.	4	1	Proposed Orange Route has more NHIS records of rare species within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	0	1	C2 Segment Option Variation has one threatened NHIS record within 1 mile.	2	0	Proposed Orange Route has 2 threatened NHIS records within 1 mile.

Central Section [1], [2]			C2 Segment Option			J2 Segment Option		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands			C2 Segment Option Variation would have an SNA within 1,500 feet; however, it would not have an SNA within its ROW. The C2 Segment Option Variation also passes through a SNA WPA. Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance and Ecologically Important Lowland Conifer Areas. C2 Segment Option Variation would parallel existing transmission line corridors for most of its length, while the Proposed Blue Route would not parallel any existing corridor.			Proposed Orange Route would cross more MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	1--26	C2 Segment Option Variation has 150 acres of SNA within 1,500 feet, while no SNAs are within 1,500 feet of the Proposed Blue Route. The C2 Segment Option Variation would pass through a SNA WPA.	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	642	510	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance. C2 Segment Option Variation would parallel existing transmission line corridors for most of its length, while the Proposed Blue Route would not parallel any existing corridor.	489	185	Proposed Orange Route would cross more MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--7	0--6	Both alternatives would cross a relatively similar amount of Ecologically Important Lowland Conifer Areas. C2 Segment Option Variation would parallel existing transmission line corridors for most of its length, while the Proposed Blue Route would not parallel any existing corridor.	0--0	0--0	There are no known Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	-	-	No MBS native plant community data are available for this area.	-	-	No MBS native plant community data are available for this area.

Central Section [1], [2]			C2 Segment Option			J2 Segment Option		
Factor	**Element**	**Indicator**	Proposed Blue Route	C2 Segment Option Variation	NOTES	Proposed Orange Route	J2 Segment Option Variation	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	0	81	C2 Segment Option Variation would parallel an existing transmission line, roadway, and/or trail corridor for most of its length. Proposed Blue Route would not parallel any existing transmission line, roadway, or trail corridor.	0	0	Neither alternative would parallel existing transmission line, roadways, or trails corridors.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$35,769,239	$54,466,435	The cost of the alternative is more than 20% above the cost of the Proposed Blue Route.	$48,706,641	$52,128,879	The cost of the alternative is within 20% of the cost of the Proposed Orange Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

Central Section [1], [2]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways, railways	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas (SNAs), state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [(1), (2)]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Human settlement	**Aesthetics**	Proximity to residences (count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--0--0	0--0--0	No residences are present within 1,500 feet of the anticipated alignment for either alternative.	0--0--0	0--0--0	No residences are present within 1,500 feet of the anticipated alignment for either alternative.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data			J2 Segment Option Variation would cross USFWS Interest Lands (28 acres). Both alternatives would cross a relatively similar amount of private land.			The Cutfoot Variation would cross more private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)			J2 Segment Option Variation would cross USFWS Interest Lands (28 acres), while the Northome Variation would not. Crossing this land would require obtaining a provisional special use permit for construction from the USFWS.			There are no land use compatibility issues identified for the alternatives.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 91 (67--25)	Total: 99 (81--18)	Both alternatives would cross a relatively similar amount of private land.	Total: 103 (95--8)	Total: 116 (93--23)	The Cutfoot Variation would cross more private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Northome Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Cutfoot Variation Area for details		There would be no differences in the impacts for the alternatives.

Central Section [1], [2]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 61 (20--39--2)	Total: 71 (28--28--15)	Both alternatives cross a relatively similar amount of farmland.	Total: 55 (0--2--53)	Total: 36 (0--4--32)	Both alternatives would cross a relatively similar amount of farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	<0.5	<0.5	Both alternatives would cross minimal state forest land.	103	116	Both alternatives would cross a relatively similar amount of state forest land.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	0--0	0--0	No active or expired/terminated mineral lease lands or aggregate resources are present in the ROW of any alternative.	29--1	4--1	Proposed Orange Route would cross more expired/terminated mineral lease lands. Both alternatives have aggregate resources within the ROW.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources			Northome Variation would cross a section identified with a known archaeological resource. There are no known historic architectural sites that would be affected by either alternative.			There are no known archaeological or historic architectural resources that would be affected by the alternatives.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--1	Northome Variation would cross a section identified as containing known archaeological sites.	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by either alternative.	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by the alternatives.

Central Section [1], [2]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands			J2 Segment Option Variation would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned. There would be no differences between the alternatives for crossing floodplains. J2 Segment Option Variation and Northome would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of forest wetland type conversion. J2 Segment Option Variation would have the most shrub wetland; therefore, would require the most shrub wetland type conversion.			Proposed Orange Route would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned. There would be no differences between the alternatives for crossing floodplains. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 6 (0--6) (0)	Total: 2 (1--1) (0)	J2 Segment Option Variation would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned.	Total: 2 (0--2) (0)	Total: 0	Proposed Orange Route would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 0	Total: 0	There would be no differences between the alternatives.	Total: 0	Total: 0	There are no differences between the alternatives.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	6	2	J2 Segment Option Variation would cross the most shrub wetland.	3	5	Both alternatives would cross relatively similar areas of shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	8	6	Both alternatives would cross relatively similar areas of forested wetland.	49	59	Both alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	23	14	Both alternatives would cross relatively similar areas of total wetland that are too large to span.	57	67	Both alternatives would cross relatively similar areas of total wetland that are too large to span.

Central Section [1], [2]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	89	96	Both alternatives would cross a relatively similar amount of forested land cover.	99	115	Both alternatives would cross a relatively similar amount of forested land cover.
Natural environment	**Wildlife**	Proximity to wildlife resources - Wildlife Management Areas, Important Bird Areas (acres in ROW) Proximity to shallow lakes (count in ROW)	0--0--0	0--0--1	Northome Variation would cross a shallow lake.	0--0--0	0--0--0	Neither alternative would cross designated wildlife resources.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)			There are no federally-listed species identified for these alternatives. There are no documented NHIS records within 1 mile of these alternatives.			There are no federally-listed species identified for these alternatives. Both alternatives would cross minimal amounts of critical habitat designated for gray wolf. There are no NHIS records within 1 mile of these alternatives.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--0	0--0	There are no federally-listed species identified for these alternatives. Neither alternative would cross critical habitat designated for gray wolf.	0--4	0--5	There are no federally-listed species identified for these alternatives. Both alternatives would cross minimal amounts of critical habitat designated for gray wolf.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	0	0	There are no NHIS records within 1 mile of these alternatives.	0	0	There are no NHIS records within 1 mile of these alternatives.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	0	0	No threatened or endangered NHIS records have been documented within 1 mile of either alternative.	0	0	No threatened or endangered NHIS records have been documented within 1 mile of either alternative.

Central Section [1], [2]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Area (WPA), MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands			No records of rare resources or communities have been documented in the ROW of either alternative.			Cutfoot Variation would cross more MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA Watershed Protection Area (WPA).	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA Watershed Protection Areas (WPAs).
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	0	0	No MBS Sites of Biodiversity Significance are present within the ROW of either alternative.	43	60	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--0	0--0	There are no known Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.	0--0	0--0	There are no known Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (total acres in ROW)	-	-	No MBS native plant community data are available for this area.	-	-	No MBS native plant community data are available for this area.

Central Section [1], [2]			**Northome**			**Cutfoot**		
Factor	**Element**	**Indicator**	J2 Segment Option Variation	Northome Variation	NOTES	Proposed Orange Route	Cutfoot Variation	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	0	0	Neither alternative would parallel existing transmission line, roadways, or trails corridors.	0	0	Neither alternative would parallel existing transmission line, roadways, or trails corridors.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.
Costs of constructing, operating, and maintaining the facility which are dependent on design and route		Total construction cost[3]	$4,192,942	$6,385,615	The cost of the alternative is more than 20% above the cost of the Proposed Blue Route.	$5,640,538	$6,222,257	The cost of the alternative is within 20% of the cost of the Proposed Orange Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

East Section [1], [2]			Effie			
Factor	Element	Indicator	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways and railways	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.

East Section [1], [2]			Effie			
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas, state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	**Aesthetics**	Proximity to residences (Count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--1--4	1--2--5	2--12--16	Effie Variation would pass by the most residences within 1,500 feet of the anticipated alignment.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data				There are no land use compatibility issues identified for the alternatives. All alternatives cross a relatively similar amount of private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)				There are no land use compatibility issues identified for the alternatives.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 997 (655--342)	Total: 1,081 (698--383)	Total: 1,209 (772--437)	All alternatives cross a relatively similar amount of private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.

East Section [1], [2]			Effie			
Factor	Element	Indicator	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Effie Variation Area for details			There would be no differences in the impacts for the alternatives.
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 397 (118--121--158)	Total: 510 (223--123--164)	Total: 665 (195--159--311)	All alternatives would cross a relatively similar amount of farmland. Effie Variation parallels an existing transmission line corridor for 80% of its length. The other alternatives parallel minimal existing corridor.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	909	958	1086	All alternatives would cross a relatively similar amount of state forest land. Effie Variation parallels an existing transmission line corridor for 80% of its length. The other alternatives parallel minimal existing corridor.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	647--0	819--0	824--0	All alternatives would cross a relatively similar amount of active and expired/terminated mineral lease lands.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources				Effie Variation would cross sections identified as containing known archaeological sites, while the other alternatives would not. Effie Variation has more historic architectural sites within 1 mile than the Proposed Blue Route and Proposed Orange Route.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--0	1--2	Effie Variation would cross sections identified as containing known archaeological sites; the other alternatives would not cross any of these sections.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--1--1	0--1--1	0--0--3	The Effie Variation has more historic architectural sites within 1 mile than the Proposed Blue Route and Proposed Orange Route.

East Section [1], [2]			Effie			
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands				Effie Variation would cross the most watercourses/waterbodies; including six trout streams. All crossings are expected to be spanned, although clearing vegetation adjacent to trout streams could result in increased water temperature, potentially resulting in less suitable trout habitat. Proposed Blue Route and the Proposed Orange Route would cross FEMA-designated floodplain; however the areas are small and would be spanned. All alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 19 (10--9) (0)	Total: 24 (13--11) (0)	Total: 28 (13--15) (6)	Effie Variation would cross the most watercourses/waterbodies; including six trout streams. All crossings are expected to be spanned, although clearing vegetation adjacent to trout streams could result in increased water temperature, potentially resulting in less suitable trout habitat.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 3 (3--0)	Total: 3 (3--0)	Total: 0	Proposed Blue Route and the Proposed Orange Route would cross FEMA-designated floodplains; however the areas are small and would be spanned.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	164	155	104	All alternatives would cross relatively similar areas of shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	255	217	273	All alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	443	391	413	All alternatives would cross relatively similar areas of total wetland that are too large to span.

East Section [1], [2]			Effie			
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	978	1,047	1,164	All alternatives would cross a relatively similar amount of forested land cover. Effie Variation parallels an existing transmission line corridor for 80% of its length. The other alternatives parallel minimal existing corridor.
Natural environment	**Wildlife**	Proximity to wildlife resources - Important Bird Areas (acres in ROW)	69	69	0	Proposed Blue Route and Proposed Orange Route would cross Important Bird Area.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)				The alternatives cross critical habitat designated for gray wolf. Proposed Orange Route has the most NHIS records within 1 mile. Proposed Blue Route has more NHIS records than the Effie Variation. Effie Variation would also minimize impacts by paralleling existing corridor.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--15	0--15	0--25	The alternatives cross a relatively similar amount of critical habitat designated for gray wolf. The Proposed Blue Route and Proposed Orange Route would cross along a new transmission line corridor, while the Effie Variation would parallel an existing transmission line corridor.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	5	7	2	Proposed Orange Route and the Proposed Blue Route have the most NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	1	0	0	Proposed Orange Route has one threatened NHIS record within 1 mile.

East Section (1), (2)			Effie			
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Areas, MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands				All alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (Count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	422	490	427	All alternatives would pass through a relatively similar amount of MBS Sites of Biodiversity Significance. Effie Variation parallels an existing transmission line corridor for 80% of its length. The other alternatives parallel minimal existing corridor.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--0	0--0	0--0	There are no known High Conservation Value Forests, Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (acres in ROW)	-	-	-	No MBS native plant community data are available for this area.

East Section [1], [2]			Effie			
Factor	**Element**	**Indicator**	Proposed Blue Route	Proposed Orange Route	Effie Variation	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	4	2	80	Effie Variation parallels an existing transmission line, roadway, and/or trail corridor for 80% of its length. The other alternatives parallel minimal existing corridor.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	0	0	80	Effie Variation would parallel existing 500 kV and 230 kV transmission line corridors for the entire length.
Costs of constructing, operating, and maintain the facility which are dependent on design and route		Total construction cost[3]	$46,649,600	$49,488,323	$57,353,305	The cost for the Proposed Orange Route is within 20% of the cost of the Proposed Blue Route. The cost of the Effie Variation is more than 20% above the cost of the Proposed Blue Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	Element	Indicator	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways and railways	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the altematives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	**Element**	**Indicator**	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas, state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Human settlement	**Aesthetics**	Proximity to residences (Count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--0--0	0--0--0	No residences are present within 1,500 feet of the anticipated alignment for either alternative.	0--3--7	2--10--21	2--6--12	Proposed Orange Route would pass by the most residences within 1,500 feet of the anticipated alignment.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data			There are no land use compatibility issues identified for the alternatives. Neither alternative would cross private land.				There are no land use compatibility issues identified for the alternatives. All alternatives would cross a relatively similar amount of private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)			There are no land use compatibility issues identified for the alternatives.				There are no land use compatibility issues identified for the alternatives.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 217 (217--0)	Total: 256 (256--0)	Neither alternative would cross private land.	Total: 314 (55--260)	Total: 332 (38--294)	Total: 433 (107--326)	All alternatives would cross a relatively similar amount of private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	**Element**	**Indicator**	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the East Bear Lake Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Balsam Variation Area for details			There would be no differences in the impacts for the alternatives.
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 85 (84--0--1)	Total: 160 (124--0--36)	Both alternatives would cross a relatively similar amount of farmland. East Bear Lake Variation would parallel existing corridors for nearly half of its length.	Total: 206 (156--0--50)	Total: 217 (159--12--46)	Total: 203 (141--1--61)	All alternatives cross a relatively similar amount of farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	217	256	Both alternatives would cross a relatively similar amount of state forest land. East Bear Lake Variation would parallel existing corridors for nearly half of its length.	0	0	0	None of the alternatives cross state forest land.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	96--0	193--0	Both alternatives would cross a relatively similar amount of active and expired/terminated mineral lease lands. East Bear Lake Variation would parallel existing corridors for nearly half of its length.	0--0	0--0	89--0	Balsam Variation would cross active and expired/terminated mineral lease lands while the proposed routes would not cross any mineral lease lands.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources			There are no known archaeological and historic architectural resources that would be affected by the alternatives.				Balsam Variation would cross a section identified as containing known archaeological sites, while the other alternatives would not. Balsam Variation has the most historic architectural sites within 1 mile.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.	0--0	0--0	0--1	Balsam, Variation would cross a section identified as containing known archaeological sites; the other alternatives would not cross any of these sections.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--0	0--0--0	There are no known historic architectural sites that would be affected by the alternatives.	0--0--13	0--0--24	0--4--28	The Balsam Variation has the most historic architectural sites within 1 mile.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	**Element**	**Indicator**	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands			Both alternatives would cross relatively similar numbers of watercourses/waterbodies; however, all crossings are expected to be spanned. Neither alternative would cross FEMA-designated floodplain. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.				All alternatives would cross relatively similar numbers of watercourses/waterbodies; however, all crossings are expected to be spanned. All alternatives would cross FEMA-designated floodplains; Proposed Orange Route would cross the most floodplain. All alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of shrub and forested wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 4 (4--0) (0)	Total: 5 (2--3) (0)	Both alternatives would cross relatively similar numbers of watercourses/waterbodies; however, all crossings are expected to be spanned.	Total: 8 (7--1) (0)	Total: 9 (5--4) (0)	Total: 7 (4--3) (0)	All alternatives would cross relatively similar numbers of watercourses/waterbodies; however, all crossings are expected to be spanned.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 0	Total: 0	There are no differences between the alternatives.	Total: 0	Total: 26 (26--0)	Total: 22 (22--0)	All alternatives would cross FEMA-designated floodplain areas large enough that they cannot be spanned; Proposed Orange Route would cross the most floodplain.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	64	40	Both alternatives would cross relatively similar areas of shrub wetland.	33	38	55	All alternatives would cross relatively similar areas of shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	34	47	Both alternatives would cross relatively similar areas of forested wetland.	14	21	28	All alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	104	89	Both alternatives would cross relatively similar areas of total wetland that are too large to span.	54	69	96	All alternatives would cross relatively similar areas of total wetland that are too large to span.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	**Element**	**Indicator**	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	216	251	Both alternatives would cross a relatively similar amount of forested land cover. East Bear Lake Variation would parallel existing corridors for nearly half of its length.	299	318	401	All alternatives would cross a relatively similar amount of forested land cover. Balsam Variation parallels existing transmission line, roadway, or field corridor for a greater proportion of its length than the proposed routes.
Natural environment	**Wildlife**	Proximity to wildlife resources - Important Bird Areas (acres in ROW)	0	0	Neither alternative would cross designated wildlife resources.	0	0	0	None of the alternatives would cross designated wildlife resources.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)			There are no federally-listed species identified for these alternatives. All alternatives would have a relatively similar number of NHIS records within 1 mile. Neither alternative has threatened or endangered NHIS records within 1 mile.				There are no federally-listed species identified for these alternatives. The alternatives have the same number of NHIS records within 1 mile, none of which are threatened or endangered species.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--0	0--0	There are no federally-listed species identified for these alternatives. Neither alternative would cross critical habitat designated for gray wolf.	0--0	0--0	0--0	There are no federally-listed species identified for these alternatives. None of the alternatives would cross critical habitat designated for gray wolf.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	3	2	Both alternatives have a relatively similar amount of NHIS records within 1 mile.	2	2	2	All alternatives have the same number of documented NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	0	0	Neither alternative has threatened or endangered NHIS records within 1 mile.	0	0	0	None of the alternatives have a threatened or endangered NHIS record within 1 mile.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	**Element**	**Indicator**	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Areas, MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands			Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.				All alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (Count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA Watershed Protection Areas (WPAs).	0--0	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	217	255	Both alternatives would pass through a relatively similar amount of MBS Sites of Biodiversity Significance.	78	105	95	All alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--0	0--0	There are no known High Conservation Value Forests, Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.	0--0	0--0	0--0	There are no known High Conservation Value Forests, Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (acres in ROW)	-	-	No MBS native plant community data are available for this area.	-	-	-	No MBS native plant community data are available for this area.

East Section [1], [2]			East Bear Lake			Balsam			
Factor	**Element**	**Indicator**	Proposed Orange Route	East Bear Lake Variation	NOTES	Proposed Blue Route	Proposed Orange Route	Balsam Variation	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	0	42	East Bear Lake Variation would parallel existing transmission line, roadway, and/or trail corridor, while the Proposed Orange Route would not parallel these corridors.	21	17	36	All alternatives would parallel existing transmission line, roadway, and/or trail corridor. Balsam Variation would be located in an abandoned transmission line corridor for 66% of it's length.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	0	42	East Bear Lake Variation would parallel existing 500 kV and 230 kV transmission line corridors for 42% of its length.	15	14	0	Proposed Blue Route and Proposed Orange Route would parallel two existing 115 kV transmission line corridors for 15% of their lengths.
Costs of constructing, operating, and maintain the facility which are dependent on design and route		Total construction cost[3]	$9,736,790	$13,279,079	The cost of the East Bear Lake Variation is more than 20% above the cost of the Proposed Orange Route.	$15,121,621	$16,018,490	$19,502,472	The cost for the Proposed Orange Route is within 20% of the cost of the Proposed Blue Route. The cost of the Balsam Variation is more than 20% above the cost of the Proposed Blue Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.

East Section [1], [2]			**Dead Man's Pond**			**Blackberry**		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Human settlement	Displacement	Proximity to residences	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Noise	Proximity to noise receptors	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Air quality	Air emissions (criteria pollutants and greenhouse gases)	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Property values	Proximity to residences	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Electronic interference	Proximity to communication towers	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to roadways and railways	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Transportation and public services	Proximity to airstrips	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Minority populations	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Environmental justice	Low-income populations	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Population	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Employment	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Taxes and revenue generated	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Socioeconomics	Housing availability	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.

East Section [1], [2]			Dead Man's Pond			Blackberry		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Human settlement	Recreation and tourism	Proximity to recreational resources (county, state, and federal parks and forests, state Scientific and Natural Areas, state trails, scenic byways, and snow and water trails)	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	Cultural values	Proximity to residences	See section on Human Settlement in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Human Settlement in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Human settlement	**Aesthetics**	Proximity to residences (Count within 0-500, 0-1,000, & 0-1,500 ft from the anticipated alignment)	0--1--2	0--1--4	Dead Man's Pond Variation would pass by more residences within 1,500 feet of the anticipated alignment.	2--6--11	0--5--22	Proposed Orange Route would pass by more residences within 1,500 feet of the anticipated alignment.
Human settlement	**Land use compatibility**	Summary - land use type data and land ownership data			There are no land use compatibility issues identified for the alternatives. Both alternatives would cross a relatively similar amount of private land.			There are no land use compatibility issues identified for the alternatives. Both alternatives would cross a relatively similar amount of private land.
Human settlement	Land use compatibility	Land use type data (crosses USFWS Interest Lands or other features, e.g. airstrips)			There are no land use compatibility issues identified for the alternatives.			There are no land use compatibility issues identified for the alternatives.
Human settlement	Land use compatibility	Land ownership type data - total acres in ROW (acres of public and private land in the ROW)	Total: 54 (19--35)	Total: 56 (37--19)	Both alternatives would cross a relatively similar amount of private land.	Total: 133 (41--92)	Total: 147 (54--93)	Both alternatives would cross a relatively similar amount of private land.
Public health and safety	Electric and magnetic Fields	Proximity to residences	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Implantable medical devices	Proximity to residences	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Stray voltage	Proximity to residences	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Induced voltage	Proximity to residences	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Intentional destructive acts	Intentional destructive acts	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.

East Section [1], [2]			Dead Man's Pond			Blackberry		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Public health and safety	Environmental contamination	Registered sites of contamination	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Public health and safety	Worker health and safety	Worker health and safety	See section on Public Health and Safety in the Dead Man's Pond Variation Area for details		There would be no differences in the impacts for the alternatives.	See section on Public Health and Safety in the Blackberry Variation Area for details		There would be no differences in the impacts for the alternatives.
Land based economies	**Agriculture**	Proximity to farmland - total acres in ROW (acres of prime farmland, farmland of statewide importance, and prime farmland if drained in ROW)	Total: 20 (11--0--9)	Total: 39 (38--0--1)	Both alternatives would cross a relatively similar amount of farmland.	Total: 82 (59--11--12)	Total: 90 (80--2--8)	Both alternatives would cross a relatively similar amount of farmland.
Land based economies	**Forestry**	Proximity to forest land (acres of state forest land in ROW)	0	0	Neither alternative would cross state forest land.	0	0	Neither alternative would cross state forest land.
Land based economies	**Mining and mineral resources**	Proximity to state mining lease lands (active and/or expired/terminated; acres in ROW) and aggregate resources (count in ROW)	0--0	0--0	No active or expired/terminated mineral lease lands or aggregate resources are present in the ROW of any alternative.	37--0	33--0	Proximity to expired/terminated mineral lease lands are relatively similar between the alternatives.
Archaeological and historic architectural resources		Summary - proximity to archaeological and historic architectural resources			There are no known archaeological sites that would be affected by the alternatives. Both alternatives have 1 historic architectural site within 1 mile.			There are no known archaeological resources that would be affected by the alternatives. Proposed Blue Route has more historic architectural sites within 1 mile.
Archaeological and historic resources	Archaeological sites	Proximity to archaeological sites (count within 0-100 ft and 0-1,500 ft from the anticipated alignment)	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.	0--0	0--0	There are no known archaeological sites that would be affected by the alternatives.
Archaeological and historic resources	Historic architectural sites	Proximity to historic architectural sites (count within 0-100 ft, 0-1,500 ft, and 0-1 mile from the anticipated alignment)	0--0--1	0--0--1	Both alternatives have a historic architectural resource within 1 mile.	0--0--6	0--0--1	Proposed Blue Route has more historic architectural sites within 1 mile.

East Section [1], [2]			Dead Man's Pond			Blackberry		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Natural environment	**Water resources**	Summary - proximity to watercourses, waterbodies, floodplains, and wetlands			There would be no differences between the alternatives for crossing watercourses, waterbodies, and floodplains. Proposed Blue Route would cross wetlands that are too large to span, while Dead Man's Pond Variation would be able to span wetlands. Both alternatives would result in relatively similar areas of forested wetland type conversion. Proposed Blue Route would have the most shrub wetland; therefore, would require the most shrub wetland type conversion.			Proposed Orange Route would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned. There would be no differences between the alternatives for crossing floodplains. Both alternatives would cross relatively similar areas of wetlands that are too large to span and would result in relatively similar areas of forested wetland type conversion. Proposed Blue Route would have the most shrub wetland; therefore, would require the most shrub wetland type conversion.
Natural environment	Water resources	Proximity to watercourses and waterbodies - Total number of crossings in ROW (number of PWI crossings, non-PWI crossings); - Trout stream (number of crossings)	Total: 0	Total: 0	There are no differences between the alternatives.	Total: 1 (1--0) (0)	Total: 3 (3--0) (0)	Proposed Orange Route would cross the most watercourses/waterbodies; however, all crossings are expected to be spanned.
Natural environment	Water resources	Proximity to floodplains - total acres of floodplain in ROW (acres of Zone A, acres of Zone B)	Total: 0	Total: 0	There are no differences between the alternatives.	Total: 0	Total: 0	There are no differences between the alternatives.
Natural environment	Water resources	Proximity to wetlands (acres of PSS wetlands in ROW resulting in wetland type conversion)	11	2	Proposed Blue Route would cross the most shrub wetland.	15	10	Proposed Blue Route would cross the most shrub wetland.
Natural environment	Water resources	Proximity to wetlands (acres of PFO wetlands in ROW resulting in wetland type conversion)	3	2	Both alternatives would cross relatively similar areas of forested wetland.	36	29	Both alternatives would cross relatively similar areas of forested wetland.
Natural environment	Water resources	Proximity to wetlands (acres of total wetlands in ROW too large to span)	14	4	Proposed Blue Route would cross wetlands that are too large to span, while Dean Man's Pond Variation would be able to span wetlands.	51	40	Both alternatives would cross relatively similar areas of total wetland that are too large to span.

East Section [1], [2]			Dead Man's Pond			Blackberry		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Natural environment	**Vegetation**	Cover type (acres of forested land cover in ROW)	50	54	Both alternatives would cross a relatively similar amount of forested land cover.	129	130	Both alternatives would cross a relatively similar amount of forested land cover. Proposed Orange Route parallels more existing transmission line corridor.
Natural environment	**Wildlife**	Proximity to wildlife resources - Important Bird Areas (acres in ROW)	0	0	Neither alternative would cross designated wildlife resources.	0	0	Neither alternative would cross designated wildlife resources.
Rare and unique natural resources	**Federal and state listed species**	Summary - proximity of federal and state-listed species (based on the Natural Heritage Information System (NHIS) database)			There are no federally-listed species identified for these alternatives. There is 1 threatened NHIS record within 1 mile of the Dead Man's Pond Variation. However, this species is a fish and because it is anticipated that all waterbodies and watercourses would be spanned, impacts to this aquatic species are not expected.			There are no federally-listed species identified for these alternatives. Both alternatives have a relatively similar number of NHIS records, including threatened or endangered NHIS records, within 1 mile.
Rare and unique natural resources	Federally listed species	Federally-listed species (# of records within 1 mile), designated critical habitat (miles crossed)	0--0	0--0	There are no federally-listed species identified for these alternatives. Neither alternative would cross critical habitat designated for gray wolf.	0--0	0--0	There are no federally-listed species identified for these alternatives. Neither alternative would cross critical habitat designated for gray wolf.
Rare and unique natural resources	State listed species	State-listed species (total # of NHIS records within 1 mile)	0	1	There is 1 NHIS record within 1 mile of the Dead Man's Pond Variation. However, this species is a fish and because it is anticipated that all waterbodies and watercourses would be spanned, impacts to this aquatic species are not expected.	2	3	Both alternatives have a relatively similar number of NHIS records within 1 mile.
Rare and unique natural resources	State listed species	State-listed species (# of threatened and endangered NHIS records within 1 mile)	0	1	There is 1 threatened NHIS record within 1 mile of the Dead Man's Pond Variation. However, this species is a fish and because it is anticipated that all waterbodies and watercourses would be spanned, impacts to this aquatic species are not expected.	2	2	Both alternatives have a relatively similar number of threatened or endangered NHIS records within 1 mile.

East Section [1], [2]			Dead Man's Pond			Blackberry		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Rare and unique natural resources	**State rare communities**	Summary - proximity to Scientific and Natural Areas (SNAs), SNA Watershed Protection Areas, MBS Sites of Biodiversity Significance, MBS native plant communities, High Conservation Value Forest, and Ecologically Important Lowland Conifer stands			No known rare and unique natural resources were identified for the alternatives.			Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to Scientific and Natural Areas (SNAs) (Count within 1,500 feet) and SNA Watershed Protection Area (acres within ROW)	0--0	0--0	Neither alternative has a SNA within 1,500 feet or an SNA WPA within the ROW.	0--0	0--0	No SNAs would be located within 1,500 feet of any alternative; no alternative would cross an SNA WPA.
Rare and unique natural resources	State rare communities	Proximity to MBS Sites of Biodiversity Significance (total acres within ROW)	0--0	0--0	No known MBS Sites of Biodiversity Significance were identified for the alternatives.	57	79	Both alternatives would cross a relatively similar amount of MBS Sites of Biodiversity Significance.
Rare and unique natural resources	State rare communities	Proximity to MnDNR High Conservation Value Forest, MnDNR Ecologically Important Lowland Conifer Areas (acres within ROW)	0--0	0--0	There are no known High Conservation Value Forests, Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.	0--0	0--0	There are no known High Conservation Value Forests, Ecologically Important Lowland Conifer Areas that would be affected by the alternatives.
Rare and unique natural resources	State rare communities	Proximity to MBS native plant communities (acres in ROW)	-	-	No MBS native plant community data are available for this area.	-	-	No MBS native plant community data are available for this area.

East Section [1], [2]			Dead Man's Pond			Blackberry		
Factor	**Element**	**Indicator**	Proposed Blue Route	Dead Man's Pond Variation	NOTES	Proposed Blue Route	Proposed Orange Route	NOTES
Use or paralleling of existing rights-of-way		Proximity to high voltage transmission lines, roadways, and trails (percent of total length)	17	0	Proposed Blue Route parallels some existing transmission line, roadway, and/or trail corridor, while the Dead Man's Pond Variation does not parallel any of these existing corridors.	22	37	Both alternatives would parallel a relatively similar amount of transmission line, roadway, and/or trail corridor.
Electrical system reliability		Proximity to two or more high voltage transmission lines (percent of total length)	-	-	There are no issues with electrical reliability since there would not be three transmission lines paralleling the same corridor.	20	37	Both alternatives would parallel 2 existing high voltage transmission lines for a relatively similar proportion of their length.
Costs of constructing, operating, and maintain the facility which are dependent on design and route		Total construction cost[3]	$2,873,223	$4,409,841	The cost of the Dead Man's Pond Variation is more than 20% above the cost of the Proposed Blue Route.	$8,380,680	$10,148,060	The cost of the Proposed Orange Route is more than 20% above the cost of the Proposed Blue Route.

(1) Colors represent least impacts (green), moderate impacts (yellow), greatest impacts (red), and no impacts or similar impacts (gray) relative to the specific factor.

(2) Red text indicates information in these rows are included within the DEIS.

(3) Using the Applicant's methodology (see comment in Appendix U), the Applicant-proposed route is green; if the maximum cost of the alternative is less than the Applicant-proposed route - it is green; if the maximum cost of the alternative is up to 20% more than the Applicant-proposed route - it is yellow; if the maximum cost of the alternative is more than 20% above the cost of the Applicant-proposed route - it is red.