PSC REF#:164802

Xcel Energy
NORTHERN STATES POWER

1414 W. HAMILTON AVENUE
EAU CLAIRE, WI 54701

Public Service Commission of Wisconsin
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May 15 2012

Ms. Sandra Paske
Secretary to the Commission
610 North Whitney Way
Public Service Commission of Wisconsin
Post Office Box 7854
Madison, WI 53707-7854

Mr. Dave Siebert
Director, Office of Energy
Wis. Department of Natural Resources
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707-7921

RE: **Application for PSCW Certificate of Authority for the Couderay – Osprey 69 kV to 161/69 kV Transmission Line Upgrade Project (Docket No. 4220-CE-178)**

Dear Ms. Paske and Mr. Seibert:

Pursuant to Wis. Stat.§ 196.49 and Wis. Admin.Code chs. PSC 4 and 112, Northern States Power Company, a Wisconsin Corporation d/b/a Xcel Energy, hereby submits an application for a Certificate of Authority (CA) and WDNR Utility Permit for the 35.5-mile Couderay – Osprey 69 kV to 161/69 kV Transmission Line Upgrade Project.

In addition to the printed materials, NSPW is providing the Commission a formatted DVD with the following:

- Microsoft Word, Excel, and Adobe PDF files of the application, and
- Geographic Information System data files supporting mapping.

We are filing this application according to the Commission's Electronic Regulatory filing system. If there are any questions regarding this filing, please contact Matt McFarlane, Permitting Analyst, at (715) 737-2434 or Matthew.J.McFarlane@xcelenergy.com.

Sincerely,

Mark E. Stoering
President and Chief Executive Officer
Northern States Power Company (WI)

cc Scot Cullen, PSCW (6 Paper Copies plus DVD)
Ben Callan, WDNR (3 Paper Copies plus DVD)

Enclosures

INTRODUCTION AND OVERVIEW

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INTRODUCTION AND OVERVIEW

A. INTRODUCTION

Northern States Power Company, a Wisconsin corporation ("NSPW") owns and operates electric transmission facilities, and transacts business as an electric utility with the purpose of planning, constructing, operating, and maintaining transmission facilities to serve native load requirements and provide electric transmission service. In order to meet this obligation, pursuant to Wis. Stat. §§ 196.49 and Wis. Admin. Code Chs. PSC 4 and 112, NSPW hereby submits this Application to the Public Service Commission of Wisconsin ("PSCW" or "Commission") for a Certificate of Authority ("CA") and any other authorization needed to rebuild and construct new transmission and substation facilities in Sawyer and Rusk County, Wisconsin. NSPW has designated this project as the Couderay – Osprey 161/69 kV Transmission Line and Substation Upgrade Project (the "Project").

Furthermore, in accordance with Wis. Stat. § 30.025(1m), Wis. Stat. Ch. 183, Wis. Admin. Code Ch. NR 216, NSPW hereby submits its Utility Permit Application to the Wisconsin Department of Natural Resources ("WDNR") for permits necessary to construct the proposed facilities ("Utility Permits"). The information presented in the accompanying Technical Support Document ("TSD") and Appendices contains detailed information required by the WDNR and PSCW to evaluate and grant the Utility Permits and CA

This combined application is organized into two parts, the Introduction and Overview portion containing Sections A – K, and the TSD portion containing Sections 2.1 – 2.10. Appendices A – G are provided in support of the TSD, with most of these appendices containing multiple documents as referenced in the Table of Contents above. There are 4 new right-of-way segments proposed parallel and adjacent to the existing transmission line. These segments would impact existing landowners for which the Company has a transmission line easement; therefore, the project meets the CPCN exemption in Wis. Stat. §§ 196.491(4)(1m)(b).

B. PURPOSE AND NECESSITY

The existing transmission line is proposed to be upgraded to a double-circuit 161/69 kV transmission line to accommodate future load in northern Wisconsin. This project is one of a series of transmission line upgrades in northern Wisconsin and part of the Northern Wisconsin to Upper Michigan Transmission Load Serving Study (see Appendix A, Exhibit A-1). The existing single-circuit 69 kV transmission line connecting NSPW's Couderay – Osprey Substations needs to be rebuilt due to the deteriorated state of the original poles, crossarms, and conductors. This line was originally built in 1956 and has been exposed to decades of woodpecker and carpenter

ant damage and natural weathering. Rebuilding this line will allow NSPW to provide greater reliability in western Wisconsin.

Approximately 285 existing wood pole structures make up this circuit. Recent testing of the structures has shown advanced areas of deterioration. In addition, many other components (cross arms, braces, guying, insulators, etc.) are in need of being replaced.

The primary purpose of this 35.5-mile 161/69 kV transmission line upgrade is to provide power to many distribution substations and rebuild an aging transmission line. The secondary purpose of this line is to ensure voltage support during system outages and maintenance.

A high percentage of transmission projects are initiated for violations of voltage criteria or to mitigate overloaded facilities. Neither voltage nor loading are concerns for this project. This line has reached the end of its useful life. Outages are becoming more frequent. A more reliable line is needed to minimize outages.

Long term planning scenarios show that loss of the Couderay end of the 69 kV line will cause voltages to drop to the lower 90% of nominal range. These lower voltages are seen in 2020 and beyond. NSPW has a criteria for minimum voltage of 90%. Since the voltage criteria are still met in the 10-year planning horizon, this project is not driven by a needed change in electrical characteristics. The lower future voltages indicate the need to install a larger conductor for the expected 40 or more years of operation.

C. PROJECT DESCRIPTION

The Project involves the following:

1. NSPW rebuilding and upgrading 35.5 miles of existing 69 kV transmission line on wood poles connecting NSPW's Couderay – Trails End – Osprey Substations to double-circuit 161/69 kV transmission line on self-supporting steel pole structures;
2. Expanding the existing Osprey Substation to accommodate 161 kV transformers and terminations; and
3. NSPW acquiring new ROW in Segments 2B, 5B, 6B, and 7B.

**Note: the existing Couderay Substation is being rebuilt in a nearby location and permitted in the Stone Lake – Couderay Project (PSC Docket No. 4220 CE 176). The new substation will be called Radisson. See Appendix B, Exhibit B-6 for a map showing the existing Couderay and future Radisson Substation locations. However, at the time of the filing, the Stone Lake – Couderay Project is pending PSCW approval, therefore, NSPW is calling this project Couderay – Osprey, but in reality, it may actually terminate at the Radisson Substation if the Stone Lake – Couderay Project is approved.*

D. PROJECT COST

The total Project cost is estimated to be $46,173,000. Estimated Project costs are set forth in greater detail in Section 2.1.7 of the TSD.

E. CONSTRUCTION SCHEDULE

While dependent on the date the CA and Utility Permits are granted, Project construction is expected to begin in December of 2012 and be in-service by December of 2015. NSPW expects to phase construction over a period of years to accommodate for outage availability and to utilize several winters of frozen conditions in wetland areas to minimize wetland impacts.

F. ENVIRONMENTAL IMPACTS

NSPW believes the Project is properly categorized as a Type III action pursuant to Wis. Admin. Code § PSC 4.10(2). The information necessary for preparation of an environmental assessment is provided in the TSD section of this Application. NSPW's Utility Permit Application is a combined Application to the PSCW and the WDNR. The information contained within this combined Application includes the detailed technical information required by the WDNR to determine if permits are needed for the Project.

G. ENTITIES AFFECTED BY THE PROJECT

Several state, regional, and local units of government are affected by the Project. Any required permits would be obtained prior to construction of the new facilities, as discussed in Section 2.9.3 of the TSD. Mailing lists in the prescribed format for potentially affected public, government officials, libraries, and other entities which may require project notification are provided in Appendix G.

H. PROPERTY OWNERS AFFECTED BY THE PROJECT

NSPW held an open house at the Ladysmith City Hall in Ladysmith, WI on September 14, 2011. Prior to holding the open house, NSPW sent informational mailings to elected officials in the project area and property owners within one-half mile of the existing line. Copies of correspondence and informational mailings sent by NSPW to the public within the Project area are included in Appendix F, Exhibit F-1. A mailing list of property owners located within one-half mile of the existing line is provided in Appendix G, List G-1. A mailing list of local officials located in the project area is in Appendix G, List G-2. Written comments received after the open houses are included in Appendix F, Exhibit F-2. See Section 2.2.4 for more information on public outreach and the open house.

I. COST OF OPERATION AND RELIABILITY OF SERVICE

NSPW believes the Project is the most appropriate means for meeting its obligation as a public utilitycharged with the obligation of providing reliable service. The proposed transmission facilities would support existing and accommodate future electric distribution facilities that are necessary to meet the growing electrical demand in the northern Wisconsin and Upper Peninsula of Michigan areas. When placed in operation, the proposed facilities would not result in annual costs disproportionate to the service value of the work performed or the quantity of available service.

J. CORRESPONDENCE AND PLEADINGS CONCERNING THIS APPLICATION ARE TO BE SENT TO:

Matthew J. McFarlane
Siting and Permitting
Xcel Energy
P.O. Box 8
Eau Claire, WI 54702-0008
(715) 737-1131
Matthew.J.McFarlane@xcelenergy.com

Mara N. Koeller
Associate Attorney
Xcel Energy
414 Nicollet Mall, 5th Floor
Minneapolis, MN 55401
(612) 215-4605
Mara.N.Koeller@xcelenergy.com

K. CONCLUSION

Based on the material contained, set forth, or adopted for inclusion in this combined Application, and any subsequent material submitted in response to a request by the PSCW, the WDNR or their respective staffs relative to this combined Application, NSPW requests that the PSCW grant a Certificate of Authority for the construction of the transmission facilities as described herein and in the manner specified herein. NSPW also requests that the WDNR grant any Utility Permits required for the Project as granted by the Commission.

Respectfully submitted this 15 day of May, 2012.

Mark E. Stoering
President and Chief Executive Officer
Northern States Power Company – Wisconsin

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2.1. ENGINEERING INFORMATION

2.1.1. Type and Location of Line Construction

Rebuild Routes (Existing ROW Sections)
Proposed Route
NSPW proposes to rebuild an existing single-circuit 69 kV transmission line on wood poles to a double-circuit 161/69 kV transmission line on self-supporting steel pole structures. The line would be rebuilt within NSPW's existing 100-foot ROW, except for four (4) Segments where additional ROW is needed (Segments 2B, 5B, 6B, 7B). The need for these new ROW areas is explained in Section 2.1.2. NSPW has existing easements with landowners along all four (4) new ROW Segments. NSPW plans to modify those easements to accommodate the additional ROW widths. A detailed Segment description of the line design and components is described below. A photo showing existing pole structures is provided in Appendix A, Exhibit A-3. A photo showing the proposed structure type options for Segments 1-8 is shown in Appendix A, Exhibits A-4 and A-5.

2.1.2. General Description

2.1.2.1. and 2.1.2.2. Size of Lines and Transmission Line Configuration
NSPW is proposing to construct self-supporting steel poles varying in heights of 65 to 110 above ground and approximately three to seven feet in diameter at the base. NSPW is proposing to use a double circuit davit arm configuration for tangent self-supporting steel pole structures. All steel structures will be constructed on concrete pier foundations.

The proposed Project route includes eight (8) existing line Segments (1-8) and four (4) new ROW Segments (2B, 5B, 6B, 7B) that are adjacent and parallel to existing line Segments 2, 5, 6, and 7. See the aerial map in Appendix A, Figure 5 for the location of Segments. A more detailed engineering description of all twelve (12) Segments is described below:

Segment 1 consists of new 0.04 mile tap of 161 kV and 69 kV lines into the future Radisson Substation located immediately south of Polish Road. The transmission line will be located on NSPW property assuming the Radisson Substation location is approved in the Stone Lake – Couderay Project.

The 69 kV transmission line of this segment will be supported by self-supporting, weathering steel dead-end structures, approximately 65-80 feet tall.

Two to three structures are anticipated to allow for connection to the 69 kV substation terminations from the double circuit line.

The 161 kV transmission line of this segment will utilize a 70 to 90-foot self-supporting, weathering steel davit arm dead-end structure to allow for the 161 kV substation terminations.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69 kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor, and one or two 3/8" extra high strength (EHS) 7-strand shield wires.

Segment 2 (Existing Alignment) consists of reconstruction of 9.08 miles of single-circuit 69 kV transmission line (W3472) to double-circuit 161/69 kV line. The existing line to be removed utilizes wood pole h-frame structures with span lengths of from 520 to 875 feet and structure heights from 44 to 66 feet above ground. The existing conductor is three phases of 4/0 ACSR, and the line is unshielded.

The new transmission lines will be supported by double circuit, self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

The transmission line segment will be located on existing and new easement and travel cross-country approximately two miles west and parallel to Hwy 40. The transmission line crosses the following roads from north to south: Cemetery, Hwy 48, Gadwell, Hwy C, and Taylor.

Segment 2B (Proposed ROW Expansion)
NSPW plans to acquire an additional 100 feet of ROW for a distance of 0.38 mile (2,000 feet) to cross beneath American Transmission Company's (ATC) Arrowhead – Weston 345 kV transmission line to switch from vertical to horizontal phase configuration for the purpose of maintaining required separation distances to ground and to the 345 kV line above.

The new transmission lines will be supported by single or double circuit, self-supporting, weathering steel h-frame structures, approximately 60-80 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor. Additional 3/8" extra high strength ("EHS") 7-strand shield wires may be added at the crossing beneath ATC's line for continuity of protection.

The ATC crossing location is also a possible location for phase transposition as necessary.

Segment 3 consists of reconstruction of 9.14 miles of single-circuit 69 kV line (W3472) to double-circuit 161/69 kV transmission line. The existing line to be removed utilizes wood pole h-frame structures with span lengths of from 540 to 800 feet and structure heights from 44 to 66 feet above ground. The existing conductor is three phases of 4/0 without shield wire.

The new transmission lines will be supported by double circuit self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three

phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

The transmission line will be located on existing easements and travel cross-country approximately two miles west and parallel to Hwy 40. The transmission line crosses the following roads from north to south: Hause, Hwy H, Blodgett, Imalone, Benner, and Edgewood.

Segment 4 consists of reconstruction of 1.4 miles of single-circuit 69 kV line (W3472) to double-circuit 161/69 kV transmission line. The existing line to be removed utilizes wood pole h-frame structures with span lengths of from 550 to 775 feet and structure heights from 48 to 70 feet above ground. The existing conductor is three phases of 4/0 ACSR, and the line is unshielded.

The new transmission lines will be supported by double circuit, self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

The transmission line will be located on existing easements and travel cross-country a few miles west and parallel to the Chippewa River. The transmission line crosses the following roads from north to south: Hwy 40 and Trails End

Segment 5 (Existing Alignment) consists of reconstruction of 0.47 mile of single-circuit 69 kV line (W3472 and W3474) to double-circuit 161/69 kV transmission line. The 69 kV circuit will connect in and out of the Trails End 69 kV Substation whereas the 161 kV circuit will bypass it. The existing line to be removed utilizes wood pole h-frame structures with span lengths of from 550 to 775 feet and structure heights from 48 to 70 feet above ground. The existing conductor is three phases of 4/0 ACSR, and the line is unshielded.

The new transmission lines will be supported by double circuit, self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

The transmission line will be located on existing easements and new easement (Segment 5B) and travel cross-country a short distance to where it connects to NSPW's Trails End 69 kV Substation.

Segment 5B (Proposed ROW Expansion) NSPW plans to acquire an additional 100 feet of ROW for a distance of 0.38 mile (2,000 feet) to bypass the 161 kV circuit north of the 69 kV Trails End Substation and to accommodate clearance to install the 69 kV in and out of the Trails End Substation.

The new transmission lines will be supported by double circuit, self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor. An additional 3/8" extra high strength ("EHS") 7-strand shield wire may be added at the substation slack spans for continuity of protection.

Segment 6 (Existing Alignment) consists of reconstruction of 12 miles of single-circuit 69 kV line (W3474) to double-circuit 161/69 kV transmission line. This Segment ends where the 69 kV transmission line to Dairyland Reservoir (W3476) meets W3474 and parallels this corridor to Big Falls Hydro. The

existing line to be removed utilizes wood pole h-frame structures with span lengths of from 420 to 800 feet and structure heights from 44 to 61 feet above ground. The existing conductor is three phases of 4/0 ACSR, and the line is unshielded.
The new transmission lines will be supported by double circuit self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

The transmission line will be located on existing easements and span the Chippewa and Thornapple Rivers at existing crossings. The transmission line crosses the following roads from west to east: Trails End, Thornapple, Polack, Sunfish Lake, Bell School, Hwy 27, Cemetary, Park Lake, and Mae West. This segment also crosses a railroad.

Segment 6B (Proposed ROW Expansion) NSPW plans to acquire an additional 100 feet of ROW for a distance of 0.38 mile (2,000 feet) to cross a second time beneath ATC's Arrowhead – Weston 345 kV transmission line to switch from vertical to horizontal phase configuration for the purpose of maintaining required separation distances to ground and to the 345 kV line above.

The new transmission lines will be supported by single or double circuit, self-supporting, weathering steel h-frame structures, approximately 60-80 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three

phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor. Additional 3/8" extra high strength ("EHS") 7-strand shield wires may be added at the crossing beneath ATC's line for continuity of protection.

The ATC crossing location is also a possible location for phase transposition as necessary.

Segment 7 (Existing Alignment) consists of reconstruction of 3.61 miles of single-circuit 69 kV line (W3472) to double-circuit 161/69 kV transmission line. The existing line to be removed utilizes wood pole h-frame structures with span lengths of from 400 to 710 feet and structure heights from 44 to 53 feet above ground. The existing conductor is three phases of 4/0 ACSR, and the line is unshielded.

The new transmission lines will be supported by double circuit, self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

The transmission line will be located on existing easements and travel cross-country to where it adjoins Flambeau Rd, a point at which the 69 kV and 161 kV circuits split. The transmission line only crosses Hwy I within this Segment

Segment 7B (Proposed ROW Expansion) NSPW plans to acquire an additional 50 feet of ROW width for a distance of 3.74 miles for the purpose of reliability of the line and safety of workers during line construction due to operating adjacent to two energized and paralleling 69 kV transmission lines.

The new transmission lines will be supported by double circuit, self-supporting, weathering steel davit arm structures, approximately 85-110 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical

or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor.

Segment 8 consists of reconstruction of 0.46 mile of single-circuit 69 kV line (W3472) and the construction of 0.46 mile of single-circuit 161 kV transmission line. The existing line to be removed utilizes wood pole h-frame structures with span lengths of from 410 to 630 feet and structure heights from 44 to 57 feet above ground. The existing conductor is three phases of 4/0 ACSR, and the line is unshielded except for at the Flambeau River crossing.

The new transmission lines will be supported by single circuit, self-supporting, weathering steel H-frame structures, approximately 65-85 feet tall. Both transmission line circuits will be insulated to 161 kV standards. Tangent and light angle structures will use polymer or glass suspension insulators in either a vertical or vee-string configuration. Heavy angle and dead end structures will use glass insulators.

The 161 kV circuit will utilize three phases of 795 kcmil 26/7 (Drake) ACSS conductor and two shield wires; one 3/8" extra high strength ("EHS") 7-strand wire and one fiber optic overhead ground wire. The 69kV line will utilize three phases of either 795 kcmil 26/7 (Drake) ACSS, or 477 kcmil 24/7 (Hawk) ACSR conductor and two 3/8" extra high strength ("EHS") 7-strand shield wires.

The 69 kV transmission line will be located on existing easement and travel a short distance cross-country to where it spans the Flambeau River and ultimately connects into the Big Falls Substation. The transmission line crosses Flambeau Rd within this Segment.

The 161 kV transmission line will be located on existing easement and travel a short distance cross-country to where it spans the Flambeau River and ultimately connects into the Osprey Substation.

2.1.3. Transmission Studies

As noted above, this project is on of a series of transmission line upgrades in northern Wisconsin and part of the Northern Wisconsin and Upper Michigan Load Serving Study. This Load Serving Study addresses the applicable requirements of Section 2.1.3.

2.1.3.1. System Normal

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.2. Single Contingencies

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.3. Alternative Transmission Network Solutions

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.3.1. Regional Studies

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.3.2. Reliability and Performance Benefits

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.4. Electrical Losses

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.5. Short Circuit, Stability and Thermal Analyses

Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.3.6. Distribution Substations, Need and Alternatives Considered

There are no new distribution-specific substations for the Project.

2.1.3.7. Data Input Files

The Data Input Files used in completion of Northern Wisconsin and Upper Michigan Load Serving Study will be provided on a DVD to PSCW staff.

2.1.4. Substation Facilities

The Project involves an expansion of the existing Osprey Substation located near the Big Falls Hydro facility to accommodate a new 161 kV transformer and bus configurations. In addition, there will be a small expansion of the existing Trails End Substation area to square of the existing oblong fence along Trails End Road and combine the two existing fenced areas into one.

The Substation location plan layout and a circuit diagram drawing are included in Appendix B.

2.1.5. Contractual Agreements

There are no contractual agreements established yet for this project.

2.1.6. Transmission Service Agreements

Not applicable. None of the proposed facilities included in the Project are being constructed pursuant to any specific transmission service request. Rather, the facilities are being proposed for local-region reliability needs.

2.1.7. Transmission and Substation Costs

NSPW believes the proposed Project is the most cost-effective means for NSPW to meet its obligation to provide reliable transmission service. When placed in operation, the proposed facilities would not result in annual costs disproportionate to the service value of the work performed or the quantity of available service.

2.1.7.1. –2.1.7.2. Segment and Route Cost Estimate

The table on the following page summarizes the total estimated project costs.

COUDERAY - OSPREY 161/69 kV TOTAL PROJECT COSTS	
Substation Costs	
Osprey (OPY) Substation	
Capital Costs	$6,160,000
Removal	$15,000
Salvage	$0
Operation and Maintenance	$0
Radisson (RAD) Substation	
Capital Costs	$1,795,000
Removal	$0
Salvage	$0
Operation and Maintenance (relay changes)	$10,000
Trails End (TRL) and Big Falls (BFA) Substations	
Capital Costs	$320,000
Removal	$42,000
Salvage	$0
Operation and Maintenance (relay changes)	$10,000
Substation Subtotal (Capital)	$8,275,000
Substation Subtotal (O&M)	$20,000
Transmission Line Costs	
RAD-OPY New 161 kV (35.5 mi)	
Capital Costs	$28,798,000
Removal	$0
Salvage	$0
Operation and Maintenance	$0
RAD-OPY Rebuild 69 kV (35.5 mi)	
Capital Costs	$6,213,000
Removal	$687,000
Salvage (credit)	$50,000
Operation and Maintenance	$0
Transmission Line Subtotal (Capital)	$35,648,000
Transmission Line Subtotal (O&M)	$0
Permitting and Land Rights Costs	
RAD-OPY Land Acquisition*	$2,035,000
Permitting	$215,000
Permitting and Land Rights Subtotal	$2,250,000
Project Capital Cost Summary	
Substation Subtotal	$8,275,000
Transmission Line Subtotal	$35,648,000
Permitting and Land Rights Subtotal	$2,250,000
Total Project Costs	**$46,173,000**

2.1.7.3. Projects for 345 kV or Greater:
Not Applicable.

2.1.7.4. Regional Cost Benefit Allocation Analysis
There will be no regional cost allocation with this project. The NSP rate payers will split costs between NSPW and Northern States Power Company – Minnesota, (approximately 15% : 85%) pursuant to the "Restated Agreement to Coordinate Planning and Operations and Interchange Power and Energy between Northern States Power Company (Minnesota) and Northern States Power Company (Wisconsin)" (the "Interchange Agreement"), on file with the Federal Energy Regulatory Commission.

2.1.7.5. Electrical Losses and Assumptions
Refer to the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1.

2.1.8. Construction Schedule and Constraints
While dependent on the date the CA and Utility Permit are granted, Project construction is expected to begin in December of 2012 and be phased over a period of 2-3 years to utilize winter construction and outage availability due to the length of the line. This project has a planned in-service date of December 2015.

2.1.9. Transmission Tariffs
NSPW provides transmission service in accordance with the Midwest Independent Transmission System Operator ("MISO") FERC-accepted Open Access Transmission, Energy and Operating Reserve Markets Tariff.

2.2. PROJECT DEVELOPMENT AND ALTERNATIVES

2.2.1. System and Local Level Alternatives

The Project is necessary to provide adequate and reliable transmission service to the study area and would support growing transmission needs in future years. The specific system and local alternatives investigated in the development of the Project are discussed in Section 2.1.3.3 (the Northern Wisconsin and Upper Michigan Load Serving Study, Appendix A, Exhibit A-1).

2.2.2. Route Evaluation Factors

Siting of new transmission lines is a multi-stage process consisting of:

1. Identifying potential route corridors between established end-points meeting the routing priorities defined in Wis. Stat. § 1.12(6). These priorities, consistent with economic and engineering considerations, reliability of the transmission system, and protection of the environment, include in order of priority:
   a. Existing utility corridors.
   b. Highway and railroad corridors.
   c. Recreational trails to the extent the facilities may be constructed below ground and do not significantly impact environmentally sensitive areas.
   d. New corridors.
2. Segmenting identified corridors into discrete segments and recombining to identify potential transmission line routes. Possible transmission line routes were screened against several criteria to determine the route alternatives to propose in this application. These criteria include, to the extent practical and applicable:
   • Avoiding high-density residential areas.
   • Conforming to existing and proposed land use patterns.
   • Using existing ROW to minimize the need for additional ROW (corridor sharing).
   • Avoiding public and private hunting grounds, woodlands, floodplains, and wetlands.
   • Maintaining compatibility with local agricultural practices.
   • Minimizing environmental impacts consistent with engineering and economic considerations.
   • Assessing the ability to meet identified or reasonably foreseeable future needs.
3. Soliciting input from local landowners and public officials during the planning and development process to identify local issues and concerns with potential transmission line corridors and routes.

4. Performing a multidisciplinary review and evaluation considering and balancing the quantitative as well as qualitative factors discussed above along with design, engineering, economic, and operational considerations, to identify two routes, preferred and alternate, for presentation to the PSCW.

2.2.3. Route Corridor Alternatives

The Project consists of rebuilding 35.5 miles of existing 69kV transmission line from NSPW's existing Couderay (future Radisson) – Trails End – Osprey Substations in Sawyer and Rusk Counties. The Project will be rebuilt on an existing 100-foot wide transmission line right-of-way (ROW). Four (4) new ROW Segments are proposed including 2B, 5B, 6B, and 7B.

NSPW presented one potential re-route option located northeast of Ladysmith where the existing line runs through a major wetland complex extending over 1 mile in length. The route would have followed east along Mae West Rd near several homes for a short distance then north paralleling an existing 69 kV transmission line corridor. However, after considering the overall new impacts to existing homes, landowners, trees, and agricultural areas versus temporary impacts during construction and future maintenance, NSPW determined the existing alignment to be the best option.

NSPW also analyzed many other highway and road corridors between the Couderay – Trails End – Osprey Substaions and determined the existing route corridor to be the best option.

Approximately 75 of 285 existing pole structures were identified to be within wetland. During final engineering design, NSPW anticipates spotting new poles outside of wetland to minimize future permanent impacts in areas where possible and practical.

2.2.4. Public Outreach

Public outreach activities for the Project consisted of one open house for property owners located within 0.5 mile of the Project and local officials. NSPW held the open house at the Ladysmith City Hall in Ladysmith, WI on September 14, 2011. Prior to hosting the open house, NSPW published a news release on September 14, 2011 in the Ladysmith News. The news release was also sent to WLDY Ladysmith, Ashland Current, and the Ashland Daily Press.

The purpose of the open house was to introduce the Project to the public, property owners, and local officials and answer questions. The NSPW project

team provided detailed aerial maps showing the entire project, including areas where new ROW is proposed. Other project information available included fact sheets, comment forms, electric brochures, and proposed structure photos.

Comments were solicited in mailings to the public, local officials and at the public open house – a few comments were received and are summarized in Appendix F, Exhibit F-2. A mailing list of property owners will be submitted on the PSCW's ERF system when the CA application is filed due to the high number of pages. A placeholder for this list is included in Appendix G, List G-1. A complete list of local officials is included on a single page in Appendix G, List G-1.

2.3. GENERAL TRANSMISSION LINE SITING INFORMATION

2.3.1. General Route Maps
Appendix A, Figures 1, 2

2.3.1.1. Topographic Map
Appendix A, Figure 6

2.3.1.2. Parcel Map
Appendix A, Figure 8

2.3.1.3. Street Map
Not applicable. The proposed route is located in a rural area.

2.3.2. Aerial Photographs
Appendix A, Figures 3, 5, 7, 8, 9, and 13 are shown on a 2010 aerial photograph.

2.3.3. Geographic Information Systems (GIS) Data
All Figures were created using ESRI ArcGIS 10.0.

2.3.3.1. General Route Maps
Appendix A, Figures 1, 2

2.3.3.2. Aerial Photographs
Aerial photographs submitted in this CA application are properly georeferenced.

2.3.3.3. GIS Shapefiles
Shapefiles will be made available to the PSCW Staff in pmf format.

2.3.4. Zoning

2.3.4.1 Zoning Map

Appendix A, Figure 7. At the time of application filing, zoning data for Rusk County is only partially available.

2.3.4.2. GIS Data

See Section 2.3.3.3 above.

2.3.5. Current/Planned Land Use

See Appendix A, Figure 10.

2.3.6. Floodplain Maps

Appendix A, Figure 9. FEMA floodplain maps are not currently available for Sawyer County.

2.4. DETAILED ROUTE INFORMATION

Proposed Route: The impacts resulting from the Project's actions of (1) removal of the existing 69 kV line and associated structures and (2) upgrade of the line to a 161/69 kV double circuit line and associated structures are discussed below.

2.4.1. General Route Impacts

Appendix A, Table 1 quantifies the new right-of-way impacts resulting from the Project's actions.

2.4.1.1. ROW Required, New ROW and Corridor Sharing

New ROW Segments 2B, 5B, 6B, and 7B are described in Section 2.1.2 and Appendix A, Table 1A.

2.4.1.2. Railroad, Transmission and Pipeline Corridors

The new right-of-way will not cross any major railroad, transmission or pipeline features.

The portion of the Project that will utilize existing rights-of-way crosses a Canadian National Railroad's line (formerly known as the Soo Line Railroad) twice. The Project crosses a right-of-way within which the Arrowhead – Weston 345 kV line and an Enbridge pipeline are co-located. The Project is also collocated with existing NSPW transmission line for approximately 4.1 miles of the route prior to entering the Osprey Substation.

2.4.1.3. Interstate or State Highways

The new right-of-way will not cross any major interstate or state highways.

The portion of the Project that will utilize existing rights-of-way crosses State Highway 27, as well as five different secondary state or county highways, one of which is crossed twice. In addition to highway crossings, there are 22 crossings of local roads along the route.

2.4.1.4. Route Segments Building Impacts

Appendix A, Table 1B provides building impacts by route segment for the new right-of-way.

2.4.1.4.1. Building Categories

The number of buildings (residences, apartments, schools, daycare centers, hospitals and commercial/industrial) were measured (using GIS) from the proposed transmission centerline and tallied by type within the following distances: 0-25 feet, 26-50 feet, 51-100 feet, 101-150 feet and 151-300 feet. There are no buildings within 300 feet of the new right-of-way as shown in Appendix A, Table 1B.

Appendix A, Table 4B provides residential counts for the existing rights-of-way to be affected by the Project.

2.4.1.4.1.1. Homes

There are no homes within 300 feet of the new right-of-way. Appendix A, Table 4B showing the number of homes within 300 feet of the existing rights-of-way to be affected by the Project.

2.4.1.4.1.2. Apartments

There are no apartments within 300 feet of the new right-of-way or of the existing rights-of-way to be affected by the Project.

2.4.1.4.1.3. Schools

There are no schools located within 300 feet of the new or existing right-of-way.

2.4.1.4.1.4. Daycare Centers

There are no known daycare centers located within 300 feet of the new or existing right-of-way.

2.4.1.4.1.5. Hospitals

There are no hospitals located within 300 feet of the new or existing right-of-way.

2.4.1.4.1.6. Commercial/Industrial

There are no commercial buildings within 300 feet of the new or existing right-of-way.

2.4.1.5 Changes to Existing Easements

NSPW has existing easements with all of the landowners along existing transmission line corridor. However, many of these landowners signed Clarification Agreements in the 1990s, which limited the easement for maintaining a 69 kV voltage. Therefore, NSPW will need to acquire all new

easements with these same landowners to specify the voltage upgrade from a single-circuit 69 kV line to a double-circuit 161/69 kV line. .

2.4.2. Impacts by Land Type

Appendix A, Table 2 provides total length and area of the right-of-way which passes through the following resource areas: cultivated crops, hay/pasture, developed low intensity, developed open space, deciduous forest, evergreen forest, mixed forest, shrub/scrub, emergent herbaceuous wetlands, herbaceuous, and woody wetlands from the 2006 US Department of Agriculture National Land Cover Dataset.

Appendix A, Table 4B provides a summary of land types along the existing rights-of-way to be affected by the Project.

2.4.3. Impacts by Land Ownership

Appendix A, Table 3 presents an assessment of land impacts by land ownership for the new right-of-way.

2.4.3.1. Table 3

See Appendix A, Table 3

2.4.3.1.1. Federal Land

There are no Federal lands located along the proposed route.

2.4.3.1.2. State Properties

The new right-of-way will not cross any state properties.

The portion of the Project that will utilize existing rights-of-way crosses the Weirgor Springs State Wildlife Area for 3,920 feet (0.74 miles) with a 100-foot right-of-way; however, because no new right-of-way is proposed in this portion of the Project (Segment 2), no additional land area within the wildlife area will be impacted by the Project's actions.

The Weirgor Springs State Wildlife Area is comprised of 2,243 acres within Sawyer County. The habitat present includes aspen, pine, northern hardwoods, lowland brush, marsh and waterbodies. The portion of the Project within the wildlife area is located within forest habitat. The Weirgor Springs Wildlife Area was designated in 1950's to protect the watershed and wildlife and aquatic resources. The forest habitat was designated to benefit wildlife resources while still producing renewable timber products.

2.4.3.1.2.1. Trail/Bike Path
There are no trails or bike paths crossed by the Project.

2.4.3.1.3. County-Owned Land
No county-owned land is crossed by the Project other than existing county road rights-of-way.

2.4.3.1.3.1. County Park
There are no county park lands crossed by the Project.

2.4.3.1.4. Village, City or Town
There are no village or city properties crossed by the Project.

The new right-of-way will not be located in or near municipal boundaries.

The Project does cross the following town areas: Radisson, Weirgor, Murry, Atlanta, Thornapple, Flambeau, Dewey, and a small portion of Big Falls. The Project is near the Village of Exeland, Village of Bruce, and the City of Ladysmith; however, the route does not cross the municipalities' boundaries.

2.4.3.1.4.1. Town Parks
There are no town parks crossed by the Project.

2.4.3.1.5. Tribal Lands
There are no tribal lands crossed by the Project.

2.4.4. Route Impact Summaries
See Table 4A for a route impact summary for new right-of-way and Table 4B for a route impact summary for existing right-of-way.

2.4.5. Agricultural Land
Impacts to agricultural land along the existing right-of-way include temporary construction easements. Refer to Appendix D, Exhibit D-4 for a response letter from DATCP indicating no Agricultural Impact Statement is needed for this project.

See Section 2.6.8.2 for impacts to agricultural land from substation construction and operation.

2.4.5.1. Type of Farming
Agricultural parcels affected by the proposed transmission line are primarily used for row crops, primarily corn (for grain and silage) and soybeans.

2.4.5.2. Practices Potentially Affected
The Project route will cause no long term impacts to agricultural practices land.

See Section 2.6.8.2 for potential impacts to agricultural practices from substation construction and operation.

2.4.5.3. Farmland Preservation Programs
No farmland preservation programs (i.e. Conservation Reserve Program) were identified along the Project's route.

2.4.5.4. Proximity to Farm Buildings
The new right-of-way will not be located in proximity to any existing farm buildings.

There are farm buildings associated with farm residences within 300 feet of the existing rights-of-way to be affected by the Project.

2.4.6. Forest Land
The new right-of-way segments include land identified as forest that will be cleared to accommodate route construction. The new right-of-way associated with Segment 2B includes 4.59 acres of deciduous forest, Segment 5B includes 2.01 acres of evergreen forest, Segment 6B includes 0.75 acres of deciduous forest, and Segment 7B includes 14.00 acres of deciduous forest. A total of approximately 19.44 acres of deciduous forest and 2.01 acres of evergreen forest will be cleared to accommodate the new right-of-way.

See Section 2.6.8.3 for impacts to forest land from substation construction and operation.

2.4.7. Conservation Easements
No conservation easements have been identified along the Project.

2.4.8. Endangered, Threatened, or Special Concern Species and Natural Communities
See Section 2.8.4.

2.4.9. Archaeological and Historic Resources

Data from the Wisconsin Historical Society – Division of Historical Preservation was obtained and reviewed, and is included in Appendix A, Figure 12.

2.4.10. Nearby Airports

The closest airports to the Project are the Rusk County Airport and the Northland Landing Field. NSPW met with airport staff in March 2012 and confirmed the existing and proposed structures are located outside of the airport height restriction zones and it does not have any future plans to expand runway strips. Existing ground elevations along the project route are at elevation 1,220 feet above sea level. The airport height limitation is at elevation 1,374 at this same location is a difference of 154 feet. The proposed structure heights will be approximately 50-60 feet below the limitation at this location. See Appendix A, Exhibit A-7 to view the airport limitation zoning map.

2.4.11. Access Issues

Access to transmission structure locations will be from existing town roads, farm fields, and private property. Access to the existing transmission structure locations is limited along portions of the line due to the remote location of the route. See Appendix A, Figure 5 for access routes.

2.4.12. Waterway Permitting Activities

NSPW's existing 69 kV transmission line spans 13 named waterways and 4 other unnamed waterways, see Appendix A, Table 5. Wis. Admin. Code § NR 103.04 affords special consideration to waterways in areas of Special Natural Resource Interest (ASNRI). As indicated in Appendix A, Table 5, nine of the waterways spanned or very near the Project route are considered ASNRI. See Section 2.3.13.1.1 for more information. The three larger waterways crossed by the Project are the Chippewa River, Thornapple River and Flambeau River. Due to natural stream meanders some waterways are spanned more than once. Waterways spanned by the Project from north to south include:

- Unnamed Stream (Segment 2)
- Little Weirgor Creek (Segment 2)
- Maple Creek (Segment 2)
- Swan Creek (Segment 2)
- Big Weirgor Creek (Segment 3)
- Unnamed Stream (Segment 3)
- Unnamed Stream (Segment 3)

- Clear Creek (Segment 3)
- Becky Creek (Segment 3)
- Unnamed Stream (Segment 4)
- Devils Creek (Segment 4)
- Chippewa River (Segment 6)
- Thornapple River (Segment 6)
- Tributary to Thornapple River (Segment 6)
- Twin Creek (Segment 6)
- Crooked Creek (Segment 7 and Segment 7B)
- Flambeau River (Segment 8)

All of these waterbodies are assumed navigable for the purposes of Chapter 30. See Chapter 30 permit application forms in Appendix E, Exhibit E-1. Construction equipment will not cross below the Ordinary High Water Mark (OHWM) of these streams or rivers during removal of existing structures nor placement of new structures. Construction access is identified in Appendix A, Figure 5. No temporary bridges are necessary for construction since all stream crossings are avoidable.

2.4.13. Wetlands and Wetland Crossings

Structure location in proximity to wetlands were identified along the Project and are labeled in Appendix A, Figure 5 and Table 5. There are 75 of 285 existing structures located within a wetland boundary along the Project. Timber mats will be used to cross approximately 7 miles of wetland areas to access structures during construction to minimize impacts to wetland soils and vegetation (See Appendix A, Figure 5 for mat locations). This includes accessing structures that are within wetland boundaries and crossing wetlands to access structures located in upland. Winter construction is also planned to minimize wetland impacts.

The several most common wetland types encountered along the Project are:

Wet and sedge meadow, sedges are the predominant plants including spike rushes (*Eleocharis*), bulrushes (*Scirpus*), nut sedges (*Cyperus*), rushes (*Juncus*), and grasses like blue-joint grass (*Calamagrostis canadensis*).

Conifer swamps dominated by balsam fir (*Abies balsamea*), spruces (*Picea* spp.), northern white cedar (*Thuja occidentalis*), and/or tamarack (*Larix laricina*) trees.

Shrub swamps including shrub carr communities dominated by willow (*Salix*) and/or dogwood (*Cornus*) shrubs with an understory typically comprised of various forbs, grasses, sedges, and ferns and alder thickets similar to shrub carr communities except that speckled alder is the dominant shrub.

Open bogs and coniferous bogs composed of sphagnum moss, sedges, cotton grass (*Eriophorum* spp.), labrador tea (*Ledum groenlandicum*), leatherleaf (*Chamaedaphne calyculata*). Coniferous bogs are similar to open bogs except that mature black spruce or tamarack trees are scattered and immature or exhibit stunted growth.

Calcareous fens, which contain unique calcium-tolerant plants, were not observed in the project area.

Wetland mats will be used to access existing and proposed structures that fall within a wetland boundary. Wetland mats will be used to remove the conductor and cut the structures at ground level. See Appendix E, Exhibit E-5 for photos of existing structures. Appendix A, Figure 5 shows the locations where wetland mats will be used during construction.

2.4.13.1. Wetland Verification

Wetland boundaries were field verified where accessible. Prior to field verification, the following desktop sources were consulted:

- Natural Resources Conservation Service (NRCS) excerpts from the county soil surveys where work is proposed;
- NRCS list of hydric soils for each county;
- Available topographic mapping and aerial photography for the area;
- The Wisconsin Wetland Inventory (WWI) mapping for the area; and
- Wisconsin DNR 24K Hydrography data.

These resources provided information regarding previously identified wetlands and areas that have a high likelihood of containing wetlands. Field verification took place in June 2011. Field determinations were limited to a visual observation of vegetation and surface hydrology conditions. No soil borings were conducted. The wetland/waterway boundary was documented with a GPS with submeter accuracy and a photo was taken to document preconstruction site conditions. These observations were made from publicly accessible roads and rights-of-way, as well as from private property when appropriate or allowed.

Due to the remote nature of certain portions of the Project and field conditions at the time of wetland verification, field access was limited in a few areas. Table 5 notes transmission structures presumed to be within wetlands that were not accessed on the ground during field surveys. Wetland boundaries were conservatively estimated by using WWI maps, soils data, and aerial photography in these areas.

2.4.13.1.1. Sensitive Wetlands and Areas of Special Natural Resource Interest

Wis. Admin. Code § NR 103.04 affords special consideration to wetlands in ASNRI. This designation includes those wetlands both within the boundary of designated ASNRI and those wetlands that are in proximity to, or have a direct hydrologic connection to, such designated areas. There are 24 structures in or adjacent to designated ASNRI areas according to the WDNR's Surface Data Viewer. The total permanent wetland impact for ASNRI wetlands is 0.025 acre.

- Structure 125 and 124 ASNRI Wetland associated with Little Weirgor Creek
- Structures 126 and 127 span ASNRI Chippewa River
- Structures 121 and 122 span ASNRI Thornapple River
- Structure 121 in ASNRI Wetland
- Structure 117 in ASNRI Wetland
- Structure 116 in ASNRI Wetland associated with Maple Creek
- Structure 107 in ASNRI Wetland associated with Swan Creek
- Structure 83 and 82 span ASNRI Big Weirgor Creek
- Structure 79 associated with ASNRI Big Weirgor Creek
- Structures 58 and 57 span ASNRI Clear Creek
- Structures 34 and 33 in ASNRI Wetland
- Structures 32, 31 and 30 span ASNRI Becky Creek
- Structures 9 and 8 span ASNRI unnamed waterbody
- Structures 7 and 6 span ASNRI Devils Creek
- Structure 1 to Osprey Substation spans ASNRI Flambeau River

2.4.14. Mapping Wetland and Waterway Crossings

Field verified wetlands along the Project are identified on a 2010 aerial photograph in Appendix A, Figure 5. No temporary stream crossings have been identified along the Project. A total of 75 existing wood pole structures are

located in wetlands within the Project area as described in Section 2.4.13 and shown on Appendix A, Figure 5.

2.5. CONSTRUCTION METHODS

2.5.1. General Construction Information

Construction would begin after state and local approvals are obtained, property and rights-of-way are acquired, soil conditions are established and final design is completed. The precise timing of construction would take into account various requirements that may be in place due to permit conditions, system loading issues and available workforce.

Actual construction would follow standard construction and mitigation practices that were developed from experience with past projects. Best management practices address right-of-way clearance, staging, removal and erecting transmission line structures and stringing transmission lines. Construction and mitigation practices to minimize impacts will be developed based on the proposed schedule for activities, permit requirements, prohibitions, maintenance guidelines, inspection procedures, terrain and other practices. In some cases these activities, such as schedules, are modified to minimize impacts to sensitive environments.

The following discussion is related to NSPW-specifications used in overhead transmission line construction. See Section 2.6.7 for additional discussion related to substation construction.

2.5.1.1. Type and Location of Structures

The project involves the removal of an existing single circuit 69 kV transmission line and existing structures to allow an upgrade of the system by installing a new double circuit 161/69 kV transmission line. The proposed upgraded transmission line description of structure types and span lengths are described in Section 2.1.2.

2.5.1.2. Existing Structures

The existing structures of the 69 kV single circuit line are wood h-frame type structures supporting the 4/0 ACSR conductor and shield wire. The existing conductor, shield wire and structures will be removed as part of this project. Structures will be cut off at the base in wetland areas.

2.5.1.3. Structure Placement

The double-circuit 161/ 69kV structures will be designed to support six (6) phases of conductor and two shield wires. The structures will not be designed to support distribution underbuild. The structures will be designed to provide clearance from conductor to ground of 24 feet or more. Greater clearance will be

provided at navigable waterways if required by the permit. Structures will be located within the easement to provide proper air gap to the conductor from the edge of the easement under all wind induced blowout and line tension conditions.

2.5.1.4. Concrete Foundation Type (size and depth)

All structures will be supported on a concrete foundation, which will require excavation. Anticipated concrete foundation sizes range from seven (7) to nine (9) feet in diameter by twenty-five (25) to thirty (30) feet deep depending on structure type, structural loads, and soil capacity.

2.5.1.5. Types of Machinery

Typical construction equipment used on a project consists of tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, cable tensioner, cable payout trailer and various other trailers. Many types of excavation equipment are set on wheel or track-driven vehicles.

2.5.1.6. Width of Construction Zone

Construction-related disturbance would be confined to the 100 feet right-of-way and along access routes. NSPW would utilize existing roads or right-of-way, and/or arrange access locations where roadways are not present. Any disturbance would likely occur in the areas immediately surrounding transmission line structures. In areas where access cannot be gained from existing roads, some disturbance along access routes from vehicular traffic may also occur. Likely disturbances in these areas may include clearing of vegetative cover, soil compaction, vehicular tracking, and some topsoil disturbance.

2.5.1.7. Staging Areas

Staging involves delivering the equipment and materials necessary to construct the new transmission line or substation facilities. The materials and equipment are stored at staging areas until they are needed for the Project. Staging areas will be determined prior to construction.

2.5.1.8. Construction Methods

If necessary, construction to remove the existing line and to upgrade the proposed line in environmentally sensitive areas may need to be scheduled for winter months to minimize ground disturbances.

2.5.1.8.1. Agricultural Lands

Agricultural lands are found along the route. NSPW will use general upland construction procedures as described in Construction Site Erosion and Storm Water Control Plan (Appendix B, Exhibit B-5). NSPW will use access routes to minimize impacts to agricultural land to the largest extent possible (e.g., utilizing field edges along roads). Landowners may be compensated for crop and other damages arising from construction activity consistent with the terms in the property easements.

2.5.1.8.2. Forest Lands

All tall-growing vegetation and brush within the right-of-way, except for exceptional or unique riparian areas, would be cleared to facilitate the safe and efficient construction, operation, and maintenance of the transmission line. A vegetated buffer would be used to preserve and protect riparian areas. Vegetation outside the riparian areas would be cut at or slightly above the ground surface. Root stocks would be left in place to regenerate after construction, except in areas where stump removal is necessary to facilitate the movement of construction vehicles along the right-of-way. Re-growth of tall-growing species under the transmission line would not be allowed.

The disposition of trees of commercial or other value would be negotiated with the landowner prior to the commencement of land clearing and included in the easement agreement. The only tree clearing associated with the Project will be for the new right-of-way areas.

2.5.1.8.3. Surface Waters and Wetlands

There are 75 existing wood pole structures in wetland as described in 2.4.13. All streams will be spanned and crossings avoided as described in Section 2.4.12 and 2.4.13.

2.5.2. Underground Construction Details

No underground transmission line construction is proposed for the Project. All proposed transmission lines will be above ground.

2.5.3. Stream/River Crossings

All existing pole structures to be removed and proposed structures to be installed will be accessed in a manner to avoid all stream crossings. There are no temporary bridge crossings proposed. There will not be any equipment operated below the OHWM of the streams listed in Section 2.4.12.

2.5.4. Wetland Crossings

The Project route crosses many large wetland complexes and several riparian wetlands. Temporary impacts to these wetlands will be minimized through the installation of wetland mats. These mats are 11 feet wide. Permanent wetland impacts will result from the installation of new steel pole structures and concrete structure foundations. Temporary and permanent wetland impacts are summarized in Appendix A, Table 5. Silt fences will be installed around structures in wetlands and areas with steep terrain.

2.5.4.1. Crossing Method

Wetland mats will be installed within the existing right-of-way to minimize wetland disturbance during structure placement and stringing of the conductor. Wetland impacts may be further minimized if done in the winter months, but will be based on application approvals and outage availability in these segments.

2.5.4.2. Cleaning of Machinery, Control of Invasive Species

The cleaning of machinery and control of invasive species would follow the requirements of Wis. Admin. Code NR 40. See Appendix A, Exhibit A-2 for the Invasive Species Report and Appendix A, Figure 5 for an aerial map showing their locations and proposed invasive species cleaning stations. Eight invasive species were identified along the Project. Seven of these were classified as "restrictive" in NR 40. One species (bird's-foot trefoil) is classified as "not-regulated". No "prohibited" invasive species were found.

2.5.4.3. Excavated Materials

A 7 to 9 foot auger drill will be used to excavate material for the placement of the proposed steel poles on concrete foundations. Equipment will be operating from wetland mats where necessary to minimize ground disturbance surrounding the excavated hole. All excess spoils (if any) will be hauled to an upland location.

2.5.4.4. Site De-watering and Fill Materials

It is expected that structures located in wetlands will require culvert foundations and de-watering may be necessary. The annular space between the culvert and drilled hole will require backfill soil to provide support of the culvert.

2.5.5. Re-vegetation

The need for and approach to site restoration and re-vegetation would be based on the degree of disturbance caused by construction activities and the ecological setting of each site, and need to reflect and satisfy the requirements of the

property owner. For instance, the property owner of an existing agricultural site may not wish for any re-vegetation, but may want careful replacement of topsoil. If construction can be accomplished without soil disturbance, re-vegetation may not be required. Restoration activities would be implemented following the completion of construction activities. These activities will begin as soon as practical and as allowed by weather conditions.

2.5.5.1. Re-vegetation and Site Restoration Plan

The particular ecological setting at any disturbed location will allow NSPW to identify the type of restoration and/or re-vegetation that may be appropriate. For example, if construction results in disturbance of a turf-grass sod area, the type of seed mix used for re-vegetation would be different than if the disturbance occurred in a wet meadow community. Native seed banks, especially resilient species of common grasses and shrubs, may facilitate re-vegetation in disturbed areas. Areas with significant soil compaction and disturbance from construction activities along the proposed transmission line corridors may require assistance in reestablishing the vegetation stratum.

2.5.5.2. Post-construction Monitoring

In cases where there is no sign of re-growth of pre-existing vegetation species in the first month of the subsequent growing season, an appropriate seed mix would be properly applied. NSPW would monitor the sites that were seeded to ensure growth occurs.

2.5.6. Erosion Control Plan

2.5.6.1. Transmission Line

2.5.6.1.1. Methods and Materials

The methods and materials to be used are addressed in the Erosion Control Plan (BMPs/Runoff Controls) Appendix B, Exhibit B-5.

2.5.6.1.2. Site Plan

Appendix B, Exhibit B-5 Erosion Control Plan, specifies applicable BMPs to be utilized to minimize erosion and sedimentation under appropriate circumstances.

2.5.6.1.3. Sequence

The sequence of major construction activities is described in Appendix B, Exhibit B-5.

2.5.6.1.4. Off-site Diversion Methods
NPW does not anticipate diverting water to install new poles. However, some de-watering may be necessary to install concrete foundations and these methods are included in the Erosion Control Plan in Appendix B-5.

2.5.6.2. The New Couderay/Radisson Substation

2.5.6.2.1. Methods and Materials
The methods and materials to be used for erosion control during construction of the Couderay/Radisson Substation are addressed in Appendix B-5.

2.5.6.2.2. Site Plan
Site plan for the Couderay/Radisson Substation is shown in Appendix B, Exhibit B-1.

2.5.6.2.3. Sequence
The sequence of major construction activities is described in Appendix B, Exhibit B-5.

2.5.6.2.4. Off-site Diversion Methods
Since NSPW does not plan on diverting any water flow, no off-site diversion methods are necessary.

2.5.6.3. Provisions for Inspection and Maintenance
See Section 9 in the Stormwater Plan, Appendix B, Exhibit B-5.

2.5.7. Materials Management Plan

2.5.7.1. Access Point Locations
NSPW has established access routes for the entire line when it was built in the 1950s and plans to use these same routes to rebuild this line. Existing access point locations are described in Section 2.4.11 and shown in Appendix A, Figure 5.

2.5.7.2. Haul Routes
See aerial maps Appendix A, Figure 5 for access routes.

2.5.7.3. Stockpile Areas
Stockpile areas are shown in the Stormwater Plan, Appendix B, Exhibit B-5.

2.5.7.4. Equipment Staging Areas

Equipment staging areas include the Couderay/Radisson Substation, Trails End Substation, and Osprey Substation. Additional laydown areas in fields between these substations may be required.

2.5.7.5. Field Screening Protocol for Contaminant Testing

A master services environmental contractor would be called into the field if color or odor causes NSPW to suspect contamination. The contractor would perform initial testing with portable analyzers. If contamination is present, the environmental contractor would excavate all visible traces and store the material until lab test results documented the type and amount of contamination present. Lastly, the contractor would properly dispose of the material based upon analyses results.

2.5.7.6. Estimated Types, Concentrations and Volumes of Contaminated Materials

There are no known contaminated materials on existing easements or fee-owned right-of-way.

2.5.7.7. Excavation Methods

Holes would also be augured for culvert foundations used for light duty steel poles in areas of weak soils or for poles with large structural loads. Large diameter holes would be augured for steel poles supported on concrete drilled pier foundations. For excavation methods of concrete foundations required for steel pole structures, see Construction Methods, Section 2.5.1.1. Excess excavated soils and excess concrete would be disposed as discussed in Sections 3.3 and 3.2, respectively, of the Erosion Control Plan included in Appendix B, Exhibit B-5.

2.5.7.8. Methods for Dewatering of Excavated Materials

Based upon the presence of large wetland complexes in the Project area, it is anticipated that free water will be encountered in lowland areas during foundation excavation. Methods of dewatering would occur as discussed in Section 2.1.3 of the Erosion Control Plan included in Appendix B, Exhibit B-5. Water would be discharged as discussed in Section 3.4 of the Erosion Control Plan. Standard Erosion Control practices would be implemented as discussed in Section 3.1 of the Erosion Control Plan.

2.5.7.9. Estimated Volumes (In-channel and Upland Excavated Materials)

Volume of excavated soil material estimated for steel poles on concrete drilled pier foundations is based upon a 7.0 foot diameter hole, 25 feet deep for tangent structures and 9.0 foot diameter hole, 30 feet deep for dead-end structures.

2.5.7.10. Estimated Volumes and Location of Re-used In-Channel and Upland Excavated Materials

Volume of excavated soil material estimated for steel poles on concrete drilled pier foundations is based upon a 7.0 foot diameter hole, 25 feet deep for tangent structures and 9.0 foot diameter hole, 30 feet deep for dead-end structures.

2.5.7.11. Off-site Disposal Plans for Contaminated Materials and Non-contaminated Materials

Total volumes of upland material excavation including volumes re-used at structure sites and volumes disposed off-site are estimated to be as follows for the proposed substations site and transmission line route (structures delineating segments are assumed to belong to the lower numbered segment):

	Section 2.5.7.9 Volumes Excavated		**Section 2.5.7.10 Volumes Re-used**		**Section 2.5.7.11 Volumes Disposed**	
Structure and Foundation Type	No. of Strs Excavated.	Est. Foun-dation Vol. per Str. [CY]	No. Strs. with Mat'l Re-used	Est. Vol. Re-used per Str. [CY]	No. Strs. Mat'l Dis-posed	Est. Vol. Dis-posed [CY]
Segment 1:						
Dead end steel pole w/concrete foundation	5	35	0	0	5	35
Segment 2 and 2B:						
Steel pole w/ concrete foundation	84	35	0	0	84	35
Segment 3:						
Steel pole w/ concrete foundation	81	35	0	0	81	35
Segment 4:						
Steel pole w/ concrete foundation	13	35	0	0	13	35

Segment 5 and 5B:						
Steel pole w/ concrete foundation	8	35	0	0	8	35
Segment 6 and 6B:						
Steel pole w/ concrete foundation	109	35	0	0	109	35
Segment 7 and 7B:						
Steel pole w/ concrete foundation	34	35	0	0	34	35
Segment 8:						
Steel pole w/ concrete foundation	11	35	0	0	11	35

2.5.8. Dewatering Plan

Further details about potential dewatering of foundation excavations are included in Section 2.1.3 and 3.4 of the Construction Site Erosion and Storm Water Control Plan, which is included as Appendix B, Exhibit B-5.

2.5.8.1. Dewatering/Diversion of Flow

Based upon the presence of large wetland complexes in the Project area, it is anticipated that free water will be encountered in lowland areas during foundation excavation. Methods of dewatering would occur as discussed in Erosion Control Plan Section 2.1.3. Water will be discharged as discussed in Erosion Control Plan Section 3.4. Standard Erosion Control practices would be implemented as discussed in Erosion Control Plan Section 3.1.

2.5.8.2. Downstream Impact Minimization

No stream impacts are expected from the Project. All runoff will infiltrate into area soils.

2.5.8.3. Analysis of Possible System Overload Scenarios

No stream impacts are expected with the Project, since all runoff will infiltrate into area soils.

2.5.8.4. Impacts of System Overload on Construction Activities and Water Quality

No stream impacts are expected from this Project.

2.5.8.5. Water Discharge Locations

Runoff water is expected to infiltrate into local area soils, as described in Section 3.4 of the Erosion Control Plan. There would be no water discharge to wetlands or waterways. As mentioned in Section 3.4, in sensitive areas where discharge of groundwater from foundation dewatering to the surrounding soils is not appropriate, the excavated material would be pumped or transported to a suitable

upland disposal area. Standard Erosion Control practices would be implemented as discussed in Erosion Control Plan Section 3.1.

2.5.8.6. Details of a Back-up System

If discharge water (dewatering) needs to be pumped rather than displaced by concrete pour or backfill installation, an electric pump and generator may be required. The back-up system would consist of a second pump and generator.

2.5.8.7. High Flow Plan

No stream impacts are expected from the Project. Runoff is expected to infiltrate into local area soils.

2.5.8.8. Contaminated Water

A master services environmental contractor would take samples, complete analyses, and treat the area as a contaminated spill area if analyses indicate contamination may reach surface or ground water.

2.6. SUBSTATION INFORMATION

2.6.1. Substation Layout

Radisson Substation –
The proposed Radisson substation would be constructed on the initial phase 1 series of projects between Stone Lake and Radisson substations (PSC Docket No. 4220-C-176). The initial Radisson substation will provide a 161kV transmission line to Stone Lake substation, three 69kV lines to Stone Lake, Stacik, and Big Falls substations and a 112MVA, 161-69kV transformer.

This project would expand the 161kV system at Radisson substation to install two 161kV breakers and bus to construct a three position 161kV ring bus. One position of the new 161kV ring bus would accommodate a new 161kV line termination for the associated 161kV line to Osprey substation. The other two positions would be for the 161kV line to Stone Lake substation and the 112MVA, 161-69kV transformer which would be installed in the initial project.

Trails End Substation-
Since a new 69kV breaker is installed at Radisson substation on the phase 1 series of projects between Stone Lake and Radisson, the 69kV breaker at Trails End substation is no longer required and will be removed. This project will install two motor operated 69kV switches to provide sectionalizing. The estimate will connect the two fenced area together to provide a common ground grid and to utilize the existing electrical equipment enclosure to accommodate the controls and DC power for the new motor operators.

Osprey Substation –
This project would expand the existing Osprey substation to accommodate a new 161kV Line termination, a 161kV breaker position, and a 161-115kV, 187MVA transformer. The project would remove the 115kV oil circuit breaker in position 5R84 and install two 115kV gas circuit breakers to expand the existing 4 position 115kV ring bus into a 5 position 115kV ring bus to accommodate connection of the new 187MVA transformer into the 115kV system.

The location and revised layout for the Osprey Substation is shown in Appendix B, Exhibit B-1 and B-3.

2.6.2 Size and Orientation

Radisson Substation -
The initial substation project to construct the proposed Radisson substation would provide an area of 325 feet x 415 feet (3.1 acres) for the fenced and graded area for the new substation. This would be adequate to accommodate the installation for the equipment in this project.

Trails End Substation -
The existing footprint changes include removing approximately 50 feet of existing fence and installing 75 feet of new fence along the east and southeast portions of the substation. The amount of new graded area will be approximately 30 feet x 45 feet (0.03 acres) and on NSPW-owned property.

Osprey Substation -
The existing substation fence will be expanded approximately 212 feet south of the existing Osprey substation to accommodate the substation expansion for this project. The new substation graded area would be approximately 331 feet x 212 feet (1.61 acres).

The location and revised layout for the Osprey Substation is shown in Appendix B, Exhibit B-1.

2.6.3. Landscaping
Any landscaping for the existing substations to be expanded would be in accordance with applicable local planning and zoning requirements.

2.6.4. Ownership and Topography
The property for Trails End and Osprey substations is owned by NSPW. There is adequate property on each site to accommodate the proposed substation expansions for this project.

The property for the proposed Radisson substation is privately owned and NSPW has negotiated an Option to Purchase from the landowner. See Appendix A, Figure 8 for ownership by tax parcel near the Radisson substation site. This property purchase is dependent on the approval of the Stone Lake – Couderay Project to construct the Radisson substation.

The Couderay/Radisson Substation location is shown on USGS base topographic maps in Appendix A, Figure 6. Appendix B, Exhibit B-1, shows preliminary elevation contours and the surrounding elevations.

2.6.5. Transmission Lines and Structures

The Couderay/Radisson Substation would include equipment for two (2) 161 kV line terminations and four (4) 69 kV line terminations as described in Section 2.6.1.

2.6.6. Access Roads

An access road exists from Polish Road to the proposed Couderay/Radisson Substation, but will need to be upgraded in order to meet the standards. This will occur during Phase I of the Stone Lake – Couderay/Radisson Project. The standard substation road access is twenty (20) feet wide with a fifty (50) foot turn radius to accommodate substation access for large equipment to perform maintenance and emergency replacements. A parking area outside the substation fence would be provided for maintenance and operational purposes.

2.6.7. Construction Procedures

Couderay/Radisson Substation – The construction sequence would begin by installing silt fence around the perimeter of the site and constructing a stone tracking pad at the entrance to the site. The site would then be cleared and a minimum twelve (12) inches of topsoil containing organic materials would be stripped. The site would then be graded to rough grade elevation utilizing onsite common fill and Class 5 gravel to create the substation pad area. The site would be sloped for drainage. The depth of the Class 5 material would be a minimum of twelve (12) inches (1,600 cubic yards) and the graded area would be surfaced with four (4) inches of crushed rock (550 cubic yards). All disturbed areas outside of the substation pad perimeter would be seeded and mulched. A permanent wet sedimentation basin would be included in the design.

Construction procedures would be in accordance with any local permit requirements. Appropriate erosion and storm water control measures as described in the Storm Water and Erosion Control Plan will be utilized.

2.6.8. Environmental Information

Environmental impacts for the Couderay/Radisson Substation site and expansion of the Osprey Substation site are discussed in Sections 2.6.8.1 through 2.6.8.7.

2.6.8.1. Land Use and Zoning

Based upon a review of recent aerial photograph and field verification, the current land use at the Couderay/Radisson Substation site is agricultural land, mixed forest, and forested wetland. The site is currently zoned agricultural.

Based upon a review of recent aerial photograph and field verification, the current land use for the expanded Osprey Substation site is undeveloped land, developed roadways, and mixed forest. Zoning data is currently unavailable for the site.

2.6.8.2. Impacts to Agriculture

Approximately 1.1 acres of agricultural land is expected to be permanently disturbed to construct the Couderay/Radisson Substation. No agricultural land will be disturbed to construct the Osprey Substation expansion.

2.6.8.3. Impacts to Forest Lands

Approximately 1.4 acres of mixed forest will be removed to construct Couderay/Radisson Substation. See Section 2.6.8.7 for impacts to forested wetlands from the construction of the Couderay/Radisson Substation.

Approximately 0.5 acres of mixed forest will be removed to construct the Osprey Substation expansion.

2.6.8.4. Endangered, Threatened, and Special Concern Species

Endangered, Threatened, and Special Concern plants and animals, or valuable natural communities are discussed in Section 2.4.8.

2.6.8.5. Archeological and Historic Resources

Refer to Section 2.4.9 for information on Archeological and Historic resources in the Project area and Appendix A, Figure 12 for a map presenting known archeological and historic resources. There are no known archeological or historical resources identified on, or close to the proposed Couderay/Radisson Substation site or the Osprey Substation expansion.

2.6.8.6. Waterways

Section 21 Creek and the Couderay River are the nearest waterbodies to the Couderay/Radisson Substation. The nearest point on Section 21 Creek to the Couderay/Radisson Substation site is approximately 1,150 feet northwest. The nearest point on the Couderay River to the Couderay/Radisson Substation site is approximately 2,900 feet north.

The Flambeau River is the nearest waterbody to the Osprey Substation. The Flambeau River is located approximately 400 feet north of the Osprey Substation.

See Appendix A, Figure 5 for the location of these waterbodies in proximity to the Couderay/Radisson Substation and Osprey Substation.

No negative adverse impacts are expected to these waterways by the development of the Couderay/Radisson Substation or the expansion of the Osprey Substation.

2.6.8.7. Wetlands

Based on WWI maps the Couderay/Radisson Substation will permanently impact 0.37 acres of wetland.

2.7. ELECTRIC AND MAGNETIC FIELDS (EMF)

2.7.1. Transmission Line EMF

2.7.1.1. – 2.7.1.2. Transmission Lines

A summary of the electric and magnetic field calculations for proposed line are found in Appendix C, Tables 1-6. Structure type drawings for the proposed lines are found in Appendix C, Figures 1-5. A cross-reference table linking EMF calculations to their corresponding structure type drawing is found in Appendix C, Exhibit C-1.

The strength of the electric field, defined as the Electric Field Intensity, is measured in kilovolts per meter (kV/m) and is dependent on the charge of the object (a transmission line in this case) creating the field. The charge at ground level is strongly influenced by the system voltage level. The nominal voltages of the lines being constructed by the proposed Project are 161kV and 69 kV. The electric fields in Appendix C, Tables 1-2 were calculated using the maximum operating voltage, which is assumed to be 105% of the nominal voltage. For any specific design, the height of the set of phase conductors above ground has a marked influence on the maximum electric field.

Magnetic Field Density is measured in milliGauss (mG) and is used to describe the magnetic field generated by current flowing in the conductors of transmission lines. Magnetic field calculations for the proposed lines in Appendix C, Tables 3-4 are based on the summer peak and average (80% peak load) current flows projected for the planned in service year of the final component (2017) and five (5) years following (2017) under normal system conditions.

The values presented in the table are calculated at the low point (typically midspan) of the transmission line where the conductor is closest to the ground. Vertical clearance measurements are based on NSPW minimum design clearances (more conservative than NESC Section 23 requirements) at the highest conductor operating temperature.

There is no federal standard for transmission line electric fields. However, the Minnesota Environmental Quality Board (MEQB) has imposed a maximum electric field limit of 8 kV/meter measured at one meter above the ground. The standard was designed to prevent serious hazard from shocks when touching large objects parked under alternating current (AC) transmission lines of 500 kV

or greater. The maximum electric field, measured at one meter above ground, associated with the Project is calculated to be 1.34 kV/m, as shown in Appendix C, Table 2).
The maximum magnetic field, measured at one meter above ground, associated with the Project is calculated to be 18.69 mG as shown in Appendix C Table 3

Electric and Magnetic field effects on transmission lines presented in Appendix C, Tables 1-4 are obtained from 'ENVIRO', a software program, licensed by Electric Power Research Institute, Inc. ("EPRI").

2.7.2. Existing Substations

This project involves line terminations within the following three substations: Couderay/Radisson, Trails End, and Osprey. There will be no change to the electric and magnetic fields due to the proposed substation changes.

2.7.3. New Power Plants (requiring no line additions)

Not applicable. No new power plants are involved with the Project.

2.7.4. Stray Voltage (NEV)

Neutral to earth voltage ("NEV"), also referred to as stray voltage, is a condition that can occur on the electric service entrances from distribution lines. Stray voltage exists when there is small 0.5 voltage difference between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors.

Transmission lines do not create stray voltage because they do not connect to businesses or residences. However, in some circumstances transmission lines can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. NSPW staff considers and analyzes the potential for this phenomenon to occur on its transmission line projects.

A screening for any confined animal operation ("CAO") within one-half mile of the proposed Project as well as a determination if any distribution lines are located within a short distance (150 feet or less) from the transmission line is conducted.

In preparing this application, NSPW conducted an NEV assessment that included identifying possible CAO and identifying impacted distribution lines. One commercial agriculture business with confined livestock was identified near Mae West Road and Co Hwy J. At the time of the letter sent to Mr. Mark Cook,

Appendix D, Exhibit D-2, NSPW was still in the process of analyzing reroute options near Mae West Road. However, NSPW decided to eliminate a reroute along Mae West and NEV is no longer a concern.

2.8. WDNR PERMITS AND APPROVALS

WDNR permits may be required for various Project components, in particular a WPDES general permit under Wis. Stats. Ch. 283 and Wis. Admin. Code Ch. NR 216 for storm water management and erosion control for the proposed Couderay/Radisson Substation and the expansion of the Osprey Substation.

See Appendix E, Exhibits E-1 for the joint WQC permit application being submitted to the WDNR and USACE as part of this CA application.

2.8.1. Waterways and Wetlands

No Wis. Admin. Code CH 30 permits are anticipated for the Project since there are no stream crossings. Construction equipment will not cross below the Ordinary High Water Mark (OHWM) of these streams or rivers during removal of existing structures nor placement of new structures.

See Section 2.5.4; Appendix A, Figure 5; and Appendix A, Table 5 for more details on wetlands impacted by this Project.

2.8.2. Wetlands Alternatives Analysis

2.8.2.1. Wetlands Factored into the Corridor and Route Selection

The area of the state in which the Project occurs is characterized by large wetland complexes. The Project is a rebuild and is within a previously cleared and disturbed ROW. Environmental and social impacts along with engineering feasibility and cost were evaluated in the substation site and route alternative analysis. Site and route selection were based on a balancing of factors including consideration of proximity to existing right-of-way, residences, topography, soil conditions, zoning, accessibility, transmission line access, and presence of wetlands and other important natural resource features. Further discussion of this initial evaluation is included in Sections 2.2.2 and 2.2.3. Also see Appendix E, Exhibit E-1 for the WQC practicable alternatives analysis.

2.8.2.2. Wetland Avoidance and Minimization

The Project is a rebuild and is within a previously cleared and disturbed ROW. This proposed route routing was chosen to minimize new wetland impacts, follow existing ROW, impact fewer homes, and maintain customer reliability. See Section 2.4.13 for specific details on wetland avoidance and minimization. Also see Appendix E, Exhibit E-1 for the WQC practicable alternatives analysis.

2.8.2.3. Construction and Restoration

The use of heavy equipment in wetlands will be operated on wetland mats to minimize disturbance. The use of low impact vehicles and frozen conditions will be utilized to the extent practicable. Upon completion of the Project, NSPW will complete site restoration and re-vegetation in the manner described in Section 2.5.5.

2.8.3. Storm Water Management

Authorization for Storm Water Discharges Associated with Land Disturbing Construction Activities (Wis. Admin. Code Ch. NR 216) will be required as ground disturbance will exceed one (1) acre for the grading of the Couderay/Radisson Substation, expansion of the Osprey Substation, and associated transmission line construction. Information required under NR 216 is addressed in Appendix B, Exhibit B-5 Construction Site Erosion and Storm Water Control Plan.

2.8.4. Endangered/Threatened Species Incidental Take

Information concerning the presence of rare species (threatened, endangered, or special concern species) in areas near the proposed line route was obtained through review of the Wisconsin Natural Heritage Inventory ("NHI") database by a qualified biologist with NHI screening training. Information contained in the NHI database identified previously reported rare plant and animal species located within a one (1) and two (2) mile search surrounding the proposed transmission line rebuild.

NSPW reviewed habitat requirements of these species and compared them to habitat observed along the existing and proposed routes and substation locations. National Heritage Inventory results for the two (2) mile search area are provided in Appendix A, Figure 13 (CONFIDENTIAL). The following is a list of species identified within the 2 mile NHI buffer and their habitat requirements.

Purple Wartyback (*Cyclonaias tuberculata*) – The purple wartyback, a freshwater mussel, is listed as endangered in Wisconsin. The shell is brown or black in color with a sub-rectangular shape. The surface of the shell is covered with elongated pustules and the nacre is purple in color. The species can grow to 5 inches in length. Suitable habitat consists of medium-sized rivers containing areas with a depth up to five feet of slow to moderate currents. The purple wartyback is located in stable, rocky substrate layered with gravel, cobble or sand. The species will also attach to hosts such as the bullhead and catfish species.

The Project will cross the Chippewa River in Rusk County where known occurrences of the purple wartyback have been identified by NHI data. The Project will traverse the Chippewa River with an aerial span and no in-water work will be required. Additionally NSPW will implement best management practices during construction to prevent the release of sediment into the river. The Project will have no effect on the purple wartyback or its habitat. No surveys were recommended for the purple wartyback.

Blanding's Turtle (*Emydoidea blandingii*) – The Blanding's turtle is listed as a threatened species in Wisconsin. This semi-terrestrial species is a medium-sized turtle with an elongated and high domed carapace. The Blanding's turtle has a dark, brown or black head with yellow markings. Adults have a bright, yellow chin used as a key identification feature. Suitable habitat consist of marshes, shallow bays of lakes with dense vegetation (emergent and submergent) present, slow current streams, oxbows or any backwater of rivers, and drainage ditches within wetlands. Sedge or wet meadows are often adjacent to the above habitats. Blanding's turtle are active from early March to mid-October and overwinter in standing water over three feet deep. The species will hibernate in organic substrate in both warm and cold water streams. Nesting season is dependent on spring temperatures; however, nesting usually occurs from mid-May through June. Blanding's turtle hatchlings often emerge from early August through September; however, the hatchlings may also overwinter in the nest.

The Project follows an existing right-of-way at all wetland and waterbody crossings. The Blanding's turtle occurrence identified by the NHI data is outside the one mile buffer. The location of the new pole structures will be strategically placed to limit the impact to wetlands. Additionally NSPW will implement best management practices during construction to prevent the release of sediment into wetlands and waterbodies. Field surveys for Blanding's turtle habitat were conducted in conjuction with wetland surveys. No suitable habitat was found. The Project will have no effect on the Blanding's turtle or its habitat. No further surveys are recommended for the Blanding's turtle.

Pygmy Snaketail (*Ophiogomphus howei*) – The pygmy snaketail is listed as threatened in Wisconsin. This dragonfly species grow to approximately 1.2 to 1.3 inches in length. The body is an olive-green with brown stripes and a black abdomen with yellow markings. The pygmy snaketail prefers clean water in largely forested watersheds. The species is associated with fast current, streams with high water quality and a substrate consisting of gravel or sand. The larvae burrow in clean gravel and sand substrates in deep waters. Adults forage and rest

on the underside of the forest canopy and have a flight period from late May through June.

The Project will cross the Chippewa River in Rusk County where known occurrences of the pygmy snaketail have been identified by NHI data. Limited tree removal and alteration to existing habitat will be needed since the corridor has already been cleared and maintained for the existing transmission lines. The Project will traverse the Chippewa River with an aerial span. Additionally NSPW will implement best management practices during construction to prevent the release of sediment into the river. The Project will have no effect on the pygmy snaketail or its habitat. No surveys were recommended for the pygmy snaketail.

Saint Croix Snaketail (*Ophiogomphus susbehcha*) – The Saint Croix snaketail is listed as endangered in Wisconsin. This dragonfly species has a color pattern and shape of the terminal appendages which make identification easy. The Saint Croix snaketail prefers clean water in larger forested watersheds. The species is associated with large streams with fast currents with high water quality and a substrate consisting of cobble, gravel and sand. The larvae burrow in deep water. Adults forage above the forest canopy. The species can be occasionally located in bushes or fields adjacent to streams. The flight period is mid-May through June.

The Project will cross the Chippewa River in Rusk County where known occurrences of the Saint Croix snaketail have been identified by NHI data. Limited tree removal and alteration to existing habitat will be needed since the corridor has already been cleared and maintained for the existing transmission lines. The Project will traverse the Chippewa River with an aerial span. Additionally NSPW will implement best management practices during construction to prevent the release of sediment into the river. The Project will have no effect on the Saint Croix snaketail or its habitat. No surveys were recommended for the Saint Croix snaketail.

Gilt Darter (*Percina evides*) – The gilt darter is a fish listed as threatened in Wisconsin. The species can be identified by bright reds and blues on the stout-body and five to eight dark saddle located above the lateral blotches. The back of the body is an olive blue. The species can grow to 2.6 inches in length. The gilt darter prefers medium to large streams with moderate to fast, deep riffles and pools present. The substrate preference is a silt-free with gravel, cobble, and small boulders present. The larger, colorful males are associated with deep water with cobble and boulder substrate. The females and smaller males are often

adjacent to this larger males' habitat. Spawning occurs from late May to mid-June. The gilt darter males are territorial and die after spawning occurs. The species primary diet consists of caddisfly larvae, diptera larvae and mayfly nymphs.

The Project will cross the Chippewa River in Rusk County where known occurrences of the gilt darter have been identified by NHI data. The Project will traverse the Chippewa River with an aerial span and no in-water work will be required. Additionally NSPW will implement best management practices during construction to prevent the release of sediment into the river. The Project will have no effect on the gilt darter or its habitat. No surveys were recommended for the gilt darter.

Bullhead (*Plethobasus cyphyus*) – The bullhead mussel is listed as endangered in Wisconsin. The bullhead has an elongated heavy, brown shell with radial knobs on the disc. The epidermis has a yellow to brown coloration in the smaller shells and dark, brown in older shells. Both the pseudocardinal and lateral teeth are heavy. The nacre is white in color. The species can grow to 5 inches in length. The bullhead prefers large rivers with a fast current. The species lives on stable mud, sand, or gravel substrate at one to two meters in depth. The Suager (*Stizostedion canadense*) is the host fish for the bullhead. Between May through July the bullhead are gravid and/or infesting fish.

The Project will cross the Chippewa River in Rusk County where known occurrences of the bullhead have been identified by NHI data. The Project will traverse the Chippewa River with an aerial span and no in-water work will be required. Additionally NSPW will implement best management practices during construction to prevent the release of sediment into the river. The Project will have no effect on the bullhead or the suager (the host fish) or its habitat. No surveys were recommended for the bullhead.

Wood Turtle (*Glyptemys insculpta*) – The wood turtle is listed as a threatened in Wisconsin. This medium-sized turtle species has a dull, brown carapace and a yellow plastron. Wood turtles are located in lowland hardwood forests and open, wet meadows associated with moderate to fast current rivers with sand or gravel substrates. During the summer, the species will often forage in upland deciduous mesic forests or open meadows. Wood turtles reach sexual maturity between 10 to 14 years of age. The species nest in groups throughout their active season. Nesting sites vary from sandy soils adjacent to rivers, roadsides, fields, and meadows. Areas adjacent to rivers containing alder are considered

critical habitat for hatchlings and juveniles. The wood turtle will hibernate in banks, bottoms of streams and rivers, or large community burrows.

The Project's footprint is small in areas that may contain wood turtle habitat. The Thornapple and Couderay Rivers are crossed by the project and both rivers have documented occurrences of the wood turtle. NSPW plans to conduct preconstruction surveys for wood turtles near the crossings of the Thornapple and Couderay River to establish designated wood turtle habitat protection zones. The probability of encountering wood turtles at these stream crossing is low, since the nearest record is one mile away from the Project corridor. When working in designated turtle habitat protection zones mitigation measures to avoid or minimize impacts to turtles will be implemented.

Bald Eagle (*Haliaeetus leucocephalus*) – The bald eagle is federally protected under the Bald and Golden Eagle Protection Act. The bald eagle has a white head and a wingspan of seven feet. The species suitable habitat consist of large trees in isolated forests in close proximity to large water surface areas, complexes of deciduous forests, coniferous forest, wetland, and shrub communities. Nesting sites often are located in tall pines with large lakes or rivers nearby. The bald eagle's breeding season is from February through August.
The Project transverses near six areas identified by NHI data as bald eagle locations. Two of those are within 660 feet of the route. Correspondence with the DNR regarding these nest locations took place prior to field survey. It was confirmed that these NHI nest locations are no longer present based on spring 2011 fly-over surveys conducted by the DNR.

NSPW will follow U.S. Fish and Wildlife Service management guidelines specified for bald eagles. NSPW will consult with the WDNR prior to construction to determine if any new bald eagle nests have been established and to ensure that appropriate avoidance measures are implemented. These measures may include timing and distance restrictions depending on Project activities.

Osprey (*Pandion haliatus*) – The osprey is listed as special concern in Wisconsin. Osprey prefer large trees in isolated areas in proximity to large areas of surface water, large complexes of deciduous forest, coniferous forest, wetland, and shrub communities. Large lakes and rivers with nearby tall pine trees are preferred for nesting. The breeding season extends from late April through August.

During field survey an occupied osprey nest was identified on Pole 134. NSPW plans to relocate this nest onto a stand alone structure within the ROW to allow the osprey to continue to nest in this same general location and at a safe distance away from the line. Relocation will take place prior to construction and outside of the breeding and nesting season.

Conclusion

Based on the NHI results, field surveys conducted in 2011, preconstruction surveys planned for the wood turtle, and avoidance measures discussed above, no incidental take permits are expected to be required for the Project.

2.9. OTHER AGENCY CORRESPONDENCE

2.9.1. NSPW Correspondence

Copies of NSPW correspondence with other governmental agencies are included in Appendix D.

2.9.2. Agency Responses

2.9.2.1. Wisconsin Department of Transportation (Highways and Aeronautics)

The existing line crosses Hwy 27 and NSPW will coordinate with WDOT prior to construction.

2.9.2.2. Department of Agriculture, Trade and Consumer Protection (DATCP)

DATCP has determined that an agricultural impact statement will be necessary for the Project. See DATCP review and NSPW's AIS application in Appendix D, Exhibits D-1 and D-4.

2.9.2.3. Wisconsin Historical Society

NSPW acquired the GIS shapefile subscription for the Wisconsin Historic Preservation Database from the Wisconsin Historical Society and used this data for the archeological and historical sections in this CA application. See Appendix A, Figure 12.

2.9.2.4. Township

NSPW invited all local townships to the open house and none attended nor commented on the project.

2.9.3. Permits

2.9.3.1 Permits for CPCN Applications

Not applicable because this project is a Certificate of Authority, not a Certificate of Public Convenience and Necessity.

2.9.3.2 Local Zoning Permits

Local zoning authorizations may be required for the construction of the proposed Couderay/Radisson Substation and expansion of the existing Osprey Substation. NSPW has informed the Rusk and Sawyer County Zoning

Departments of the Project. The Zoning Departments indicated a land use permit may be required for the Project.

2.9.3.3. Federal Permits

A joint waterway and wetland application was submitted to the WDNR and U.S. Army Corps of Engineers (USACE) as part of this application. The USACE will make a determination as to whether a federal waterway and wetland permit will be required for the Project.

2.9.3.4. Other Permits

Other permits that may be required include:

1. WDOT road crossings, construction in ROW, construction across state roads and oversize loads;
2. Wisconsin Historical Society approval of archeological surveys, if required.

2.10. PROPERTY OWNER INFORMATION

2.10.1. Alphabetized Lists

Mailing lists of all affected (and nearby) private and public property owners are located in Appendix G, List G-1. Additionally, mailing lists for public officials including town and county clerks, government agencies, local media and library are provided in Appendix G, List G-2.